Technical Information
iTEMP TMT82

Dual-input temperature transmitter

With HART® protocol and SIL compliance

Field of Application

- Temperature transmitter with 2 input channels and HART® communication for the conversion of different input signals into a scalable, analog 4 to 20 mA output signal
- The iTEMP TMT82 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 flat-face terminal head as per DIN EN 50446
- Optional: Installation in field housing for Ex d applications
- Optional: device design for DIN rail mounting

Your benefits

- Safe operation in hazardous areas with international approvals
- SIL certification as per IEC 61508:2010
- Protocol extension for safe HART® transmission
- High accuracy of measuring point through sensor-transmitter matching
- Reliable operation with sensor monitoring and device hardware fault recognition
- Diagnostics information according to NAMUR NE107
- Several mounting versions and sensor connection combinations
- Rapid no-tools wiring due to optional spring terminal technology
- Write protection for device parameters

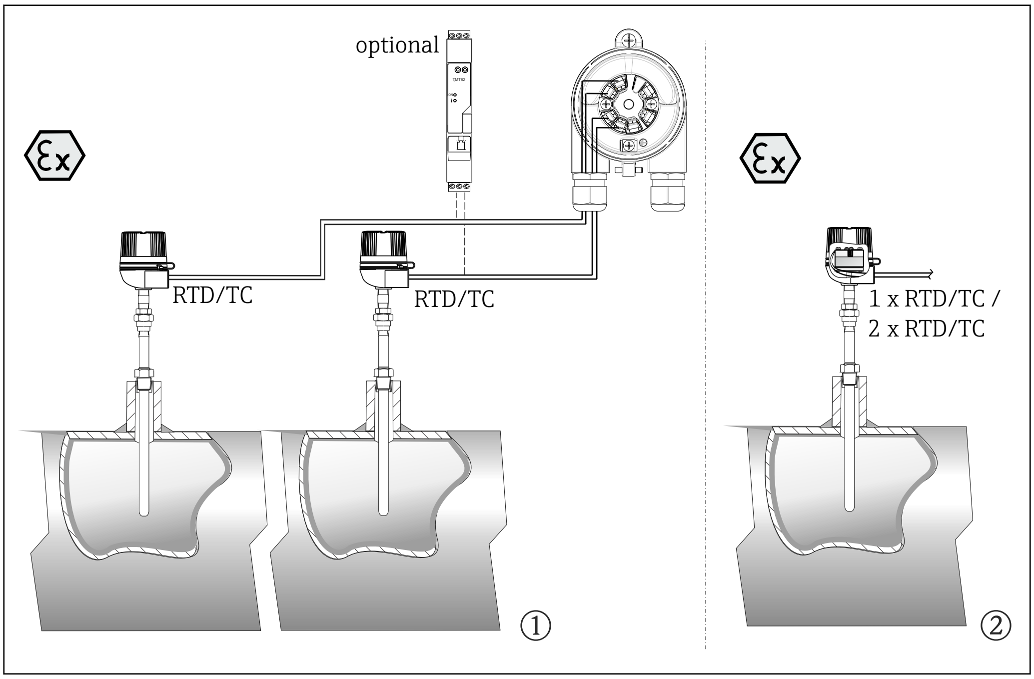
Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

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

Measuring system



1 *Application examples*

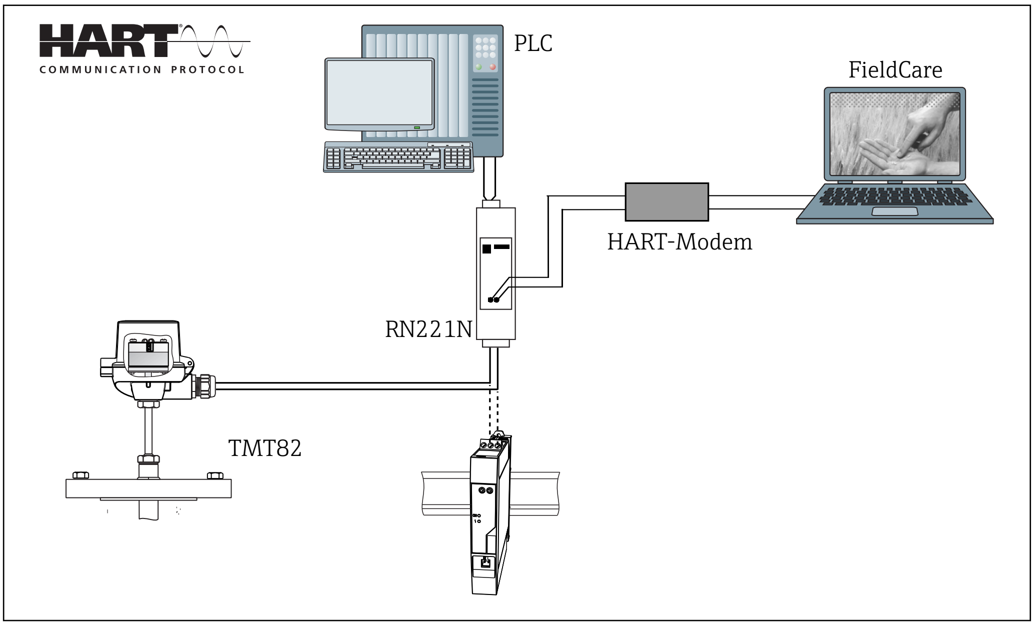
① *Two sensors with measuring input (RTD or TC) in remote installation with the following advantages: drift warning, sensor backup function and temperature-dependent sensor switching*

② *Integrated transmitter - 1 x RTD/TC or 2 x RTD/TC for redundancy*

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 two measuring inputs and one analog output. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers 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. It is used for instrumentation in the terminal head (flat face) as per DIN EN 50446 or as a DIN rail device for installation in the control cabinet on a TH35 mounting rail as per EN 60715.



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
- Ambient temperature out-of-range detection

Corrosion detection as per NAMUR NE89

Corrosion of the sensor connection cables can cause incorrect measured value readings. The transmitter offers the possibility of detecting any corrosion of the thermocouples and resistance thermometers with 4-wire connection before a measured value is corrupted. The transmitter prevents incorrect measured values from being exported 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.

2-channel functions

These functions increase the reliability and availability of the process values:
- Sensor backup switches to the second sensor if the primary sensor fails
- Drift warning or alarm if the deviation between sensor 1 and sensor 2 is less than or greater than a predefined limit value
- Temperature-dependent switching between sensors which are used in different measuring ranges
- Mean value or differential measurement from two sensors
- Mean value measurement with sensor redundancy

Not all modes are available in the SIL mode, see the 'Functional Safety Manual'.

Functional Safety Manual for temperature transmitter TMT82: SD01172T/09/en

Input

Measured variable

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

Measuring range

It is possible to connect two sensors that are independent of one another [1]. The measuring inputs are not galvanically isolated from each other.

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)
	▪ Type of connection: 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	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) −270 to +1 000 °C (−454 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) −260 to +400 °C (−436 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) +50 to +1 768 °C (+122 to +3 214 °F) +50 to +1 768 °C (+122 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 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 R8.8585-2001	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)

1) In the case of 2-channel measurement the same measuring unit must be configured for the two channels (e.g. both °C or F or K). Independent 2-channel measurement of a resistance transmitter (Ohm) and voltage transmitter (mV) is not possible.

