ABB MEASUREMENT & ANALYTICS | DATA SHEET

TTF300, NINVA™ TTF300-N

Field-mount temperature transmitter

Measurement made easy

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

Reliable temperature measurement for the highest demands

- High accuracy, reliability and durability
- Specific sensor linearization via Callendar-Van Dusen coefficients and with value pair table (32 points)
- Suited for use in harsh environments from −50 °C (−58 °F)

Input circuit and communication

- Two universal sensor inputs for resistance thermometers (e.g. 2 x Pt100 in three-wire circuit) and thermocouples
- 4 to 20 mA, HART, PROFIBUS PA, FOUNDATION Fieldbus

Safety

- Global approvals for explosion protection up to Zone 0
- Functional safety SIL 2 / SIL 3 in accordance with IEC 61508 (HART)
- Device versioning in accordance with NE 53
- Monitoring of the 4 to 20 mA loop current
- Wire break / corrosion monitoring in accordance with NE 89
- Sensor drift monitoring
- Device status signaling and freely configurable diagnostic categorization with diagnostic history according to NE 107

Configuration and tracking

- Supports FDI, EDD, and DTM standard
- Event monitor for the logging of critical events
- Configuration monitor for configuration changes
- Turnable LCD indicator with operating buttons (optional)

Specification

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

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

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 t90
400 to 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 to 100 s

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

Housing material
- Die-cast aluminum, epoxy coated, color: gray RAL9002
- Stainless steel, AISI 316L (1.4404)

Casting compound used for the device electronics
- Polyurethane (PUR)

Installation conditions
Mounting position: no restrictions

Electrical connection
- Thread (selectable) 2 × M20 × 1.5 / 2 × ½ in NPT / 2 × ¾ in NPT (using reducing piece),
- Ground screw external 6 mm^2, M5 internal 2 × 2.5 mm^2, M4 terminals for lines up to 2.5 mm^2 and handheld terminal interface

Plastic cable gland 2 × M20 1.5:
- Cable outside diameter 6 to 12 mm (0.24 to 0.47 in), Ex: 5 to 10 mm (0.2 to 0.39 in)
- Temperature range −30 to 80 °C (−22 to 176 °F), Ex: −20 to 80 °C (−4 to 176 °F)
- For Non-Ex: Polyamide gray
- For intrinsically safe design, intrinsic safety, non-incendive and dust-explosion protection: Polyamide blue

Metal cable gland (2 × M20 x 1.5 / 2 × ½ in NPT):
- Flameproof (enclosure), explosionproof
- Cable outside diameter 3.2 to 8.7 mm (0.13 to 0.34 in)
- Temperature range: −50 to 85 °C (−58 to 185 °F)
- Additional cable outside diameters: upon request

Dimensions
Refer to **Dimensions** on page 18.

Ambient conditions

Ambient temperature
- Standard: −40 to 85 °C (−40 to 185 °F)
- Optional: −50 to 85 °C (−58 to 185 °F)
- Limited temperature range for use in potentially explosive atmospheres: see relevant certificate

Transport / storage temperature
−50 to 85 °C (−58 to 185 °F)

Climate class in accordance with DIN EN 60654-1
Cx −40 to 85 °C (−40 to 185 °F) at 5 to 95 % relative air humidity

Temperature and humidity limits
In accordance with IEC 60068-2-30

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

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

IP rating
IP 66 and IP 67

… Specification

Electromagnetic compatibility

Emitted interference and interference immunity in accordance with

- IEC EN 61326-1
- IEC EN 61326-3-2*
- NAMUR NE 21

* For HART communication from HW-Rev. 02.00.

SIL functional safety

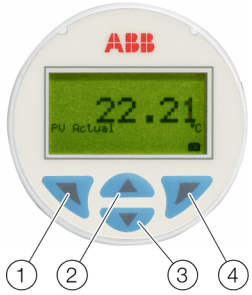
Only for devices with HART communication.
With certificate* in accordance with IEC 61508 for the use in safety-relevant applications up to and including SIL 3 (redundant).

- In the use of one transmitter the device fulfills the requirements according to SIL 2.
- In the use of redundant handled transmitters the requirements can be fulfilled according to SIL 3.

Detailed information can be found in the SIL-Safety Manual.

* From HW-Rev.: 02.00.02, previously Declaration of Conformity.

Type B LCD indicator



① Quit / Cancel
② Scroll back
③ Scroll forward
④ Select

Figure 1: LCD indicator Type B

CE Marking

The LCD indicator Type B fulfills all the requirements for CE marking in accordance with the applicable guidelines.

Properties

Transmitter-controlled graphic (alphanumeric) LCD indicator

- 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 %
- Display diagnostic information related to transmitter and sensor status

HART devices from SW-Rev.: 03.00
(corresponds to HW-Rev.: 02.00 and higher)

- Display of either one or two process values
- Advanced diagnostics: Error display in plain text with possible shutdown measures. Display of multiple simultaneous diagnoses.

Specification

Temperature range
−50 to 85 °C (−58 to 185 °F)

Restricted display function (contrast, reaction time) in the temperature ranges:
- −50 to −20 °C (−58 to −4 °F) or
- 70 to 85 °C (158 to 185 °F)

Air humidity
0 to 100 %, condensation permitted.

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 with HART® and PROFIBUS PA®

Input - resistance thermometer / resistances

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

Resistance measurement
- 0 to 500 Ω
- 0 to 5000 Ω

Sensor connection type
Two-, three-, four-wire circuit

Connection lead
- Maximum sensor line resistance per line 50 Ω in accordance with NE 89
- Three-wire circuit: Symmetrical sensor line resistances
- Two-wire circuit: Compensation up to 100 Ω total lead resistance

Measurement current
< 300 µA

Sensor short circuit
< 5 Ω (for resistance thermometer)

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

Detection of sensor wire break in accordance with NE 89 in all lines

Sensor error signaling
- Resistance thermometer: Sensor short circuit and sensor wire break
- Linear resistance measurement: Sensor wire break

… Specification

Input - thermocouples / voltages

Types
- B, E, J, K, N, R, S, T in accordance with IEC 60584
- U, L in accordance with DIN 43710
- C in accordance with IEC 60584 / ASTM E988
- D in accordance with ASTM E988

Voltages
- −125 to 125 mV
- −125 to 1100 mV

Connection lead
- Maximum sensor line resistance:
  per line 1.5 kΩ, total 3 kΩ

Detection of sensor wire break in accordance with NE 89 in all lines

Input resistance
> 10 MΩ

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

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

Functionality input

Freestyle characteristic / 32-points-sampling point table
- Resistance measurement up to a maximum of 5 kΩ
- Voltages up to maximum 1.1 V

Sensor error adjustment
- Through Callendar-Van Dusen coefficients
- Through value table, 32 support points
- Through single-point adjustment (offset adjustment)
- Through two-point adjustment

Input functionality
- 1 Sensor
- 2 Sensors:
  mean measurement,
  differential measurement,
  sensor redundancy,
  Sensor drift monitoring

Transmission behavior
- Temperature linear
- Resistance linear
- Voltage linear

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

Simulation mode
3.5 to 23.6 mA

Induced current consumption
< 3.5 mA

Maximum output current
23.6 mA

Configurable error current signal
Note
Regardless of the alarm setting (underrange or overrange), a high alarm or low alarm is always generated for some internal device errors (e.g. hardware errors). Detailed information about this can be found in the SIL-Safety Manual.

