ABB MEASUREMENT & ANALYTICS | DATA SHEET

TTD300

Field-mount temperature transmitter with dual-compartment housing

Measurement made easy

Temperature transmitter for HART protocol. 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)
- Dual-compartment housing for highest protection of the electronics

Input circuit and communication

- Two universal sensor inputs for resistance thermometers (e.g. 2 x Pt100 in three-wire circuit) and thermocouples
- Communication via 4 to 20 mA signal and HART protocol.

Safety

- Global approvals for explosion protection up to Zone 0
- 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
< 10 s (I_a ≤ 3.6 mA during switch-on cycle)

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: 1,92 kg (4.23 lb)
- Stainless steel: 3.28 kg (7.28 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
- 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

Dimensions
Refer to **Dimensions** on page 14.

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

Optional extras

Mounting bracket
Universal for vertical and horizontal 60 mm (2 in) pipes or wall mounting.

Display
Display can be rotated in 90° increments into 4 different positions.

Additional plate
- Self-adhesive or stainless steel label for tag and / or specific calibrated span.
- Stainless steel wired-on plate with customized data.

Electromagnetic compatibility

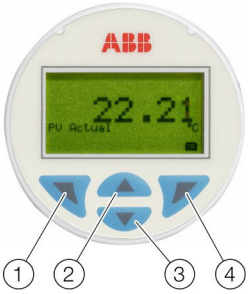
Emitted interference and interference immunity in accordance with
- IEC EN 61326-1
- IEC EN 61326-3-2
- NAMUR NE 21

Overvoltage strength
±1 KV line-to-line or ±2KV line-to-ground according to IEC 61000-4-5

With optional surge protection
±4 KV line-to-ground or line-to-line according to IEC 61000-4-5

… Specification

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
- 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

- Easy setup for quick commissioning
- Sensor configuration for standard sensors
- Measuring range
- Behavior in the event of a fault
- Software write protection for configuration data
- Device address

Input - resistance thermometer / resistances

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

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

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

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

Measurement current
< 300 µA

Sensor short circuit
< 5 Ω (for resistance thermometer)

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

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

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

Input - thermocouples / voltages

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

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

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

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

Input resistance
> 10 MΩ

Cold junction compensation by Pt1000, IEC 60751 Class B

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

… Specification

HART® output

Transmission behavior
- Temperature linear
- Resistance linear
- Voltage linear

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

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.

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)

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

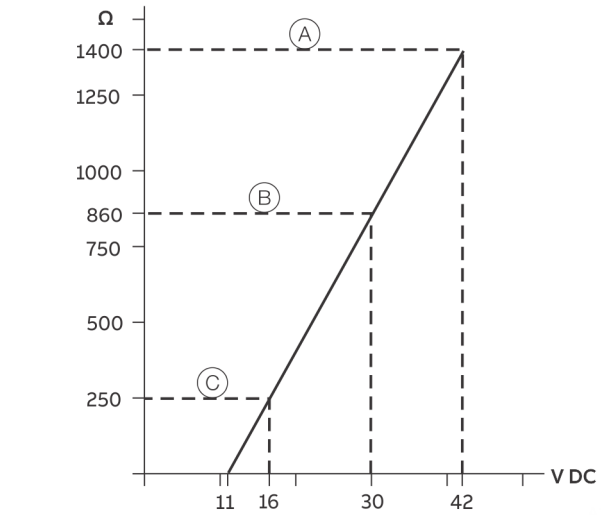


Figure 2: Maximum load depending on Supply voltage

Maximum power
$P = U_s \times 0.022$ A

E. G.: U_s = 24 V → P_{max} = 0.528 W

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	Analog output[1]
				(24-bit AD-converter)	(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