Thermocouples as per standard	Description	Measuring range limits	Min. span
	▪ Internal cold junction (Pt100) ▪ External cold junction: 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

Type of input

The following connection combinations are possible when both sensor inputs are assigned:

		Sensor input 1			
		RTD or resistance transmitter, 2-wire	**RTD or resistance transmitter, 3-wire**	**RTD or resistance transmitter, 4-wire**	**Thermocouple (TC), voltage transmitter**
Sensor input 2	**RTD or resistance transmitter, 2-wire**	☑	☑	-	☑
	RTD or resistance transmitter, 3-wire	☑	☑	-	☑
	RTD or resistance transmitter, 4-wire	-	-	-	-
	Thermocouple (TC), voltage transmitter	☑	☑	☑	☑

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 (input/output)

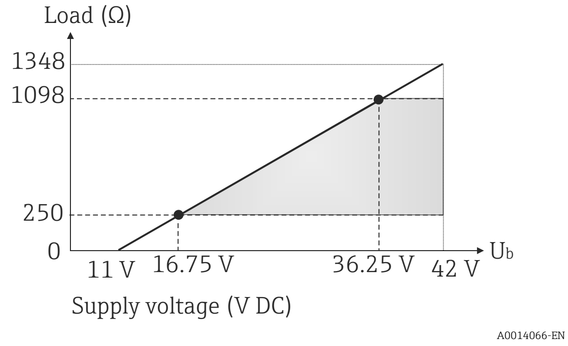
Failure information

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 drop from 4.0 to 3.8 mA
Overranging	Linear increase from 20.0 to 20.5 mA
Failure, e.g. sensor breakage, 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. Only the "low" alarm setting is possible in the SIL mode.

Load

$R_{b\ max.}$= ($U_{b\ max.}$ - 11 V) / 0.023 A (current output). Valid for head transmitter	

Linearization/transmission behavior

Temperature-linear, resistance-linear, voltage-linear

Network frequency filter

50/60 Hz

Filter

1st order digital filter: 0 to 120 s

Protocol-specific data

HART® version	7
Device address in the multi-drop mode [1]	Software setting addresses 0 to 63
Device description files (DD)	Information and files are available free of charge at: www.endress.com www.hartcomm.org
Load (communication resistor)	min.250 Ω

1) Not possible in the SIL mode, see Functional Safety Manual SD01172T/09

Write protection for device parameters

- Hardware: Write protection for head transmitter on optional display using DIP switch
- Software: Write protection using password

Switch-on delay

- Until start of HART® communication, approx. 10 s [2], with switch-on delay = $I_a \leq 3.8$ mA
- Until the first valid measured value signal is present at the current output, approx. 28 s, with switch-on delay = $I_a \leq 3.8$ mA

Power supply

Supply voltage

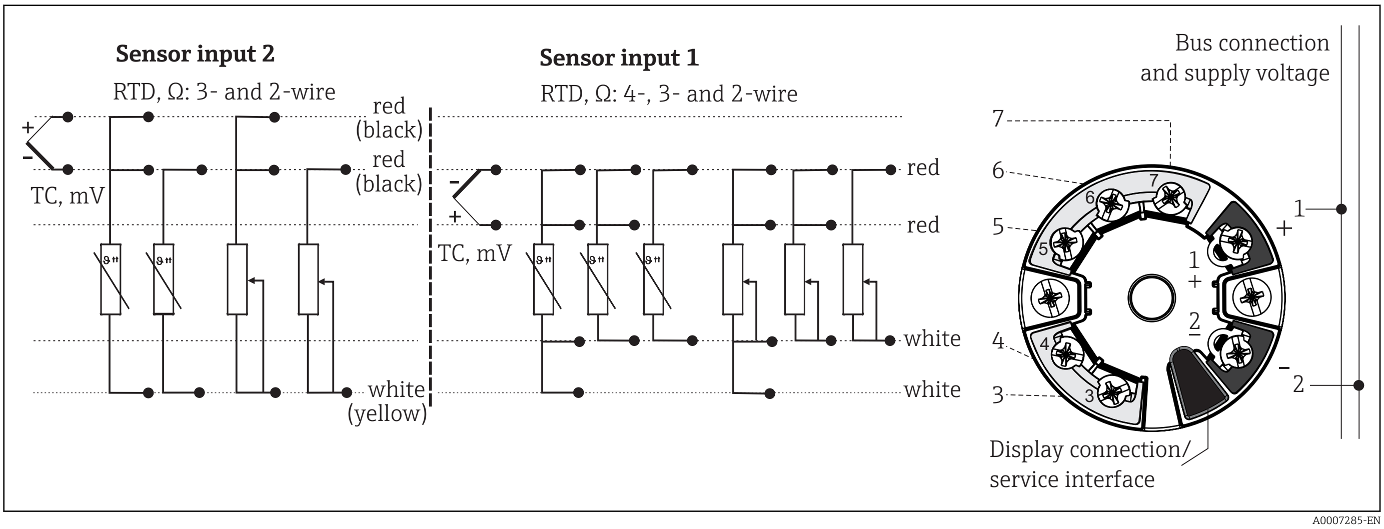
Values for non-hazardous areas, protected against polarity reversal:
- Head transmitter
  - 11 V ≤ Vcc ≤ 42 V (standard)
  - 11 V ≤ Vcc ≤ 32 V (SIL mode)
  - I: ≤ 23 mA
- DIN rail device
  - 12 V ≤ Vcc ≤ 42 V (standard)
  - 12 V ≤ Vcc ≤ 32 V (SIL mode)
  - I: < 23 mA

Values for hazardous areas, see Ex documentation .

2) Does not apply for the SIL mode, see Functional Safety Manual SD01172T/09

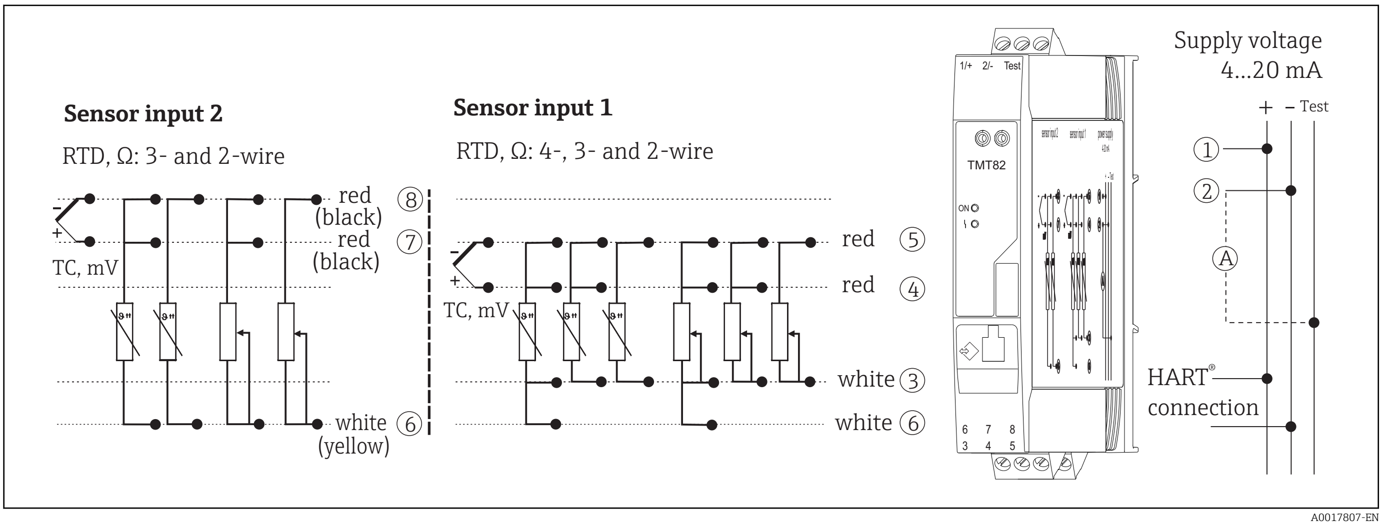
Electrical connection

Head transmitter



3 *Assignment of terminal connections for head transmitter*

DIN rail device



4 *Assignment of terminal connections for DIN rail device*

A *To check the output current, an amperemeter (DC measurement) can be connected between the "Test" and "-" terminals.*

On the sensor side, shielded cables must be used for the DIN rail transmitter from a length of 30 m (98.4 ft). Generally the use of shielded cables is recommended.

