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Technical Information
iTEMP TMT72

Temperature transmitter

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

Application

- Bluetooth®-enabled temperature transmitter with HART® communication for converting different input signals to a scalable, analog 4 to 20 mA output signal
- For a high level of plant safety, availability and risk minimization
- Universal input for resistance thermometers (RTD), thermocouples (TC), resistance transmitters (Ω), voltage transmitters (mV)
- Installation in terminal head form B (flat face) as per DIN EN 50446
- DIN rail housing for installation in cabinets
- Optional: Installation in field housing for Ex d applications

Your benefits

- Safe operation in hazardous areas thanks to international approvals
- Reliable operation thanks to sensor and device monitoring
- Integrated Bluetooth® interface for the wireless display of measured values and configuration via the Endress+Hauser SmartBlue app, optional
- Diagnostics information in accordance with NAMUR NE 107
- Attachable measured value display TID10, optional
- Optimization of the measurement accuracy by sensor-transmitter matching

Endress+Hauser
People for Process Automation

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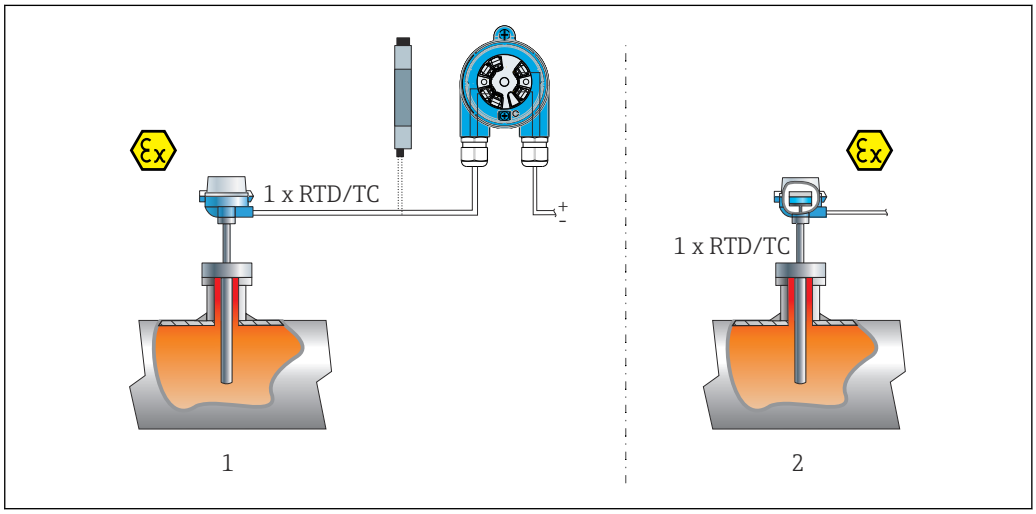
Function and system design

Measuring principle

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

Measuring system



1 *Application examples*

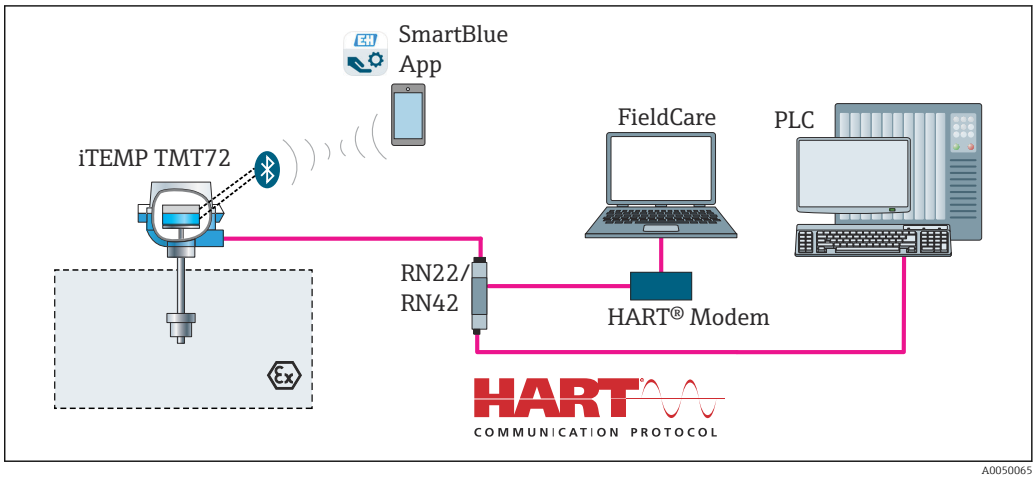
1 *An RTD or thermocouple sensor with transmitter in remote installation, e.g. head transmitter in field housing or DIN rail transmitter*
2 *Installed head transmitter – 1 x RTD/TC wired directly*

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 transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART communication, as well 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

Low voltage detection prevents incorrect analog output values in the event of power supply problems or due to 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. measuring 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. measuring span
	▪ Type of connection: 2-wire, 3-wire or 4-wire connection, sensor current: ≤ 0.3 mA ▪ With 2-wire circuit, compensation of the wire resistance is 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. measuring 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)