2) Standard Version

… Specification

… Measuring accuracy

Sensor		Measurement range limits	Minimum span	Measuring accuracy	
				Input[1] (24-bit AD-converter)	Analog output[2] (16-Bit D / A-converter)
Thermocouples[3], [4] / 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
3) For digital measuring accuracy, the reference junction error must be added /
for the highest digital measuring accuracy, the internal reference junction on the terminal board must be connected: Pt1000, DIN IEC 60751 Cl. B
4) When a thermocouple is used with an additional sensor (RTD or thermocouple), the internal reference junction error of the sensor electronics must be added: Error of Pt1000, DIN IEC 60751 Cl. B. + 0.1 K * supply voltage [V]

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)]

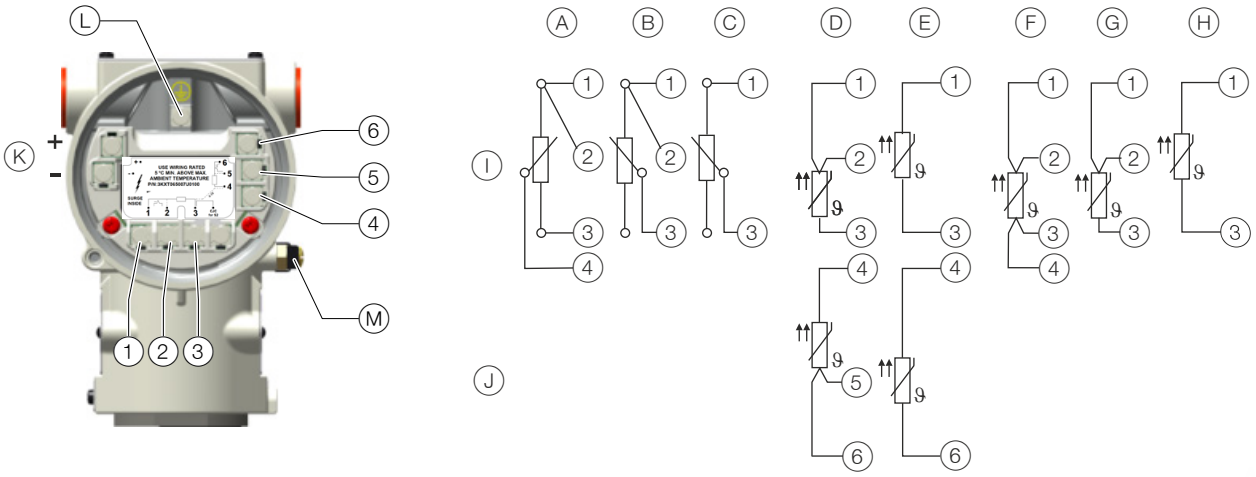
Sensor		**Ambient temperature effect per 1 °C (1.8 °F) deviation from 23 °C (73.4 °F)**	
		Input[2)]	**Analog output[3)]**
		(24-bit A / D converter)	**(16 bit DA-converter)**
Resistance thermometer for two-, three- and four-wire circuits			
IEC, JIS, MIL	Pt10	±0.04 °C (±0.072 °F)	± 0.003%
	Pt50	±0.008 °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])][4)]	± 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) 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)

