Датчики температуры TH51, TH52, TH56

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Technical Information
TH51, TH52 and TH56

General purpose MgO insulated thermocouples with connection head, extension lead wires or connectors for process and laboratory applications

Application

Magnesium Oxide (MgO) insulated thermocouples are used in many process and laboratory applications. They have many desirable characteristics making thermocouples a good choice for general and special purpose applications.

The sensors can be used on:
- Heat exchangers
- Power and recovery areas
- Furnaces, dryers, flue gas
- Compressor stations
- Process reactors
- Metallurgical and glass manufacturing

Head transmitter

All transmitters are available with enhanced accuracy and reliability compared to directly wired sensors. Easy customizing by choosing one of the following outputs and communication protocols:

- Analog output 4 to 20 mA
- HART®
- PROFIBUS® PA
- FOUNDATION Fieldbus™
- Bluetooth® connectivity (optional)

Field transmitter

Temperature field transmitters with HART® or FOUNDATION Fieldbus™ protocol for highest reliability in harsh industrial environments. Backlit display with large measured value, bargraph and fault condition indication for ease of reading.

Your benefits

- One source shopping for temperature measurement solutions. World class transmitter with integrated sensor offering.
  Remove and install straight out of the box!
- Improved galvanic isolation on most devices (2 kV)
- Simplified model structure: Competitively priced, offers great value. Easy to order and reorder. A single model number includes sensor and transmitter assembly for a complete point solution.
- All iTEMP transmitters provide long-term stability ≤ 0.05% per year

Function and system design

Measuring principle

Thermocouples (TC)

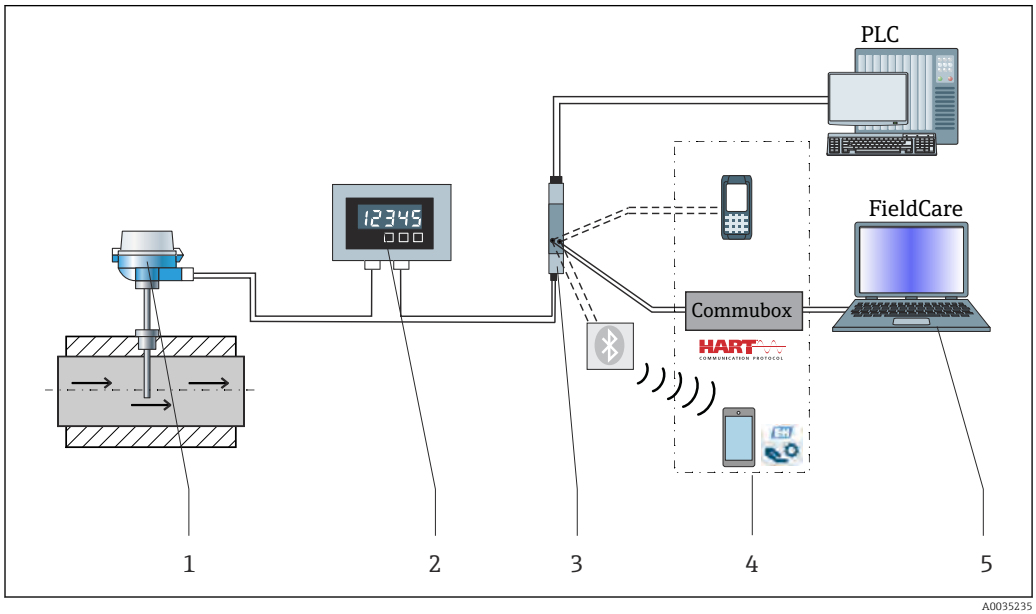
Thermocouples are comparatively simple, robust temperature sensors which use the Seebeck effect for temperature measurement: if two electrical conductors made of different materials are connected at a point, a weak electrical voltage can be measured between the two open conductor ends if the conductors are subjected to a thermal gradient. This voltage is called thermoelectric voltage or electromotive force (emf.). Its magnitude depends on the type of conducting materials and the temperature difference between the "measuring point" (the junction of the two conductors) and the "cold junction" (the open conductor ends). Accordingly, thermocouples primarily only measure differences in temperature. The absolute temperature at the measuring point can be determined from these if the associated temperature at the cold junction is known or is measured separately and compensated for. The material combinations and associated thermoelectric voltage/temperature characteristics of the most common types of thermocouple are standardized in the IEC 60584 and ASTM E230/ANSI MC96.1 standards.

Measuring system

offers a complete portfolio of optimized components for the temperature measuring point – everything you need for the seamless integration of the measuring point into the overall facility. This includes:

- Power supply unit/barrier
- Display units
- Overvoltage protection

For more information, see the brochure 'System Components - Solutions for a Complete Measuring Point' (FA00016K)



1

1 *Installed thermometer with HART® communication protocol*
2 *RIA15 loop powered process display - It is integrated in the current loop and displays the measuring signal or HART® process variables in digital form. The process display unit does not require an external power supply. It is powered directly from the current loop. More information on this can be found in the Technical Information.*
3 *Active barrier RN42 - The RN42 (17.5 V_{DC}, 20 mA) active barrier has a galvanic isolated output for supplying voltage to loop powered transmitters. The universal power supply works with an input supply voltage of 24 to 230 V AC/DC, 0/50/60 Hz, which means that it can be used in all international power grids. More information on this can be found in the Technical Information.*

'accessories'.

Input

Measured variable

Temperature (temperature-linear transmission behavior)

Measurement range

Measuring range by type and size

Upper temperature limits for various sheath diameters °C (°F)							
Nominal diameter			Thermocouple type				
Sheath O.D.	Element wire Ø (in)	Element wire gauge	T	J	E	K	N
Ø 1/16 in	0.010	30	260 °C (500 °F)	440 °C (825 °F)	510 °C (950 °F)	920 °C (1690 °F)	
Ø 1/8 in	0.020	24	315 °C (600 °F)	520 °C (970 °F)	650 °C (1200 °F)	1070 °C (1960 °F)	
Ø 3/16 in	0.029	21	370 °C (700 °F)	620 °C (1150 °F)	730 °C (1350 °F)	1150 °C (2100 °F)	
Ø 1/4 in	0.039	19		720 °C (1330 °F)	820 °C (1510 °F)		
Ø 3/8 in	0.060	15					
Maximum element temperature range limits			−270 to +400 °C (−454 to +752 °F)	−210 to +1200 °C (−346 to +2192 °F)	−270 to +1000 °C (−454 to +1832 °F)	−270 to +1372 °C (−454 to +2500 °F)	−270 to +1300 °C (−454 to +2372 °F)

These values are valid for single and duplex thermocouples. The temperature limits given are intended only as a guide to the user and should not be taken as absolute values or as guarantees of satisfactory life or performance. These types and sizes are sometimes used at temperatures above the given limits, but usually at the expense of stability or life or both. In other instances, it may be necessary to reduce the above limits in order to achieve adequate service.

Duplex versions (2 elements) of type N with 1/16 in, 3/16 in and 3/8 in sheath diameter are not available. Thermocouples with 316 SS sheath are rated for a maximum temperature of 927 °C (1700 °F).

Output

Output signal

Generally, the measured value can be transmitted in one of two ways:

- Directly-wired sensors - sensor measured values forwarded without a transmitter.
- Via all common protocols by selecting an appropriate iTEMP temperature transmitter. All the transmitters listed below are mounted directly in the terminal head or as field transmitter and wired with the sensory mechanism.