Notice – Before SW-Rev.: 03.00
The default factory setting for the error current signal is high alarm 22 mA.
- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.6 mA (3.5 to 4.0 mA)

Notice – From SW-Rev.: 03.00
The default factory setting for the error current signal is low alarm 3.5 mA, in accordance with NAMUR recommendations NE 93, NE 107 and NE 131.
- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.5 mA (3.5 to 4.0 mA)

HART® output

Transmission behavior
- Temperature linear
- Resistance linear
- Voltage linear

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

Simulation mode
3.5 to 23.6 mA

Induced current consumption
< 3.5 mA

Maximum output current
23.6 mA

Configurable error current signal
Note
Regardless of the alarm setting (underrange or overrange), a high alarm or low alarm is always generated for some internal device errors (e.g. hardware errors). Detailed information about this can be found in the SIL-Safety Manual.

Notice – Before SW-Rev.: 03.00
The default factory setting for the error current signal is high alarm 22 mA.
- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.6 mA (3.5 to 4.0 mA)

Notice – From SW-Rev.: 03.00
The default factory setting for the error current signal is low alarm 3.5 mA, in accordance with NAMUR recommendations NE 93, NE 107 and NE 131.
- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.5 mA (3.5 to 4.0 mA)

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*)
- Analog Input 2 – SECONDARY VALUE_1 (Sensor 1)
- Analog Input 3 – SECONDARY VALUE_2 (Sensor 2)
- Analog Input 4 – SECONDARY VALUE_3 (reference junction temperature)
- Analog Output – optional HMI display (Transducer Block 2)
- Discrete Input 1 – extended diagnosis 1 (Transducer Block 3)
- Discrete Input 2 – extended diagnosis 2 (Transducer Block 3)

* Sensor 1, Sensor 2 or difference or mean

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

… Specification

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*

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

LAS (Link Active Scheduler) link master functionality

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

** Sensor 1, Sensor 2 or difference or mean

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

Power supply

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

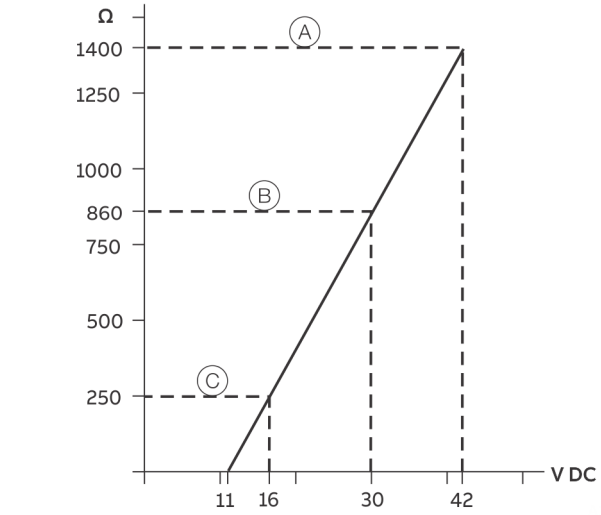
Note
Following calculations apply for standard applications. This should be taken into consideration when working with a higher maximum current.

Power supply – HART®
Supply voltage
- Non-Ex application:
  U_S = 11 to 42 V DC
- Ex applications:
  U_S = 11 to 30 V DC

Maximum permissible residual ripple for Supply voltage
During communication this complies with the HART FSK 'Physical Layer' specification.

Undervoltage detection on the transmitter
If the terminal voltage on the transmitter down-scales a value of 10 V, this may lead to an output current of $I_a \leq 3.6$ mA.

Maximum load
R_B = (supply voltage – 11 V) / 0.022 A



(A) TTF300, TTF300-N
(B) TTF300, TTF300-N in Ex-applications
(C) HART communication resistance

Figure 2: Maximum load depending on Supply voltage

Maximum power
$P = U_s \times 0.022$ A

E. G.: U_s = 24 V → P_{max} = 0.528 W

Power supply – PROFIBUS® / FOUNDATION Fieldbus®
Supply voltage
- Non-Ex application:
  U_S = 9 to 32 V DC
- Ex-applications:
  U_S = 9 to 17,5 V DC (FISCO)
  U_S = 9 to 24 V DC (Fieldbus Entity model I.S.)

Current consumption
≤ 12 mA

… Specification

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

Sensor		Measurement range limits	Minimum span	Measuring accuracy	
				Input (24-bit AD-converter)	Analog output[1] (16-Bit D / A-converter)
Resistance thermometer / resistor					
DIN IEC 60751	Pt10 (a=0.003850)	−200 to 850 °C (−328 to 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)			±0.40 °C (±0.72 °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 to 645 °C (−328 to 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 to 850 °C (−328 to 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)			±0.40 °C (±0.72 °F)	±0.05%
	Pt1000 (a=0.003920)			±0.08 °C (±0.14 °F)	±0.05%
DIN 43760	Ni50 (a=0.006180)	−60 to 250 °C (−76 to 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 to 200 °C (−58 to 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 to 500 Ω	4 Ω	±32 mΩ	±0.05%
		0 to 5000 Ω	40 Ω	±320 mΩ	±0.05%