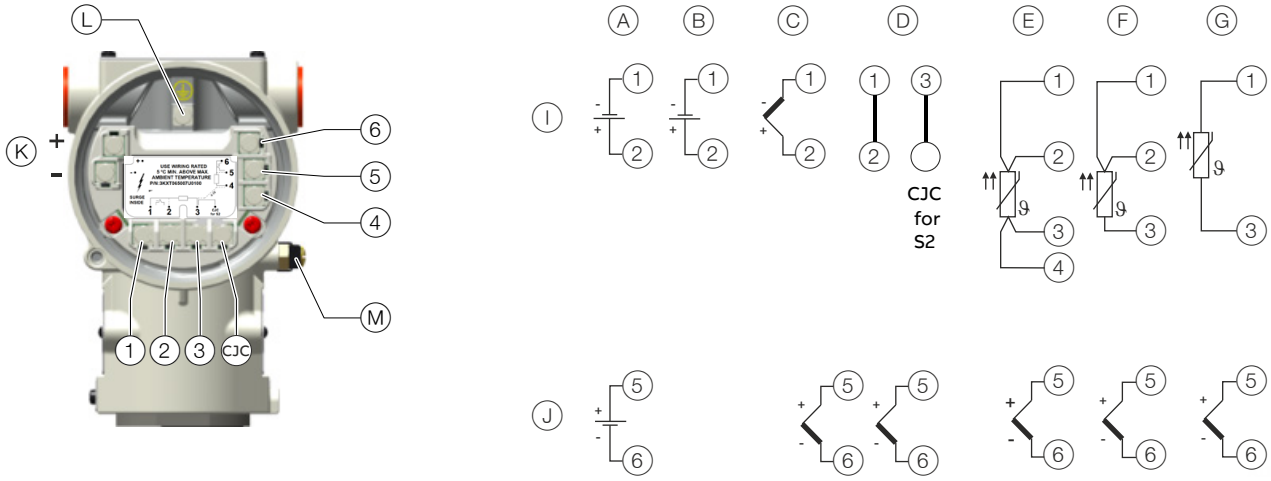


- (A) Potentiometer, four-wire circuit
- (B) Potentiometer, three-wire circuit
- (C) Potentiometer, two-wire circuit
- (D) 2 x RTD, three-wire circuit*
- (E) 2 x RTD, two-wire circuit*
- (F) RTD, four-wire circuit
- (G) RTD, three-wire circuit
- (H) RTD, two-wire circuit
- (I) Sensor 1
- (J) Sensor 2*
- (K) 4 to 20 mA HART®
- (L) Internal ground terminal for shield support for sensors and supply / signal lines
- (M) External ground terminal
- (1) – (6) Sensor connection

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

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

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



- (A) 2 x voltage measurement[1)]
- (B) 1 x voltage measurement
- (C) 2 x thermocouple[1), 2)]
- (D) 1 x thermocouple, 1 x bridge for internal reference [3)]
- (E) 1 x RTD, four-wire circuit and thermocouple [1), 2)]
- (F) 1 x RTD, three-wire circuit and thermocouple[1), 2)]
- (G) 1 x RTD, two-wire circuit and thermocouple[1), 2)]
- (I) Sensor 1
- (J) Sensor 2[1)]
- (K) 4 to 20 mA HART®
- (L) Internal ground terminal for shield support for sensors and supply / signal lines
- (M) External ground terminal
- (1) – (6) Sensor connection (of measuring inset)
- CJC Cold Junction Compensation for Sensor 2 (Bridge)

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

2) Thermocouple Cold Junction Compensation (CJC) through internal reference junction on sensor electronics.

3) Thermocouple Cold Junction Compensation (CJC) through internal reference junction on terminal board with bridge connection for highest possible digital measuring accuracy.

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 **Order form configuration** on page 21.

Write protection

Software write protection

Diagnostic information in accordance with NE 107

Standard:

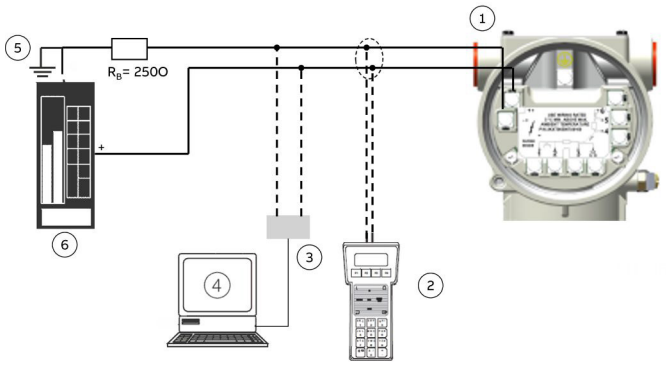
- Sensor error signaling (wire break or short-circuit)
- Device error
- Limit value up- / down-scaled
- Upper range up- / down-scaled
- Simulation active