Family of temperature transmitters

Thermometers fitted with iTEMP transmitters are an installation-ready complete solution to improve temperature measurement by significantly increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

4 to 20 mA head transmitters
They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP transmitters can be configured quickly and easily at a PC. offers free configuration software which can be downloaded from theWebsite. More information can be found in the Technical Information.

HART® head transmitters
The transmitter is a 2-wire device with one or 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. Swift and easy operation, visualization and maintenance using universal device configuration tools like FieldCare, DeviceCare or FieldCommunicator 375/475. Integrated Bluetooth® interface for the wireless display of

measured values and configuration via E+H SmartBlue (app), optional. For more information, see the Technical Information.

PROFIBUS® PA head transmitters
Universally programmable head transmitter with PROFIBUS® PA communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. The configuration of PROFIBUS PA functions and of device-specific parameters is performed via fieldbus communication. For more information, see the Technical Information.

FOUNDATION Fieldbus™ head transmitters
Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. All transmitters are released for use in all important process control systems. The integration tests are performed in System World". For more information, see the Technical Information.

Advantages of the iTEMP transmitters:
- Dual or single sensor input (optionally for certain transmitters)
- Pluggable display (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer drift, sensor backup functionality, sensor diagnostic functions
- Sensor-transmitter matching for dual sensor input transmitters, based on Callendar-Van-Dusen-coefficients (CvD).

Field transmitter
Field transmitter with HART®, FOUNDATION Fieldbus™ or PROFIBUS® PA communication and backlit display. Can be read easily from a distance, in sunlight and at night. Large measurement value, bargraph and fault indication displayed. Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring and sensor back-up functionality, corrosion detection.

Galvanic isolation

Galvanic isolation of iTEMP transmitters

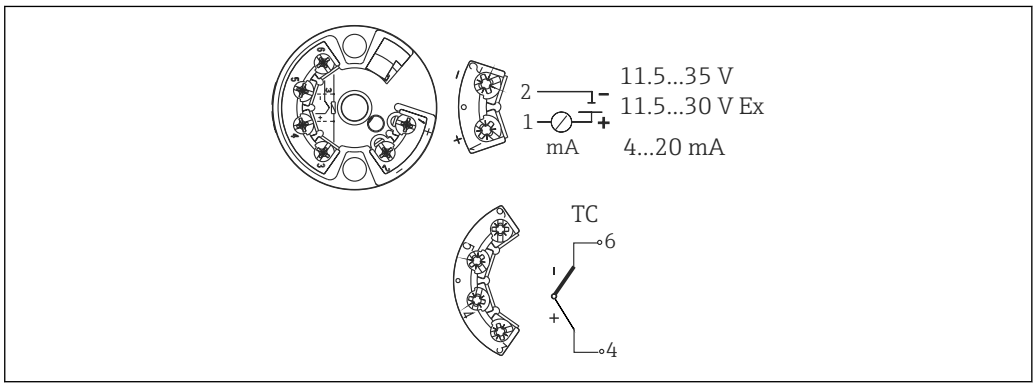
Transmitter type	Sensor
TMT162 HART® Field transmitter	U = 2 kV AC
TMT71	
TMT72 HART®	
TMT82 HART®	
TMT84 PA	
TMT85 FF	
TMT142B	

In applications where fast response time ist needed, grounded thermocouples are recommended. This thermocouple design may cause a ground loop. This can be avoided by using ITEMP transmitters with high galvanic isolation

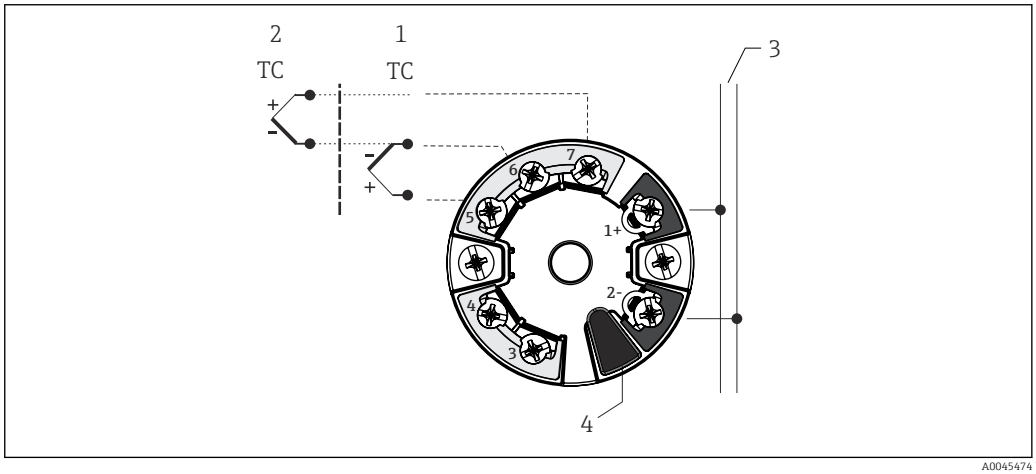
Power supply

Terminal assignments

Type of sensor connection

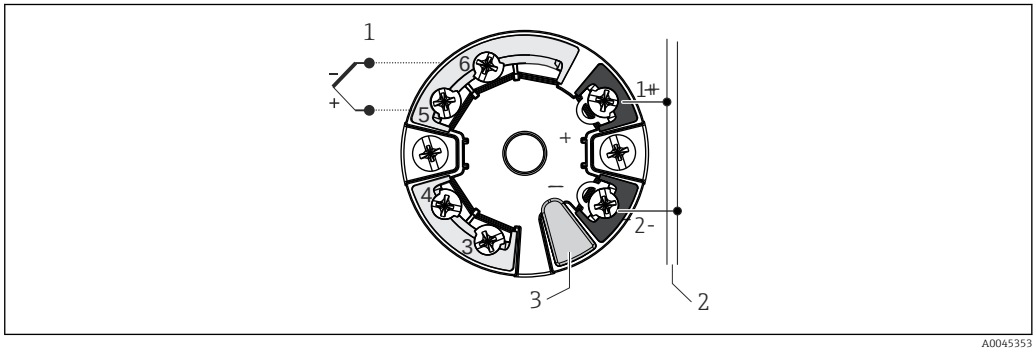


2 Head mounted transmitter TMT18x (single input)



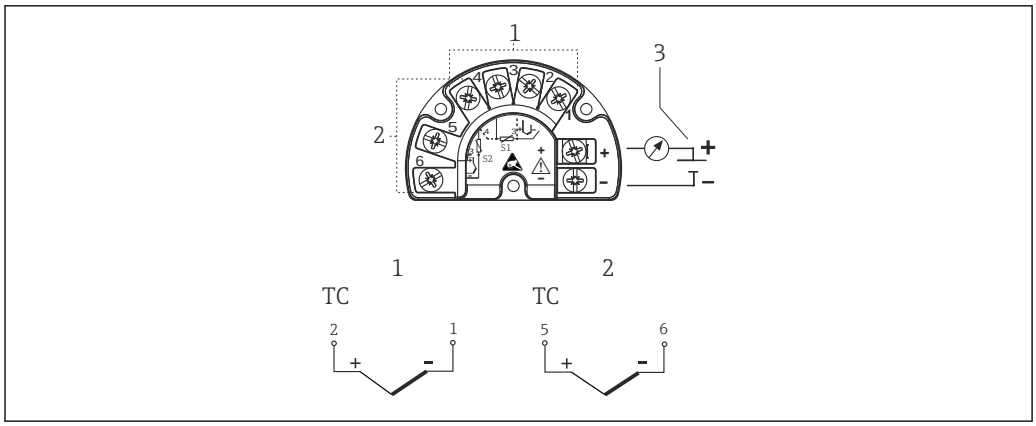
3 Head mounted transmitter TMT8x (dual input)