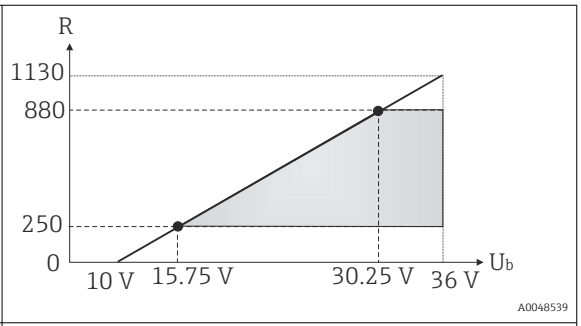
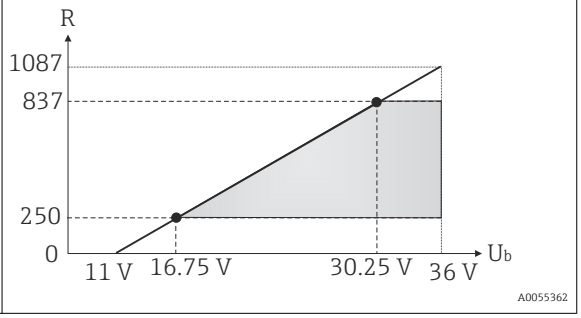
Failure signal

Failure information as per NAMUR NE43:

The 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 or 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 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 valid measured value signal is present at the current output and until start of HART communication. While switch-on delay = I_a ≤ 3.8 mA

Electrical Connection

Supply voltage

Values for the non-hazardous area, protected against reverse polarity:
- Head transmitter: 10 V ≤ Vcc ≤ 36 V
- DIN rail transmitter: 11 V ≤ Vcc ≤ 36 V

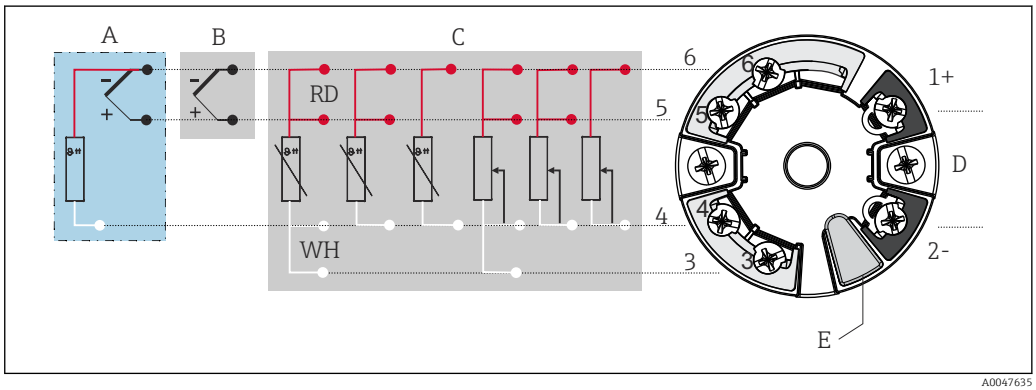
For values for hazardous areas, see the associated Safety Instructions for electrical equipment in hazardous areas (XA).

Current consumption

Current consumption ≤ 23 mA

Electrical Connection

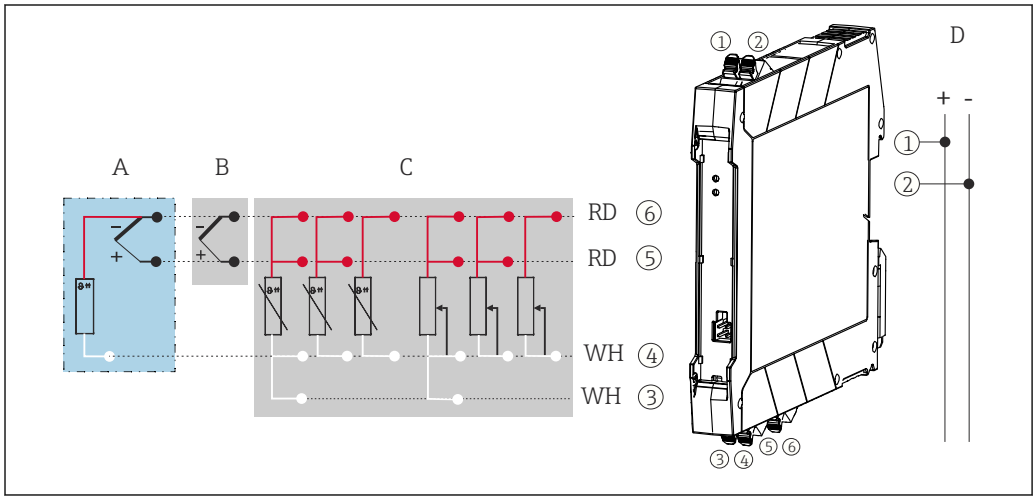
Head transmitter



3 Assignment of terminal connections for head transmitter

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

DIN rail transmitter



4 *Assignment of terminal connections for DIN rail transmitter*

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

An unshielded installation cable is sufficient if only the analog signal is used. The use of shielded cables is recommended in the event of increased EMC interference. In the case of the DIN rail transmitter, a shielded cable must be used if the sensor cable length exceeds 30 m (98.4 ft).

A shielded cable is recommended for HART communication. Refer to the 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 (TC) measurement, 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 mm².