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

2) Standard Version

Sensor		Measurement range limits	Minimum span	Measuring accuracy	
				Input[1] (24-bit AD-converter)	Analog output[2] (16-Bit D / A-converter)
Thermocouples[3] / voltages					
IEC 60584	Type K (Ni10Cr-Ni5)[4]	−200 to 1372 °C (−328 to 2502 °F)	50 °C (90 °F)	±0.35 °C (±0.63 °F)	±0.05%
	Type J (Fe-Cu45Ni)	−210 to 1200 °C (−346 to 2192 °F)			±0.05%
	Type N (Ni14CrSi-NiSi)	−200 to 1300 °C (−328 to 2372 °F)			±0.05%
	Type T (Cu-Cu45Ni)	−200 to 400 °C (−328 to 752 °F)			±0.05%
	Type E (Ni10Cr-Cu45Ni)	−200 to 1000 °C (−328 to 1832 °F)			±0.05%
	Type R (Pt13Rh-Pt)	−50 to 1768 °C (−58 to 3215 °F)	100 °C (180 °F)	±0.95 °C (±1.71 °F)	±0.05%
	Type S (Pt10Rh-Pt)			±1.15 °C (±2.07 °F)	±0.05%
	Type B (Pt30Rh-Pt6Rh)	250 to 1820 °C (482 to 3308 °F)		±1.05 °C (±1.89 °F)	±0.05%
DIN 43710	Type L (Fe-CuNi)	−200 to 900 °C (−328 to 1652 °F)	50 °C (90 °F)	±0.35 °C (±0.63 °F)	±0.05%
	Type U (Cu-CuNi)	−200 to 600 °C (−328 to 1112 °F)			±0.05%
IEC 60584 / ASTM E988	Type C	0 to 2315 °C (32 to 4200 °F)	100 °C (180 °F)	±1.35 °C (±2.43 °F)	±0.05%
ASTM E988	Type D				±0.05%
	Voltage measurement	−125 to 125 mV	2 mV	±12 µV	±0.05%
		−125 to 1100 mV	20 mV	±120 µV	±0.05%

1) Due to the physical properties of thermocouples, the accuracy of temperature measurement decreases at low temperatures and may then be outside the specified accuracy range at the input. The specified accuracy applies to
Type K: > −60 °C, type J: > −140 °C, type N: >250 °C, type T: > −40 °C, type E: > −150 °C,
Type R: >860 °C (400 to 860 °C: ±1.15 °C), type S: >650 °C (250 to 650 °C: ±1.36 °C),
Type B: >1440 °C (500 to <1000 °C: ±2.4 °C, 1000 to 1440 °C: ±1.32 °C)
Type L: > −140 °C (≤ −140 °C: ±0.41 °C), type U: > −40 °C (≤ −40 °C: ±0.63 °C),
Type C and type D: no restriction

Type K: > −76 °F, type J: > −220 °F, type N: >482 °F, type T: > −40 °F, type E: > −238 °F,
Type R: >1580 °F (752 to 1580 °F: ±2.07 °F), type S: >1202 °F (482 to 1202 °F: ±2.45 °F),
Type B: >2624 °F (932 to <1832 °F: ±4.32 °F, 1832 to 2624 °F: ±2.38 °F)
Type L: > −220 °F (≤ −220 °F: ±0.74 °F), type U: > −40 °F (≤ −40 °F: ±1.13 °F),
2) Percentages refer to the configured measuring span, omitted for PROFIBUS PA® and FOUNDATION Fieldbus®
3) For digital measuring accuracy, the internal reference junction error must be added: Pt1000, DIN IEC 60751 Cl. B
4) Enhanced base accuracy is available for the temperature range from 0 to 600 °C (32 to 1112 °F):
   - Measuring accuracy input: 0.15 °C
   - Measurement accuracy analog output: 0.025 %

… Specification

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.

Normal-mode rejection ratio:
> 65 dB at 50 / 60 Hz
Common-mode rejection ratio:
> 120 dB at 50 / 60 Hz

Ambient temperature influence:
Based on 23 °C (73.4 °F) for an ambient temperature range of −40 to 85 °C (−40 to 185 °F)[1)]

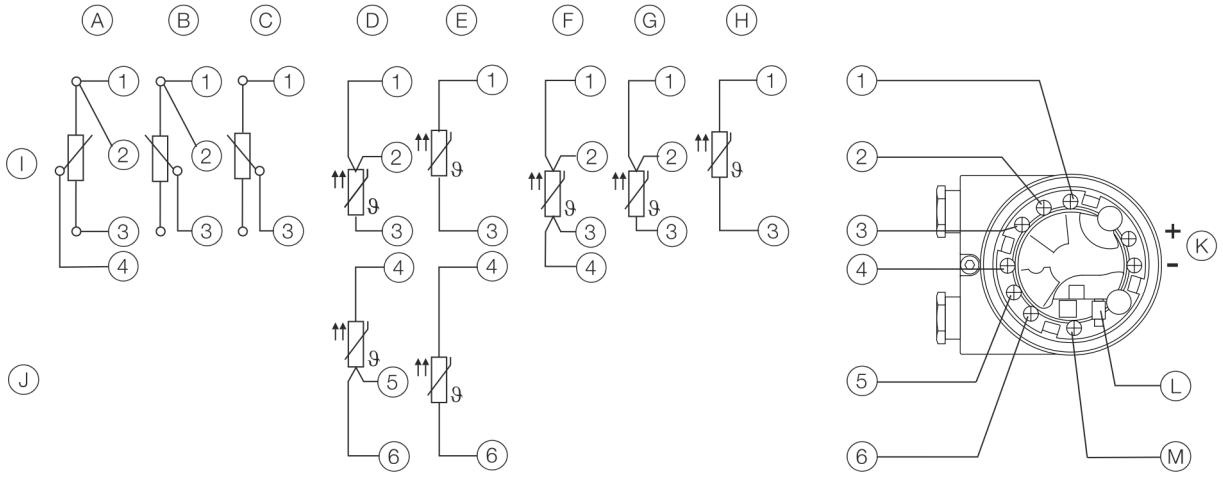
Sensor		**Ambient temperature effect per 1 °C (1.8 °F) deviation from 23 °C (73.4 °F)**	
		Input[2)] (24-bit A / D converter)	**Analog output[3), 4)] (16 bit DA-converter)**
Resistance thermometer for two-, three- and four-wire circuits			
IEC, JIS, MIL	Pt10	±0.04 °C (±0.072 °F)	± 0.003%
	Pt50	±0.008 °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 to 500 Ω	±0.002 Ω	± 0.003%
	0 to 5000 Ω	±0.02 Ω	± 0.003%
Thermocouple, for all defined types			
		± [(0.001 % × (ME[mV] / MS[mV]) + (100 % × (0.009 °C / MS [°C])][5)]	± 0.003%
Voltage measurement			
	−125 to 125 mV	±1.5 µV	± 0.003%
	−125 to 1100 mV	±15 µV	± 0.003%

