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Technical Information
iTEMP TMT72

Temperature transmitter

HART® temperature transmitter as head transmitter, field transmitter or DIN rail device with universal sensor input for hazardous areas

Application

- Universal temperature transmitter with HART communication for the conversion of various input signals into a scalable, analog 4 to 20 mA output signal
- The iTEMP TMT72 is characterized by its reliability, long-term stability, high precision and advanced diagnostic function (important in critical processes).
- For the highest level of safety, reliability and risk reduction
- Universal input for resistance thermometers (RTD), thermocouples (TC), resistance transmitters (Ω), voltage transmitters (mV)
- Installation in terminal head, form B (flat face)
- Optional: installation in field housing for Ex d applications
- Optional: device design for DIN rail mounting

Your benefits

- Safe operation in hazardous locations thanks to international approvals
- Reliable operation thanks to sensor and device monitoring
- Diagnostics information according to NAMUR NE107
- Attachable measured value display TID10, optional
- Integrated Bluetooth interface for the wireless display of measured values and configuration via Endress+Hauser SmartBlue (app), optional
- Fast and tool-free wiring thanks to push-in terminal technology, optional

Endress+Hauser
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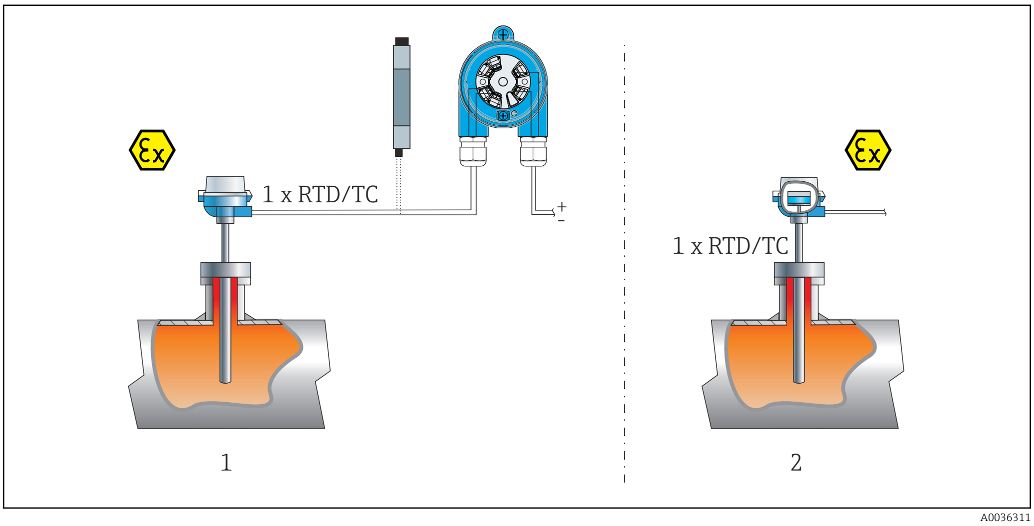
Function and system design

Measuring principle

Electronic recording and conversion of various input signals in industrial temperature measurement.

Measuring system



1 *Application examples*

1 *An RTD or thermocouple sensor with transmitter in remote installation, e.g. head transmitter in field housing or DIN rail transmitter*

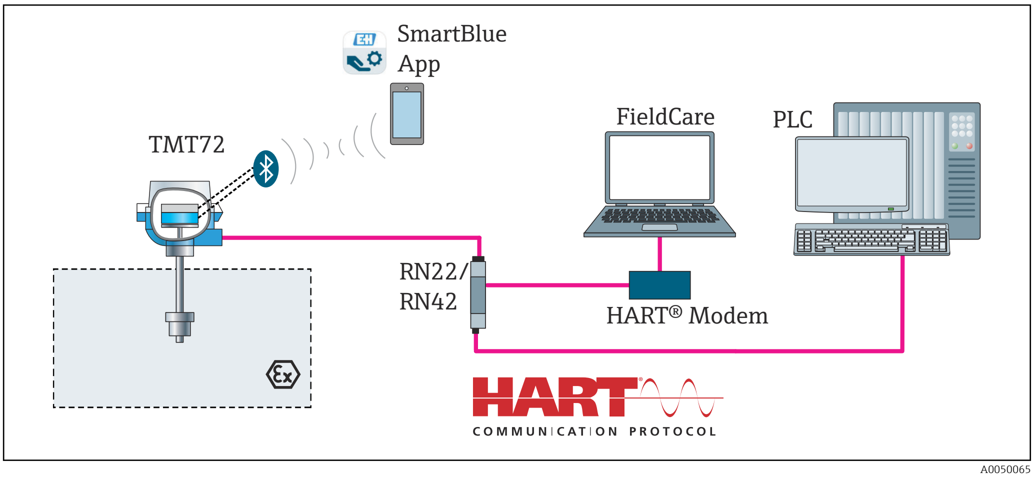
2 *Installed head transmitter - 1 x RTD/TC wired directly*

Endress+Hauser offers a comprehensive range of industrial thermometers with resistance sensors or thermocouples.

When combined with the temperature transmitter, these components form a complete measuring point for a wide range of applications in the industrial sector.

The temperature transmitter is a 2-wire device with one measuring input and one analog output. The device not only transmits converted signals from resistance thermometers and thermocouples, it also transmits resistance and voltage signals using HART communication and as a 4 to 20 mA current signal. It can be installed as an intrinsically safe apparatus in hazardous areas and is used for instrumentation purposes in the terminal head form B (flat face) as per DIN EN 50446 or as a DIN rail device for installation in the cabinet on a TH35 mounting rail as per EN 60715.

Intuitive commissioning and operation - wireless access to all device data via Bluetooth using the SmartBlue app.



2 *Device architecture for HART communication*

Standard diagnostic functions

- Cable open-circuit, short-circuit of sensor wires
- Incorrect wiring
- Internal device errors
- Overrange/underrange detection
- Device temperature overrange/underrange detection

Corrosion detection as per NAMUR NE89

Corrosion of the sensor connection cables can cause incorrect measured value readings. The transmitter makes it possible to detect corrosion of the thermocouples and mV transmitters, as well as resistance thermometers and ohmmeters with 4-wire connection, before a measured value is corrupted. The transmitter prevents incorrect measured values from being read out and can issue a warning via the HART protocol if conductor resistance values exceed plausible limits.

Low voltage detection

The low voltage detection function prevents the device from continuously transmitting an incorrect analog output value (caused by an incorrect or damaged power supply system or a damaged signal cable). If the supply voltage drops below the required value, the analog output value drops to < 3.6 mA for approx. 5 s. The device then tries to output the normal analog output value again. If the supply voltage is still too low, this process is repeated cyclically.

Diagnostics simulation

Device diagnostics can be simulated. The following items are set during such simulations:
- Measured value status
- Current diagnostics information
- Status bit of HART command 48
- Current output value as per simulated diagnostics

This simulation makes it possible to check that all higher-level systems respond as expected.

Input

Measured variable

Temperature (temperature-linear transmission behavior), resistance and voltage.

Resistance thermometer (RTD) as per standard	Description	α	Measuring range limits	Min. span
IEC 60751:2008	Pt100 (1) Pt200 (2) Pt500 (3) Pt1000 (4)	0.003851	−200 to +850 °C (−328 to +1 562 °F) −200 to +850 °C (−328 to +1 562 °F) −200 to +500 °C (−328 to +932 °F) −200 to +250 °C (−328 to +482 °F)	10 K (18 °F)
JIS C1604:1984	Pt100 (5)	0.003916	−200 to +510 °C (−328 to +950 °F)	10 K (18 °F)
DIN 43760 IPTS-68	Ni100 (6) Ni120 (7)	0.006180	−60 to +250 °C (−76 to +482 °F) −60 to +250 °C (−76 to +482 °F)	10 K (18 °F)
GOST 6651-94	Pt50 (8) Pt100 (9)	0.003910	−185 to +1 100 °C (−301 to +2 012 °F) −200 to +850 °C (−328 to +1 562 °F)	10 K (18 °F)
OIML R84: 2003, GOST 6651-2009	Cu50 (10) Cu100 (11)	0.004280	−180 to +200 °C (−292 to +392 °F) −180 to +200 °C (−292 to +392 °F)	10 K (18 °F)
	Ni100 (12) Ni120 (13)	0.006170	−60 to +180 °C (−76 to +356 °F) −60 to +180 °C (−76 to +356 °F)	10 K (18 °F)
OIML R84: 2003, GOST 6651-94	Cu50 (14)	0.004260	−50 to +200 °C (−58 to +392 °F)	10 K (18 °F)
-	Pt100 (Callendar van Dusen) Nickel polynomial Copper polynomial	-	The measuring range limits are specified by entering the limit values that depend on the coefficients A to C and R0.	10 K (18 °F)

Resistance thermometer (RTD) as per standard	Description	α	Measuring range limits	Min. span
	▪ Connection type: 2-wire, 3-wire or 4-wire connection, sensor current: ≤ 0.3 mA ▪ With 2-wire circuit, compensation of wire resistance possible (0 to 30 Ω) ▪ With 3-wire and 4-wire connection, sensor wire resistance up to max. 50 Ω per wire			
Resistance transmitter	Resistance Ω		10 to 400 Ω 10 to 2 000 Ω	10 Ω 10 Ω