1 Sensor input 2
2 Sensor input 1
3 Bus connection and supply voltage
4 Display connection



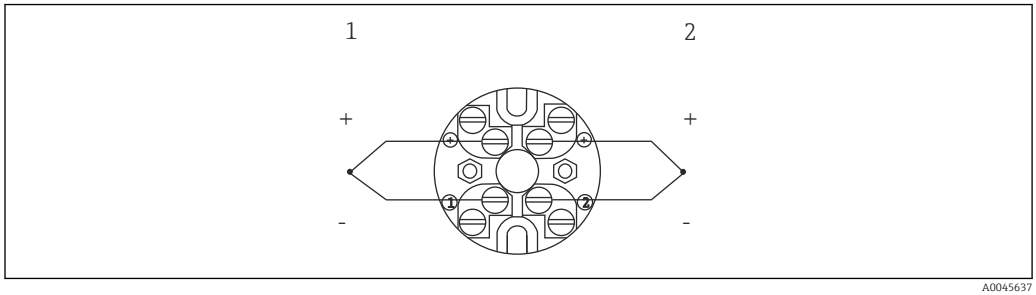
4 Head mounted transmitter TMT7x (single input)

1 Sensor input
2 Bus connection and supply voltage
3 Display connection and CDI interface



5 Field mounted transmitter TMT162 (dual Input) or TMT142B (single Input)

1 Sensor 1
2 Sensor 2 (not TMT142B)
3 Power supply field transmitter and analog output 4 to 20 mA or bus connection



6 Terminal block mounted

1 Sensor 1
2 Sensor 2

The blocks and transmitters are shown as they sit inside the heads in reference to the conduit opening.

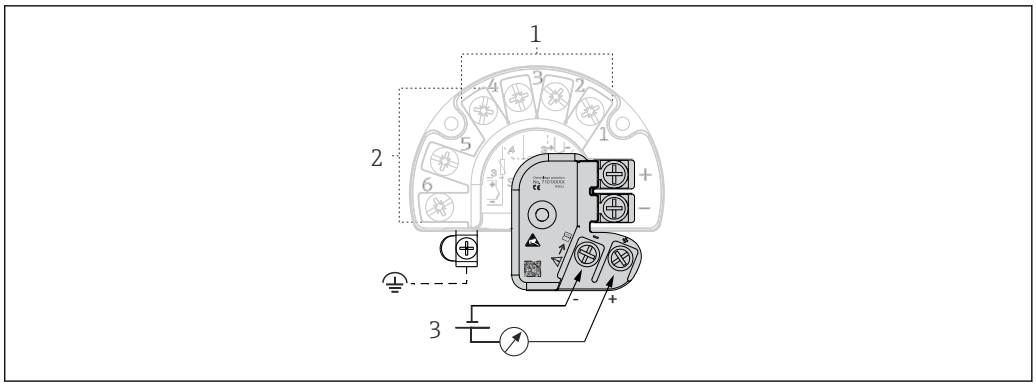
Integrated overvoltage protection

The integrated overvoltage protection module can be ordered as an optional extra [1]. The module protects the electronics from damage from overvoltage. Overvoltage occurring in signal cables (e.g. 4 to 20 mA, communication lines (fieldbus systems) and power supply is diverted to ground. The functionality of the transmitter is not affected as no problematic voltage drop occurs.

Connection data:

Maximum continuous voltage (rated voltage)	U_C = 42 V_{DC}
Nominal current	I = 0.5 A at $T_{amb.}$ = 80 °C (176 °F)
Surge current resistance ▪ Lightning surge current D1 (10/350 µs) ▪ Nominal discharge current C1/C2 (8/20 µs)	 ▪ I_{imp} = 1 kA (per wire) ▪ I_n = 5 kA (per wire) I_n = 10 kA (total)
Temperature range	–40 to +80 °C (–40 to +176 °F)
Series resistance per wire	1.8 Ω, tolerance ±5 %

1) Available for the field transmitter with HART® 7 specification



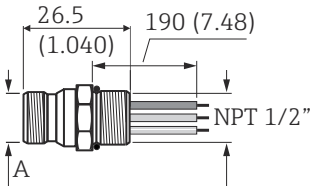
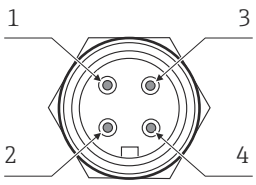
7 *Electrical connection of the overvoltage protection*

1 Sensor 1
2 Sensor 2
3 Bus connection and supply voltage

Grounding

The device must be connected to the potential equalization. The connection between the housing and the local ground must have a minimum cross-section of 4 mm^2 (13 AWG) . All ground connections must be secured tightly.

Fieldbus connector

Type (dimensions in mm (in))	Specification	
Fieldbus connector to PROFIBUS® -PA or FOUNDATION Fieldbus™  *A M12 on PROFIBUS® -PA connector or 7/8-16 UNC on FOUNDATION Fieldbus™ connector*	▪ Ambient temperature: −40 to 150 °C (−40 to 300 °F) ▪ Degree of protection IP 67 Wiring diagram:  	
	PROFIBUS® -PA Pos. 1: grey (shield) Pos. 2: brown (+) Pos. 3: blue (-) Pos. 4: not connected	FOUNDATION Fieldbus™ Pos. 1: blue (-) Pos. 2: brown (+) Pos. 3: not connected Pos. 4: ground (green/ yellow)

Performance characteristics

Reference conditions

These data are relevant for determining the accuracy of the temperature transmitters used. More information on this can be found in the Technical Information of the iTEMP temperature transmitters.

Response time

63% response time per ASTM E839

Junction style	Ø1/16"	Ø1/8"	Ø3/16"	Ø1/4"	Ø3/8"
Grounded	0.3 s	0.6 s	0.9 s	1.3 s	3.5 s
Ungrounded	0.4 s	1.6 s	2.4 s	2.9 s	7.2 s

Response time for the sensor assembly without transmitter.

Maximum measured error

Thermocouples corresponding to ASTM E230

Type	Temperature range	Standard tolerance (IEC class 2)	Special tolerance (IEC class 1)
		[°C] whichever is greater	[°C] whichever is greater
E	0 to 870 °C (32 to 1 600 °F)	±1.7 or ±0.5%	±1 or ±0.4%
J	0 to 760 °C (32 to 1 400 °F)	±2.2 or ±0.75%	±1.1 or ±0.4%
K	0 to 1 260 °C (32 to 2 300 °F)	±2.2 or ±0.75%	±1.1 or ±0.4%
T	0 to 370 °C (32 to 700 °F)	±1 or 0.75%	±0.5 or ±0.4%
N	0 to 1 260 °C (32 to 2 300 °F)	±2.2 or ±0.75%	±1.1 or ±0.4%

For measurement errors in °F, calculate using equation above in °C, then mulitply the outcome by 1.8.

Transmitter long-term stability

≤ 0.1 °C (0.18 °F) / year or ≤ 0.05 % / year

Data under reference conditions; % relates to the set span. The larger value applies.

Insulation resistance

Insulation resistance for MgO insulated thermocouples with ungrounded hot junction between terminals and probe sheath, test voltage 500 V_{DC}.

1000 MΩ at 25 °C (77 °F)

These values for insulation resistance also apply between each thermocouple wire at single and duplex constructions with ungrounded hot junction.