1) For the optionally extended ambient temperature range down to −50 °C (−58 °F), twice the influence values apply in the range from −50 to −40 °C (−58 to −40 °F)
2) Typical values
3) Percentages refer to the configured measuring span of the analog output signal
4) Influence DA-converter not applicable for PROFIBUS PA® and FOUNDATION Fieldbus®
5) Percentages refer to the configured measuring span
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)

Electrical connections

Terminal assignment

Resistance thermometers (RTD) / resistors (potentiometer)



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

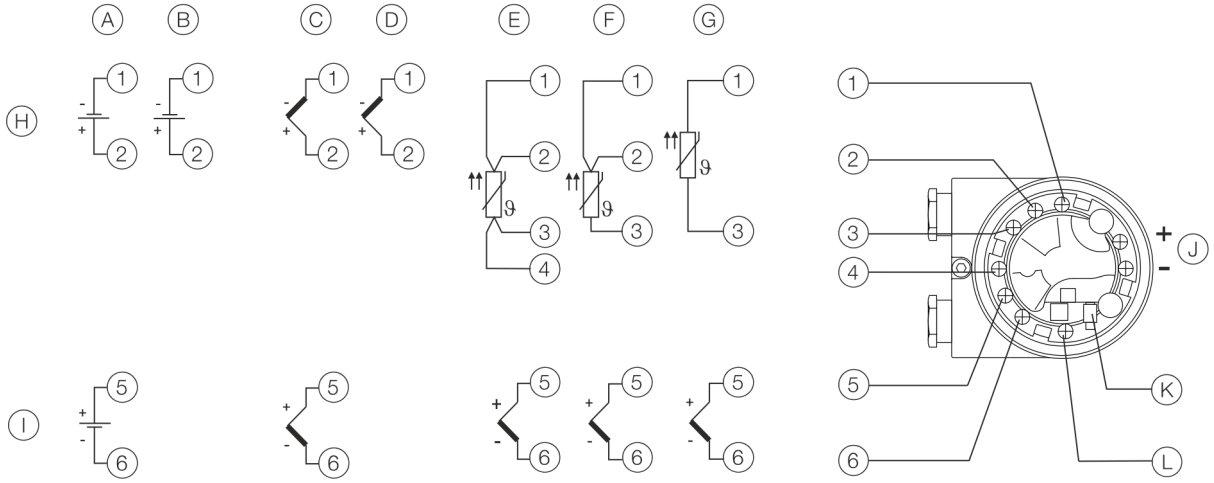
* Sensor backup / sensor redundancy, sensor drift monitoring, mean measurement, or differential measurement

Figure 3: Terminal assignment Resistance thermometer (RTD) / resistances (potentiometer)

… Electrical connections

… Terminal assignment

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



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

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

Figure 4: Terminal assignment: Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations

Communication

Configuration parameters

Measurement type

- Sensor type, connection type
- Error signaling
- Measuring range
- General information, e.g. TAG number
- Damping
- Warning and alarm thresholds
- Output signal simulation
- For details, see .

Write protection

Software write protection

Diagnostic information in accordance with NE 107

Standard:

- Sensor error signaling (wire break or short-circuit)
- Device error
- Limit value up- / down-scaled
- Upper range up- / down-scaled
- Simulation active

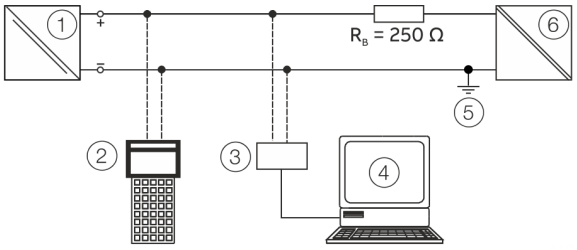
Advanced:

- Sensor redundancy / sensor backup active (in case sensor fails) with configurable analog alarm pulse signaling

  From SW-Rev.: 03.00: Redundancy can be configured via device configuration tools for:
  - Increased availability (default setting for redundancy),
  - Increased security,
  - Increased accuracy (average value output)
- Drift monitoring
- Configurable alarm pulse signaling
- Sensor- / sensor connection lead corrosion
- Supply voltage down-scaled
- Drag indicator for Sensor 1, Sensor 2 and ambient temperature
- Ambient temperature up-scaled
- Ambient temperature down-scaled
- Operating hours counter

HART® Communication

The device is listed with the FieldComm Group.



1 Transmitter
2 Handheld terminal
3 HART® modem
4 PC with Asset Management Tool
5 Grounding (optional)
6 Power supply unit (process interface)
R_B load resistance (if necessary)

Figure 5: Example of HART® interface connection

Manufacturer ID	0x1A
Device-ID*	TTF300: HART 5: 0x004B (0x000B), HART 7: 0x1A4B (0x1A0B) TTF300-N: HART 7: 0x1A4E
Profile	From SW-Rev.: 03.00 (corresponds to HW-Rev.: 02.00 and higher): HART 5 and HART 7, can be switched via • LCD indicator with configuration function • Tools • HART commands Default, if nothing else ordered: HART 7.6. To SW-Rev.: 01.03: HART 5.1 and HART 7, switchable via DIP switch. Default, if nothing else ordered: HART 5.1. SW-Rev.: 01.01: HART 5.1, previously HART 5.
Configuration	On device using LCD indicator FDI, EDD, DTM
Transmission signal	BELL Standard 202

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

… Communication

… HART® Communication

Operating modes

- Point-to-point communication mode – standard (general address 0)
- HART 5: Multidrop mode (addressing 1 to 15)
- HART 7: Addressing 0 to 63, independent of current loop mode
- Burst Mode

Configuration options / tools

Driver-independent:

- HMI LCD indicator with configuration function

Driver-dependent:

- Device configuration / Asset management tools
- FDI technology – via TTx300 FDI Device Package (Field Information Manager / FIM)
- EDD – via TTX300 EDD driver (Handheld terminal, Field Information Manager / FIM)
- FDT technology – via TTX300-DTM driver

Diagnosis notice

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

Extended from SW-Rev.: 03.00:

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

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

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

The information can be output via tools:

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

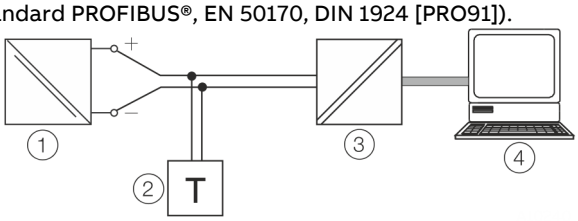
For detailed information, see interface description