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 EN IEC 62828 and the reference operating conditions specified above. The measurement error data corresponds to ±2 σ (Gaussian distribution). The data includes non-linearities and repeatability. MV = Measured value LRL = Lower range limit of 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)	0.05 °C (0.09 °F)	0.08 °C (0.14 °F)
IEC 60751:2008	Pt1000 (4)		0.04 °C (0.072 °F)	0.07 °C (0.13 °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 [1]	Value at current output
IEC 60584, Part 1	Type K (NiCr-Ni) (36)	0 to +800 °C (32 to +1 472 °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 1 562 °F)	ME = ± (0.04 °C (0.07 °F) + 0.0036% * (MV - LRL))	0.03 % (≙ 4.8 µA)
	Pt200 (2)		ME = ± (0.08 °C (0.14 °F) + 0.011% * (MV - LRL))	
	Pt500 (3)	−200 to 510 °C (−328 to 950 °F)	ME = ± (0.035 °C (0.063 °F) + 0.006% * (MV - LRL))	
	Pt1000 (4)	−200 to 250 °C (−328 to 482 °F)	ME = ± (0.02 °C (0.04 °F) + 0.005% * (MV - LRL))	
JIS C1604:1984	Pt100 (5)	−200 to 510 °C (−328 to 950 °F)	ME = ± (0.04 °C (0.07 °F) + 0.004% * (MV - LRL))	
GOST 6651-94	Pt50 (8)	−185 to 1 100 °C (−301 to 2 012 °F)	ME = ± (0.07 °C (0.13 °F) + 0.006% * (MV - LRL))	
	Pt100 (9)	−200 to 850 °C (−328 to 1 562 °F)	ME = ± (0.045 °C (0.08 °F) + 0.004% * (MV - LRL))	0.03 % (≙ 4.8 µA)
DIN 43760 IPTS-68	Ni100 (6)	−60 to 250 °C (−76 to 482 °F)	ME = ± (0.035 °C (0.06 °F) - 0.004% * (MV - LRL))	
	Ni120 (7)		ME = ± (0.035 °C (0.06 °F) - 0.004% * (MV - LRL))	

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 = ± (0.07 °C (0.13 °F) + 0.004% * (MV - LRL))	
	Cu100 (11)	−180 to 200 °C (−292 to 392 °F)	ME = ± (0.035 °C (0.06 °F) + 0.003% * (MV - LRL))	
	Ni100 (12)	−60 to 180 °C (−76 to 356 °F)	ME = ± (0.037 °C (0.07 °F) - 0.004% * (MV - LRL))	
	Ni120 (13)		ME = ± (0.035 °C (0.06 °F) - 0.004% * (MV - LRL)	
OIML R84: 2003, GOST 6651-94	Cu50 (14)	−50 to 200 °C (−58 to 392 °F)	ME = ± (0.07 °C (0.13 °F) + 0.004% * (MV - LRL))	
Resistance transmitter	Resistance Ω	10 to 400 Ω	ME = ± (15 mΩ + 0.0017%* (MV-LRL)	0.03 % (≙ 4.8 µA)
		10 to 2 000 Ω	ME = ± 60 mΩ+ 0.004%* (MV-LRL)	

1) Measured value transmitted via HART.
2) Percentages based on the configured measuring 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 - LRL))	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 - LRL))	
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 - LRL))	
ASTM E988-96	Type D (33)		ME = ± (0.4 °C (0.72 °F) * (MV - LRL))	
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 - LRL))	
	Type J (35)	−150 to 1 200 °C (−238 to 2 192 °F)	ME = ± (0.17 °C (0.31 °F) * (MV - LRL))	
	Type K (36)		ME = ± (0.24 °C (0.43 °F) - 0.002% * (MV - LRL))	
	Type N (37)	−150 to 1 300 °C (−238 to 2 372 °F)	ME = ± (0.27 °C (0.49 °F) - 0.003% * (MV - LRL))	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 - LRL))	
	Type S (39)		ME = ± (0.54 °C (0.97 °F) - 0.002% * (MV - LRL))	
	Type T (40)	−150 to 400 °C (−238 to 752 °F)	ME = ± (0.24 °C (0.43 °F) - 0.02% * (MV - LRL))	
DIN 43710	Type L (41)	−150 to 900 °C (−238 to 1 652 °F)	ME = ± (0.2 °C (0.36 °F) - 0.002% * (MV - LRL))	
	Type U (42)	−150 to 600 °C (−238 to 1 112 °F)	ME = ± (0.27 °C (0.49 °F) - 0.019% * (MV - LRL))	

Standard	Description	Measuring range	Measurement error (±)	
			Digital [1]	D/A [2]
GOST R8.585-2001	Type L (43)	−200 to 800 °C (−328 to 1472 °F)	ME = ± (2.2 °C (3.96 °F) - 0.005% * (MV - LRL))	
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 measuring 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 = ±0.04 °C + 0.0036% x (200 °C - (-200 °C)):	0.05 °C (0.09 °F)
Measurement error D/A = 0.003 % x 200 °C (360 °F)	0.06 °C (0.108 °F)
Measurement error digital value (HART):	0.05 °C (0.09 °F)
Measurement error analog value (current output): √(measurement error digital² + measurement error D/A²)	0.08 °C (0.14 °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 = 0.04 °C + 0.0036% x (200 °C - (-200 °C)):	0.05 °C (0.09 °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	**0.09 °C (0.16 °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 coefficient (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 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 - LRL), at least 0.003 °C (0.005 °F)	0.003 %	0.0007% * (MV - LRL), 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 - LRL), at least 0.006 °C (0.011 °F)		0.0007% * (MV - LRL), 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 - LRL), at least 0.003 °C (0.005 °F)		0.0007% * (MV - LRL), at least 0.001 °C (0.002 °F)	
Pt50 (8)	GOST 6651-94	0.0015% * (MV - LRL), at least 0.01 °C (0.018 °F)		0.0007% * (MV - LRL), at least 0.004 °C (0.007 °F)	
Pt100 (9)		0.0013% * (MV - LRL), at least 0.003 °C (0.005 °F)		0.0007% * (MV - LRL), 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)					