Calibration specifications

The manufacturer provides comparison temperature calibrations from −20 to +300 °C (−4 to +573 °F) on the ITS-90 (International Temperature Scale). Calibrations are traceable to standards maintained by the National Institute of Standards and Technology (NIST). Calibration services are in conformance with ASTM E220. The report of calibration is referenced to the serial number of the RTD assembly.

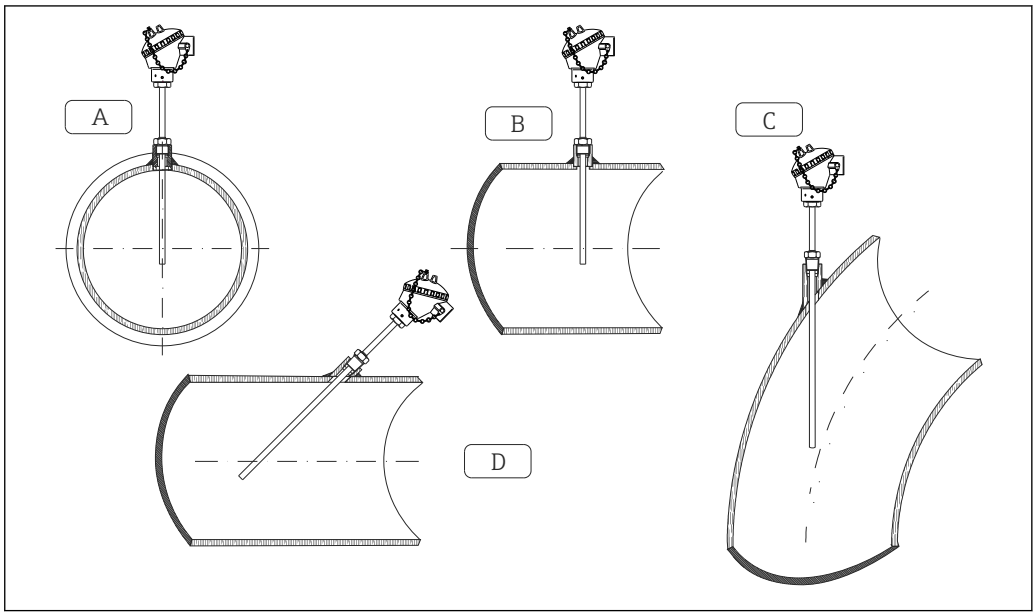
Three point calibrations are provided, given that the specified temperatures are within the recommended range and the minimum length requirements are met as specified. The minimum length is based on overall length 'x' of the spring loaded insert.

Installation conditions

Orientation

No restrictions.

Installation instructions



8 Installation examples

A-B In pipes with a small cross section the thermowell tip should reach or extend slightly past the center line of the pipe (= U)
C-D Tilted installation

The immersion length of the thermometer influences the accuracy. If the immersion length is too small then errors in the measurement are caused by heat conduction via the process connection and the container wall. If installing into a pipe then the immersion length should be at least half of the pipe diameter. A further solution could be an angled (tilted) installation (see C-D). When determining the immersion length all thermometer parameters and the process to be measured must be taken into account (e.g. flow velocity, process pressure).

- Installation possibilities: Pipes, tanks or other plant components
- Minimum immersion length should be 10 times the OD of the sheath, nominal.

Environment

Ambient temperature range

Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector, see 'Terminal heads' section
With mounted head transmitter	−40 to 85 °C (−40 to 185 °F) SIL mode (HART 7 transmitter): −40 to 70 °C (−40 to 158 °F)
With mounted head transmitter and display	−20 to 70 °C (−4 to 158 °F)
With mounted field transmitter	▪ Without display: −40 to 85 °C (−40 to 185 °F) ▪ With display and/or integrated overvoltage protection module: −40 to +80 °C (−40 to +176 °F) ▪ SIL mode: −40 to +75 °C (−40 to +167 °F)

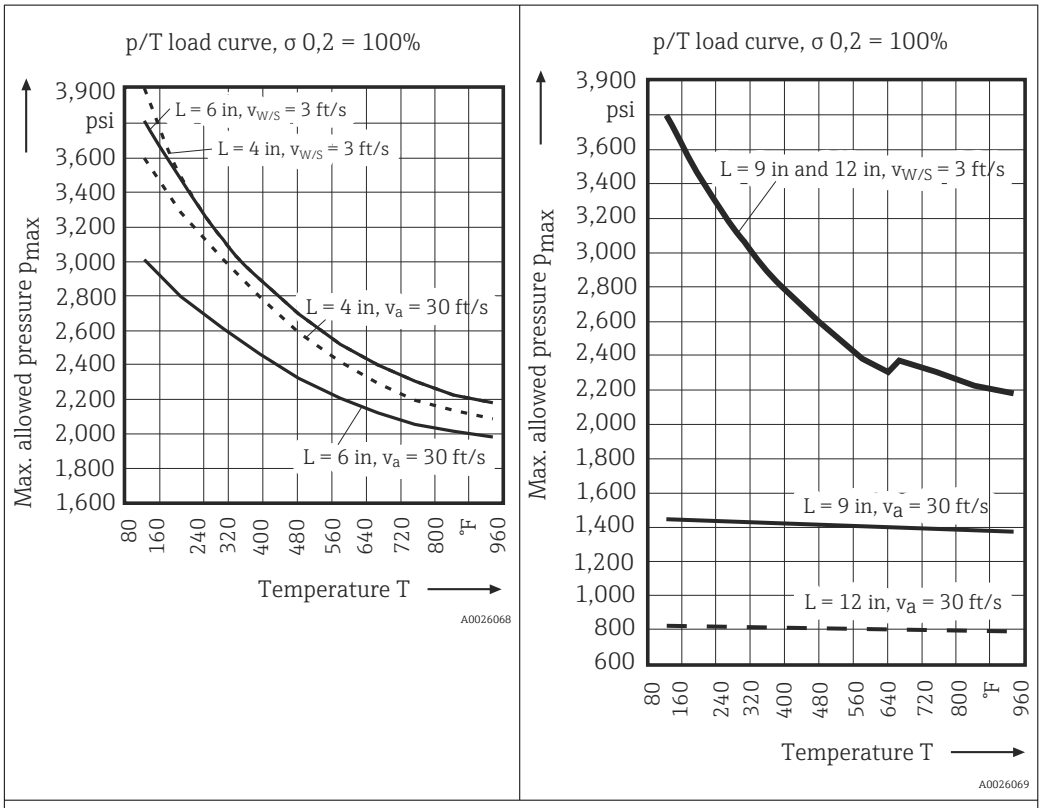
Shock and vibration resistance

4 g/2 to 150 Hz as per IEC 60068-2-6

Process

Process pressure limits

p/T load curve example according to Dittrich



L = Insertion length
v_a = Flow velocity air
$v_{w/s}$ = Flow velocity water or stream
Example calculation: Probe = 316SS
Sheath Ø = ¼" ; 0.028" wall thickness

Avoid resonance frequency as this will cause damage to the probe!

- L = 4 and 6 in:
  Resonance frequency occurs when permanent flow velocity is at 18.1, 22.6 or 27.1 ft/s (air) for 6 in and/or 40.5, 50.6 or 60.8 ft/s (air) for 4 inch probe (T = 482 °F, p = 2700/2600 psi).
- L = 9 and 12 in:
  Resonance frequency occurs when permanent flow velocity is at 8.1, 10.1 or 12.1 ft/s (air) for 9 inch and/or 4.6, 5.7 or 6.8 ft/s (air) for 12 inch probe (T = 482 °F, p = 2600 psi).

The calculation was done for pipes only, for MgO insulated thermocouples the values might be higher. In any case for different lengths, other materials, variation in sheath diameter or wall thicknesses, stress analysis is recommended. Failures are caused by forces imposed by static pressure, steady state flow, and vibration.