To operate the device via the HART® protocol (terminals 1 and 2) a minimum load of 250 Ω is required in the signal circuit.

Current consumption

- 3.6 to 23 mA
- Minimum current consumption 3.5 mA, multi-drop mode 4 mA (not possible in the SIL mode)
- Current limit ≤ 23 mA

Terminals

Choice of screw or spring terminals for sensor and fieldbus cables:

	Terminal version	Cable version	Cable cross-section
Head transmitter / DIN rail device Head transmitter	**Screw terminals**	Rigid or flexible	≤ 2.5 mm² (14 AWG)
Head transmitter	**Spring 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 without plastic ferrule	0.25 to 1.5 mm² (24 to 16 AWG)
		Flexible with wire end ferrules with plastic ferrule	0.25 to 0.75 mm² (24 to 18 AWG)

When connecting flexible cables to spring terminals, it is recommended not to use wire end ferrules.

Residual ripple

Permanent residual ripple U_{ss} ≤ 3 V at U_b ≥ 13.5 V, $f_{max.}$ = 1 kHz

Performance characteristics

Response time

The measured value update depends on the type of sensor and connection method and moves within the following ranges:

Resistance thermometer (RTD)	0.9 to 1.3 s (depends on the connection method 2/3/4-wire)
Thermocouples (TC)	0.8 s
Reference temperature	0.9 s

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

Reference operating conditions

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

Maximum measured error

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

Typical

Standard	Description	Measuring range	Typical measured 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)	0.08 °C (0.14 °F)	0.1 °C (0.18 °F)
IEC 60751:2008	Pt1000 (4)		0.08 K (0.14 °F)	0.1 °C (0.18 °F)
GOST 6651-94	Pt100 (9)		0.07 °C (0.13 °F)	0.09 °C (0.16 °F)
Thermocouples (TC) as per standard			Digital value	Value at current output
IEC 60584, Part 1	Type K (NiCr-Ni) (36)	0 to +800 °C (32 to +1472 °F)	0.31 °C (0.56 °F)	0.39 °C (0.7 °F)

Standard	Description	Measuring range	Typical measured error (±)	
IEC 60584, Part 1	Type S (PtRh10-Pt) (39)		0.97 °C (1.75 °F)	1.0 °C (1.8 °F)
GOST R8.8585-2001	Type L (NiCr-CuNi) (43)		2.18 °C (3.92 °F)	2.2 °C (3.96 °F)

1) Measured value transmitted via HART®.

Measured error for resistance thermometers (RTD) and resistance transmitters

Standard	Description	Measuring range	Measured error (±)		
			Digital [1]		D/A [2]
			Maximum [3]	Based on measured value [4]	
IEC 60751:2008	Pt100 (1)	−200 to +850 °C (−328 to +1 562 °F)	≤ 0.12 °C (0.21 °F)	ME = ± (0.06 °C (0.11 °F) + 0.006% * (MV - LRV))	0.03 % (≙ 4.8 µA)
	Pt200 (2)		≤ 0.28 °C (0.50 °F)	ME = ± (0.12 °C (0.22 °F) + 0.015% * (MV - LRV))	
	Pt500 (3)	−200 to +510 °C (−328 to +950 °F)	≤ 0.15 °C (0.27 °F)	ME = ± (0.05 °C (0.09 °F) + 0.014% * (MV - LRV))	
	Pt1000 (4)	−200 to +250 °C (−328 to +482 °F)	≤ 0.09 °C (0.16 °F)	ME = ± (0.03 °C (0.05 °F) + 0.013% * (MV - LRV))	
JIS C1604:1984	Pt100 (5)	−200 to +510 °C (−328 to +950 °F)		ME = ± (0.05 °C (0.09 °F) + 0.006% * (MV - LRV))	
GOST 6651-94	Pt50 (8)	−185 to +1 100 °C (−301 to +2 012 °F)	≤ 0.21 °C (0.38 °F)	ME = ± (0.10 °C (0.18 °F) + 0.008% * (MV - LRV))	
	Pt100 (9)	−200 to +850 °C (−328 to +1 562 °F)	≤ 0.11 °C (0.2 °F)	ME = ± (0.05 °C (0.09 °F) + 0.006% * (MV - LRV))	
DIN 43760 IPTS-68	Ni100 (6)	−60 to +250 °C (−76 to +482 °F)	≤ 0.05 °C (0.09 °F)	ME = ± (0.05 °C (0.09 °F) - 0.006% * (MV - LRV))	
	Ni120 (7)				
OIML R84: 2003 / GOST 6651-2009	Cu50 (10)	−180 to +200 °C (−292 to +392 °F)	≤ 0.12 °C (0.22 °F)	ME = ± (0.10 °C (0.18 °F) + 0.006% * (MV - LRV))	
	Cu100 (11)	−180 to +200 °C (−292 to +392 °F)	≤ 0.06 °C (0.11 °F)	ME = ± (0.05 °C (0.09 °F) + 0.003% * (MV - LRV))	
	Ni100 (12)	−60 to +180 °C (−76 to +356 °F)	≤ 0.06 °C (0.11 °F)	ME = ± (0.06 °C (0.11 °F) - 0.006% * (MV - LRV))	
	Ni120 (13)		≤ 0.05 °C (0.09 °F)	ME = ± (0.05 °C (0.09 °F) - 0.006% * (MV - LRV))	
OIML R84: 2003, GOST 6651-94	Cu50 (14)	−50 to +200 °C (−58 to +392 °F)	≤ 0.11 °C (0.2 °F)	ME = ± (0.10 °C (0.18 °F) + 0.004% * (MV - LRV))	
Resistance transmitter	Resistance Ω	10 to 400 Ω	33 mΩ	ME = ± (21 mΩ + 0.003% * (MV - LRV))	0.03 % (≙ 4.8 µA)
		10 to 2 000 Ω	310 mΩ	ME = ± (35 mΩ + 0.010% * (MV - LRV))	

1) Measured value transmitted via HART®.
2) Percentages based on the configured span of the analog output signal.
3) Maximum measured error for the specified measuring range
4) Deviations from maximum measured error due to rounding is possible.

Measured error for thermocouples (TC) and voltage transmitters

Standard	Description	Measuring range	Measured error (±)		
			Digital [1]		D/A [2]
			Maximum [3]	Based on measured value [4]	