Thermocouples as per standard	Description	Measuring range limits		Min. span
IEC 60584, Part 1 ASTM E230-3	Type A (W5Re-W20Re) (30) Type B (PtRh30-PtRh6) (31) Type E (NiCr-CuNi) (34) Type J (Fe-CuNi) (35) Type K (NiCr-Ni) (36) Type N (NiCrSi-NiSi) (37) Type R (PtRh13-Pt) (38) Type S (PtRh10-Pt) (39) Type T (Cu-CuNi) (40)	0 to +2 500 °C (+32 to +4 532 °F) +40 to +1 820 °C (+104 to +3 308 °F) −250 to +1 000 °C (−482 to +1 832 °F) −210 to +1 200 °C (−346 to +2 192 °F) −270 to +1 372 °C (−454 to +2 501 °F) −270 to +1 300 °C (−454 to +2 372 °F) −50 to +1 768 °C (−58 to +3 214 °F) −50 to +1 768 °C (−58 to +3 214 °F) −200 to +400 °C (−328 to +752 °F)	Recommended temperature range: 0 to +2 500 °C (+32 to +4 532 °F) +500 to +1 820 °C (+932 to +3 308 °F) −150 to +1 000 °C (−238 to +1 832 °F) −150 to +1 200 °C (−238 to +2 192 °F) −150 to +1 200 °C (−238 to +2 192 °F) −150 to +1 300 °C (−238 to +2 372 °F) +200 to +1 768 °C (+392 to +3 214 °F) +200 to +1 768 °C (+392 to +3 214 °F) −150 to +400 °C (−238 to +752 °F)	50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F) 50 K (90 °F)
IEC 60584, Part 1 ASTM E230-3 ASTM E988-96	Type C (W5Re-W26Re) (32)	0 to +2 315 °C (+32 to +4 199 °F)	0 to +2 000 °C (+32 to +3 632 °F)	50 K (90 °F)
ASTM E988-96	Type D (W3Re-W25Re) (33)	0 to +2 315 °C (+32 to +4 199 °F)	0 to +2 000 °C (+32 to +3 632 °F)	50 K (90 °F)
DIN 43710	Type L (Fe-CuNi) (41) Type U (Cu-CuNi) (42)	−200 to +900 °C (−328 to +1 652 °F) −200 to +600 °C (−328 to +1 112 °F)	−150 to +900 °C (−238 to +1 652 °F) −150 to +600 °C (−238 to +1 112 °F)	50 K (90 °F)
GOST R8.585-2001	Type L (NiCr-CuNi) (43)	−200 to +800 °C (−328 to +1 472 °F)	−200 to +800 °C (+328 to +1 472 °F)	50 K (90 °F)
	▪ Internal reference junction (Pt100) ▪ External preset value: configurable value −40 to +85 °C (−40 to +185 °F) ▪ Maximum sensor wire resistance 10 kΩ (If the sensor wire resistance is greater than 10 kΩ, an error message is output in accordance with NAMUR NE89.)			
Voltage transmitter (mV)	Millivolt transmitter (mV)	−20 to +100 mV		5 mV

Output

Output signal

Analog output	4 to 20 mA, 20 to 4 mA (can be inverted)
Signal encoding	FSK ±0.5 mA via current signal
Data transmission rate	1200 baud
Galvanic isolation	U = 2 kV AC for 1 minute (input/output)

Failure information

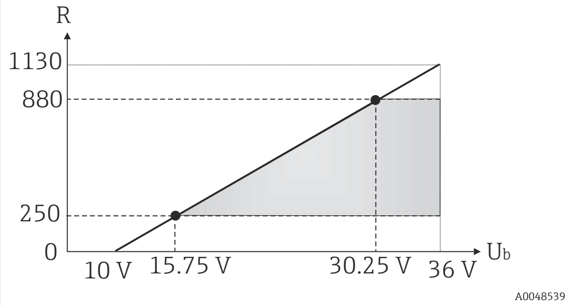
Failure information as per NAMUR NE43:

Failure information is created if the measuring information is missing or not valid. A complete list of all the errors occurring in the measuring system is created.

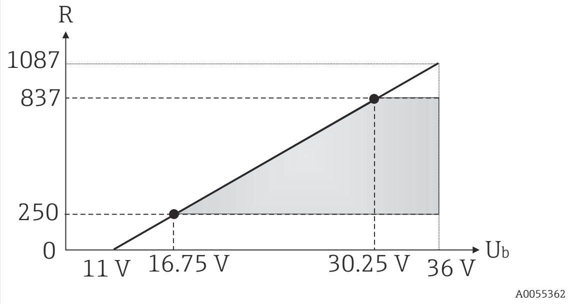
Underranging	Linear decrease from 4.0 to 3.8 mA
Overranging	Linear increase from 20.0 to 20.5 mA
Failure e.g. sensor failure; sensor short-circuit	≤ 3.6 mA ("low") or ≥ 21 mA ("high"), can be selected The "high" alarm setting can be set between 21.5 mA and 23 mA, thus providing the flexibility needed to meet the requirements of various control systems.

Load

Head transmitter: $R_{b\ max.} = (U_{b\ max.} - 10\ V)\ /\ 0.023\ A$ (current output)



Din rail transmitter: $R_{b\ max.} = (U_{b\ max.} - 11\ V)\ /\ 0.023\ A$ (current output)



Load in Ω. U_b = supply voltage in V DC

Linearization/transmission behavior

Temperature-linear, resistance-linear, voltage-linear

Mains frequency filter

50/60 Hz

Filter

1st order digital filter: 0 to 120 s

Protocol-specific data

Manufacturer ID	17 (0x11)
Device type ID	0x11D0
HART specification	7
Device address in multi-drop mode	Software setting addresses 0 to 63
Device description files (DTM, DD)	Information and files available at: www.endress.com www.fieldcommgroup.org
HART load	Min. 250 Ω
HART device variables	**Measured value for primary value (PV)** Sensor (measured value) **Measured values for SV, TV, QV (secondary, tertiary and quaternary variable)** ▪ SV: device temperature ▪ TV: sensor (measured value) ▪ QV: sensor (measured value)
Supported functions	▪ Squawk ▪ Condensed status

Wireless HART data

Minimum starting voltage	10 V_{DC}
Starting current	3.58 mA
Starting time	7 s
Minimum operating voltage	10 V_{DC}

Multidrop current	4.0 mA
Time for connection setup	9 s

Write protection for device parameters

- Hardware: Write protection for head transmitter on optional display using DIP switch
- Software: user role concept (password assignment)

Switch-on delay

≤ 7 s, until the first measured value signal is present at the current output and until the start of HART communication. While switch-on delay = $I_a \leq 3.8$ mA

Power supply

Supply voltage

Values for non-hazardous areas, protected against polarity reversal:
- Head transmitter: 10 V ≤ Vcc ≤ 36 V
- Din rail transmitter: 11 V ≤ Vcc ≤ 36 V

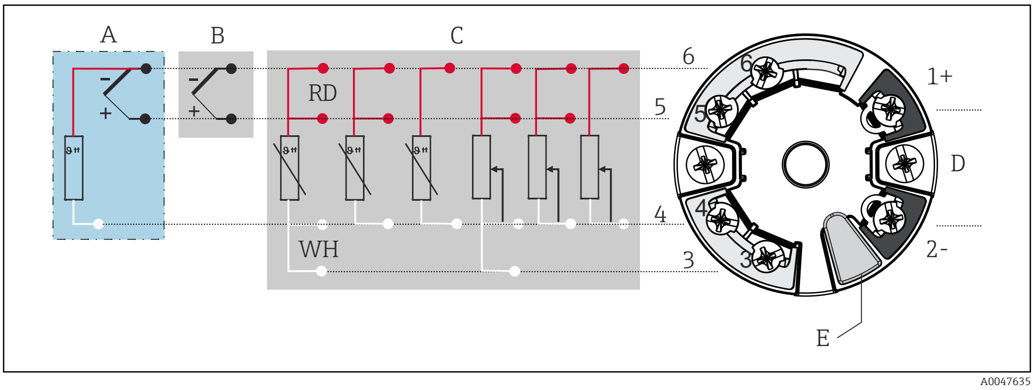
Values for hazardous area; see Ex documentation.

Current consumption

- 3.6 to 23 mA
- Minimum current consumption 3.5 mA
- Current limit ≤ 23 mA

Electrical connection

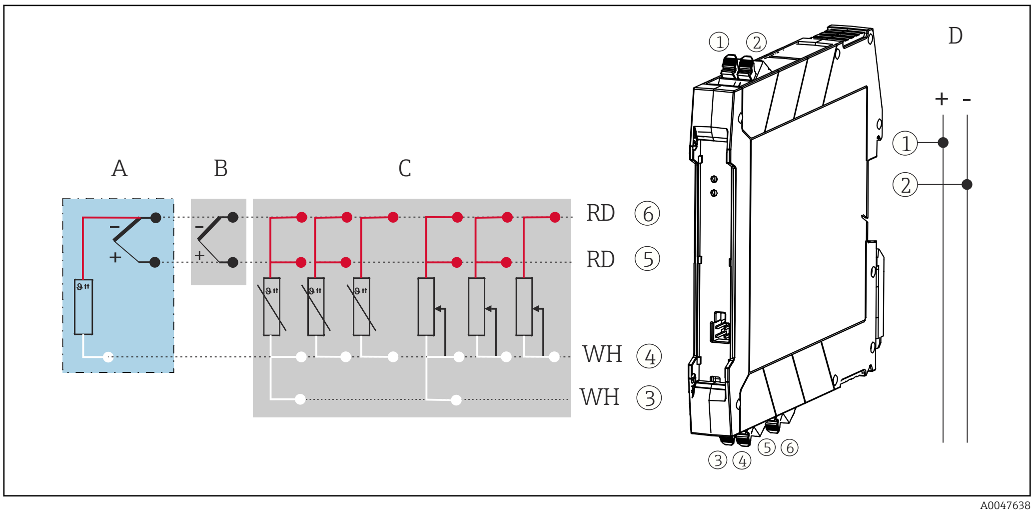
Head transmitter



3 Terminal assignment for head transmitter

A Sensor input, TC and mV, external reference junction (CJ) Pt100
B Sensor input, TC and mV, internal reference junction (CJ)
C Sensor input, RTD and Ω, 4-, 3- and 2-wire
D Bus connection and power supply 4 to 20 mA
E Display connection and CDI interface

DIN rail transmitter



4 *Terminal assignment for DIN rail transmitter*

A Sensor input, TC and mV, external reference junction (CJ), Pt100
B Sensor input, TC and mV, internal reference junction (CJ)
C Sensor input, RTD and Ω, 4-, 3- and 2-wire
D Bus connection and power supply 4 to 20 mA

If only the analog signal is used, an unshielded installation cable is sufficient. In case of increased EMC influences, the use of shielded cables is recommended. As of a sensor cable length of 30 m (98.4 ft)30 m (98.4 ft), a shielded cable must be used for the DIN rail transmitter.