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]
Cu50 (14)	OIML R84: 2003 / GOST 6651-94	≤ 0.005 °C (0.009 °F)		≤ 0.002 °C (0.004 °F)	
Resistance transmitter (Ω)					
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 measuring 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 - LRL), at least 0.01 °C (0.018 °F)	0.003 %	0.0012% * (MV - LRL), 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 - LRL), at least 0.01 °C (0.018 °F)		0.0012% * (MV - LRL), at least 0.013 °C (0.023 °F)	
Type D (33)	ASTM E988-96	0.0019% * (MV - LRL), at least 0.01 °C (0.018 °F)		0.0011% * (MV - LRL), at least 0.0 °C (0.0 °F)	
Type E (34)	IEC 60584-1 ASTM E230-3	0.0014% * (MV - LRL), at least 0.0 °C (0.0 °F)		0.0008% * (MV - LRL), at least 0.0 °C (0.0 °F)	
Type J (35)		0.0014% * (MV - LRL), 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 - LRL), at least 0.0 °C (0.0 °F)		0.0009% * (MV - LRL), at least 0.0 °C (0.0 °F)	
Type N (37)		0.0014% * (MV - LRL), 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 measuring span of the analog output signal

MV = Measured value

LRL = Lower range limit of 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 year	after 3 years	after 5 years
		Based on measured value		
Pt100 (1)	IEC 60751:2008	≤ 0.007% * (MV - LRL) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRL) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRL) or 0.03 °C (0.05 °F)
Pt200 (2)		0.09 °C (0.17 °F)	0.12 °C (0.27 °F)	0.13 °C (0.24 °F)
Pt500 (3)		≤ 0.068% * (MV - LRL) or 0.03 °C (0.06 °F)	≤ 0.011% * (MV - LRL) or 0.03 °C (0.05 °F)	≤ 0.0124% * (MV - LRL) or 0.04 °C (0.07 °F)
Pt1000 (4)		≤ 0.0088% * (MV - LRL) or 0.02 °C (0.04 °F)	≤ 0.0114% * (MV - LRL) or 0.03 °C (0.05 °F)	≤ 0.013% * (MV - LRL) or 0.03 °C (0.05 °F)
Pt100 (5)	JIS C1604:1984	≤ 0.007% * (MV - LRL) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRL) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRL) or 0.03 °C (0.05 °F)
Pt50 (8)	GOST 6651-94	≤ 0.0076% * (MV - LRL) or 0.04 °C (0.08 °F)	≤ 0.01% * (MV - LRL) or 0.06 °C (0.11 °F)	≤ 0.011% * (MV - LRL) or 0.07 °C (0.12 °F)
Pt100 (9)		≤ 0.007% * (MV - LRL) or 0.02 °C (0.04 °F)	≤ 0.0093% * (MV - LRL) or 0.03 °C (0.05 °F)	≤ 0.0102% * (MV - LRL) or 0.03 °C (0.05 °F)
Ni100 (6)	DIN 43760 IPTS-68	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	0.04 °C (0.07 °F)	0.05 °C (0.09 °F)	0.05 °C (0.09 °F)
Cu100 (11)		0.02 °C (0.04 °F)	0.03 °C (0.05 °F)	0.04 °C (0.07 °F)
Ni100 (12)		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	0.04 °C (0.07 °F)	0.05 °C (0.09 °F)	0.05 °C (0.09 °F)
Resistance transmitter				
10 to 400 Ω		≤ 0.0055% * MV or 7.4 mΩ	≤ 0.0073% * MV or 9.7 mΩ	≤ 0.008% * (MV - LRL) or 10.7 mΩ
10 to 2 000 Ω		≤ 0.007% * (MV - LRL) or 47 mΩ	≤ 0.009% * (MV - LRL) or 60 mΩ	≤ 0.0067% * (MV - LRL) or 67 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 ASTM E230-3	≤ 0.044% * (MV - LRL) or 0.70 °C (1.26 °F)	≤ 0.058% * (MV - LRL) or 0.93 °C (1.67 °F)	≤ 0.063% * (MV - LRL) or 1.01 °C (1.82 °F)
Type B (31)		1.66 °C (2.99 °F)	2.19 °C (3.94 °F)	2.39 °C (4.30 °F)
Type C (32)	IEC 60584-1 ASTM E230-3 ASTM E988-96	0.70 °C (1.26 °F)	0.92 °C (1.66 °F)	1.00 °C (1.80 °F)
Type D (33)	ASTM E988-96	0.87 °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	0.26 °C (0.47 °F)	0.34 °C (0.61 °F)	0.37 °C (0.67 °F)
Type J (35)		0.31 °C (0.56 °F)	0.41 °C (0.74 °F)	0.44 °C (0.79 °F)

Description	Standard	Long-term drift (±) [1]		
Type K (36)		0.36 °C (0.65 °F)	0.47 °C (0.85 °F)	0.51 °C (0.92 °F)
Type N (37)		0.52 °C (0.94 °F)	0.69 °C (1.24 °F)	0.75 °C (1.35 °F)
Type R (38)		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)		0.38 °C (0.68 °F)	0.50 °C (0.90 °F)	0.54 °C (0.97 °F)
Type L (41)	DIN 43710	0.25 °C (0.45 °F)	0.33 °C (0.59 °F)	0.36 °C (0.65 °F)
Type U (42)		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	0.31 °C (0.56 °F)	0.41 °C (0.74 °F)	0.44 °C (0.79 °F)
Voltage transmitter (mV)				
–20 to 100 mV		≤ 0.025% * MV or 8.4 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 year	after 3 years	after 5 years
0.030%	0.036%	0.038%