Standard	Description	Measuring range	Measured error (±)		
IEC 60584-1	Type A (30)	0 to +2 500 °C (+32 to +4 532 °F)	≤ 1.33 °C (2.39 °F)	ME = ± (0.08 °C (0.14 °F) + 0.021% * (MV - LRV))	0.03 % (≙ 4.8 µA)
	Type B (31)	+500 to +1 820 °C (+932 to +3 308 °F)	≤ 1.43 °C (2.57 °F)	ME = ± (1.43 °C (2.57 °F) - 0.06% * (MV - LRV))	
IEC 60584-1 / ASTM E988-96	Type C (32)	0 to +2 000 °C (+32 to +3 632 °F)	≤ 0.66 °C (1.19 °F)	ME = ± (0.55 °C (0.99 °F) + 0.0055% * (MV - LRV))	
ASTM E988-96	Type D (33)		≤ 0.75 °C (1.35 °F)	ME = ± (0.85 °C (1.53 °F) - 0.008% * (MV - LRV))	
IEC 60584-1	Type E (34)	−150 to +1 000 °C (−238 to +1 832 °F)	≤ 0.22 °C (0.4 °F)	ME = ± (0.22 °C (0.40 °F) - 0.006% * (MV - LRV))	
	Type J (35)	−150 to +1 200 °C (−238 to +2 192 °F)	≤ 0.27 °C (0.49 °F)	ME = ± (0.27 °C (0.49 °F) - 0.005% * (MV - LRV))	
	Type K (36)		≤ 0.35 °C (0.63 °F)	ME = ± (0.35 °C (0.63 °F) - 0.005% * (MV - LRV))	
	Type N (37)	−150 to +1 300 °C (−238 to +2 372 °F)	≤ 0.48 °C (0.86 °F)	ME = ± (0.48 °C (0.86 °F) - 0.014% * (MV - LRV))	
	Type R (38)	+50 to +1 768 °C (+122 to +3 214 °F)	≤ 1.12 °C (2.02 °F)	ME = ± (1.12 °C (2.02 °F) - 0.03% * (MV - LRV))	
	Type S (39)		≤ 1.15 °C (2.07 °F)	ME = ± (1.15 °C (2.07 °F) - 0.022% * (MV - LRV))	
	Type T (40)	−150 to +400 °C (−238 to +752 °F)	≤ 0.35 °C (0.63 °F)	ME = ± (0.35 °C (0.63 °F) - 0.04% * (MV - LRV))	
DIN 43710	Type L (41)	−150 to +900 °C (−238 to +1 652 °F)	≤ 0.29 °C (0.52 °F)	ME = ± (0.29 °C (0.52 °F) - 0.009% * (MV - LRV))	
	Type U (42)	−150 to +600 °C (−238 to +1 112 °F)	≤ 0.33 °C (0.59 °F)	ME = ± (0.33 °C (0.59 °F) - 0.028% * (MV - LRV))	
GOST R8.8585-2001	Type L (43)	−200 to +800 °C (−328 to +1 472 °F)	≤ 2.20 °C (3.96 °F)	ME = ± (2.2 °C (3.96 °F) - 0.015% * (MV - LRV))	
Voltage transmitter (mV)		−20 to +100 mV	10.7 µV	ME = ± (7.7 µV + 0.0025% * (MV - LRV))	4.8 µA

1) Measured value transmitted via HART®.
2) Percentages based on the configured span of the analog output signal.
3) Maximum measured error for the specified measuring range.
4) Deviations from maximum measured error due to rounding is possible.

MV = Measured Value

LRV = Lower Range Value of relevant sensor

Total measured error of transmitter at current output = √(Measured error digital^2 + Measured error D/A^2)

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

Measured error digital = 0.06 °C + 0.006% x (200 °C - (-200 °C)):	0.084 °C (0.151 °F)
Measured error D/A = 0.03 % x 200 °C (360 °F)	0.06 °C (0.108 °F)
Measured error digital value (HART):	0.084 °C (0.151 °F)
Measured error analog value (current output): √(Measured error digital^2 + Measured error D/A^2)	0.103 °C (0.185 °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:

Measured error digital = 0.06 °C + 0.006% x (200 °C - (-200 °C)):	0.084 °C (0.151 °F)
Measured error D/A = 0.03 % x 200 °C (360 °F)	0.06 °C (0.108 °F)
Influence of ambient temperature (digital) = (35 - 25) x (0.002% x 200 °C - (-200 °C)), min. 0.005 °C	0.08 °C (0.144 °F)
Influence of ambient temperature (D/A) = (35 - 25) x (0.001% x 200 °C)	0.02 °C (0.036 °F)
Influence of supply voltage (digital) = (30 - 24) x (0.002% x 200 °C - (-200 °C)), min. 0.005 °C	0.048 °C (0.086 °F)
Influence of supply voltage (D/A) = (30 - 24) x (0.001% x 200 °C)	0.012 °C (0.022 °F)
Measured error digital value (HART): √(Measured error digital² + Influence of ambient temperature (digital)² + Influence of supply voltage (digital)²	**0.126 °C (0.227 °F)**
Measured error analog value (current output): √(Measured error digital² + Measured 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	**0.141 °C (0.254 °F)**

The measured error data correspond to ±2 σ (Gaussian distribution).

MV = Measured Value

LRV = Lower Range Value of relevant sensor

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

Other measured errors apply in SIL mode.

For more information please refer to the Functional Safety Manual SD01172T/09.

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 explained 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

2-point adjustment (sensor trimming)

Correction (slope and offset) of the measured sensor value at transmitter input

Current output adjustment

Correction of 4 or 20 mA current output value (not possible in SIL mode)

Operating influences

The measured error data correspond 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		D/A
		Maximum	Based on measured value		Maximum	Based on measured value	
Pt100 (1)	IEC 60751:2008	≤ 0.02 °C (0.036 °F)	0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)	0.001 %	≤ 0.02 °C (0.036 °F)	0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)	0.001 %
Pt200 (2)		≤ 0.026 °C (0.047 °F)	-		≤ 0.026 °C (0.047 °F)	-	
Pt500 (3)		≤ 0.014 °C (0.025 °F)	0.002% * (MV -LRV), at least 0.009 °C (0.016 °F)		≤ 0.014 °C (0.025 °F)	0.002% * (MV -LRV), at least 0.009 °C (0.016 °F)	
Pt1000 (4)		≤ 0.01 °C (0.018 °F)	0.002% * (MV -LRV), at least 0.004 °C (0.007 °F)		≤ 0.01 °C (0.018 °F)	0.002% * (MV -LRV), at least 0.004 °C (0.007 °F)	
Pt100 (5)	JIS C1604:1984		0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)			0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)	
Pt50 (8)	GOST 6651-94	≤ 0.03 °C (0.054 °F)	0.002% * (MV -LRV), at least 0.01 °C (0.018 °F)		≤ 0.03 °C (0.054 °F)	0.002% * (MV -LRV), at least 0.01 °C (0.018 °F)	
Pt100 (9)		≤ 0.02 °C (0.036 °F)	0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)		≤ 0.02 °C (0.036 °F)	0.002% * (MV -LRV), at least 0.005 °C (0.009 °F)	
Ni100 (6)	DIN 43760 IPTS-68	≤ 0.005 °C (0.009 °F)	-		≤ 0.005 °C (0.009 °F)	-	
Ni120 (7)			-			-	
Cu50 (10)	OIML R84: 2003 / GOST 6651-2009	≤ 0.008 °C (0.014 °F)	-		≤ 0.008 °C (0.014 °F)	-	
Cu100 (11)			0.002% * (MV -LRV), at least 0.004 °C (0.007 °F)			0.002% * (MV -LRV), at least 0.004 °C (0.007 °F)	
Ni100 (12)		≤ 0.004 °C (0.007 °F)	-		≤ 0.004 °C (0.007 °F)	-	
Ni120 (13)			-			-	
Cu50 (14)	OIML R84: 2003 / GOST 6651-94	≤ 0.008 °C (0.014 °F)	-		≤ 0.008 °C (0.014 °F)	-	
Resistance transmitter (Ω)							
10 to 400 Ω		≤ 6 mΩ	0.0015% * (MV -LRV), at least 1.5 mΩ	0.001 %	≤ 6 mΩ	0.0015% * (MV -LRV), at least 1.5 mΩ	0.001 %
10 to 2000 Ω		≤ 30 mΩ	0.0015% * (MV -LRV), at least 15 mΩ		≤ 30 mΩ	0.0015% * (MV -LRV), at least 15 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
		Maximum	Based on measured value		Maximum	Based on measured value	
Type A (30)	IEC 60584-1	≤ 0.14 °C (0.25 °F)	0.0055% * (MV -LRV), at least 0.03 °C (0.054 °F)	0.001 %	≤ 0.14 °C (0.25 °F)	0.0055% * (MV -LRV), at least 0.03 °C (0.054 °F)	0.001 %
Type B (31)		≤ 0.06 °C (0.11 °F)	-		≤ 0.06 °C (0.11 °F)	-	
Type C (32)	IEC 60584-1 / ASTM E988-96	≤ 0.09 °C (0.16 °F)	0.0045% * (MV -LRV), at least 0.03 °C (0.054 °F)		≤ 0.09 °C (0.16 °F)	0.0045% * (MV -LRV), at least 0.03 °C (0.054 °F)	
Type D (33)	ASTM E988-96	≤ 0.08 °C (0.14 °F)	0.004% * (MV -LRV), at least 0.035 °C (0.063 °F)		≤ 0.08 °C (0.14 °F)	0.004% * (MV -LRV), at least 0.035 °C (0.063 °F)	
Type E (34)	IEC 60584-1	≤ 0.03 °C (0.05 °F)	0.003% * (MV -LRV), at least 0.016 °C (0.029 °F)		≤ 0.03 °C (0.05 °F)	0.003% * (MV -LRV), at least 0.016 °C (0.029 °F)	
Type J (35)		≤ 0.02 °C (0.04 °F)	0.0028% * (MV -LRV), at least 0.02 °C (0.036 °F)		≤ 0.02 °C (0.04 °F)	0.0028% * (MV -LRV), at least 0.02 °C (0.036 °F)	
Type K (36)		≤ 0.04 °C (0.07 °F)	0.003% * (MV -LRV), at least 0.013 °C (0.023 °F)		≤ 0.04 °C (0.07 °F)	0.003% * (MV -LRV), at least 0.013 °C (0.023 °F)	
Type N (37)			0.0028% * (MV -LRV), at least 0.020 °C (0.036 °F)			0.0028% * (MV -LRV), at least 0.020 °C (0.036 °F)	
Type R (38)		≤ 0.06 °C (0.11 °F)	0.0035% * (MV -LRV), at least 0.047 °C (0.085 °F)		≤ 0.06 °C (0.11 °F)	0.0035% * (MV -LRV), at least 0.047 °C (0.085 °F)	
Type S (39)		≤ 0.05 °C (0.09 °F)	-		≤ 0.05 °C (0.09 °F)	-	
Type T (40)		≤ 0.01 °C (0.02 °F)	-		≤ 0.01 °C (0.02 °F)	-	
Type L (41)	DIN 43710	≤ 0.02 °C (0.04 °F)	-		≤ 0.02 °C (0.04 °F)	-	
Type U (42)		≤ 0.01 °C (0.02 °F)	-		≤ 0.01 °C (0.02 °F)	-	
Type L (43)	GOST R8.8585-2001	≤ 0.01 °C (0.02 °F)	-		≤ 0.01 °C (0.02 °F)	-	
Voltage transmitter (mV)				0.001 %			0.001 %
-20 to 100 mV	-	≤ 3 µV	-		≤ 3 µV	-	