A shielded cable is recommended for HART communication. Observe grounding concept of the plant. A minimum load of 250 Ω is required in the signal circuit in order to operate the HART transmitter via the HART protocol (terminals 1 and 2).

In the case of a thermocouple measurement (TC), a 2-wire RTD can be connected to measure the reference junction temperature. This is connected to terminals 4 and 6.

Terminals

Choice of screw terminals or push-in terminals for sensor and power supply cables:

Terminal design	Cable design	Cable cross-section
Screw terminals	Rigid or flexible	≤ 2.5 mm² (14 AWG)
Push-in terminals (cable version, stripping length = min. 10 mm (0.39 in)	Rigid or flexible	0.2 to 1.5 mm² (24 to 16 AWG)
	Flexible with wire end ferrules with/without plastic ferrule	0.25 to 1.5 mm² (24 to 16 AWG)

Ferrules must be used with push-in terminals and when using flexible cables with a cable cross-section of ≤ 0.3 mm^2. Otherwise, the use of ferrules when connecting flexible cables to push-in terminals is not recommended.

Performance characteristics

Response time

Resistance thermometer (RTD) and resistance transmitter (Ω measurement)	≤1 s
Thermocouples (TC) and voltage transmitters (mV)	≤ 1 s
Reference temperature	≤ 1 s

When recording step responses, it must be taken into account that the times of the internal reference measuring point are added to the specified times where applicable.

Update time

≤ 100 ms

Reference conditions

- Calibration temperature: +25 °C ±3 K (77 °F ±5.4 °F)
- Supply voltage: 24 V DC
- 4-wire circuit for resistance adjustment

Maximum measurement error

In accordance with DIN EN 60770 and the reference conditions specified above. The measurement error data correspond to ±2 σ (Gaussian distribution). The data include non-linearities and repeatability.

MV = measured value

LRV = lower range value of the relevant sensor

MR = measuring range of the relevant sensor

Typical

Standard	Description	Measuring range	Typical measurement error (±)	
Resistance thermometer (RTD) as per standard			Digital value [1]	Value at current output
IEC 60751:2008	Pt100 (1)	0 to +200 °C (32 to +392 °F)	0.07 °C (0.13 °F)	0.10 °C (0.18 °F)
IEC 60751:2008	Pt1000 (4)		0.05 °C (0.09 °F)	0.08 °C (0.14 °F)
GOST 6651-94	Pt100 (9)		0.06 °C (0.11 °F)	0.09 °C (0.16 °F)
Thermocouples (TC) as per standard			Digital value [1]	Value at current output
IEC 60584, Part 1	Type K (NiCr-Ni) (36)	0 to +800 °C (32 to +1472 °F)	0.26 °C (0.47 °F)	0.35 °C (0.63 °F)
	Type R (PtRh13-Pt) (38)		0.46 °C (0.83 °F)	0.52 °C (0.94 °F)
	Type S (PtRh10-Pt) (39)		0.55 °C (0.99 °F)	0.60 °C (1.08 °F)

1) Measured value transmitted via HART

Measurement error for resistance thermometers (RTD) and resistance transmitters

Standard	Description	Measuring range	Measurement error (±)	
			Digital [1]	**D/A [2]**
			Based on measured value [3]	
IEC 60751:2008	Pt100 (1)	−200 to +850 °C (−328 to +1562 °F)	ME = ± (0.05 °C (0.09 °F) + 0.006% * (MV - LRV))	0.03 % (≙ 4.8 µA)
	Pt200 (2)		ME = ± (0.08 °C (0.14 °F) + 0.011% * (MV - LRV))	
	Pt500 (3)	−200 to +510 °C (−328 to +950 °F)	ME = ± (0.035 °C (0.063 °F) + 0.008% * (MV - LRV))	
	Pt1000 (4)	−200 to +250 °C (−328 to +482 °F)	ME = ± (0.02 °C (0.04 °F) + 0.007% * (MV - LRV))	
JIS C1604:1984	Pt100 (5)	−200 to +510 °C (−328 to +950 °F)	ME = ± (0.045 °C (0.08 °F) + 0.006% * (MV - LRV))	
GOST 6651-94	Pt50 (8)	−185 to +1100 °C (−301 to +2012 °F)	ME = ± (0.08 °C (0.14 °F) + 0.008% * (MV - LRV))	
	Pt100 (9)	−200 to +850 °C (−328 to +1562 °F)	ME = ± (0.045 °C (0.08 °F) + 0.006% * (MV - LRV))	0.03 % (≙ 4.8 µA)
DIN 43760 IPTS-68	Ni100 (6)	−60 to +250 °C (−76 to +482 °F)	ME = ± (0.042 °C (0.07 °F) - 0.004% * (MV- LRV))	
	Ni120 (7)		ME = ± (0.04 °C (0.07 °F) - 0.004% * (MV- LRV))	

Standard	Description	Measuring range	Measurement error (±)	
			Digital [1]	D/A [2]
OIML R84: 2003 / GOST 6651-2009	Cu50 (10)	−180 to +200 °C (−292 to +392 °F)	ME = ± (0.08 °C (0.14 °F) + 0.006% * (MV - LRV))	
	Cu100 (11)	−180 to +200 °C (−292 to +392 °F)	ME = ± (0.04 °C (0.07 °F) + 0.003% * (MV - LRV))	
	Ni100 (12)	−60 to +180 °C (−76 to +356 °F)	ME = ± (0.04 °C (0.07 °F) - 0.004% * (MV- LRV))	
	Ni120 (13)			
OIML R84: 2003, GOST 6651-94	Cu50 (14)	−50 to +200 °C (−58 to +392 °F)	ME = ± (0.086 °C (0.004 °F) + 0.004% * (MV - LRV))	
Resistance transmitter	Resistance Ω	10 to 400 Ω	ME = ± 17 mΩ + 0.0032 % * MV	0.03 % (≙ 4.8 μA)
		10 to 2 000 Ω	ME = ± 60 mΩ + 0.006 % * MV	

1) Measured value transmitted via HART
2) Percentages based on the configured span of the analog output signal.
3) Deviations from maximum measurement error possible due to rounding.

Measurement error for thermocouples (TC) and voltage transmitters

Standard	Description	Measuring range	Measurement error (±)	
			Digital [1]	D/A [2]
			Based on measured value [3]	
IEC 60584-1 ASTM E230-3	Type A (30)	0 to +2 500 °C (+32 to +4 532 °F)	ME = ± (0.57 °C (1.03 °F) + 0.025% * (MV - LRV))	0.03 % (≙ 4.8 μA)
	Type B (31)	+500 to +1 820 °C (+932 to +3 308 °F)	ME = ± (0.78 °C (1.4 °F) - 0.025% * (MV- LRV))	
IEC 60584-1 ASTM E230-3 ASTM E988-96	Type C (32)	0 to +2 000 °C (+32 to +3 632 °F)	ME = ± (0.28 °C (0.5 °F) + 0.011% * (MV - LRV))	
ASTM E988-96	Type D (33)		ME = ± (0.4 °C (0.72 °F) * (MV - LRV))	
IEC 60584-1 ASTM E230-3	Type E (34)	−150 to +1 000 °C (−238 to +1 832 °F)	ME = ± (0.13 °C (0.23 °F) - 0.001% * (MV- LRV))	
	Type J (35)	−150 to +1 200 °C (−238 to +2 192 °F)	ME = ± (0.17 °C (0.31 °F) * (MV - LRV))	
	Type K (36)		ME = ± (0.24 °C (0.43 °F) - 0.002% * (MV - LRV))	
	Type N (37)	−150 to +1 300 °C (−238 to +2 372 °F)	ME = ± (0.27 °C (0.49 °F) - 0.003% * (MV - LRV))	0.03 % (≙ 4.8 μA)
	Type R (38)	+200 to +1 768 °C (+392 to +3 214 °F)	ME = ± (0.48 °C (0.86 °F) - 0.004% * (MV - LRV))	
	Type S (39)		ME = ± (0.54 °C (0.97 °F) - 0.002% * (MV - LRV))	
	Type T (40)	−150 to +400 °C (−238 to +752 °F)	ME = ± (0.24 °C (0.43 °F) - 0.02% * (MV - LRV))	
DIN 43710	Type L (41)	−150 to +900 °C (−238 to +1 652 °F)	ME = ± (0.2 °C (0.36 °F) - 0.002% * (MV - LRV))	
	Type U (42)	−150 to +600 °C (−238 to +1 112 °F)	ME = ± (0.27 °C (0.49 °F) - 0.019% * (MV - LRV))	
GOST R8.585-2001	Type L (43)	−200 to +800 °C (−328 to +1 472 °F)	ME = ± (2.2 °C (3.96 °F) - 0.005% * (MV - LRV))	

Standard	Description	Measuring range	Measurement error (±)	
			Digital 1)	D/A 2)
Voltage transmitter (mV)		−20 to +100 mV	ME = ± 10.0 µV	4.8 µA

1) Measured value transmitted via HART
2) Percentages based on the configured span of the analog output signal.
3) Deviations from maximum measurement error possible due to rounding.