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

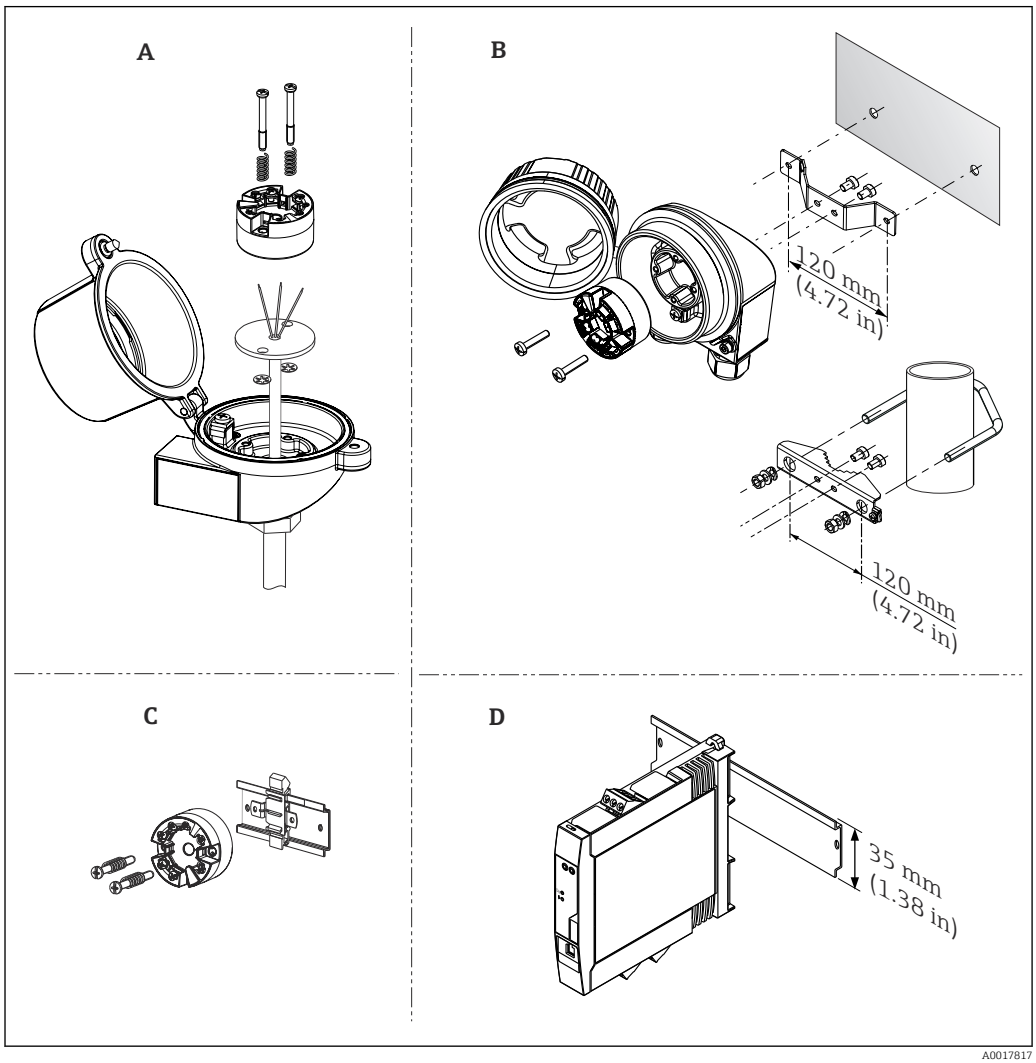
Influence of the Reference Junction

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 must be taken into consideration.

Installation

Installation location



5 Mounting location options for the transmitter

A Terminal head form B in accordance with 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 DIN rail clip on DIN rail as per IEC 60715 (TH35)
D DIN rail transmitter for mounting on DIN rail as per IEC 60715 (TH35)

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

Orientation

When a DIN rail transmitter is used with a thermocouple/mV measurement, increased measurement deviation may occur depending on the installation situation and ambient conditions. If the DIN rail transmitter is mounted in series between other DIN rail devices (reference operating condition: 24 V, 12 mA), deviations of max. +2.9 °C may occur.

Environment

Ambient temperature range

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)

Relative humidity

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

Operating altitude

Up to 4 000 m (13 123 ft) above sea level.

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 or push-in terminals: IP 20. In the installed state, it depends on the terminal head or field housing used.
- 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