Max. allowable process pressure (PSIG) for instrumentation with one time adjustable compression fittings.

Temperature	**⅛" NPT and ¼" NPT compression fitting**				
°C (°F)	**Sheath Ø = 1/16"**	**Sheath Ø = ⅛"**	**Sheath Ø = 3/16"**	**Sheath Ø = ¼"**	**Sheath Ø = ⅜" 1)**
−28 to 204 °C (−20 to 300 °F)	3 300	2 850	3 150	3 350	3 900
204 °C (400 °F)	3 200	2 750	3 050	3 250	3 800
260 °C (500 °F)	3 000	2 550	2 850	3 000	3 500
316 °C (600 °F)	2 800	2 400	2 700	2 850	3 300

Temperature	⅛" NPT and ¼" NPT compression fitting				
°C (°F)	Sheath Ø = 1/16"	Sheath Ø = ⅛"	Sheath Ø = 3/16"	Sheath Ø = ¼"	Sheath Ø = ⅜" [1]
371 °C (700 °F)	2 700	2 350	2 600	2 750	3 200
427 °C (800 °F)	2 650	2 300	2 550	2 650	3 100
482 °C (900 °F)	2 600	2 200	2 450	2 600	3 050
538 °C (1 000 °F)	2 400	2 100	2 300	2 450	2 850

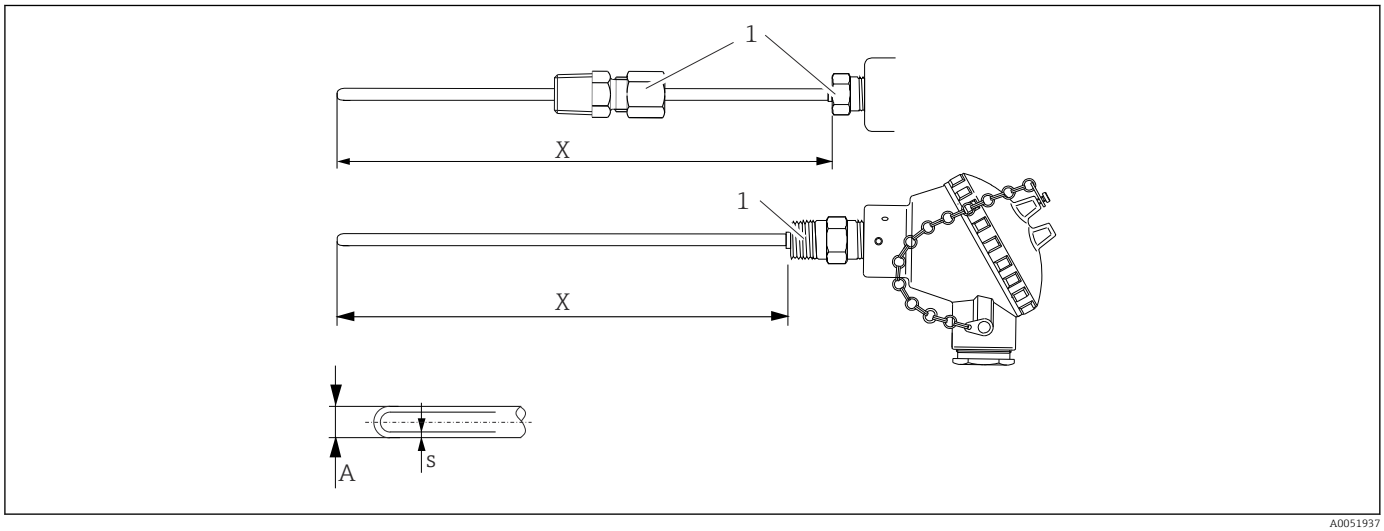
1) not available with compression fittings ⅛" NPT

Re-adjustable compression fittings are not intended to be used for pressure retaining applications and should only be used for the mechanical holding of sensors.

Mechanical construction

Design, dimensions

For values related to the graphics please refer to the table below.



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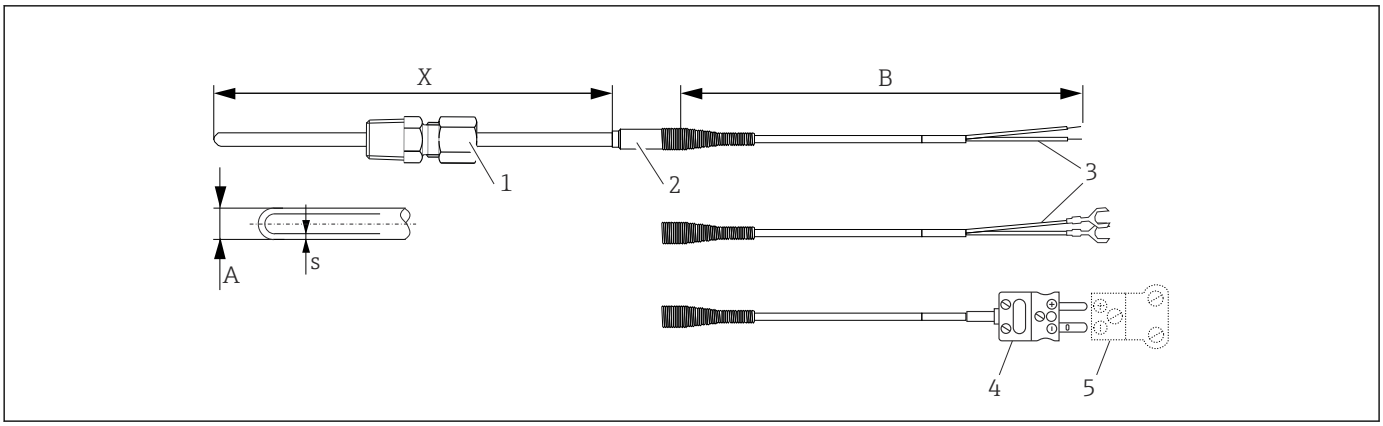
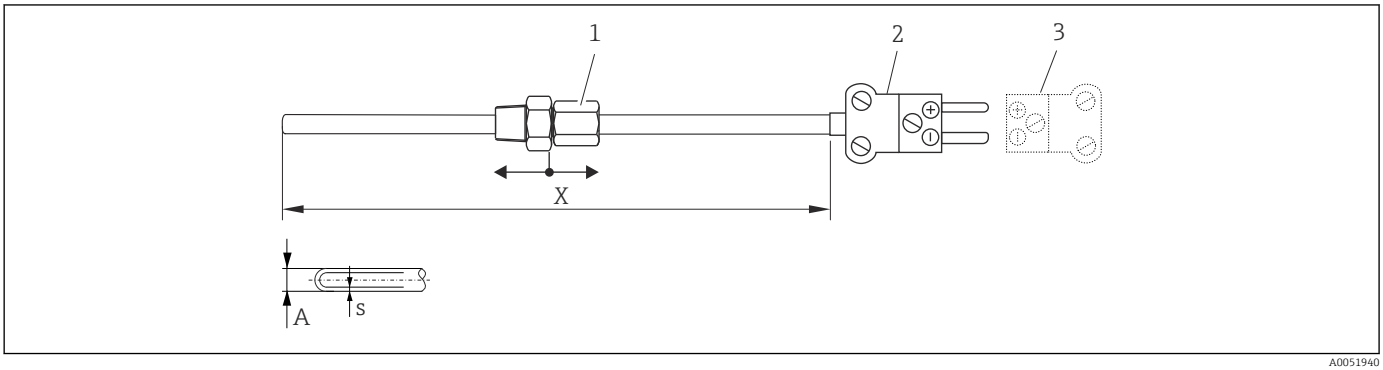
9 Design of TH51