Total measurement error of transmitter at current output = √(Measurement error digital² + Measurement error D/A²)

Sample calculation with Pt100, measuring range 0 to +200 °C (+32 to +392 °F), ambient temperature +25 °C (+77 °F), supply voltage 24 V:

Measurement error digital = 0.05 °C + 0.006% x (200 °C - (-200 °C)):	0.07 °C (0.126 °F)
Measurement error D/A = 0.03 % x 200 °C (360 °F)	0.06 °C (0.108 °F)
Measurement error digital value (HART):	0.07 °C (0.126 °F)
Measurement error analog value (current output): √(Measurement error digital² + Measurement error D/A²)	0.10 °C (0.18 °F)

Sample calculation with Pt100, measuring range 0 to +200 °C (+32 to +392 °F), ambient temperature +35 °C (+95 °F), supply voltage 30 V:

Measurement error digital = 0.05 °C + 0.006% x (200 °C - (-200 °C)):	0.07 °C (0.126 °F)
Measurement error D/A = 0.03 % x 200 °C (360 °F)	0.06 °C (0.108 °F)
Influence of ambient temperature (digital) = (35 - 25) x (0.0013 % x 200 °C - (-200 °C)), min. 0.003 °C	0.05 °C (0.09 °F)
Influence of ambient temperature (D/A) = (35 - 25) x (0.003% x 200 °C)	0.06 °C (0.108 °F)
Influence of supply voltage (digital) = (30 - 24) x (0.0007% x 200 °C - (-200 °C)), min. 0.005 °C	0.02 °C (0.036 °F)
Influence of supply voltage (D/A) = (30 - 24) x (0.003% x 200 °C)	0.04 °C (0.72 °F)
Measurement error digital value (HART): √(Measurement error digital² + Influence of ambient temperature (digital)² + Influence of supply voltage (digital)²	**0.10 °C (0.18 °F)**
Measurement error analog value (current output): √(Measurement error digital² + Measurement error D/A² + Influence of ambient temperature (digital)² + Influence of ambient temperature (D/A)² + Influence of supply voltage (digital)² + Influence of supply voltage (D/A)²	**0.13 °C (0.23 °F)**

The measurement error data corresponds to 2 σ (Gaussian distribution).

Physical input measuring range of sensors	
10 to 400 Ω	Cu50, Cu100, polynomial RTD, Pt50, Pt100, Ni100, Ni120
10 to 2 000 Ω	Pt200, Pt500, Pt1000
−20 to +100 mV	Thermocouples type: A, B, C, D, E, J, K, L, N, R, S, T, U

Sensor adjustment

Sensor-transmitter matching

RTD sensors are one of the most linear temperature measuring elements. Nevertheless, the output must be linearized. To significantly improve temperature measurement accuracy, the device allows the use of two methods:

- Callendar van Dusen coefficients (Pt100 resistance thermometer)
  The Callendar van Dusen equation is described as:
  $R_T = R_0[1+AT+BT^2+C(T-100)T^3]$

  The coefficients A, B and C are used to match the sensor (platinum) and transmitter in order to improve the accuracy of the measuring system. The coefficients for a standard sensor are specified in IEC 751. If no standard sensor is available or if greater accuracy is required, the coefficients for each sensor can be determined specifically with the aid of sensor calibration.

- Linearization for copper/nickel resistance thermometers (RTD)
  The polynomial equation for copper/nickel is as follows:
  $R_T = R_0(1+AT+BT^2)$

  The coefficients A and B are used for the linearization of nickel or copper resistance thermometers (RTD). The exact values of the coefficients derive from the calibration data and are specific to each sensor. The sensor-specific coefficients are then sent to the transmitter.

Sensor-transmitter matching using one of the methods mentioned above significantly improves the temperature measurement accuracy of the entire system. This is because the transmitter uses the specific data pertaining to the connected sensor to calculate the measured temperature, instead of using the standardized sensor curve data.

1-point adjustment (offset)

Shifts the sensor value

Current output adjustment

Correction of the 4 or 20 mA current output value.

Operating influences

The measurement error data corresponds to 2 σ (Gaussian distribution).

Influence of ambient temperature and supply voltage on operation for resistance thermometers (RTD) and resistance transmitters

Description	Standard	Ambient temperature: Influence (±) per 1 °C (1.8 °F) change		Supply voltage: Influence (±) per V change	
		Digital [1]	D/A [2]	Digital [1]	D/A [2]
		Based on measured value		Based on measured value	
Pt100 (1)	IEC 60751:2008	0.0013% * (MV - LRV), at least 0.003 °C (0.005 °F)	0.003 %	0.0007% * (MV - LRV), at least 0.002 °C (0.004 °F)	0.003 %
Pt200 (2)		≤ 0.017 °C (0.031 °F)		≤ 0.009 °C (0.016 °F)	
Pt500 (3)		0.0013% * (MV - LRV), at least 0.006 °C (0.011 °F)		0.0007% * (MV - LRV), at least 0.002 °C (0.004 °F)	
Pt1000 (4)		≤ 0.005 °C (0.009 °F)		≤ 0.003 °C (0.005 °F)	
Pt100 (5)	JIS C1604:1984	0.0013% * (MV - LRV), at least 0.003 °C (0.005 °F)		0.0007% * (MV - LRV), at least 0.001 °C (0.002 °F)	
Pt50 (8)	GOST 6651-94	0.0015% * (MV - LRV), at least 0.01 °C (0.018 °F)		0.0007% * (MV - LRV), at least 0.004 °C (0.007 °F)	
Pt100 (9)		0.0013% * (MV - LRV), at least 0.003 °C (0.005 °F)		0.0007% * (MV - LRV), at least 0.002 °C (0.004 °F)	
Ni100 (6)	DIN 43760 IPTS-68	≤ 0.003 °C (0.005 °F)	0.003 %	≤ 0.001 °C (0.002 °F)	0.003 %
Ni120 (7)					
Cu50 (10)	OIML R84: 2003 / GOST 6651-2009	≤ 0.005 °C (0.009 °F)		≤ 0.002 °C (0.004 °F)	
Cu100 (11)		≤ 0.004 °C (0.007 °F)		≤ 0.002 °C (0.004 °F)	
Ni100 (12)		≤ 0.003 °C (0.005 °F)		≤ 0.001 °C (0.002 °F)	
Ni120 (13)					
Cu50 (14)	OIML R84: 2003 / GOST 6651-94	≤ 0.005 °C (0.009 °F)		≤ 0.002 °C (0.004 °F)	
Resistance transmitter (Ω)					

Description	Standard	Ambient temperature: Influence (±) per 1 °C (1.8 °F) change		Supply voltage: Influence (±) per V change	
		Digital 1)	D/A 2)	Digital 1)	D/A 2)
10 to 400 Ω		0.001% * MV, at least 1 mΩ	0.003 %	0.0005% * MV, at least 1 mΩ	0.003 %
10 to 2 000 Ω		0.001% * MV, at least 10 mΩ		0.0005% * MV, at least 5 mΩ	

1) Measured value transmitted via HART
2) Percentages based on the configured span of the analog output signal

Influence of ambient temperature and supply voltage on operation for thermocouples (TC) and voltage transmitters

Description	Standard	Ambient temperature: Influence (±) per 1 °C (1.8 °F) change		Supply voltage: Influence (±) per V change	
		Digital 1)	D/A 2)	Digital	D/A 2)
		Based on measured value		Based on measured value	
Type A (30)	IEC 60584-1 ASTM E230-3	0.003% * (MV - LRV), at least 0.01 °C (0.018 °F)	0.003 %	0.0012% * (MV - LRV), at least 0.013 °C (0.023 °F)	0.003 %
Type B (31)		≤ 0.04 °C (0.072 °F)		≤ 0.02 °C (0.036 °F)	
Type C (32)	IEC 60584-1 ASTM E230-3 ASTM E988-96	0.0021% * (MV - LRV), at least 0.01 °C (0.018 °F)		0.0012% * (MV - LRV), at least 0.013 °C (0.023 °F)	
Type D (33)	ASTM E988-96	0.0019% * (MV - LRV), at least 0.01 °C (0.018 °F)		0.0011% * (MV - LRV), at least 0.0 °C (0.0 °F)	
Type E (34)	IEC 60584-1 ASTM E230-3	0.0014% * (MV - LRV), at least 0.0 °C (0.0 °F)		0.0008% * (MV - LRV), at least 0.0 °C (0.0 °F)	
Type J (35)		0.0014% * (MV - LRV), at least 0.0 °C (0.0 °F)		0.0008% * MV, at least 0.0 °C (0.0 °F)	
Type K (36)		0.0015% * (MV - LRV), at least 0.0 °C (0.0 °F)		0.0009% * (MV - LRV), at least 0.0 °C (0.0 °F)	
Type N (37)		0.0014% * (MV - LRV), at least 0.02 °C (0.036 °F)	0.003 %	0.0008% * MV, at least 0.0 °C (0.0 °F)	0.003 %
Type R (38)		≤ 0.03 °C (0.054 °F)		≤ 0.02 °C (0.036 °F)	
Type S (39)		≤ 0.03 °C (0.054 °F)		≤ 0.02 °C (0.036 °F)	
Type T (40)		≤ 0.01 °C (0.018 °F)		≤ 0.0 °C (0.0 °F)	
Type L (41)	DIN 43710	≤ 0.01 °C (0.018 °F)		≤ 0.01 °C (0.018 °F)	
Type U (42)		≤ 0.01 °C (0.018 °F)		≤ 0.0 °C (0.0 °F)	
Type L (43)	GOST R8.585-2001	≤ 0.01 °C (0.018 °F)		≤ 0.01 °C (0.018 °F)	
Voltage transmitter (mV)					
−20 to 100 mV	-	0.0015% * MV	0.003 %	0.0008% * MV	0.003 %