- HART® COM/TTX300/HART
- HART® COM/TTX300-N/HART

PROFIBUS PA® communication

The interface conforms to Profile 3.01

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



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

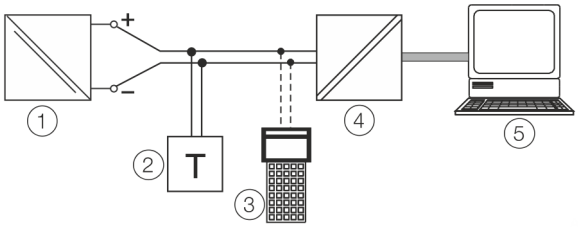
Figure 6: Example of PROFIBUS PA® interface connection

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

Voltage / current consumption

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

FOUNDATION Fieldbus® Communication



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

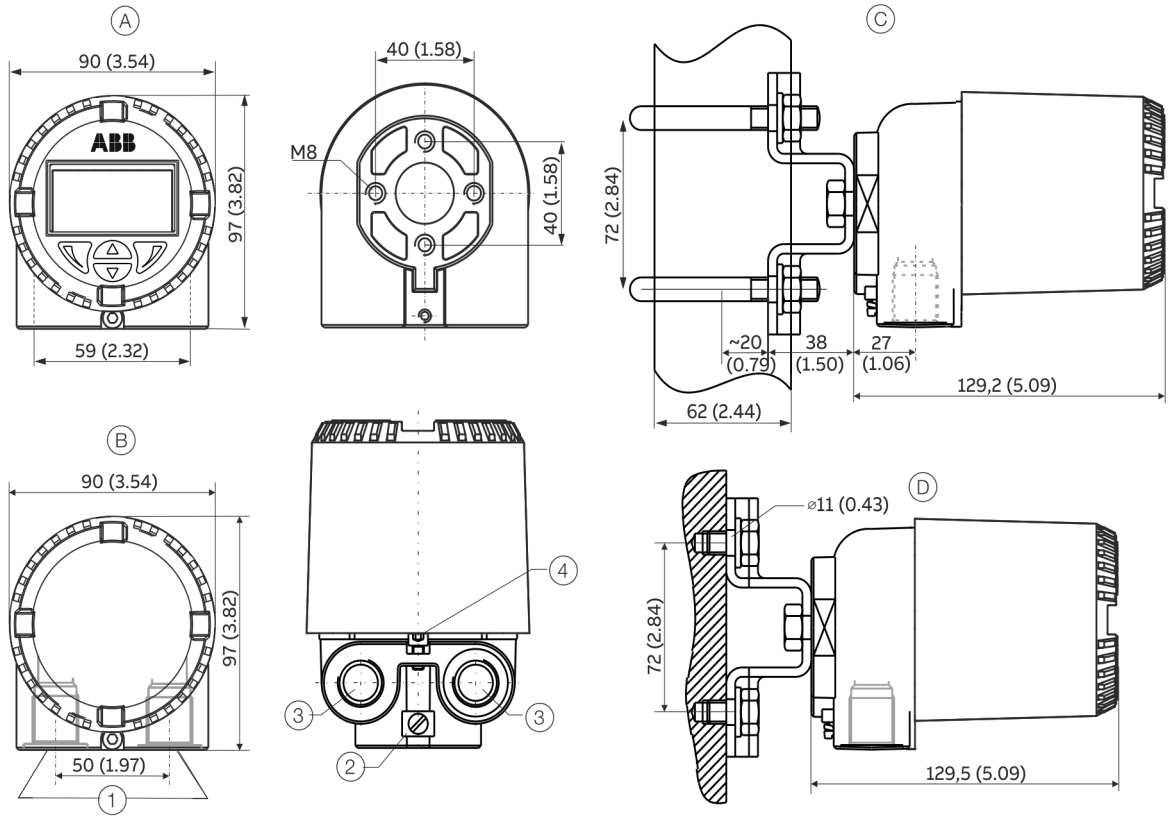
Figure 7: Example of FOUNDATION Fieldbus® interface connection

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

Voltage / current consumption

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

Dimensions



(A) Housing with clear lid for indicator
(B) Closed housing
(C) Pipe mounting, stainless steel mounting bracket
(D) Wall mounting, 4-hole wall attachment, Ø 11 mm (0.43 in) quadratically arranged, at distance of 72 mm (2.84 in)

(1) Electrical connections
(2) Potential equalization screw M5
(3) M20 x 1.5 or ½ in NPT
(4) Locking screw

Figure 8: Dimensions in mm (in)

Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Note

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

- In devices with several types of protection, for example TTF300, TTF300-N-E4, observe the 'Product Identification' chapter in the operating or commissioning instruction before commissioning.

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

ATEX increased safety and dust explosion protection

Approved for use in zone 2 and 22.

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

ATEX dust explosion protection

Approved for use in Zone 21 and 22.

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

ATEX dust explosion protection | intrinsic safety

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

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

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

ATEX flameproof (enclosure)

Approved for use in Zone 1 and 2.

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

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

… Ex marking

ATEX flameproof (enclosure) | intrinsic safety

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

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

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

IECEx intrinsic safety

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

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

IECEx dust explosion protection

Approved for use in Zone 21 and 22.

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

IECEx flameproof (enclosure)

Approved for use in Zone 1 and 2.

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

LCD indicator

ATEX intrinsic safety

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

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

IECEx intrinsic safety

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

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

Temperature data

Transmitter

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

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

ATEX / IECEx flameproof (enclosure)

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

LCD indicator

ATEX / IECEx intrinsic safety

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

Electrical data

Transmitter

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

Supply circuit

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

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

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

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

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

TTF300-E1H, TTF300-H1H measurement current circuit model

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

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

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

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

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

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

… Electrical data

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

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

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

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

Type of protection: flameproof (enclosure) Ex db IIC

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

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

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

Non-intrinsically safe power supply

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

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

Intrinsically safe power supply

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

In this case, the electric data of the transmitter for the intrinsic safety type of protection Ex ia IIC (Part 1) for TTF300-E1H and TTF300-H1H, Ex ia IIC (Part 2) as well Ex ia IIC (Part 3) should be complied with.
Refer to **Transmitter** on page 21.