1 Process connection: Thread, none or compression fitting
A Sheath diameter
s Wall thickness



10 Design of TH52

1 Process connection not selected or with compression fitting
2 Extension leadwire transition with relief spring (400 °F)
3 Leadwire termination: Stripped leads or stripped leads with fork lugs
4 Plug version
5 Female jack
A Sheath diameter
B Wire length
s Wall thickness



11 Design of TH56

1 Process connection not selected or with compression fitting
2 Plug version
3 Female jack
A Sheath diameter
s Wall thickness

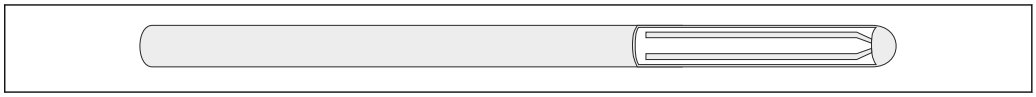
Duplex version (2 elements) of TH56 is not available.

Dimensions in inches

Immersion length X			**Wire length B**	**Sheath diameter A**	**Wall thickness S**
TH51	**TH52**	**TH56**			
4", 6", 9", 12"	6", 12", 18", 24"	12", 18", 24", 48", 72", 96"	48", 72", 120" specified length 12" to 300" in 12" increments	Ø1/16"	0.007"
				Ø1/8"	0.014"
				Ø3/16"	0.022"
				Ø1/4"	0.029"
specified length 2" to 96" in ½" increments				Ø3/8"	0.045"

Hot or measuring junction

Grounded junction



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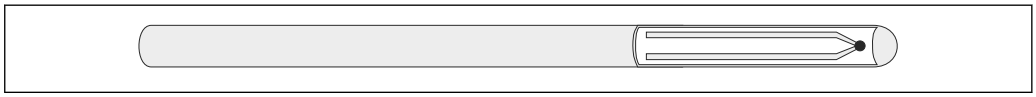
12 Grounded junction

The thermocouple junction is welded securely into the closure end of the sheath, becoming an integral part of the weld. This is a good general purpose, low cost junction providing faster response times than an ungrounded junction of similar sheath diameter. Grounded junctions should not be used with Type T thermocouples, due to the copper wire. For a reliable temperature reading of grounded thermocouples transmitters with galvanic isolation are strongly recommended. iTEMP transmitters have galvanic isolation of min. 2 kV (from the sensor input to the output and the housing).

Ungrounded junction



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13 Ungrounded junction

The welded thermocouple junction is fully isolated from the welded closed end sheath. This junction provides electrical isolation to reduce problems associated with electrical interference. Ungrounded junctions are also recommended for use in extreme positive or negative temperatures, rapid thermal cycling and for ultimate corrosion resistance of the sheath alloy. iTEMP transmitters have an excellent noise immunity (EMC) meeting all requirements listed under IEC 61326 for use in noisy environments.

Dual ungrounded elements supplied with individually isolated junctions, except Ø$^{1}/_{16}$" which are supplied with common junctions.

Weight

0.5 to 2.5 kg (1 to 5.5 lb)

Material

Process connection, terminal head and sheath

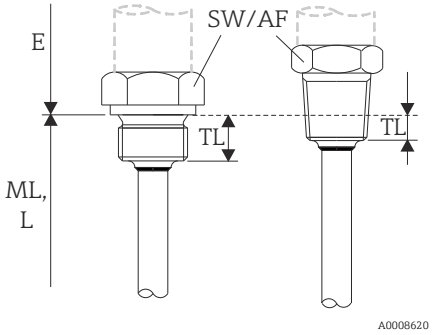
The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load. The maximum operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316/ 1.4401	X5CrNiMo17-12-2	650 °C (1 202 °F) [1]	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration)
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1 202 °F) [1]	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) ▪ Increased resistance to intergranular corrosion and pitting ▪ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
Alloy600/ 2.4816	NiCr15Fe	1 100 °C (2 012 °F)	▪ A nickel/chromium alloy with very good resistance to aggressive, oxidizing and reducing atmospheres, even at high temperatures ▪ Resistant to corrosion caused by chlorine gas and chlorinated media as well as many oxidizing mineral and organic acids, sea water etc. ▪ Corrosion from ultrapure water ▪ Not to be used in a sulfur-containing atmosphere

1) Can be used to a limited extent up to 800 °C (1472 °F) for low compressive loads and in non-corrosive

Process connection

Thread

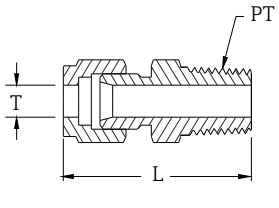
Threaded process connection	Version	Thread length TL	Width across flats	Max. process pressure
 14 *Cylindrical (left side) and conical (right side) version*	G ½" DIN / BSP [1]	0.6 in	1.06 in	Maximum static process pressure for threaded process connection: [2] 400 bar (5 802 psi) at +400 °C (+752 °F)
	NPT ½"	0.32 in	0.87 in	

1) DIN ISO 228 BSPP
2) Maximum pressure specifications only for the thread. The failure of the thread is calculated, taking the static pressure into consideration. The calculation is based on a fully tightened thread (TL = thread length)

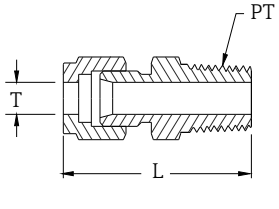
Compression fitting

All dimensions in inch

Re-adjustable compression fittings in stainless steel with FEP ferrule

Type of fitting	Tube size - Outer diameter (T) in inch	Process thread (PT) in inch	Length (L) in inch
	1/8	1/8" NPT	1 1/4
	3/16	1/8" NPT	1 1/4
	1/4	1/4" NPT	1 1/2
	3/8	1/4" NPT	1 1/2
	1/4	1/8" NPT	1 1/4
	1/8	1/4" NPT	1 1/2
	3/16	1/4" NPT	1 1/2
	1/4	1/2 NPT	1 3/4

One-time adjustable compression fittings in stainless steel with SS ferrule

Type of fitting	Tube size - Outer diameter (T) in inch	Process thread (PT) in inch	Length (L) in inch
	1/8	1/8" NPT	1 1/4
	3/16	1/8" NPT	1 1/4
	1/4	1/8" NPT	1 1/4
	1/8	1/4" NPT	1 1/2
	3/16	1/4" NPT	1 1/2
	1/4	1/4" NPT	1 1/2
	3/8	1/4" NPT	1 1/2
	1/4	1/2 NPT	1 3/4