1) Measured value transmitted via HART
2) Percentages based on the configured span of the analog output signal

MV = measured value

LRV = lower range value of the relevant sensor

MR = measuring range of the relevant sensor

Total measurement error of transmitter at current output = √(Measurement error digital² + Measurement error D/A²)

Long-term drift, resistance thermometers (RTD) and resistance transmitters

Description	Standard	Long-term drift (±) 1)				
		after 1 month	after 6 months	after 1 year	after 3 years	after 5 years
		Based on measured value				
Pt100 (1)	IEC 60751:2008	≤ 0.039% * (MV - LRV) or 0.01 °C (0.02 °F)	≤ 0.061% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.007% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRV) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRV) or 0.03 °C (0.05 °F)
Pt200 (2)		0.05 °C (0.09 °F)	0.05 °C (0.09 °F)	0.09 °C (0.17 °F)	0.12 °C (0.27 °F)	0.13 °C (0.24 °F)
Pt500 (3)		≤ 0.048% * (MV - LRV) or 0.01 °C (0.02 °F)	≤ 0.0075% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.068% * (MV - LRV) or 0.03 °C (0.06 °F)	≤ 0.011% * (MV - LRV) or 0.03 °C (0.05 °F)	≤ 0.0124% * (MV - LRV) or 0.04 °C (0.07 °F)
Pt1000 (4)			≤ 0.0077% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0088% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0114% * (MV - LRV) or 0.03 °C (0.05 °F)	≤ 0.013% * (MV - LRV) or 0.03 °C (0.05 °F)
Pt100 (5)	JIS C1604:1984	≤ 0.039% * (MV - LRV) or 0.01 °C (0.02 °F)	≤ 0.0061% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.007% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRV) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRV) or 0.03 °C (0.05 °F)
Pt50 (8)	GOST 6651-94	≤ 0.042% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0068% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.0076% * (MV - LRV) or 0.04 °C (0.08 °F)	≤ 0.01% * (MV - LRV) or 0.06 °C (0.11 °F)	≤ 0.011% * (MV - LRV) or 0.07 °C (0.12 °F)
Pt100 (9)		≤ 0.016% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.0061% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.007% * (MV - LRV) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRV) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRV) or 0.03 °C (0.05 °F)
Ni100 (6)	DIN 43760 IPTS-68	0.01 °C (0.02 °F)	0.01 °C (0.02 °F)	0.02 °C (0.04 °F)	0.02 °C (0.04 °F)	0.02 °C (0.04 °F)
Ni120 (7)						
Cu50 (10)	OIML R84: 2003 / GOST 6651-2009	0.02 °C (0.04 °F)	0.03 °C (0.05 °F)	0.04 °C (0.07 °F)	0.05 °C (0.09 °F)	0.05 °C (0.09 °F)
Cu100 (11)		0.01 °C (0.02 °F)	0.02 °C (0.04 °F)	0.02 °C (0.04 °F)	0.03 °C (0.05 °F)	0.04 °C (0.07 °F)
Ni100 (12)			0.01 °C (0.02 °F)	0.02 °C (0.04 °F)	0.02 °C (0.04 °F)	0.02 °C (0.04 °F)
Ni120 (13)						
Cu50 (14)	OIML R84: 2003 / GOST 6651-94	0.02 °C (0.04 °F)	0.03 °C (0.05 °F)	0.04 °C (0.07 °F)	0.05 °C (0.09 °F)	0.05 °C (0.09 °F)
Resistance transmitter						
10 to 400 Ω		≤ 0.003% * MV or 4 mΩ	≤ 0.0048% * MV or 6 mΩ	≤ 0.0055% * MV or 7 mΩ	≤ 0.0073% * MV or 10 mΩ	≤ 0.008% * (MV - LRV) or 11 mΩ
10 to 2 000 Ω		≤ 0.0038% * MV or 25 mΩ	≤ 0.006% * MV or 40 mΩ	≤ 0.007% * (MV - LRV) or 47 mΩ	≤ 0.009% * (MV - LRV) or 60 mΩ	≤ 0.0067% * (MV - LRV) or 67 mΩ

1) Whichever is greater

Long-term drift, thermocouples (TC) and voltage transmitters

Description	Standard	Long-term drift (±) 1)				
		after 1 month	after 6 months	after 1 year	after 3 years	after 5 years
		Based on measured value				
Type A (30)	IEC 60584-1 ASTM E230-3	≤ 0.021% * (MV - LRV) or 0.34 °C (0.61 °F)	≤ 0.037% * (MV - LRV) or 0.59 °C (1.06 °F)	≤ 0.044% * (MV - LRV) or 0.70 °C (1.26 °F)	≤ 0.058% * (MV - LRV) or 0.93 °C (1.67 °F)	≤ 0.063% * (MV - LRV) or 1.01 °C (1.82 °F)
Type B (31)		0.80 °C (1.44 °F)	1.40 °C (2.52 °F)	1.66 °C (2.99 °F)	2.19 °C (3.94 °F)	2.39 °C (4.30 °F)

Description	Standard	Long-term drift (±) [1]				
Type C (32)	IEC 60584-1 ASTM E230-3 ASTM E988-96	0.34 °C (0.61 °F)	0.58 °C (1.04 °F)	0.70 °C (1.26 °F)	0.92 °C (1.66 °F)	1.00 °C (1.80 °F)
Type D (33)	ASTM E988-96	0.42 °C (0.76 °F)	0.73 °C (1.31 °F)	0.87 °C (1.57 °F)	1.15 °C (2.07 °F)	1.26 °C (2.27 °F)
Type E (34)	IEC 60584-1 ASTM E230-3	0.13 °C (0.23 °F)	0.22 °C (0.40 °F)	0.26 °C (0.47 °F)	0.34 °C (0.61 °F)	0.37 °C (0.67 °F)
Type J (35)		0.15 °C (0.27 °F)	0.26 °C (0.47 °F)	0.31 °C (0.56 °F)	0.41 °C (0.74 °F)	0.44 °C (0.79 °F)
Type K (36)		0.17 °C (0.31 °F)	0.30 °C (0.54 °F)	0.36 °C (0.65 °F)	0.47 °C (0.85 °F)	0.51 °C (0.92 °F)
Type N (37)		0.25 °C (0.45 °F)	0.44 °C (0.79 °F)	0.52 °C (0.94 °F)	0.69 °C (1.24 °F)	0.75 °C (1.35 °F)
Type R (38)		0.62 °C (1.12 °F)	1.08 °C (1.94 °F)	1.28 °C (2.30 °F)	1.69 °C (3.04 °F)	1.85 °C (3.33 °F)
Type S (39)				1.29 °C (2.32 °F)	1.70 °C (3.06 °F)	
Type T (40)		0.18 °C (0.32 °F)	0.32 °C (0.58 °F)	0.38 °C (0.68 °F)	0.50 °C (0.90 °F)	0.54 °C (0.97 °F)
Type L (41)	DIN 43710	0.12 °C (0.22 °F)	0.21 °C (0.38 °F)	0.25 °C (0.45 °F)	0.33 °C (0.59 °F)	0.36 °C (0.65 °F)
Type U (42)		0.18 °C (0.32 °F)	0.31 °C (0.56 °F)	0.37 °C (0.67 °F)	0.49 °C (0.88 °F)	0.53 °C (0.95 °F)
Type L (43)	GOST R8.585-2001	0.15 °C (0.27 °F)	0.26 °C (0.47 °F)	0.31 °C (0.56 °F)	0.41 °C (0.74 °F)	0.44 °C (0.79 °F)
Voltage transmitter (mV)						
– 20 to 100 mV		≤ 0.012% * MV or 4 µV	≤ 0.021% * MV or 7 µV	≤ 0.025% * MV or 8 µV	≤ 0.033% * MV or 11 µV	≤ 0.036% * MV or 12 µV

1) Whichever is greater

Long-term drift analog output

Long-term drift D/A [1] (±)				
after 1 month	after 6 months	after 1 year	after 3 years	after 5 years
0.018%	0.026%	0.030%	0.036%	0.038%

1) Percentages based on the configured span of the analog output signal.