Advanced:

- Sensor redundancy / sensor backup active (in case sensor fails) with configurable analog alarm pulse signaling
- Redundancy can be configured via device drivers (FDIX/DTM/EDD) 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. TTD300
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	HART 5: 0x004B HART 7: 0x1A4B
Profile	HART 5.9 and HART 7.6, can be switched via • LCD indicator with configuration function • Device configuration tools Default: HART 7
Configuration	On device using LCD indicator FDI, EDD, DTM
Transmission signal	BELL Standard 202

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:

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

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

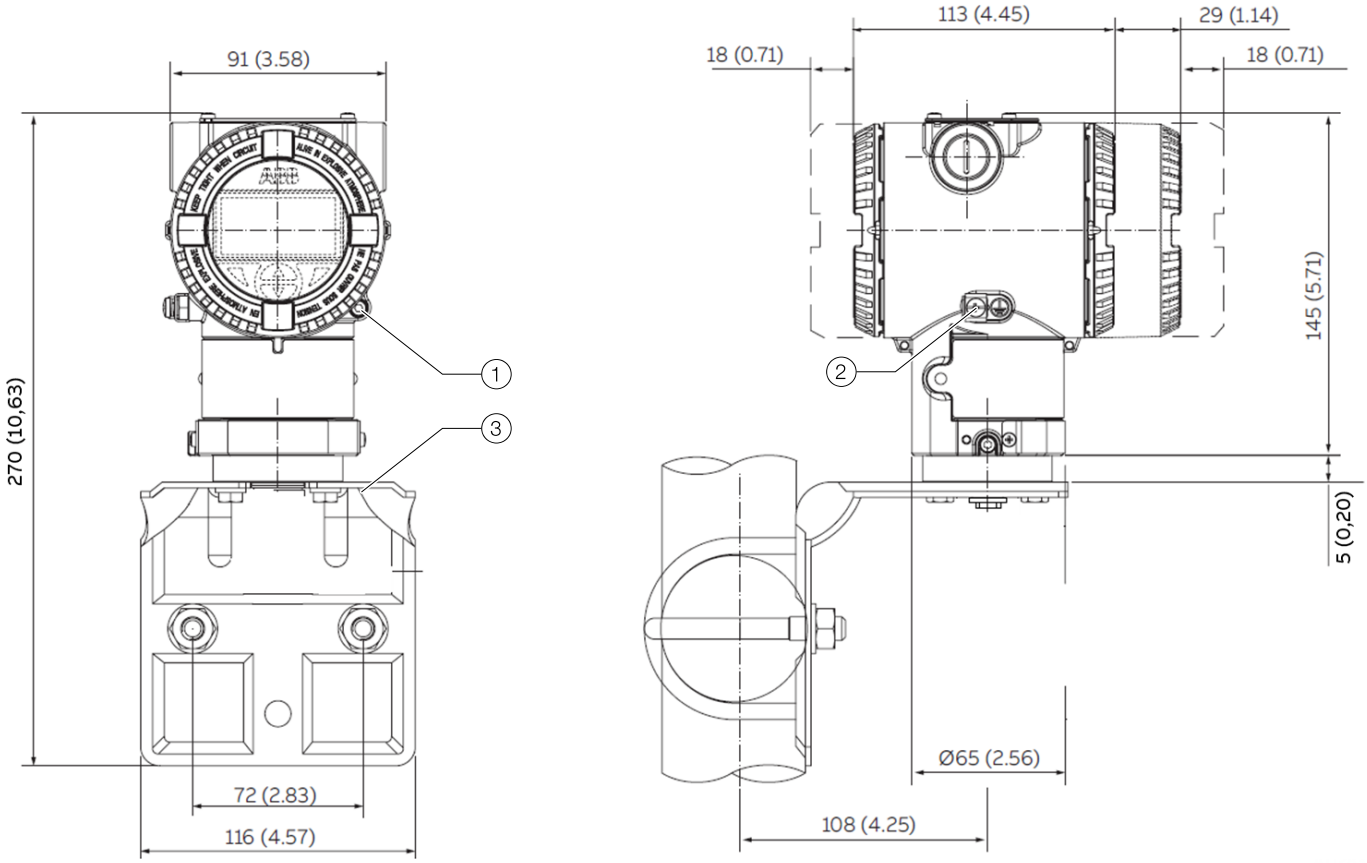
The information can be output via device configuration tools:

- 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

Dimensions



1. Locking screw
2. Potential equalization screw M5
3. Mounting bracket

Figure 6: 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.
- Devices with several types of protection may only be operated in one of the possible types of protection.
- In devices with several types of protection, for example TTD300-E4, observe the 'Product Identification' chapter in the operating or commissioning instruction before commissioning.

- In devices with several types of protection, for example TTD300-E4, observe the 'Product Identification' chapter in the operating or commissioning instruction before commissioning.

Ex marking

Transmitter

ATEX intrinsic safety

Approved for use in Zone 0 & 1 and 20 & 21.

Model TTD300(-N)-E1	
Type Examination Test Certificate	FM23ATEX0031X
II 1 G Ex ia IIC T6...T4 Ga	
II 1 D Ex ia IIIC T85°C...T100°C Da	
II 2(1) G Ex ib [ia Ga] IIC T6...T4 Gb	
II 2(1) D Ex ib [ia Da] IIIC T85°C...T100°C Db	
II 2 G / (1) D Ex ib IIC T6…T4 Ga/ [Ex ia Da] IIIC	
II 1 D / (1) G Ex ia IIIC T85°C…T100°C Da / [Ex ia Ga] IIC	
-40°C ≤ Ta ≤ 85°C (-50°C for option "SE")	

IECEx intrinsic safety

Approved for use in Zone 0 & 1 and 20 & 21.

Model TTD300(-N)-H1	
IECEx certificate of conformity	IECEx FMG 23.0015X
Ex ia IIC T6...T4 Ga	
Ex ia IIIC T85°C...T100°C Da	
Ex ib [ia Ga] IIC T6...T4 Gb	
Ex ib [ia Da] IIIC T85°C...T100°C Db	
Ex ib IIC T6…T4 Gb / [Ex ia Da] IIIC	
Ex ia IIIC T85°C…T100°C Da / [Ex ia Ga] IIC	
-40°C ≤ Ta ≤ 85°C (-50°C for option "SE")	

ATEX flameproof enclosures and protection by enclosure

Model TTD300(-N)-E3	
Type Examination Test Certificate	FM23ATEX0031X
II 2 G Ex db IIC T6 Gb	
II 2 D Ex tb IIIC T100°C Db	
-40°C ≤ Ta ≤ 75°C (-50°C for option "SE")	

IECEx flameproof enclosures and protection by enclosure

Model TTD300(-N)-H5	
IECEx Certificate of Conformity	IECEx FMG 23.0015X
Ex db IIC T6…T4 Gb	
Ex tb IIIC T85°C...T100°C Db	
-40°C ≤ Ta ≤ 75°C (-50°C for option "SE")	

ATEX increased safety and protection by enclosure

Model TTD300(-N)-E5	
Type Examination Test Certificate	FM23ATEX0032X
II 3 G Ex ec IIC T6...T4 Gc	
II 3 D Ex tc IIIC T85°C...T100°C Dc	
-40°C ≤ Ta ≤ 85°C (-50°C for option "SE")	

IECEx increased safety and protection by enclosure

Model TTD300(-N)-H2	
Type Examination Test Certificate	IECEx FMG 23.0015X
Ex ec IIC T6 … T4 Gc	
Ex tc IIIC T85°C...T100°C Dc	
-40°C ≤ Ta ≤ 85°C (-50°C for option "SE")	

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

LCD indicator

ATEX intrinsic safety

Approved for use in Zone 0.