Housing

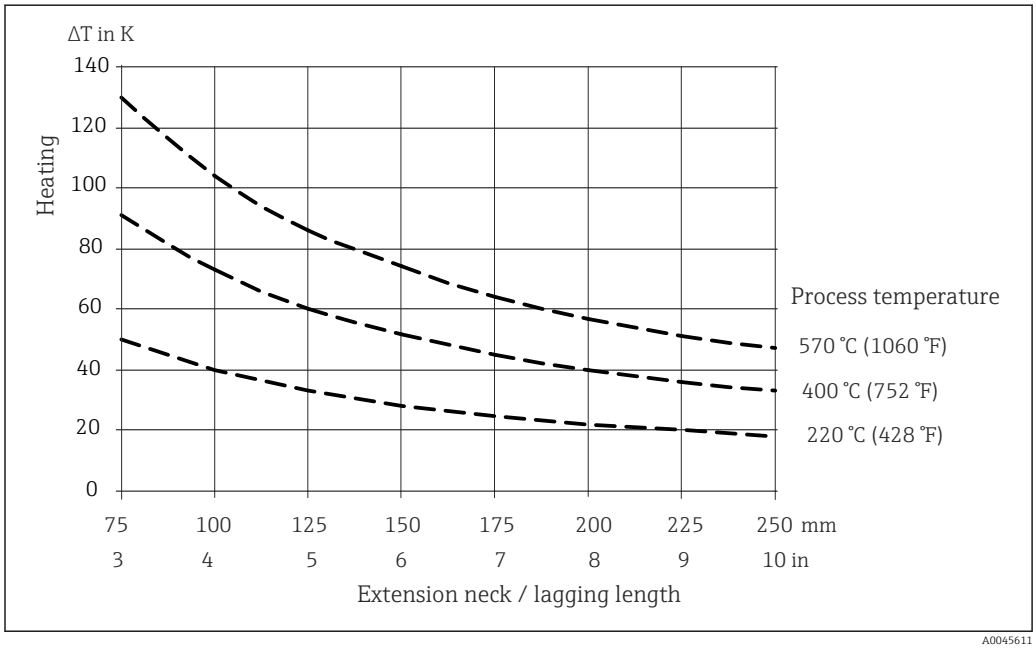
Terminal heads

All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face and a thermometer connection with a ½" NPT thread. All dimensions in mm (in). Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see the 'Environment' section.

As a special feature, offers terminal heads with optimized terminal accessibility for easy installation and maintenance.

Some of the specifications listed below may not be available on this product line.

As illustrated in the following diagram, the length of the extension neck can influence the temperature in the terminal head. This temperature must remain within the limit values defined in the "Operating conditions" section.

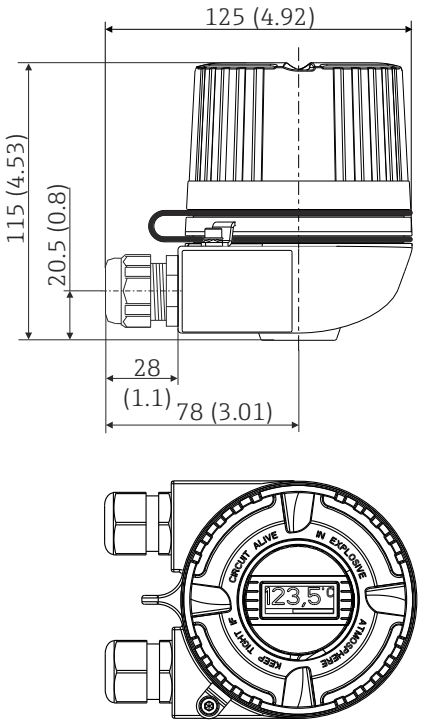


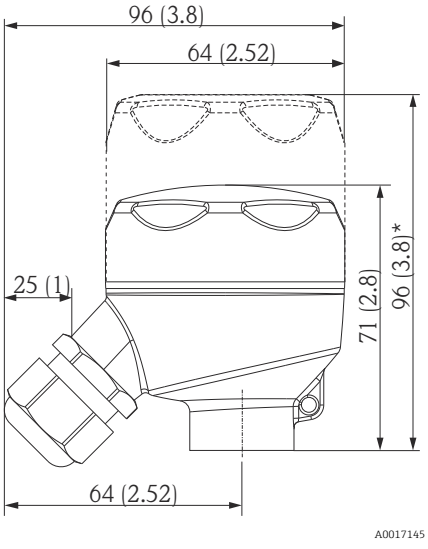
15 Heating of the terminal head as a function of the process temperature. Temperature in terminal head = ambient temperature 20 °C (68 °F)+ ΔT

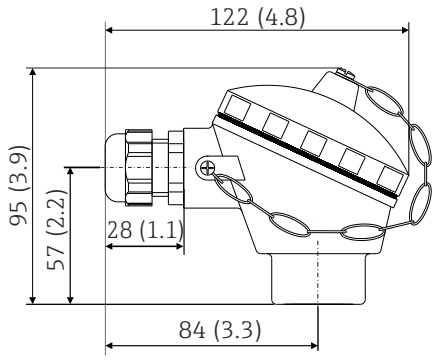
The diagram can be used to calculate the transmitter temperature.

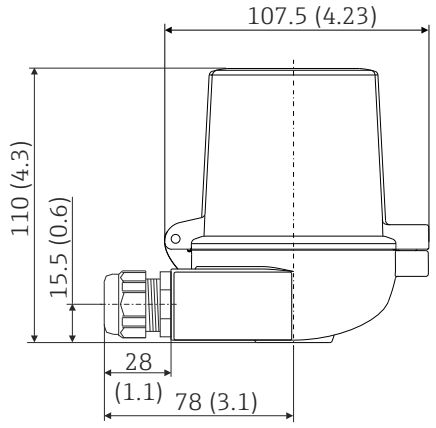
Example: At a process temperature of 220 °C (428 °F) and with a lagging length of 100 mm (3.94 in), the heat conduction is 40 K (72 °F). The transmitter temperature is therefore 40 K (72 °F) plus the ambient temperature, e.g. 25 °C (77 °F): 40 K (72 °F) + 25 °C (77 °F) = 65 °C (149 °F).

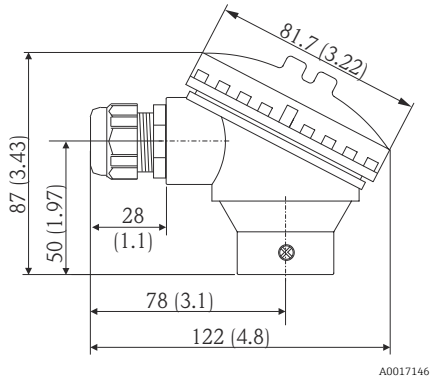
Result: The temperature of the transmitter is o.k., the length of the lagging is sufficient.

TA30H with display window in cover	Specification
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, available with one or two cable entries ▪ Degree of protection: IP 66/68, NEMA Type 4x encl. Ex-version: IP 66/67 ▪ 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 316L without coating ▪ Klüber Syntheso Glep 1 dry-film lubricant ▪ Display window: single-pane safety glass according to DIN 8902 ▪ Thread: ½" NPT, ¾" NPT, M20x1.5, G½" ▪ Extension neck/thermowell connection: M20x1.5 or 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) ▪ Head transmitter optionally available with TID10 display If the housing cover is unscrewed: Before tightening, clean the thread in the cover and housing base and lubricate if necessary (Recommended lubricant: Klüber Syntheso Glep 1)