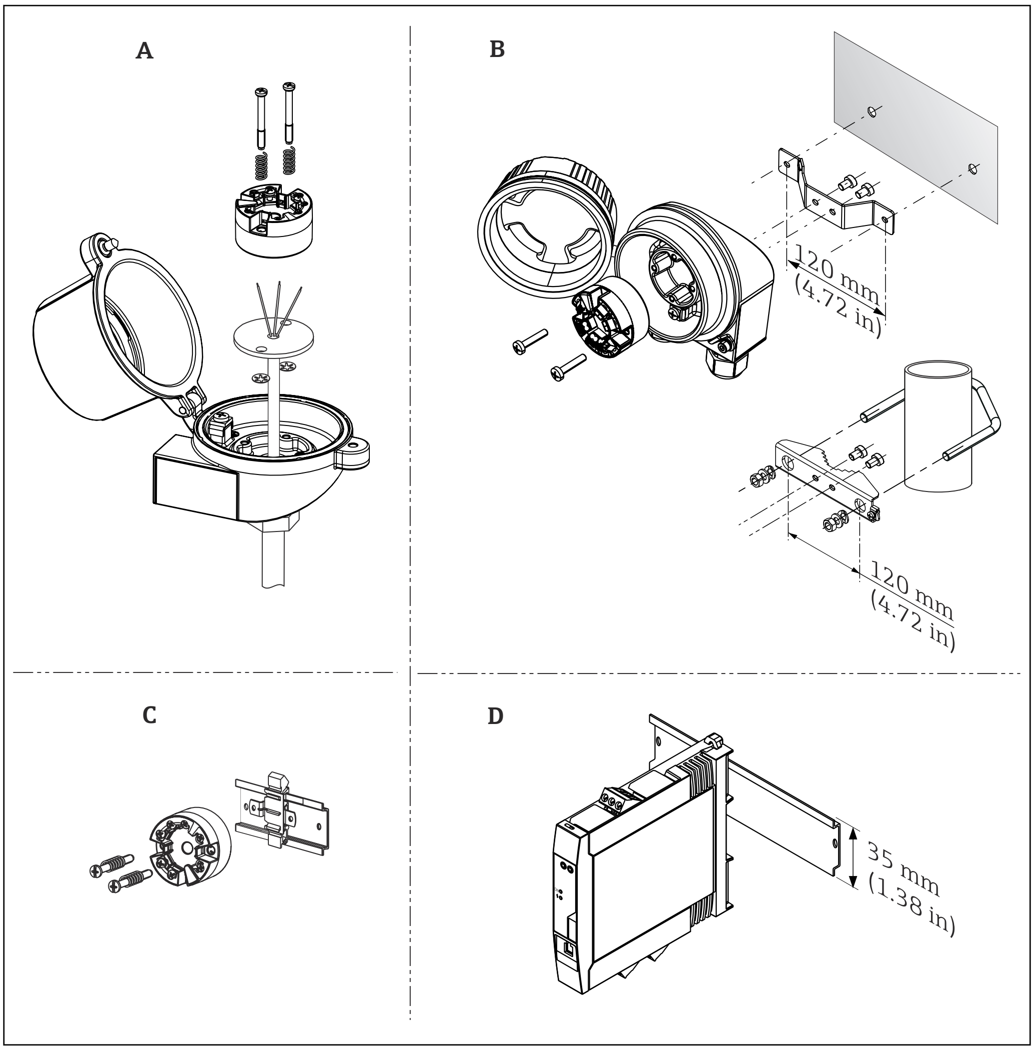
Influence of the reference junction

Pt100 DIN IEC 60751 Cl. B (internal reference junction with thermocouples TC)

If an external 2-wire Pt100 is used for the reference junction measurement, the measurement error caused by the transmitter is < 0.5 °C (0.9 °F). The measurement error of the sensor element also needs to be added.

Installation

Mounting location



5 Mounting location options for the transmitter

A *Terminal head form B (flat face) as per DIN EN 50446, direct installation on insert with cable entry (middle hole 7 mm (0.28 in))*
B *Separated from process in field housing, wall or pipe mounting*
C *With DIN rail clip on DIN rail as per IEC 60715 (TH35)*
D *DIN rail transmitter for mounting on TH35 mounting rail as per EN 60715*

-
- When installing the head transmitter in a terminal head form B (flat face), make sure there is sufficient space in the terminal head!

Orientation

Orientation
When DIN rail transmitters are used with a thermocouple/mV measurement, increased measurement deviation may occur depending on the installation situation and ambient conditions. If the transmitter is mounted on the DIN rail without any adjacent devices, this may result in deviations of ±1.3 °C. If the transmitter is mounted in series between other DIN rail devices (reference condition: 24 V, 12 mA), deviations of max. +2.9 °C may occur.

Ambient conditions

Ambient temperature

Head transmitter/DIN rail transmitter	−40 to +85 °C (−40 to +185 °F); for hazardous areas, see Ex documentation.

Storage temperature

Head transmitter	−50 to +100 °C (−58 to +212 °F)
DIN rail transmitter	−40 to +100 °C (−40 to +212 °F)

Operating altitude

Up to 4,000 m (4,374.5 yards) above sea level.

Humidity

- Condensation:
  - Head transmitter permitted
  - DIN rail transmitter not permitted
- Max. rel. humidity: 95% as per IEC 60068-2-30

Climate class

- Head transmitter: climate class C1 as per EN 60654-1
- DIN rail transmitter: climate class B2 as per IEC 60654-1

Degree of protection

- Head transmitter with screw terminals: IP 20, with push-in terminals: IP 30. When the device is installed, the degree of protection depends on the terminal head or field housing used.
- When installed in field housing TA30A, TA30D or TA30H: IP 66/68 (NEMA Type 4x encl.)
- DIN rail transmitter: IP 20

Shock and vibration resistance

Vibration resistance as per DNVGL-CG-0339:2015 and DIN EN 60068-2-27
- Head transmitter: 2 to 100 Hz at 4g (increased vibration stress)
- DIN rail transmitter: 2 to 100 Hz at 0.7 g (general vibration stress)

Shock resistance as per KTA 3505 (section 5.8.4 Shock test)

Electromagnetic compatibility (EMC)

CE conformity

Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/EN 61326 series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity. All tests were passed both with and without ongoing digital HARTcommunication.

Maximum measurement error <1% of measuring range.

Interference immunity as per IEC/EN 61326 series, industrial requirements

Interference emission as per IEC/EN 61326 series, Class B equipment

Overvoltage category

Overvoltage category II

Pollution degree

Pollution degree 2

Protection class

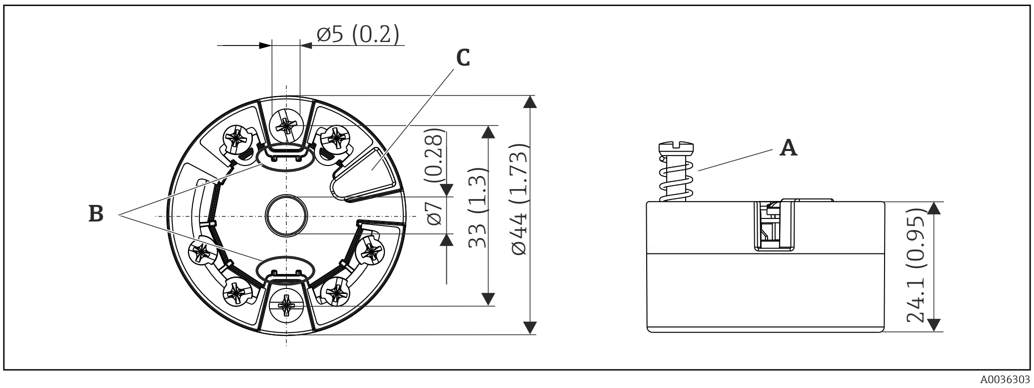
Protection class III

Mechanical construction

Design, dimensions

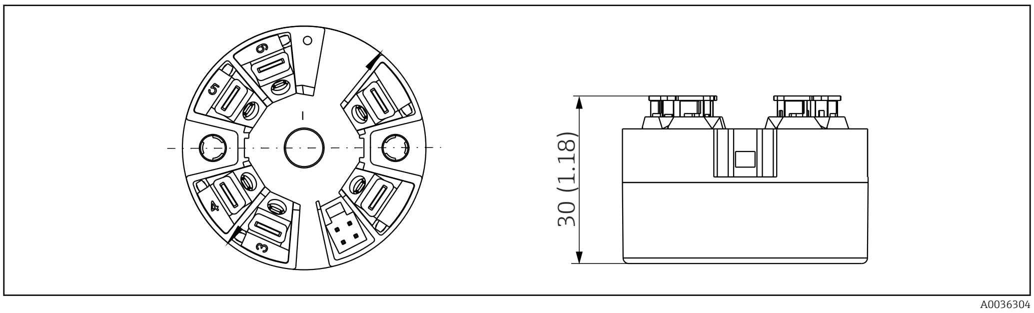
Dimensions in mm (in)

Head transmitter



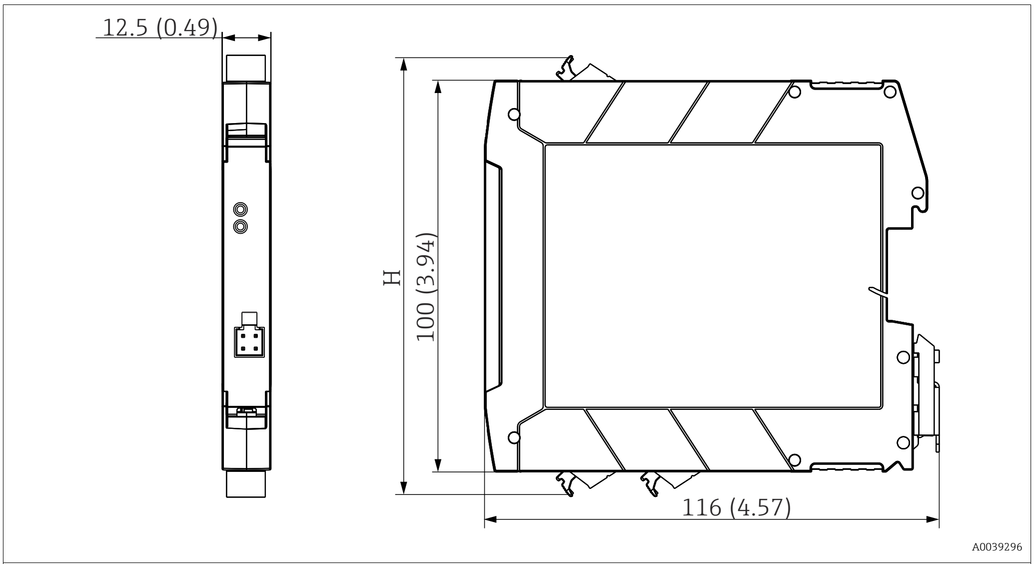
6 *Version with screw terminals*

A Spring travel L ≥ 5 mm (not for US - M4 securing screws)
B Mounting elements for attachable measured value display TID10
C Interface for connecting measured value display or configuration tool



7 *Version with push-in terminals. Dimensions are identical to the version with screw terminals, apart from housing height.*