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 relevant sensor

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

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

Description	Standard	Long-term drift (±) [1]		
		after 1 year	after 3 years	after 5 years
		Based on measured value		
Pt100 (1)	IEC 60751:2008	≤ 0.016% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.025% * (MV - LRV) or 0.05 °C (0.09 °F)	≤ 0.028% * (MV - LRV) or 0.06 °C (0.10 °F)

Description	Standard	Long-term drift (±) [1]		
Pt200 (2)		0.25 °C (0.44 °F)	0.41 °C (0.73 °F)	0.50 °C (0.91 °F)
Pt500 (3)		≤ 0.018% * (MV - LRV) or 0.08 °C (0.14 °F)	≤ 0.03% * (MV - LRV) or 0.14 °C (0.25 °F)	≤ 0.036% * (MV - LRV) or 0.17 °C (0.31 °F)
Pt1000 (4)		≤ 0.0185% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.031% * (MV - LRV) or 0.07 °C (0.12 °F)	≤ 0.038% * (MV - LRV) or 0.08 °C (0.14 °F)
Pt100 (5)	JIS C1604:1984	≤ 0.015% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.024% * (MV - LRV) or 0.07 °C (0.12 °F)	≤ 0.027% * (MV - LRV) or 0.08 °C (0.14 °F)
Pt50 (8)	GOST 6651-94	≤ 0.017% * (MV - LRV) or 0.07 °C (0.13 °F)	≤ 0.027% * (MV - LRV) or 0.12 °C (0.22 °F)	≤ 0.03% * (MV - LRV) or 0.14 °C (0.25 °F)
Pt100 (9)		≤ 0.016% * (MV - LRV) or 0.04 °C (0.07 °F)	≤ 0.025% * (MV - LRV) or 0.07 °C (0.12 °F)	≤ 0.028% * (MV - LRV) or 0.07 °C (0.13 °F)
Ni100 (6)	DIN 43760 IPTS-68	0.04 °C (0.06 °F)	0.05 °C (0.10 °F)	0.06 °C (0.11 °F)
Ni120 (7)				
Cu50 (10)	OIML R84: 2003 / GOST 6651-2009	0.06 °C (0.10 °F)	0.09 °C (0.16 °F)	0.11 °C (0.20 °F)
Cu100 (11)		≤ 0.015% * (MV - LRV) or 0.04 °C (0.06 °F)	≤ 0.024% * (MV - LRV) or 0.06 °C (0.10 °F)	≤ 0.027% * (MV - LRV) or 0.06 °C (0.11 °F)
Ni100 (12)		0.03 °C (0.06 °F)	0.05 °C (0.09 °F)	0.06 °C (0.10 °F)
Ni120 (13)		0.03 °C (0.06 °F)	0.05 °C (0.09 °F)	0.06 °C (0.10 °F)
Cu50 (14)	OIML R84: 2003 / GOST 6651-94	0.06 °C (0.10 °F)	0.09 °C (0.16 °F)	0.10 °C (0.18 °F)
Resistance transmitter				
10 to 400 Ω		≤ 0.0122% * (MV - LRV) or 12 mΩ	≤ 0.02% * (MV - LRV) or 20 mΩ	≤ 0.022% * (MV - LRV) or 22 mΩ
10 to 2 000 Ω		≤ 0.015% * (MV - LRV) or 144 mΩ	≤ 0.024% * (MV - LRV) or 240 mΩ	≤ 0.03% * (MV - LRV) or 295 mΩ

1) Whichever is greater

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

Description	Standard	Long-term drift (±) [1]		
		after 1 year	after 3 years	after 5 years
		Based on measured value		
Type A (30)	IEC 60584-1	≤ 0.048% * (MV - LRV) or 0.46 °C (0.83 °F)	≤ 0.072% * (MV - LRV) or 0.69 °C (1.24 °F)	≤ 0.1% * (MV - LRV) or 0.94 °C (1.69 °F)
Type B (31)		1.08 °C (1.94 °F)	1.63 °C (2.93 °F)	2.23 °C (4.01 °F)
Type C (32)	IEC 60584-1 / ASTM E988-96	≤ 0.038% * (MV - LRV) or 0.41 °C (0.74 °F)	≤ 0.057% * (MV - LRV) or 0.62 °C (1.12 °F)	≤ 0.078% * (MV - LRV) or 0.85 °C (1.53 °F)
Type D (33)	ASTM E988-96	≤ 0.035% * (MV - LRV) or 0.57 °C (1.03 °F)	≤ 0.052% * (MV - LRV) or 0.86 °C (1.55 °F)	≤ 0.071% * (MV - LRV) or 1.17 °C (2.11 °F)
Type E (34)	IEC 60584-1	≤ 0.024% * (MV - LRV) or 0.15 °C (0.27 °F)	≤ 0.037% * (MV - LRV) or 0.23 °C (0.41 °F)	≤ 0.05% * (MV - LRV) or 0.31 °C (0.56 °F)
Type J (35)		≤ 0.025% * (MV - LRV) or 0.17 °C (0.31 °F)	≤ 0.037% * (MV - LRV) or 0.25 °C (0.45 °F)	≤ 0.051% * (MV - LRV) or 0.34 °C (0.61 °F)
Type K (36)		≤ 0.027% * (MV - LRV) or 0.23 °C (0.41 °F)	≤ 0.041% * (MV - LRV) or 0.35 °C (0.63 °F)	≤ 0.056% * (MV - LRV) or 0.48 °C (0.86 °F)
Type N (37)		0.36 °C (0.65 °F)	0.55 °C (0.99 °F)	0.75 °C (1.35 °F)
Type R (38)		0.83 °C (1.49 °F)	1.26 °C (2.27 °F)	1.72 °C (3.10 °F)
Type S (39)		0.84 °C (1.51 °F)	1.27 °C (2.29 °F)	1.73 °C (3.11 °F)
Type T (40)		0.25 °C (0.45 °F)	0.37 °C (0.67 °F)	0.51 °C (0.92 °F)