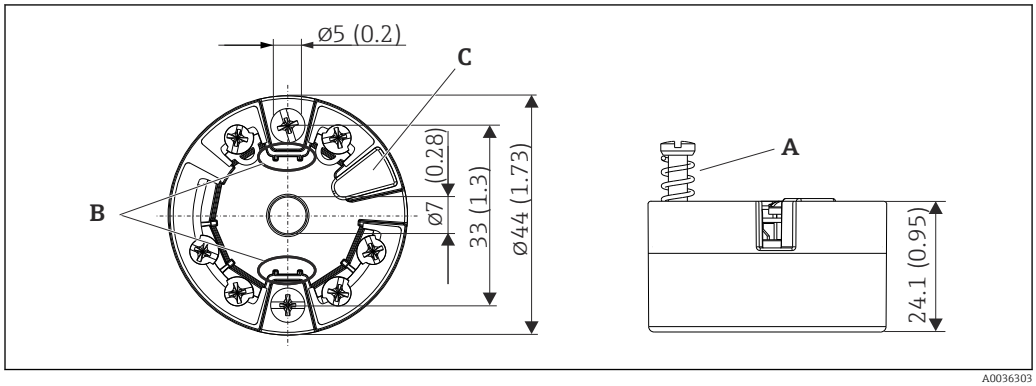
Protection class III

Mechanical Construction

Design and dimensions

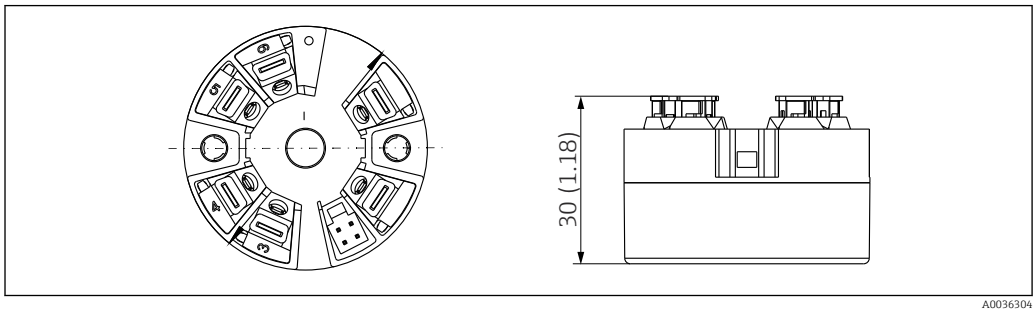
Dimensions in mm (in)

Head transmitter



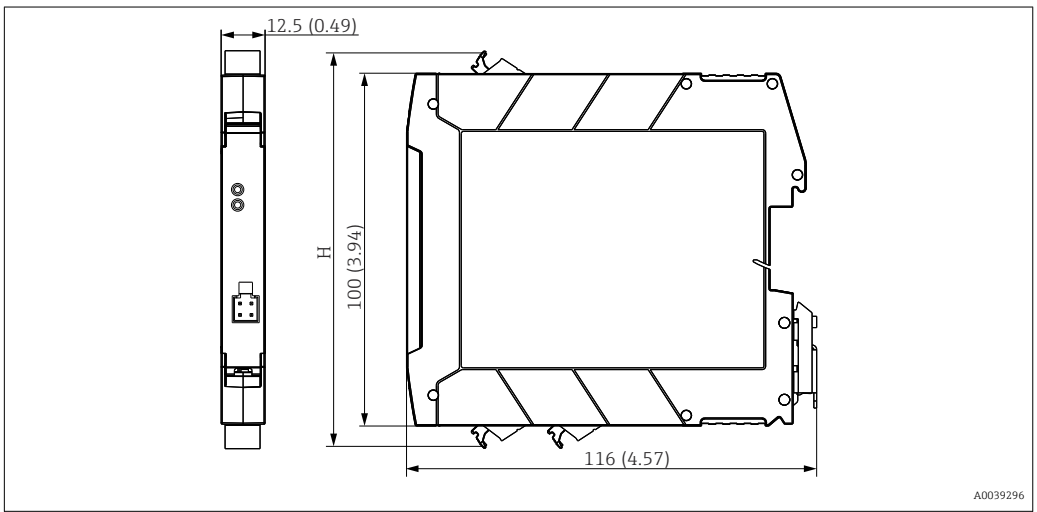
6 Version with screw terminals

A Spring travel L ≥ 5 mm (0.2 in) (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

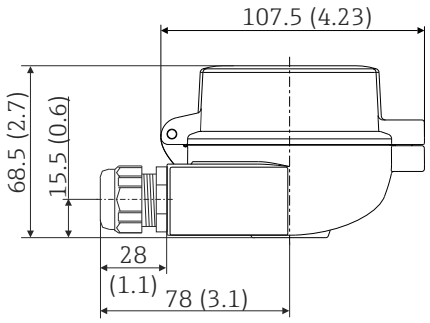


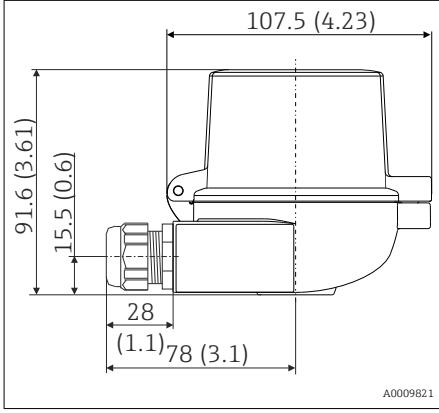
Height of housing H varies depending on the terminal version:
- Screw terminals: H = 114 mm (4.49 in)
- Push-in terminals: H = 111.5 mm (4.39 in)

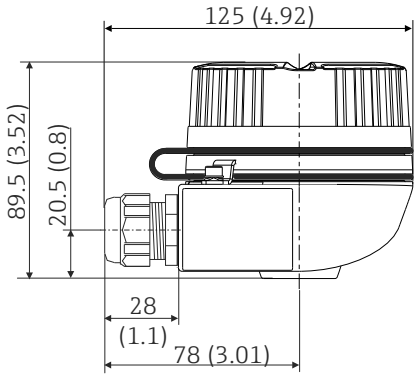
Field housing

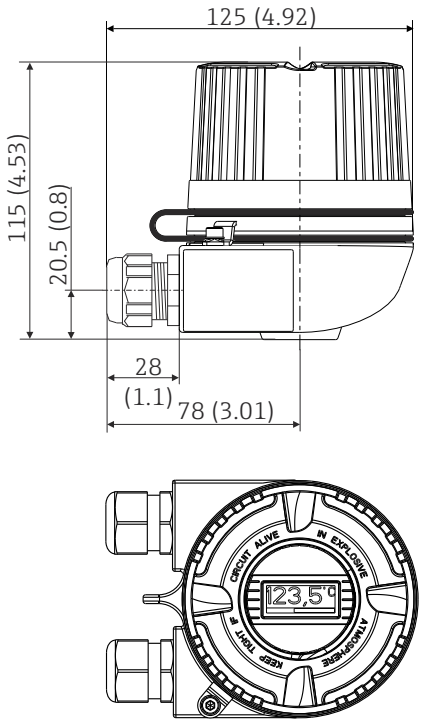
All field housings have an internal geometry in accordance with DIN EN 50446, Form B (flat face).
Cable glands in the diagrams: M20x1.5