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.

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

Temperature data

Transmitter

ATEX / IECEx intrinsic safety

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)
T85°C	−50 to 70 °C (−58 to 158 °F)
T100°C	−50 to 85 °C (−58 to 185.0 °F

ATEX / IECEx flameproof enclosures and protection by enclosure

Temperature class	Permissible ambient temperature range on the connection head
T6	−50 to 75 °C (−58 to 167 °F)
T100°C	−50 to 75 °C (−58 to 167 °F)

ATEX / IECEx increased safety and protection by enclosure

Temperature class	Permissible ambient temperature range on the connection head
T6 to T1	−50 to 85 °C (−58 to 185 °F)
T85°C to T100°C	−50 to 85 °C (−58 to 185 °F)

Electrical data

Transmitter

ATEX / IECEx Intrinsic safety

Supply circuit	**TTD300(-N)-E1** **TTD300(-N)-H1**
Max. voltage	U_i = 30 V
Short-circuit current	I_i = 130 mA
Max. power	P_i = 0.8 W
Internal inductance	L_i = 160 µH
Internal capacitance	C_i = 3.5 nF

Measurement current circuit	**Resistance thermometers, resistors (passive sensors)**	**Thermocouples, voltages (active sensors)**
Max. voltage	U_o = 6.5 V	U_o = 1.2 V
Short-circuit current	I_o = 17.8 mA	I_o = 50 mA
Max. power	P_o = 29 mW	P_o = 60 mW
Internal inductance	L_i ≈ 0 mH (negligible)	L_i ≈ 0 mH (negligible)
Internal capacitance	C_i = 55 nF	C_i = 55 nF
Maximum permissible external inductance	L_o = 5 mH	L_o = 5 mH
Maximum permissible external capacitance	IIC: C_o = 1.65 µF IIB / IIIC: C_o = 8.85 µF	IIC: C_o = 1.15 µF IIB / IIIC: C_o =6.35 µF

ATEX / IECEx flameproof enclosures and protection by enclosure

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 = 29 mW

ATEX / IECEx increased safety and protection by enclosure

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 = 29 mW

Use in potentially explosive atmospheres in accordance with cFMus

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.

Ex marking

Transmitter

cFMus Intrinsically Safe

Approved for

- Class I, II, & III, Division 1
- Class I, Zone 0, Zone 20

Model TTD300(-N)-L1	
Certificate of conformity	FM23US0067X
	FM23CA0049X
Control drawing	IS 3XT065000G0023
IS Class I, II, III; Division 1, Groups A, B, C, D, E, F, G; T6...T4	
Zone 0, AEx/ Ex ia IIC T6...T4 Ga	
Zone 20, AEx/Ex ia IIIC T85°C...T100°C Da	
Entity – 3KXT065000G0023	
-40°C ≤ Ta ≤ 85°C (-50°C for option “SE”)	

cFMus Explosionproof / Flameproof Enclosures and Dust-ignition Proof / Protection by Enclosure

Approved for

- Class I, II, & III, Division 1
- Class I, Zone 1, Zone 21

Model TTD300(-N)-L3	
Certificate of conformity	FM23US0067X
	FM23CA0049X
Control drawing	XP / IS Output 3XT065000G0023
XP Class I, Division 1, Groups B, C, D; T6	
DIP Class II, III; Division 1, Groups E, F, G; T6	
Zone 1, AEx/ Ex db IIC T6 Gb	
Zone 21, AEx/Ex tb IIIC T85°C...T100°C Db	
-40°C ≤ Ta ≤ 85°C (-50°C for option “SE”)	

cFMus Increased Safety and Protection by Enclosure

Approved for

- Class I, II, & III, Division 2
- Class I, Zone 2, Zone 22

Model TTD300(-N)-L2	
Certificate of conformity	FM23US0067X
	FM23CA0049X
Control drawing	NI 3XT065000G0023
NI Class I Division 2, Groups A, B, C, D T6, T5, T4	
NI Class II, III, Division 2, Groups E, F, G, T6, T5, T4	
Zone 2, AEx / Ex ec IIC T6...T4 Gc	
Zone 22, AEx / Ex tc IIIC T85°C...T100°C Dc	
-40°C ≤ Ta ≤ 85°C (-50°C for option “SE”)	