DIN rail transmitter



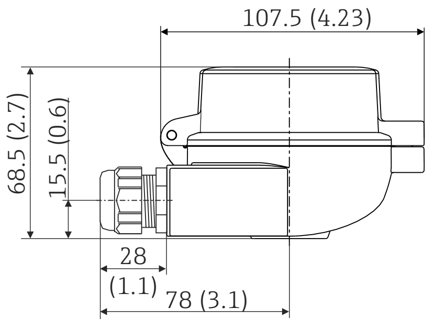
Height of housing H varies depending on the terminal version:
- Screw terminals: H = 114 mm (4.49 in)
- Push-in terminals: H = 111.5 mm (4.39 in)

Field housing

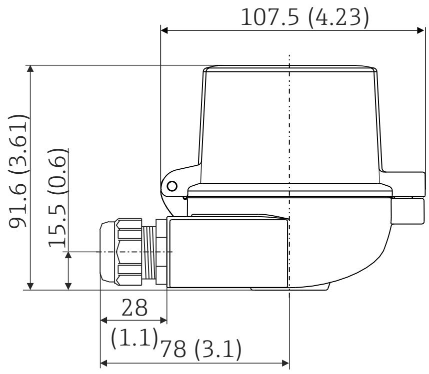
All field housings have an internal geometry in accordance with DIN EN 50446, form B (flat face).
Cable glands in the diagrams: M20x1.5

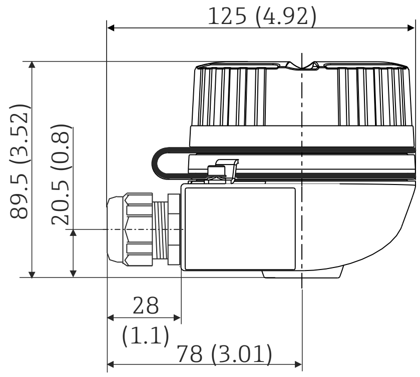
Maximum ambient temperatures for cable glands	
Type	**Temperature range**
Polyamide cable gland ½" NPT, M20x1.5 (non-Ex)	–40 to +100 °C (–40 to +212 °F)
Polyamide cable gland M20x1.5 (for dust ignition-proof area)	–20 to +95 °C (–4 to +203 °F)
Brass cable gland ½" NPT, M20x1.5 (for dust ignition-proof area)	–20 to +130 °C (–4 to +266 °F)

TA30A	Specification


 	
A0009820
	▪ Two cable entries
	▪ Material: aluminum, polyester powder coated
	Seals: silicone
	▪ Degree of protection:
	  ▪ IP66/68 (NEMA Type 4x encl.)
	  ▪ For ATEX: IP66/67
	▪ Cable entry glands: ½" NPT and M20x1.5
	▪ Head color: blue, RAL 5012
	▪ Cap color: gray, RAL 7035
	▪ Weight: 330 g (11.64 oz)

TA30A with display window in cover	Specification


 	
A0009821
	▪ Two cable entries
	▪ Material: aluminum, polyester powder coated
	Seals: silicone
	▪ Degree of protection:
	  ▪ IP66/68 (NEMA Type 4x encl.)
	  ▪ For ATEX: IP66/67
	▪ Cable entry glands: ½" NPT and M20x1.5
	▪ Color of head: blue, RAL 5012
	▪ Color of cap: gray, RAL 7035
	▪ Weight: 420 g (14.81 oz)
	▪ Display window: single-pane safety glass according to DIN 8902
	▪ Display window in cover for head transmitter with TID10 display

<table>
<tr><th>TA30H</th><th>Specification</th></tr>
<tr><td>


A0009832
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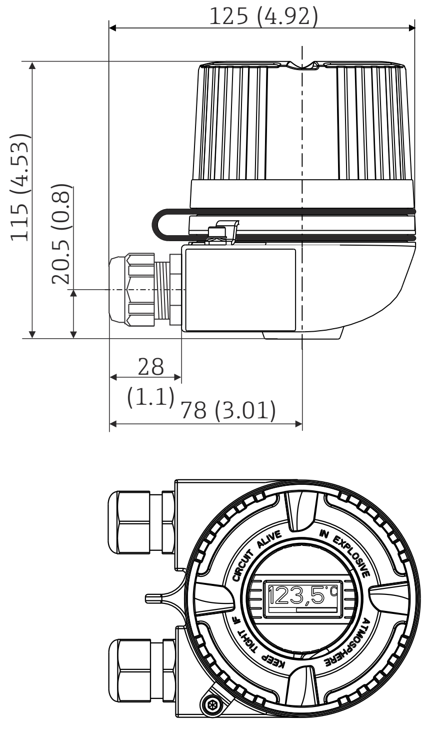
Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries
Degree of protection: IP 66/68, NEMA Type 4x encl.
Ex-version: IP 66/67
Material:

Aluminum with polyester powder coating
Stainless steel 316L without coating
Klüber Syntheso Glep 1 dry-film lubricant

Cable entry glands: ½" NPT, M20x1.5
Color of aluminum head: blue, RAL 5012
Color of aluminum cap: gray, RAL 7035
Weight:

Aluminum approx. 640 g (22.6 oz)
Stainless steel approx. 2 400 g (84.7 oz)

If the housing cover is unscrewed: Before tightening, clean the thread in the cover and housing base and lubricate if necessary (Recommended lubricant: Klüber Syntheso Glep 1)
</td></tr>
</table>

<table>
<tr><th>TA30H with display window in cover</th><th>Specification</th></tr>
<tr><td>


A0009831
</td><td>

Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries
Degree of protection: IP 66/68, NEMA Type 4x encl.
Ex-version: IP 66/67
Material:

Aluminum with polyester powder coating
Stainless steel 316L without coating
Klüber Syntheso Glep 1 dry-film lubricant

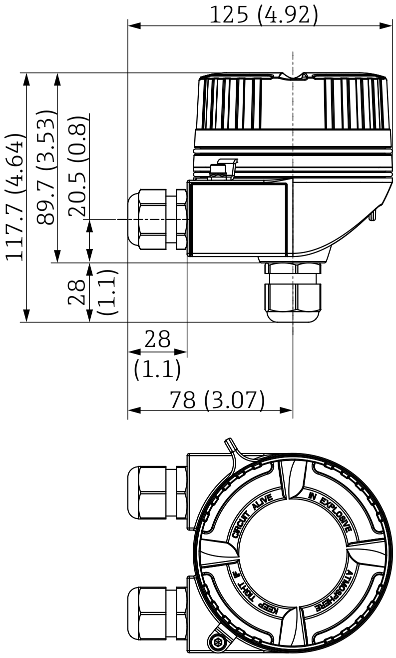
Display window: single-pane safety glass according to DIN 8902
Cable entry glands: ½" NPT, M20x1.5
Color of aluminum head: blue, RAL 5012
Color of aluminum cap: gray, RAL 7035
Weight:

Aluminum approx. 860 g (30.33 oz)
Stainless steel approx. 2 900 g (102.3 oz)

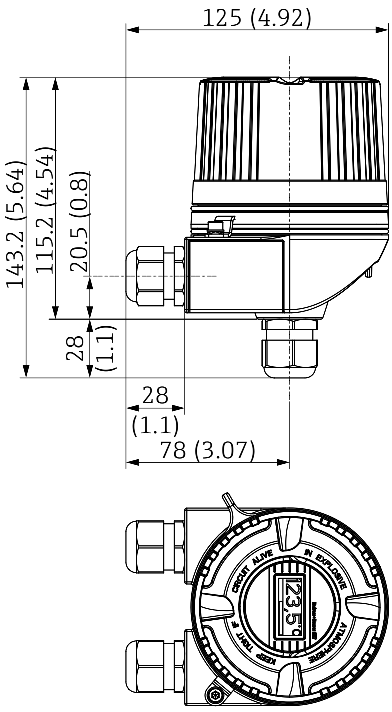
For TID10 display

If the housing cover is unscrewed: Before tightening, clean the thread in the cover and housing base and lubricate if necessary (Recommended lubricant: Klüber Syntheso Glep 1)
</td></tr>
</table>

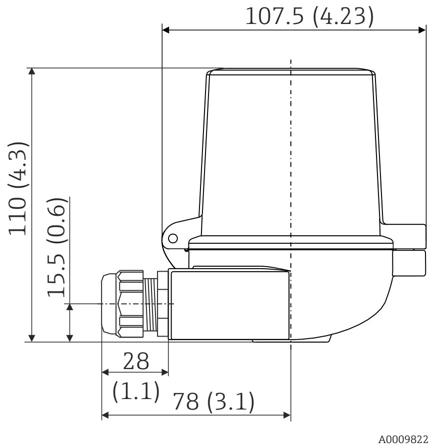
TA30H with three cable entries	Specification


A0055299
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with three cable entries (two at the front, one at the bottom) with grounding screw
	▪ Protection class: NEMA Type 4x Encl.
	▪ Material:
	  ▪ Aluminum, with polyester powder coating
	  ▪ Dry lubricant Klüber Syntheso Glep 1
	▪ Cable entry glands: ½" NPT
	▪ Color of head: blue, RAL 5012
	▪ Color of cap: gray, RAL 7035
	▪ Weight: approx. 640 g (22.6 oz)
	
	ℹ When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).

TA30H with three cable entries and display window in cover	Specification


A0055300
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with three cable entries (two at the front, one at the bottom), with grounding screw
	▪ Protection class: NEMA Type 4x Encl.
	▪ Material:
	  ▪ Aluminum with polyester powder coating
	  ▪ Stainless steel 316L without coating
	  ▪ Dry lubricant Klüber Syntheso Glep 1
	▪ Display window: single-pane safety glass according to DIN 8902
	▪ Cable entry glands: ½" NPT
	▪ Color of aluminum head: blue, RAL 5012
	▪ Color of aluminum cap: gray, RAL 7035
	▪ Weight:
	  ▪ Aluminum approx. 860 g (30.33 oz)
	  ▪ Stainless steel approx. 2 900 g (102.3 oz)
	▪ For display TID10
	
	ℹ When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).