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)

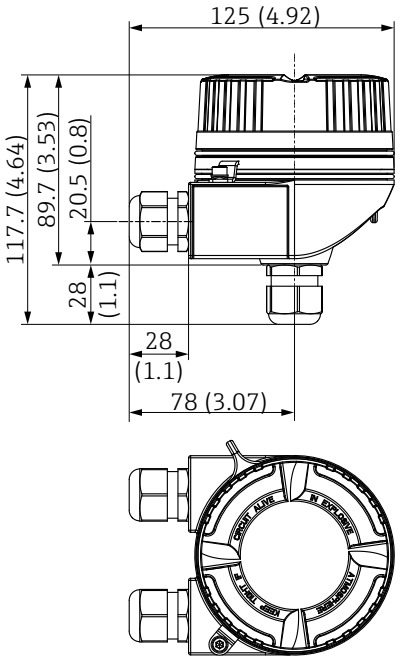
TA30A	Specification
	▪ Two cable entries ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Degree of protection: ▪ IP66/68 (NEMA Type 4x encl.) ▪ For ATEX: IP66/67 ▪ Cable entry glands: NPT ½" and M20x1.5 ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 330 g (11.64 oz)

TA30A with display window in cover	Specification
	▪ Two cable entries ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Protection degree: ▪ IP66/68 (NEMA Type 4x encl.) ▪ For ATEX: IP66/67 ▪ Cable entry glands: NPT ½" and M20x1.5 ▪ Head color: blue, RAL 5012 ▪ Cap color: 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

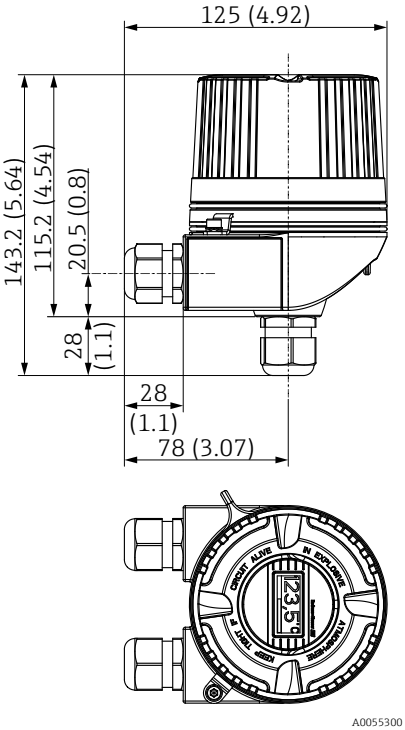
TA30H	Specification
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries ▪ Degree of protection: IP 66/68, NEMA Type 4x Encl. Ex-version: IP 66/67 ▪ Material: ▪ Aluminum, with polyester powder coating ▪ Stainless steel 316L without coating ▪ Dry lubricant Klüber Syntheso Glep 1 ▪ Cable entry glands: NPT ½", 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) When the housing cover is unscrewed: Before fastening, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).

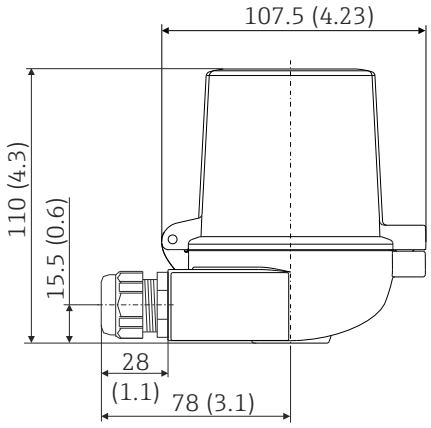
TA30H with display window in cover	Specification
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, with two cable entries ▪ Degree of protection: IP 66/68, NEMA Type 4x Encl. Ex-version: IP 66/67 ▪ Material: ▪ Aluminum with polyester powder coating ▪ Stainless steel 316L without coating ▪ Dry lubricant Klüber Syntheso Glep 1 ▪ Display window: single-pane safety glass according to DIN 8902 ▪ Cable entry glands: NPT ½", 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 display TID10 When the housing cover is unscrewed: Before fastening, 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	Specification

	▪ 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)
	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

	▪ 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
	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: NPT ½" 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