LCD indicator

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

Ordering Information

TTD300

Base model	**TTD300**	**XX**	**X**	**X**	**X**	**XX**
TTD300 Field-mount temperature transmitter with dual-compartment housing						
Explosion Protection						
Without explosion protection		Y0				
ATEX Intrinsic safety: 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 Flameproof enclosure: Zone 1: II 2 G Ex db IIC T6/T4 Gb		E3				
ATEX combined: Increased safety (ATEX II 3 G Ex ec IIC T6...T1 Gc)						
and Dust Explosion Protection (ATEX II 3D Ex tc IIIB T133°C Dc)		E5[1]				
ATEX combined: Flameproof enclosure (ATEX II 2 G Ex db IIC T6/T4 Gb)						
or Intrinsic Safety (ATEX II 1 G Ex ia IIC T6...T1 Ga)		E4[2]				
IECEx Intrinsic safety: 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 enclosure: Zone 1: Ex db IIC T6/T4 Gb		H5				
IECEx combined: Increased safety (Ex ec IIC T6...T4 Gc)						
and Dust Explosion Protection (Ex tc IIIC T85°C…T100°C Dc)		H2[1]				
IECEx combined: Flameproof enclosure (Ex db IIC T6...T4 Gb) or Intrinsic safety (Ex ia IIC T6...T4 Ga)		H9[2]				
FM Approvals (USA & Canada) Intrinsic Safety (IS)		L1[3]				
FM Approvals (USA & Canada) Nonincendive (NI)		L2[3]				
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[3]				
Housing / Display						
Dual-compartment housing (stainless steel) without indicator			M			
Dual-compartment housing (stainless steel) with LCD indicator			S			
Dual-compartment housing (Aluminum) without indicator			N			
Dual-compartment housing (Aluminium) with LCD indicator			R			
Cable Entry						
Thread 2 × M20 × 1.5				1		
Thread 2 × ½ in NPT				2		
Communication Protocol						
HART®, programmable, output signal 4 to 20 mA, dual input					H	
Configuration						
Standard configuration						BS
Customer-specific configuration, except user curve						BF[4]

1) Not for application in explosive hybrid mixtures.

2) Options are mutually exclusive.

3) HMI only with FMus (Lx) or cCSA (Rx) certification.

4) i.e. set measuring range, TAG no.

… Ordering Information

… TTD300

Additional ordering information

TTD300 Field Mounted Temperature Transmitter	**XX**	**XX**	**XXX**	**XXX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XXX**	**XX**
Declarations and Certificates													
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											
Approvals													
Petroleum and Explosives Safety Organisation			CPS[5]										
Handling of Certificates													
Send via e-mail				GHE									
Send with instrument				GHA									
Send via e-mail and with instrument				GHC									
Mounting Bracket													
For horizontal or vertical pipe and wall mounting / carbon steel					K3[6]								
For horizontal or vertical pipe and wall mounting / AISI 316L (1.4401)					K4								
Display Options													
LCD indicator type B with configuration function						D4							
Surge / Transient Protector													
With integral surge / transient protector							P1						
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			
Customer-specific Versions													
Hardware 02.00											Z2		
Please specify											Z9		
HART version													
HART 7												C07	
Documentation Language													
English													M5

5) Only available with **Explosion Protection code H1, H5**

6) Not suitable for AISI housing.

Order form configuration

HART device design

TTD300

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
Measuring 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)
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)		
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)

Trademarks

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

Sales **Service**

Notes

ABB Measurement & Analytics

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

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

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