TA30D	Specification

	▪ 2 cable entries
	▪ Material: aluminum, polyester powder coated
	Seals: silicone
	▪ Degree of protection:
	  ▪ IP66/68 (NEMA Type 4x encl.)
	  ▪ For ATEX: IP66/67
	▪ Cable entry glands: ½" NPT and M20x1.5
	▪ Two head transmitters can be mounted. In the standard configuration one transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert.
	▪ Head color: blue, RAL 5012
	▪ Cap color: gray, RAL 7035
	▪ Weight: 390 g (13.75 oz)

Weight

- Head transmitter: approx. 40 to 50 g (1.4 to 1.8 oz)
- Field housing: see specifications
- DIN rail transmitter: approx.100 g (3.53 oz)

Materials

All the materials used are RoHS-compliant.

- Housing: polycarbonate (PC)
- Terminals:
  - Screw terminals: nickel-plated brass and gold-plated or tin-plated contacts
  - Push-in terminals: tin-plated brass, contact springs 1.4310, 301 (AISI)
- Potting compound:
  - Head transmitter: QSIL 553
  - DIN rail housing: Silgel612EH

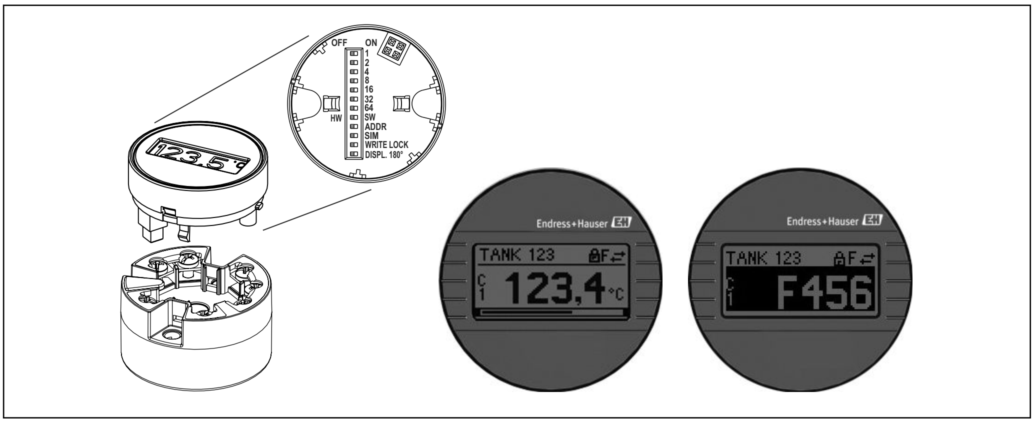
Field housing: see specifications

Operability

Onsite operation

Head transmitter

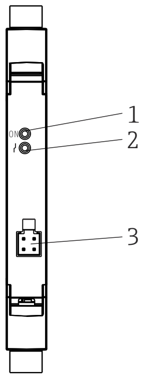
The head transmitter has no display or operating elements. There is the option of using the attachable measured value display TID10 together with the head transmitter. The display provides plain-text information on the current measured value and the measuring point identification. An optional bar graph is also used. In the event of a fault in the measuring chain, this will be displayed in inverse color showing the channel ident and error number. DIP switches can be found on the rear of the display. These enable hardware settings to be made e.g. write protection.



8 *Attachable measured value display TID10 with bar graph indicator (optional)*

If the head transmitter is installed in a field housing and used with a display, an enclosure with a glass window in the cover must be used.

DIN rail transmitter

	1:	Power LED	A green LED indicates that the voltage supply is correct
	2:	Status LED	Off: no diagnostic message
			Red: Category F diagnostic message
			Red flashing: Category C, S or M diagnostic message
	3:	Service interface	For connecting a configuration tool

Connecting a configuration tool

HART functions and device-specific parameters are configured via HART Communication or the CDI interface (service interface) of the device. There are special configuration tools from different manufacturers available for this purpose. For more information, contact your Endress+Hauser sales representative.

Bluetooth wireless technology

The device has an optional Bluetooth wireless technology interface and can be operated and configured using the SmartBlue app.

- The range under reference conditions is:
  - 10 m (33 ft) when mounted in a terminal head, or field housing with display window, or DIN rail housing
  - 5 m (16.4 ft) when mounted in a terminal head or field housing
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption.
- The Bluetooth wireless technology interface can be deactivated.

However, simultaneous use of the Bluetooth wireless technology interface and attachable measured value display is not possible.

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.

3. Select **Downloads**.

HART certification

The temperature transmitter is registered by the HART® Communication Foundation. The device meets the requirements of the HART® Communication Protocol Specifications, Revision 7.

Radio approval

The device has Bluetooth radio approval in accordance with the Radio Equipment Directive (RED) and the Federal Communications Commission (FCC) 15.247 for the United States.

Europe	
This device meets the requirements of the Radio Equipment Directive RED 2014/53/EU:	▪ EN 300 328 ▪ EN 301 489-1 ▪ EN 301 489-17

Canada and United States	
English: This device complies with Part 15 of the FCC Rules and with Industry Canada licenceexempt RSS standard(s). Operation is subject to the following two conditions: ▪ This device may not cause harmful interference, and ▪ This device must accept any interference received, including interference that may cause undesired operation. Changes or modifications made to this equipment not expressly approved by the manufacturer may void the user's authorization to operate this equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: ▪ Reorient or relocate the receiving antenna. ▪ Increase the separation between the equipment and receiver. ▪ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. ▪ Consult the dealer or an experienced radio/TV technician for help. This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.	Français: Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : ▪ L'appareil ne doit pas produire de brouillage, et ▪ L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. Les changements ou modifications apportées à cet appareil non expressément approuvée par le fabricant peut annuler l'autorisation de l'utilisateur d'opérer cet appareil. Déclaration d’exposition aux radiations: Cet équipement est conforme aux limites d’exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

MTTF

- Without Bluetooth wireless technology: 168 years
- With Bluetooth wireless technology: 123 years

The mean time to failure (MTTF) denotes the theoretically expected time until the device fails during normal operation. The term MTTF is used for systems that cannot be repaired, e.g. temperature transmitters.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

Accessories for the head transmitter
TID10 display unit for Endress+Hauser head transmitter iTEMP TMT8x [1] or TMT7x, attachable
Field housing TA30x for Endress+Hauser head transmitter
Adapter for DIN rail mounting, clip as per IEC 60715 (TH35) without securing screws
Standard - DIN mounting set (2 screws and springs, 4 securing disks and 1 display connector cover)
US - M4 mounting screws (2 M4 screws and 1 display connector cover)
Stainless steel wall mounting bracket Stainless steel pipe mounting bracket

1) Without TMT80

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details, see Technical Information TI404F.
WirelessHART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks. For details, see Technical Information TI00026S.
Field Xpert SMT70	Universal, high-performance tablet PC for device configuration The tablet PC enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as a comprehensive, all-in-one solution. With a pre-installed driver library, it is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle. For details, see Technical Information TI01342S/04

Service-specific accessories

Applicator
Software for selecting and sizing Endress+Hauser measuring devices:
- Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections.
- Graphic illustration of the calculation results

Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.

Applicator is available:
https://portal.endress.com/webapp/applicator

Configurator
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

The Configurator is available on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and the search field -> Open the product page -> The "Configure" button to the right of the product image opens the Product Configurator.

DeviceCare SFE100
Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices
DeviceCare is available for download at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.

Technical Information TI01134S

FieldCare SFE500
FDT-based plant asset management tool
It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

Technical Information TI00028S

Netilion
IIoT ecosystem: Unlock knowledge
With the Netilion IIoT ecosystem, Endress+Hauser enables you to optimize plant performance, digitize workflows, share knowledge, and enhance collaboration. Drawing on decades of experience in process automation, Endress+Hauser provides the process industry with an IIoT ecosystem that unlocks valuable insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.

www.netilion.endress.com

System components

RN22

Single- or two-channel active barrier for safe separation of 0/4 to 20 mA standard signal circuits with bidirectional HART transmission. In the signal duplicator option, the input signal is transmitted to two galvanically isolated outputs. The device has one active and one passive current input; the outputs can be operated actively or passively. The RN22 requires a supply voltage of 24 V_{DC}.

Technical Information TI01515K

RN42

Single-channel active barrier for safe separation of 0/4 to 20 mA standard signal circuits with bidirectional HART transmission The device has one active and one passive current input; the outputs can be operated actively or passively. The RN42 can be powered with a wide range voltage of 24 to 230 $V_{AC/DC}$.

Technical Information TI01584K

RIA15

Process display, digital loop-powered display for 4 to 20 mA circuit, panel mounting, with optional HART communication. Displays 4 to 20 mA or up to 4 HART process variables

Technical Information TI01043K

Advanced Data Manager Memograph M

The Advanced Data Manager Memograph M is a flexible and powerful system for organizing process values. Optional HART input cards are available, each having 4 inputs (4/8/12/16/20), with highly accurate process values from the HART devices directly connected for the purpose of calculation and data logging. The measured process values are clearly presented on the display and logged safely, monitored for limit values and analyzed. Via common communication protocols, the measured and calculated values can be easily communicated to higher-level systems or individual plant modules can be interconnected.

Technical information: TI01180R

Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

The following documentation may be available depending on the device version ordered:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Your reference document** These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for your parameters** The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are a constituent part of the Operating Instructions. Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

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www.addresses.endress.com

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