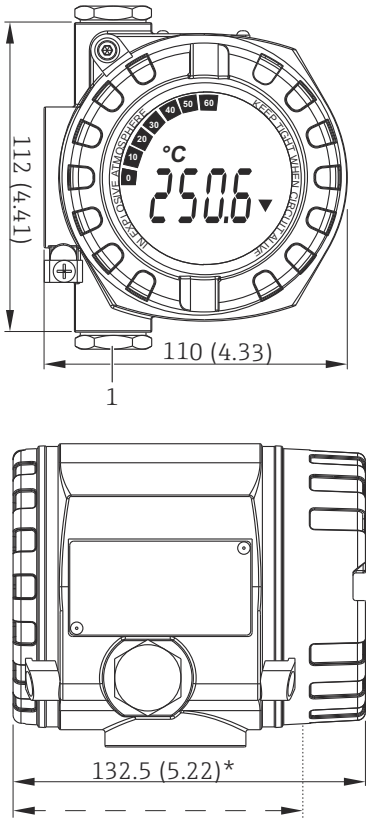
TA30R (optionally with display window in cover)	Specification
 * Dimensions of version with display window in cover	▪ Degree of protection - standard version: IP69K (NEMA Type 4x encl.) Degree of protection - version with display window: IP66/68 (NEMA Type 4x encl.) ▪ Temperature: −50 to +130 °C (−58 to +266 °F) without cable gland ▪ Material: stainless steel 316L, abrasive-blasted or polished Seals: silicone, optional EPDM for applications free from paint-wetting impairment substances Display window: polycarbonate (PC) ▪ Cable entry thread ½" NPT and M20x1.5 ▪ Weight ▪ Standard version: 360 g (12.7 oz) ▪ Version with display window: 460 g (16.23 oz) ▪ Display window in cover optionally for head transmitter with display TID10 ▪ Protection armature connection: M24x1.5 or ½" NPT ▪ Ground terminal: internal as standard ▪ Available with 3-A marked sensors ▪ Not allowed for Class II and III applications

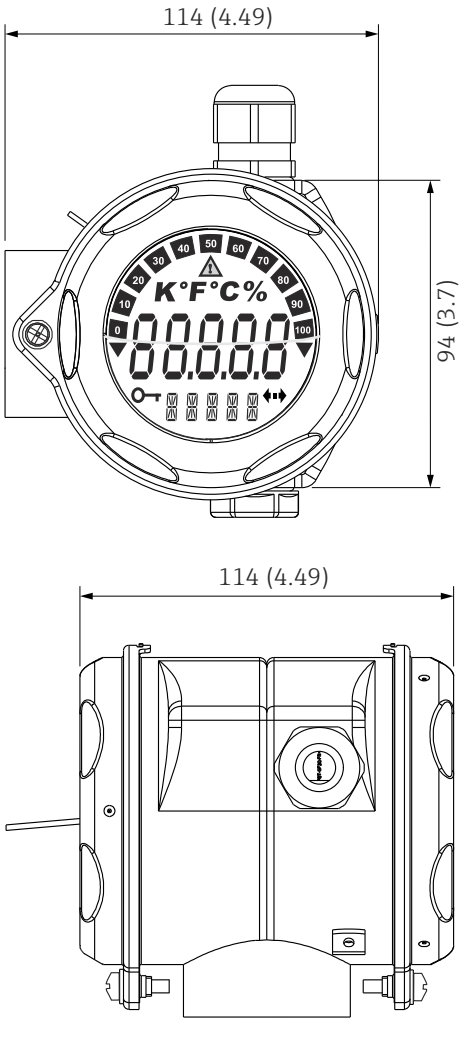
TU401	Specification
	▪ Protection class: IP65 (NEMA Type 4x encl.) ▪ Temperature: −40 to 130 °C (−40 to 266 °F) silicone, up to 100 °C (212 °F) rubber seal without cable gland (observe max. permitted temperature of the cable gland!) ▪ Material: aluminum alloy with polyester or epoxy coating, rubber or silicone seal under the cover ▪ Cable entry: M20x1.5 or plug M12x1 PA ▪ Protection armature connection: M24x1.5, G 1/2" or NPT 1/2" ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 300 g (10.58 oz)

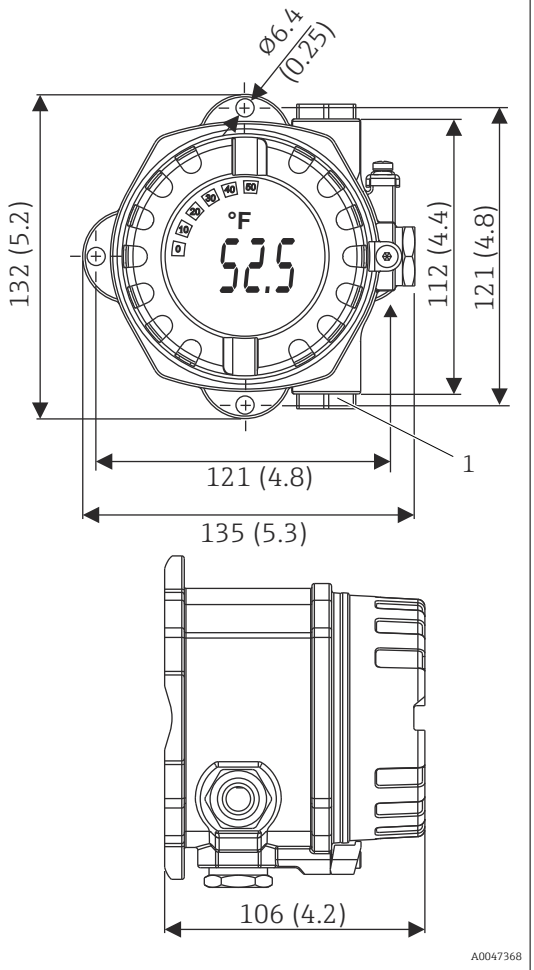
TU401 (TA30D style)	Specification
	▪ Available with one or two cable entries ▪ Protection class: IP66/68 (NEMA Type 4x encl.) ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Threaded cable entry: G ½", ½" NPT and M20x1.5 ▪ Protection armature connection: M24x1.5 ▪ Two head transmitters can be mounted. In the standard version, 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) ▪ Ground terminal, internal and external ▪ With 3-A symbol

TU401 (TA30S style)	Specification
	▪ Degree of protection: IP65 (NEMA Type 4x encl.) ▪ Temperature: −40 to +85 °C (−40 to +185 °F) without cable gland ▪ Material: polypropylene (PP), FDA-compliant, seals: O-ring EPDM ▪ Cable entry thread: ¾" NPT (with adapter for ½" NPT), M20x1.5 ▪ Protective assembly connection: ½" NPT ▪ Color: white ▪ Weight: approx. 100 g (3.5 oz) ▪ Ground terminal: only internal via auxiliary terminal **⚠ CAUTION** **Potential electrostatic charging hazard** ► Not recommended for use in hazardous (classified) locations.

Field transmitters

Temperature field transmitter iTEMP TMT162	Specification
 *1 Instrument connection for direct mounting assembly* * Dimensions without display = 112 mm (4.41 in)	▪ Separate electronics compartment and connection compartment ▪ Protection class: IP67, NEMA type 4x ▪ Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base or stainless steel 316L ▪ Display rotatable in 90° increments ▪ Cable entry: 2x ½" NPT ▪ Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness ▪ Gold plated terminals to avoid corrosion and additional measurement errors ▪ SIL certification as per IEC 61508:2010 (HART-protocol)

Temperature field transmitter iTEMP TMT162 for hygienic applications	Specification
 * Dimensions without display = 112 mm (4.41 in)	▪ Material: Stainless steel 1.4435 (AISI 316L) for hygienic applications (T17 housing) ▪ Separate electronics compartment and connection compartment ▪ Display rotatable in 90° increments ▪ Cable entry: 2 x ½" NPT ▪ Degree of protection (IP69K) ▪ Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness ▪ Gold plated terminals to avoid corrosion and additional measurement errors

Temperature field transmitter iTEMP TMT142B	Specification
 *1 Instrument connection for direct mounting assembly*	▪ Protection class: IP66/67, NEMA type 4x ▪ Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base or stainless steel 316L ▪ Display rotatable in 90° increments ▪ Integrated Bluetooth® interface for wireless measured value display and parameter configuration, optional ▪ Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness ▪ Gold plated terminals to avoid corrosion and additional measurement errors

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