LCD indicator

Intrinsic safety type of protection Ex ia IIC

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

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

Note

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

Transmitter Ex marking cFMus

cFMus Intrinsically Safe

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

cFMus Non-Incendive

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

cFMus Explosion Proof

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

cFMus Explosion Proof and Intrinsically safe

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

Transmitter Ex marking FM / CSA

FM Intrinsically Safe

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

FM Non-Incendive

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

FM Explosion proof

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

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

… Transmitter Ex marking FM / CSA

CSA Intrinsically Safe

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

CSA Non-Incendive

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

CSA Explosion proof

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

CSA Explosion Proof and Intrinsically Safe

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

LCD indicator Ex marking

FM Intrinsically Safe

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

FM Non-Incendive

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

CSA Intrinsically Safe

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

CSA Non-Incendive

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

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

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

TTF300-N Field transmitter for non-invasive temperature measurement

The TTF300-N is a variant of the TTF300 that contains an enhanced software for non-invasive temperature measurement. Non-invasive temperature measurement is a new approach that eliminates the need for a thermowell in sensing applications.

The non-invasive measurement is achieved through the ABB NINVA TSP341-N Remote sensor apparatus with a unique double sensor combination. The TTF300-N transmitter is therefore intended for use with a TSP341-N Remote sensor apparatus that contains two Pt100 (Class A) sensors each connected in a 3-wire configuration.

The two sensors are terminated in the head of the sensor assembly and are part of a complete passively mountable unit without any transmitter or electronics.

This assembly is connected to a TTF300-N with a 6-wire connection cable of the desired length to obtain a non-invasive temperature output from the transmitter. For more detailed information on non-invasive temperature measurement and the NINVA™ TSP341-N non-invasive temperature sensor, please see the associated datasheets. Detailed instructions for connecting the TTF300-N to the TSP341-N Remote sensor apparatus can be found in the associated **Operating Instructions**.

For ordering information please see section TTF300-N in the **Ordering Information** on page 24.

Ordering Information

TTF300

Base model	**TTF300**	**XX**	**X**	**X**	**X**	**XX**
TTF300 Field Mounted Temperature Transmitter, Pt100 (RTD), thermocouples, electrical isolation						
Explosion Protection						
Without explosion protection		Y0				
ATEX Intrinsic Safety type of protection: Zone 0: II 1 G Ex ia IIC T6...T1 Ga,						
Zone 1 (0): II 2 (1) G Ex [ia IIC Ga] ib IIC T6...T1 Gb, Zone 1 (20): II 2 G (1D) Ex [ia IIIC Da] ib IIC T6...T1 Gb		E1				
ATEX Increased safety as well as dust explosion protection:						
Zone 2 / Zone 22: II 3 G Ex ec IIC T6...T1 Gc and II 3 D Ex tc IIIB T133°C Dc		E5[1)]				
ATEX Flameproof type of protection: Zone 1: II 2 G Ex db IIC T6/T4 Gb		E3				
ATEX Flameproof resp. Intrinsic Safety type of protection:						
Zone 1 / Zone 0: II 2 G Ex db IIC T6/T4 Gb resp. II 1 G Ex ia IIC T6...T1 Ga		E4				
IECEx Intrinsic Safety type of protection: Zone 0: Ex ia IIC T6...T1 Ga, Zone 1 (0): Ex [ia IIC Ga] ib IIC T6...T1 Gb,						
Zone 1 (20): Ex [ia IIIC Da] ib IIC T6...T1 Gb		H1				
IECEx Flameproof type of protection: Zone 1: Ex db IIC T6/T4 Gb		H5				
FM Approvals (USA & Canada) Intrinsic Safety (IS)		L1				
FM Approvals (USA & Canada) Nonincendive (NI)		L2				
FM Approvals (USA & Canada) Explosionproof (XP, XP-IS) and Dust-Ignitionproof (DIP)		L3				
FM Approvals (USA & Canada) combined: Explosionproof (XP, XP-IS) and Dust-Ignitionproof (DIP)						
or Intrinsic Safety (IS)		L7				
CSA (Canada) Intrinsic Safety (IS)		R1				
CSA (Canada) Nonincendive (NI)		R2				
CSA (Canada) Explosionproof (XP) and Dust-Ignitionproof (DIP)		R3				
CSA (Canada) combined: Explosionproof (XP) and Dust-Ignitionproof (DIP) or Intrinsic Safety (IS)		R7				
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				
INMETRO Intrinsic Safety type of protection: Ex ia IIC T6 Ga		C1				
INMETRO Flameproof enclosure Ex db IIC T6...T1 Gb		C5				
NEPSI Intrinsic Safety type of protection: Ex ia IIC T6 Ga		S1				
NEPSI Flameproof (enclosure) type of protection: Ex d IIC T4~T6 Gb		S3				
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 × M20 × 1.5				1[2)]		
Thread 2 × ½ in NPT				2		
Communication Protocol						
HART®, programmable, output signal 4 to 20 mA, dual input					H	
PROFIBUS PA®					P	
FOUNDATION fieldbus®					F	
Configuration						
Standard configuration						BS
Customer-specific configuration, except user curve						BF[3)]
Customer-specific configuration, including user curve						BG

1) According EN 60079-0 and EN 60079-31, the application in explosive hybrid mixtures (concomitance of potentially explosive dust and gas) is currently not allowed

2) Not available with **Explosion Protection code L1, L2, L3, R1, R2, R3, R7, D5, D6, J5**

3) E.g. set measuring range, TAG no.

Additional ordering information

TTF300 Field Mounted Temperature Transmitter	**XX**	**XX**	**XXX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XXX**	**XX**
Declarations and Certificates													
SIL2 - Declaration of Conformity	CS[1]												
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										
Mounting Bracket													
Wall mounting / 2 in pipe mounting bracket (stainless steel)				K2									
Cable Entry Options													
Cable gland 2 × M20 × 1.5					U4[3]								
Cable gland 2 × ½ in NPT					U5[2]								
Extended Ambient Temperature Range													
−50 to 85 °C (−58 to 185 °F)						SE							
Accuracy													
Enhanced base accuracy for applicable configurations							AE[4]						
Device Identification Plate													
Stainless steel								T0					
Additional Identification Plate													
Stainless steel plate with customer specific text									T2				
Adhesive label (customer specific)									T3				
TAG Number													
Stainless steel										I1			
Customer-specific Versions													
Hardware 01.07											Z7		
Hardware 02.00											Z2		
Please specify											Z9		
HART version													
HART 5												C05	
HART 7												C07	
Documentation Language													
German													M1
English													M5
Chinese													M6
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)													MW
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)													ME

1) Only available with **Communication Protocol code H** (HART®)

2) Only available with **Cable Entry code 2**

3) Only available with **Cable Entry code 1**

4) Applicable for thermocouple Type K, Range: 0 to 600 °C, Input accuracy: 0,15 °C, Analog output accuracy: 0,025 %