Description	Standard	Long-term drift (±) [1]		
Type L (41)	DIN 43710	0.20 °C (0.36 °F)	0.31 °C (0.56 °F)	0.42 °C (0.76 °F)
Type U (42)		0.24 °C (0.43 °F)	0.37 °C (0.67 °F)	0.50 °C (0.90 °F)
Type L (43)	GOST R8.8585-2001	0.22 °C (0.40 °F)	0.33 °C (0.59 °F)	0.45 °C (0.81 °F)
Voltage transmitter (mV)				
−20 to 100 mV		≤ 0.027% * (MV - LRV) or 5.5 µV	≤ 0.041% * (MV - LRV) or 8.2 µV	≤ 0.056% * (MV - LRV) or 11.2 µV

1) Whichever is greater

Long-term drift analog output

Long term drift D/A [1] (±)		
after 1 year	after 3 years	after 5 years
0.021%	0.029%	0.031%

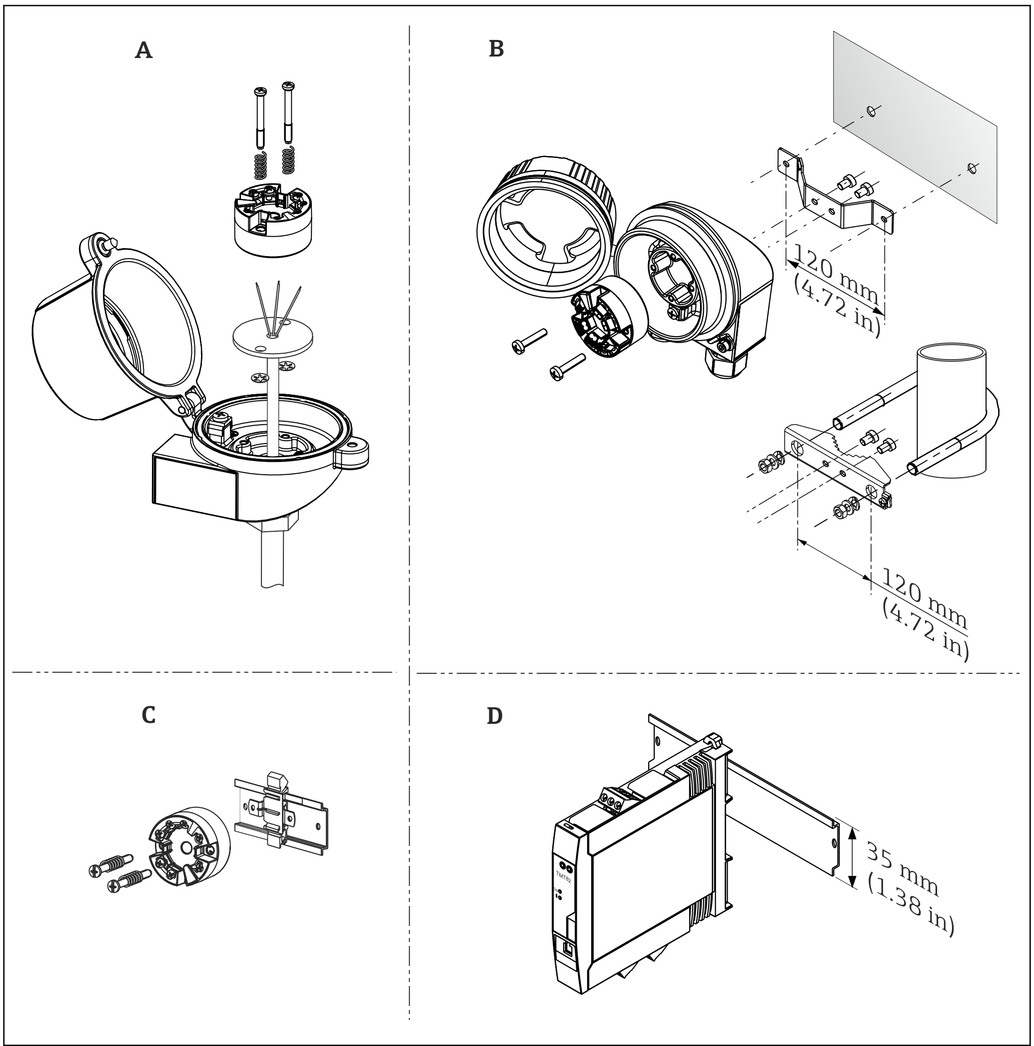
1) Percentages based on the configured span of the analog output signal.

Influence of reference junction

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

Installation

Installation instructions



5 Installation options for transmitter

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

Orientation: No restrictions

Environment

Ambient temperature range

- −40 to +85 °C (−40 to +185 °F), for hazardous areas see Ex documentation
- SIL mode: −40 to +70 °C (−40 to +158 °F)

Storage temperature

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

Altitude

Up to 4000 m (4374.5 yards) above mean sea level as per IEC 61010-1, CAN/CSA C22.2 No. 61010-1

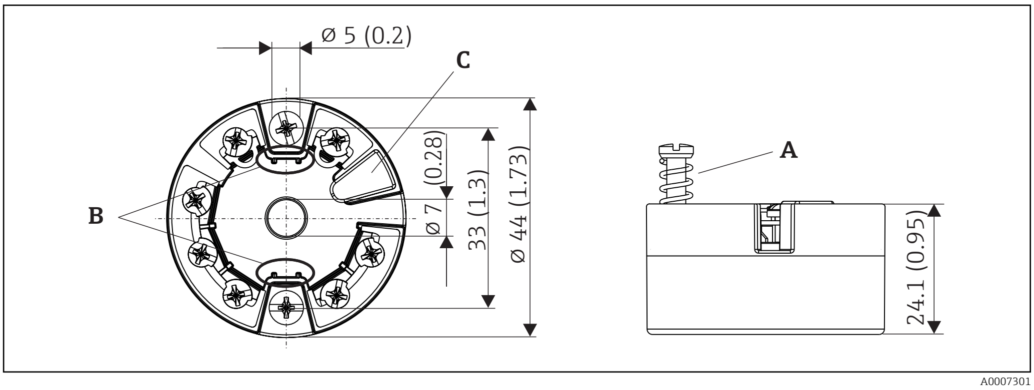
Climate class	▪ Head transmitter: climate class C1 as per EN 60654-1 ▪ DIN rail device: climate class B2 as per EN 60654-1
Humidity	▪ Condensation as per IEC 60 068-2-33: – Head transmitter permitted – DIN rail transmitter not permitted ▪ Max. rel. humidity: 95% as per IEC 60068-2-30
Degree of protection	▪ Head transmitter with screw terminals: IP 00, with spring terminals: IP 30. In installed state, depends on the terminal head or field housing used. ▪ When installing in field housing TA30A, TA30D or TA30H: IP 66/67 (NEMA Type 4x encl.) ▪ DIN rail device: IP 20
Shock and vibration resistance	Vibration resistance as per GL guideline, chapter 2, section 3B paragraph 9. Vibration and IEC 60068-2-27 or IEC 60068-2-6 ▪ Head transmitter: 2 to 100 Hz at 4g (increased vibration stress) ▪ DIN rail device: 2 to 100 Hz at 0.7g (general vibration stress) Shock resistance as per KTA 3505 (section 5.8.4 Shock test)
Electromagnetic compatibility (EMC)	**CE compliance** 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 HART® communication. Maximum measured 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
Measuring category	Measuring category II as per IEC 61010-1. The measuring category is provided for measuring on power circuits that are directly connected electrically with the low-voltage network.
Degree of contamination	Pollution degree 2 as per IEC 61010-1.