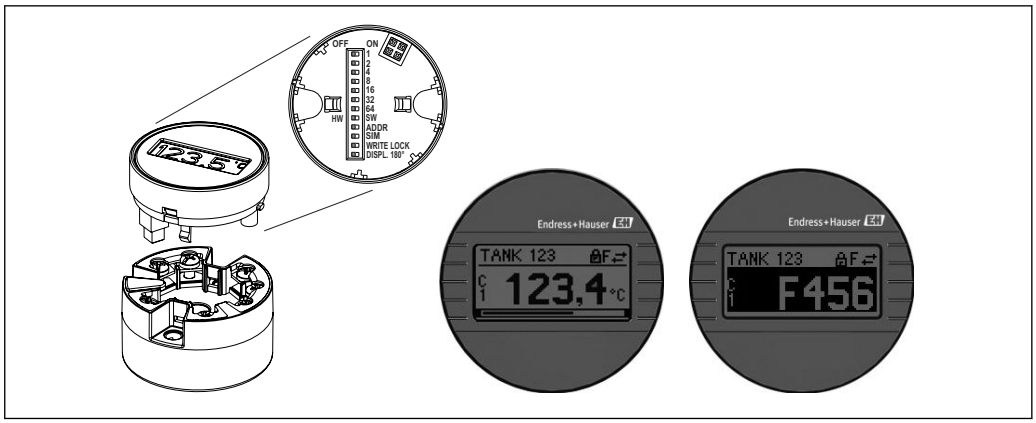
Field housing: see specifications

Operability

Local operation

Head transmitter

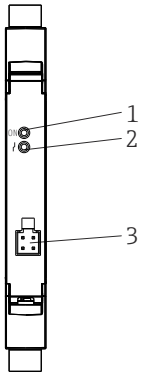
The head transmitter has no display or operating elements. There is the option of using the attachable measured value display TID10 together with the head transmitter. The display provides plain-text information on the current measured value and the measuring point identification. An optional bar graph is also used. In the event of a fault in the measuring chain, this will be displayed in inverse color showing the channel ident and diagnostic 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. Contact the manufacturer or sales department for further information.

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 operating 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 FieldComm Group. The device meets the requirements of the FieldComm Group HART 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 USA.

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 USA	
English: This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt 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 a minimum distance of 20 cm 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**.

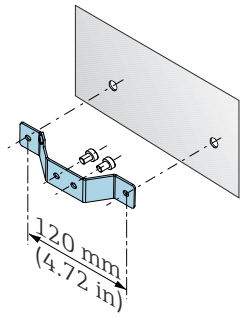
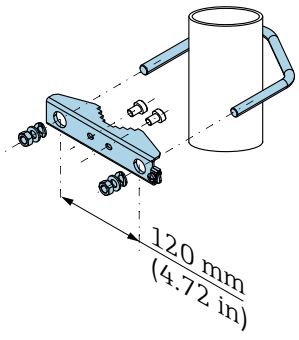
Accessories

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
Display unit TID10 for Endress+Hauser head transmitter iTEMP TMT8x or TMT7x, attachable
Field housing TA30x for Endress+Hauser head transmitter
Adapter for DIN rail mounting, DIN rail clip as per IEC 60715 (TH35) without securing screws
Standard – DIN terminal head mounting set (2 screws + springs, 4 securing disks and 1 display connector cover)
US mounting set – M4 screws (2 M4 screws and 1 display connector cover)

Accessories enclosed	
Wall mounting bracket, 316 L	 A0061686
Pipe mounting bracket, 316 L	 A0061687

Communication-Specific Accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details, see the Technical Information
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 the Technical Information
Field Xpert SMT70B	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. Field Xpert also uses the optimally secured Bluetooth® interface for its wireless connections. 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 the Technical Information

Service-specific accessories

Configurator
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the 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 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 **Configuration**.

DeviceCare SFE100
DeviceCare is an Endress+Hauser configuration tool for field devices using the following communication protocols: HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, IO/Link, Modbus, CDI and Endress+Hauser Common Data Interfaces.

www.endress.com/sfe100

FieldCare SFE500
FieldCare is a configuration tool for Endress+Hauser and third-party field devices based on DTM technology.
The following communication protocols are supported: HART, WirelessHART, PROFIBUS, FOUNDATION Fieldbus, Modbus, IO-Link, EtherNet/IP, PROFINET and PROFINET APL.

www.endress.com/sfe500

Netilion
With the Netilion IIoT ecosystem, Endress+Hauser enables the optimization of plant performance, digitization of workflows, sharing of knowledge and improved collaboration. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, reliability and ultimately a more profitable plant.

www.netilion.endress.com

SmartBlue app
SmartBlue from Endress+Hauser allows easy wireless field device configuration via Bluetooth® or WLAN. By providing mobile access to diagnostic and process information, SmartBlue saves time, even in hazardous and difficult-to-access environments.

9 *QR code for free Endress+Hauser SmartBlue app*

Online tools

Product information about the entire life cycle of the device is available at:
www.endress.com/onlinetools

System components

RN series active barrier

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.

For more information, please refer to: www.endress.com

Process indicators from the RIA product family

Easily readable process indicators with various functions: loop-powered indicators for displaying 4-20 mA values, display of up to four HART variables, process indicators with control units, limit value monitoring, sensor power supply, and galvanic isolation.

Universal application thanks to international hazardous area approvals, suitable for panel mounting or field installation..

For more information, please refer to: www.endress.com

Data Manager of the RSG product family

Data Managers are flexible and powerful systems to organize process values. Up to 20 universal inputs and up to 14 digital inputs for direct connection of sensors, optionally with HART, are available as an option. The measured process values are clearly presented on the display and logged safely, monitored for limit values and analyzed. The values can be forwarded via common communication protocols to higher-level systems and connected to one another via individual plant modules.

For more information, please refer to: www.endress.com

Documentation

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the product configuration:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid** This document contains all the technical data on the product and provides an overview of everything that can be ordered with the product.
Brief Operating Instructions (KA)	**Quick guide to obtaining the first measured value** The Operating Instructions contain all the essential information about the product from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Reference** The Operating Instructions contain the information that is required in the various phases of the life cycle of the product: 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 parameters** The document contains detailed explanations of readable or configurable parameters in the product. The description is aimed at those who work with the product over its entire life cycle and perform specific configurations.

Document type	Purpose and content of the document
Safety Instructions (XA)	Safety Instructions for electrical equipment in hazardous areas are supplied with the product depending on the approval. These are an integral part of the Operating Instructions. The nameplate indicates the Safety Instructions (XA) that are relevant to the product.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the product documentation.

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www.addresses.endress.com

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