… Ordering Information

… TTF300

Accessories	Order code
TTH / TTF300 LCD Display HMI FM Intrinsically Safe	3KXT091220L0006
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

TTF300-N

Base model	**TTF300**	**XX**	**X**	**X**	**X**	**XX**
TTF300-N Temperature Transmitter for non-invasive temperature measurement						
Explosion Protection						
without explosion protection	Y0					
ATEX Intrinsic Safety type of protection: Zone 0: II 1 G Ex ia IIC T6#T1 Ga, Zone 1 (0): II 2 (1) G Ex [ia IIC Ga] ib IIC T6#T1 Gb , Zone 1 (20): II 2 G (1D) Ex [ia IIC Da] ib IIC T6#T1 Gb	E1					
ATEX combined1, 2: Increased safety (ATEX II 3 G Ex ec IIC T6...T1 Gc) or Dust ignition protection (ATEX II 3D Ex tc IIIB T133°C Dc)	E5[1)]					
ATEX Flameproof type of protection: Zone 1: II 2 G Ex db IIC T6/T4 Gb	E3					
ATEX Flameproof resp. Intrinsic Safety type of protection: Zone 1 / Zone 0: II 2 G Ex db IIC T6/T4 Gb resp. II 1 G Ex ia IIC T6#T1 Ga	E4					
IECEx Intrinsic Safety type of protection: Zone 0: Ex ia IIC T6#T1 Ga, Zone 1 (0): Ex [ia IIC Ga] ib IIC T6#T1 Gb, Zone 1 (20): Ex [ia IIIC Da] ib IIC T6#T1 Gb	H1					
IECEx type of protection flameproof enclosure: Ex db IIC T6 / T4 Gb	H5					
FM Approvals (USA & Canada) Intrinsic Safety (IS) Canada only for HW-Rev. 02 HMI only with FMus (Lx) or cCSA (Rx) certification	L1					
FM Approvals (USA & Canada) Nonincendive (NI) Canada only for HW-Rev. 02 HMI only with FMus (Lx) or cCSA (Rx) certification	L2					
FM Approvals (USA & Canada) Explosionproof (XP, XP-IS) and Dust-Ignitionproof (DIP) Canada only for HW-Rev. 02	L3					
FM Approvals (USA & Canada) combined: Explosionproof (XP, XP-IS) and Dust-Ignitionproof (DIP) or Intrinsic Safety (IS) Canada only for HW-Rev. 02 HMI only with FMus (Lx) or cCSA (Rx) certification	L7					
INMETRO Ex ia IIC T6#T1 Ga or Ex ib [ia Ga] IIC T6#T1 Gb or Ex ib [ia IIIC Da] IIC T6#T1 Gb	R1					
Housing / Display						
Single-compartment housing (aluminum) / without display		A				
Single-compartment housing (stainless steel)/ without display		B				
Single-compartment housing / with LCD-display HMI type B (aluminum)		C				
Single-compartment housing / with LCD-display HMI type B (stainless steel)		D				
Cable Entry						
Thread 2 × M20 × 1.5			1[2)]			
Thread 2 × ½ in NPT			2			
Communication Protocol						
HART, programmable, output signal 4 to 20 mA				H		
Configuration						
Standard configuration					BS	
Customer specific configuration, except user curve					BF[3)]	
Remote sensor						
for TSP341-N						RS4

1) According EN 60079-0 and EN 60079-31, the application in explosive hybrid mixtures (concomitance of potentially explosive dust and gas) is currently not allowed.

2) Not available with **Explosion Protection code L1, L2, L3, R1, R2, R3, R7, D5, D6, J5**

3) Only available with **Housing / Display code A, C**

… Ordering Information

… TTF300-N

Additional ordering information

TTF300-N Temperature Transmitter for non-invasive temperature measurement	**XX**	**XX**	**XXX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XXX**	**XX**
Declarations and Certificates												
SIL2 - Declaration of conformity	CS											
Declaration of compliance according EN 10204-2.1 with the order	C4											
Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test	C6											
Calibration Certificates												
With 5-point factory certificate		EM										
Handling of Certificates												
Send via e-mail			GHE									
Send via mail			GHP									
Send via mail express			GHD									
Send with instrument			GHA									
Mounting Bracket												
Wall mounting / 2 in pipe mounting bracket (stainless steel)				K2								
Cable Entry Options												
Cable gland 2 x M20 x 1.5, (plastic version with limited temperature range)					U4[2]							
Cable gland 2 × ½ in NPT					U5[1]							
Extended Ambient Temperature Range												
−50 to 85 °C (−58 to 185 °F)						SE						
Device Identification Plate												
Stainless steel							T0					
Additional Identification Plate												
Stainless steel plate with customer specific text								T2				
Adhesive label								T3				
Customer-specific Versions												
Hardware 02.00									Z2			
Please specify									Z9			
TAG Number												
Stainless Steel										I1		
HART version												
HART 7											C07	
Documentation Language												
German												M1
English												M5

1) Only available with **Cable Entry code 2**

2) Only available with **Cable Entry code 1**

Accessories	**Order code**
TTH / TTF300 LCD Display HMI FM Intrinsically Safe	3KXT091220L0006
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