Mechanical construction

Design, dimensions

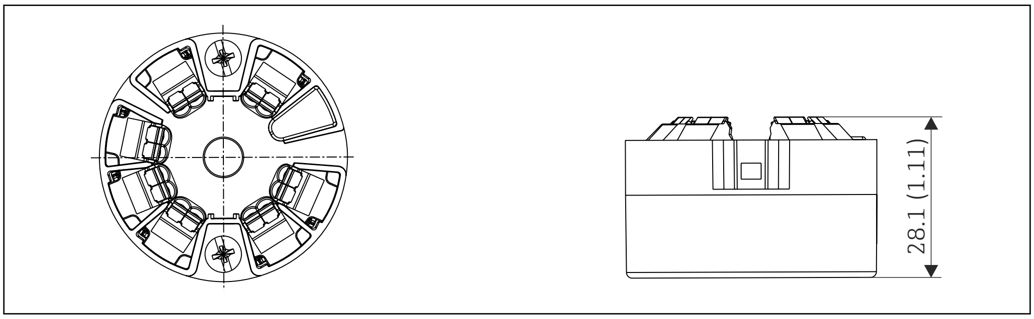
Dimensions in mm (in)

Head transmitter



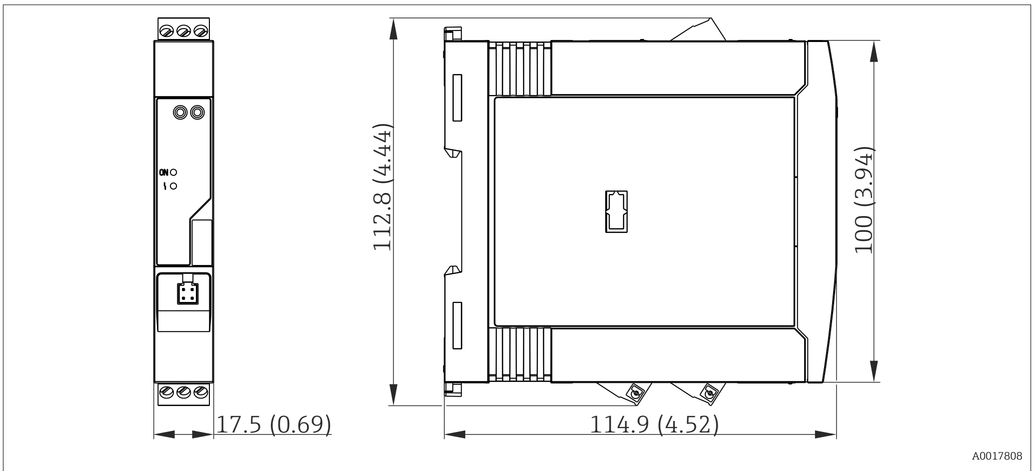
6 Version with screw terminals

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



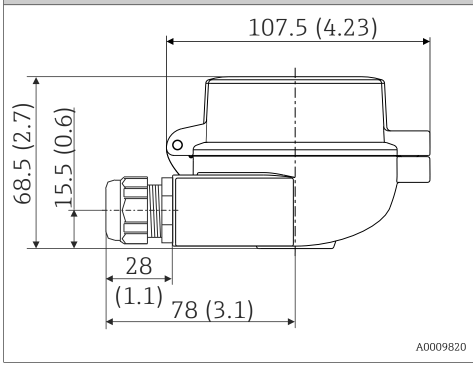
7 *Version with spring terminals. Dimensions are identical to the version with screw terminals, apart from housing height.*

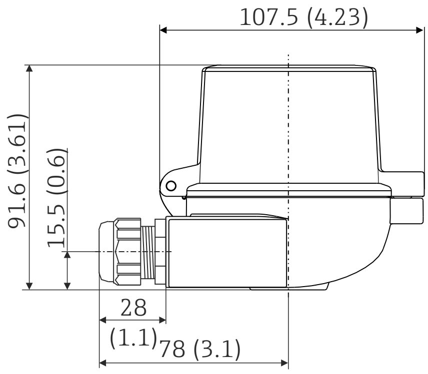
DIN rail device

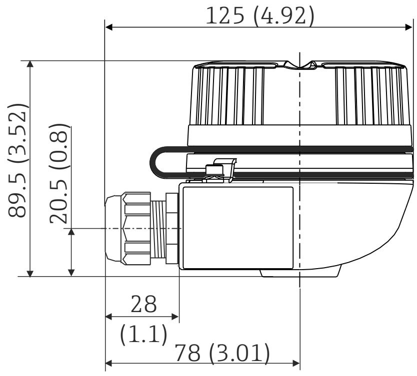


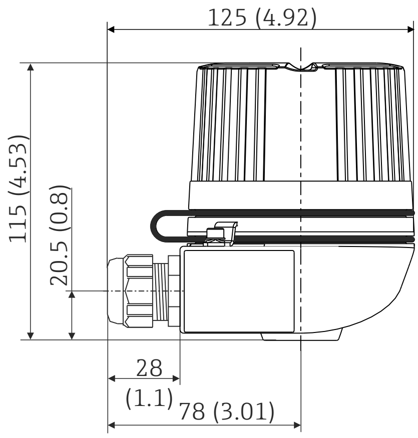
Field housing

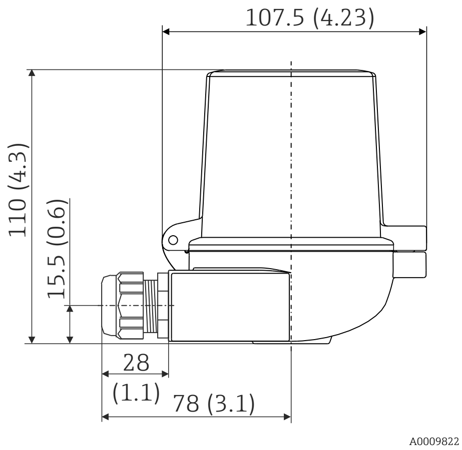
All field housings have an internal shape and size in accordance with DIN EN 50446, flat face. Cable glands in the diagrams: M20x1.5

TA30A	Specification
	▪ Two cable entries ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry glands: 1/2" NPT and M20x1.5 ▪ Color of head: blue, RAL 5012 ▪ Color of cap: gray, RAL 7035 ▪ Weight: 330 g (11.64 oz)

TA30A with display window in cover	Specification
 A0009821	▪ Two cable entries ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry glands: 1/2" NPT and M20x1.5 ▪ Color of head: blue, RAL 5012 ▪ Color of cap: gray, RAL 7035 ▪ Weight: 420 g (14.81 oz)

TA30H	Specification
 A0009832	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries ▪ Temperature: −50 to +150 °C (−58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!) ▪ Material: – Aluminum; polyester powder coated – Stainless steel ▪ Cable entry glands: ½" NPT, M20x1.5 ▪ Color of head: blue, RAL 5012 ▪ Color of cap: gray, RAL 7035 ▪ Weight: approx. 640 g (22.6 oz)

TA30H with display window in cover	Specification
 A0009831	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries ▪ Temperature: −50 to +150 °C (−58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!) ▪ Material: – Aluminum; polyester powder coated – Stainless steel ▪ Cable entry glands: ½" NPT, M20x1.5 ▪ Color of head: blue, RAL 5012 ▪ Color of cap: gray, RAL 7035 ▪ Weight: approx. 860 g (30.33 oz)

TA30D	Specification
	▪ 2 cable entries ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry glands: 1/2" 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. ▪ Color of head: blue, RAL 5012 ▪ Color of cap: gray, RAL 7035 ▪ Weight: 390 g (13.75 oz)

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)

Weight

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

Materials

All the materials used are RoHS-compliant.