Order form configuration

HART device design

TTF300

Customer-specific configuration		Selection
Number of sensors		☐ 1 sensor (Standard) ☐ 2 sensors
Measurement type		☐ Sensor redundancy / sensor backup (configured for increased availability)
(for 2-sensor selection only)		☐ Sensor drift monitoring ____°C / K sensor drift differential ____s time limit for drift overshoot
		☐ Differential measurement:Sensor 1 - Sensor 2
		☐ Differential measurement:Sensor 2 - Sensor 1
		☐ Average measurement
IEC 60751	Resistance thermometer	☐ Pt10 ☐ Pt50 ☐ Pt100 (Standard) ☐ Pt200 ☐ Pt500 ☐ Pt1000
JIS C1604		☐ Pt10 ☐ Pt50 ☐ Pt100
MIL-T-24388		☐ Pt10 ☐ Pt50 ☐ Pt100 ☐ Pt200 ☐ Pt1000
DIN 43760		☐ Ni50 ☐ Ni100 ☐ Ni120 ☐ Ni1000
OIML R 84		☐ Cu10 ☐ Cu100
	Resistance measurement	☐ 0 to 500 Ω ☐ 0 to 5000 Ω
IEC 60584	Thermocouple	☐ Type K ☐ Type J ☐ Type N ☐ Type R ☐ Type S ☐ Type T ☐ Type E ☐ Type B
DIN 43710		☐ Type L ☐ Type U
IEC 60584 / ASTM E988		☐ Type C
ASTM E988		☐ Type D
	Voltage measurement	☐ -125 to 125 mV ☐ -125 to 1100 mV
Sensor circuit		☐ Two-wire ☐ Three-wire (Standard) ☐ Four-wire
(for resistance thermometer and resistance		Two-wire circuit: Compensation of sensor line resistance max. 100 Ω
measurement only)		☐ Sensor 1:____ Ω ☐ Sensor 2:____ Ω
Reference junction		☐ Internal (for standard thermocouple, except type B) ☐ None (type B)
(for thermocouples only)		☐ External / temperature:____°C
Meas. range		☐ Lower range value: _____ (Standard:0)
		☐ Upper range value: _____ (Standard:100)
Unit		☐ Celsius (Standard) ☐ Fahrenheit ☐ Rankine ☐ Kelvin
Characteristic behavior		☐ rising 4 to 20 mA (Standard) ☐ falling 20 to 4 mA
Output behavior for error		
Before SW-Rev.: 03.00:		☐ Overrange / high alarm 22 mA (Standard) ☐ Underrange / low alarm 3.6 mA
From SW-Rev.: 03.00:		☐ Underrange / low alarm 3.5 mA (Standard) ☐ Overrange / high alarm 22 mA
Output damping (T_{63})		☐ Off (Standard) ☐ ____ seconds (1 to 100 s)
Sensor number		☐ Sensor 1:_____ ☐ Sensor 2:_____
Resistor value at 0 °C / R_o		Sensor 1: R_o: _____ Sensor 2: R_o: _____
Callendar-Van Dusen coefficient A		A: _____ A: _____
Callendar-Van Dusen coefficient B		B: _____ B: _____
Callendar-Van Dusen coefficient C		C: _____ C: _____
(optional, for resistance thermometers only)		
User characteristics based on linearization table		☐ Based on attached table of variate pairs
TAG number		☐ _____ (maximum 8 characters)
HART revision:		
SW-Rev.: 01.03		☐ HART5 (Standard) ☐ HART7
From SW-Rev.: 03.00		☐ HART5 ☐ HART7 (Standard)
Software write protection		☐ Off (Standard) ☐ On
"Maintenance required" alarm impulse		
To SW-Rev.: 01.03		☐ Off (Standard) Pulse width ____ s (0.5 to.59.5 s increment 0.5 s)
From SW-Rev.: 03.00		☐ Off (Standard) Pulse width (1 to 127 seconds) ____ s (increment 1 s)
		Pulse repetition rate (60 to 86,400 seconds / 1 day) _____ s (increment 1 s)

… Order form configuration

TTF300-N

Customer-specific configuration	Selection
Meas. range	☐ Lower range value: _____ (Standard:0) ☐ Upper range value: _____ (Standard:100)
Unit	☐ Celsius (Standard) ☐ Fahrenheit ☐ Rankine ☐ Kelvin
Characteristic behavior	☐ rising 4 to 20 mA (Standard) ☐ falling 20 to 4 mA
Output behavior for error	☐ Underrange / low alarm 3.5 mA (Standard) ☐ Overrange / high alarm 22 mA
Output damping (T_{63})	☐ Off (Standard) ☐ ____ seconds (1 to 100 s)
TAG number	☐ _____ (maximum 8 characters)
Software write protection	☐ Off (Standard) ☐ On
“Maintenance required” alarm impulse	☐ Off (Standard) Pulse width (1 to 127 seconds) ____ s (increment 1 s) Pulse repetition rate (60 to 86,400 seconds / 1 day) _____ s (increment 1 s)

PROFIBUS PA / FOUNDATION Fieldbus device design

Customer-specific configuration		Selection
Number of sensors		☐ 1 sensor (Standard) ☐ 2 sensors
Measurement type		☐ Sensor redundancy / sensor backup
(for 2-sensor selection only)		☐ Sensor drift monitoring ____°C / K sensor drift differential ____s time limit for drift overshoot
		☐ Difference measurement
		☐ Average measurement
IEC 60751	Resistance thermometer	☐ Pt10 ☐ Pt50 ☐ Pt100 (Standard) ☐ Pt200 ☐ Pt500 ☐ Pt1000
JIS C1604		☐ Pt10 ☐ Pt50 ☐ Pt100
MIL-T-24388		☐ Pt10 ☐ Pt50 ☐ Pt100 ☐ Pt200 ☐ Pt1000
DIN 43760		☐ Ni50 ☐ Ni100 ☐ Ni120 ☐ Ni1000
OIML R 84		☐ Cu10 ☐ Cu100
	Resistance measurement	☐ 0 … 500 Ω ☐ 0 … 5000 Ω
IEC 60584	Thermocouple	☐ Type K ☐ Type J ☐ Type N ☐ Type R ☐ Type S ☐ Type T ☐ Type E ☐ Type B
DIN 43710		☐ Type L ☐ Type U
ASTM E-988		☐ Type C ☐ Type D
	Voltage measurement	☐ -125 … 125 mV ☐ -125 … 1100 mV
Sensor circuit		☐Two-wire ☐ Three-wire (Standard) ☐ Four-wire
(for resistance thermometer and resistance		Two-wire circuit: Compensation of sensor-wire resistance max. 100 Ω
measurement only)		☐ Sensor 1: ____ Ω ☐ Sensor 2: ____ Ω
Reference junction		☐ Internal (for standard thermocouple, except type B) ☐ None (type B)
(for thermocouples only)		☐ External / temperature: ____°C
Unit		☐Celsius (Standard) ☐ Fahrenheit ☐ Rankine ☐ Kelvin
Resistor value at 0 °C / R_0		Sensor 1: R_0: _____ Sensor 2: R_0: _____
Callendar-Van Dusen coefficient A		A: _____ A: _____
Callendar-Van Dusen coefficient B		B: _____ B: _____
Callendar-Van Dusen coefficient C		C: _____ C: _____
(optional, for resistance thermometers only)		
IDENT_number (PROFIBUS)		☐ device-specific 0x3470 (Standard) ☐ profile 0x9700 (1 AI Block)
Bus address PROFIBUS PA		☐ PA: 0 … 125 ☐ Standard PA: 126
TAG number		☐ _____ (maximum 16 characters)
Software write protection		☐ Off (Standard) ☐ On

Trademarks

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

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

3KXT221001R1001

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