- Housing: polycarbonate (PC), corresponds to UL94, V-2 UL recognized
- Terminals:
  - Screw terminals: nickel-plated brass and gold-plated contacts
  - Spring terminals (head transmitter): tin-plated brass, contact springs 1.4310, 301 (AISI)
- Potting (head transmitter): WEVO PU 403 FP / FL

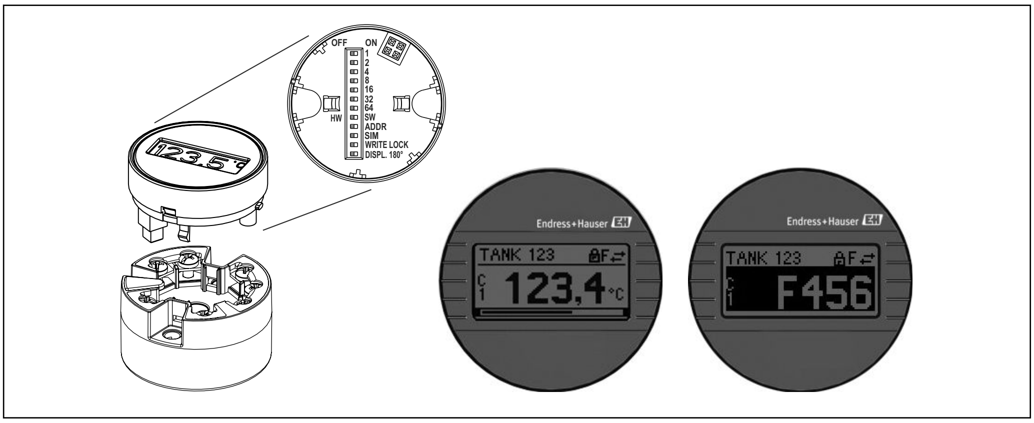
Field housing: see specifications

Operability

Local 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 measurement 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.

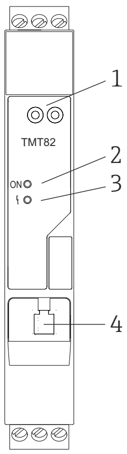


A0020347

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 device



A0017950

9 *DIN rail device TMT82*

1:	HART® communication jacks (2 mm) for commissioning and configuration	
2:	Power LED	An illuminated green LED indicates that the voltage supply is correct
3:	Status LED	Off: no diagnostic message
		Red illuminated: Category F diagnostic message
		Red flashing: Category C, S or M diagnostic message
4:	Service interface	For connecting a configuration tool (not in SIL mode)

Remote operation

The configuration of HART® functions and of device-specific parameters takes place via HART® communication or the 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.

Certificates and approvals

CE mark

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE-mark.

Ex approval

Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by your E+H Sales Center on request. All explosion protection data are given in separate documentation which is available upon request.

Maritime guidelines

For the type approval certificates (GL, BV etc.) currently available, please contact your Endress +Hauser Sales Center for information. All data relating to shipbuilding can be found in separate type approval certificates which can be requested as needed.

UL approval	UL recognized component (see www.ul.com/database, search for Keyword "E225237")
CSA GP	CAN/CSA-C22.2 No. 61010-1, 2nd edition
Functional safety	**SIL 2/3 (hardware/software) certified to:** ▪ IEC 61508-1:2010 (Management) ▪ IEC 61508-2:2010 (Hardware) ▪ IEC 61508-3:2010 (Software)
HART® certification	The temperature transmitter is registered by the HART® Communication Foundation. The device meets the requirements of the HART® Communication Protocol Specifications, Revision 7.0.
Examination certificate	In compliance with WELMEC 8.8, valid only for the SIL-Mode: "Guide on the General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instruments."

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

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

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Accessories included in the scope of delivery:
- Multilingual Brief Operating Instructions as hard copy
- Optional Functional Safety Manual (SIL mode) as hard copy
- ATEX supplementary documentation: ATEX Safety instructions (XA), **C**ontrol **D**rawings (CD)
- Mounting material for head transmitter

Device-specific accessories

Accessories
Display unit TID10 for Endress+Hauser head transmitter iTEMP TMT8x, attachable
TID10 service cable; connecting cable for service interface, 40 cm
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 + 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

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/00
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see Technical Information TI405C/07
WirelessHART adapter	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 Operating Instructions BA061S/04
Fieldgate FXA320	Gateway for accessing connected 4-20 mA measuring devices via a web browser. For details, see Technical Information TI025S/04
Fieldgate FXA520	Gateway for accessing connected HART® measuring devices via a web browser. For details, see Technical Information TI025S/04

Service-specific accessories

Accessories	Description
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: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ On CD-ROM for local PC installation.
Konfigurator+temperature	Software for selecting and configuring the product depending on the measuring task, supported by graphics. Includes a comprehensive knowledge database and calculation tools: ▪ For temperature competence ▪ Quick and easy design and sizing of temperature measuring points ▪ Ideal measuring point design and sizing to suit the processes and needs of a wide range of industries The Konfigurator is available: On request from your Endress+Hauser sales office on a CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. 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. For details, see Operating Instructions BA00027S and BA00059S

System components

Accessories	Description
Advanced Data Manager Memograph M	The Advanced Data Manager Memograph M is a flexible and powerful system for organizing process values. The measured process values are clearly presented on the display and logged safely, monitored against limit values, and analyzed. Via common communication protocols, the measured and calculated values can be easily communicated to higher-level systems and individual plant modules can be interconnected. For details, see Technical Information TI01180R/09
Universal Data Manager Ecograph T	Multi-channel data recording system with LC color graphic display (120 mm / 4.7" screen size), galvanically isolated universal inputs (U, I, TC, RTD), digital input, transmitter power supply, limit relay, communication interfaces (USB, Ethernet, RS232/485), Internal flash memory and compact flash card. For details, see Technical Information TI01079R/09
RN221N	Active barrier with power supply for safe separation of 4 to 20 mA standard signal circuits. Has bidirectional HART® transmission and optional HART® diagnosis if transmitters are connected with monitoring of 4 to 20 mA signal or HART® status byte analysis and an E+H-specific diagnostic command. For details, see Technical Information TI073R/09
RNS221	Supply unit for powering two 2-wire measuring devices solely in the non-Ex area. Bidirectional communication is possible via the HART® communication jacks. For details, see Technical Information TI081R/09
RB223	One- or two-channel, loop-powered barrier for safe separation of 4 to 20 mA standard signal circuits. Bidirectional communication is possible via the HART communication jacks. For details, see Technical Information TI132R/09
RIA14, RIA16	Loop-powered field indicator for 4 to 20 mA circuit, RIA14 in flameproof metal enclosure For details, see Technical Information TI143R/09 and TI144R/09
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 For details, see Technical Information TI01043K/09

Documentation

- Operating Instructions 'iTEMP TMT82' (BA01028T/09/en) and hard copy of associated Brief Operating Instructions 'iTEMP TMT82' (KA01095T/09/en)
- Functional Safety Manual 'iTEMP TMT82' (SD01172T/09/en)
- Supplementary ATEX documentation:
  ATEX II 1G Ex ia IIC: XA00102T/09/a3
  ATEX II2G Ex d IIC: XA01007T/09/a3 (transmitter in field housing)
  ATEX II2(1)G Ex ia IIC: XA01012T/09/a3 (transmitter in field housing)

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