Technical Information
Omnigrad M TR11

Modular RTD assembly
protection tube, thread



Application

- Universal range of application
- Measuring range: -200...600 °C (-328...1112 °F)
- Pressure range up to 75 bar (1088 psi)
- Degree of protection: up to IP 68

Head transmitters

All Endress+Hauser 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...20 mA
- HART®
- PROFIBUS® PA
- FOUNDATION Fieldbus™

Your benefits

- High flexibility due to modular assembly with standard terminal heads and customized immersion length
- Highest possible compatibility with a design according to DIN 43772
- Fast response time with reduced/tapered tip form
- Types of protection for use in hazardous locations:
  Intrinsic Safety (Ex ia)
  Non-Sparking (Ex nA)

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

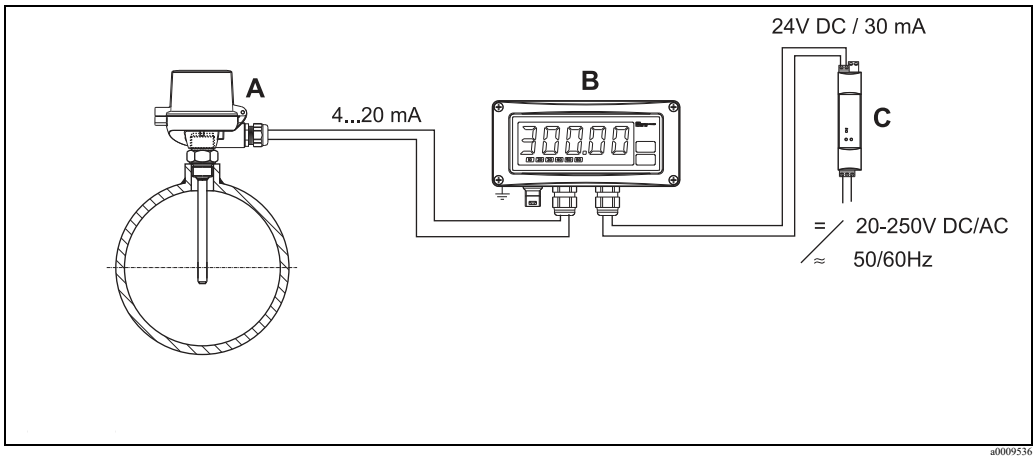
These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. This temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient $\alpha = 0.003851\ °C^{-1}$.

There are generally two different kinds of platinum resistance thermometers:

- Wire wound (WW): Here, a double coil of fine, high-purity platinum wire is located in a ceramic support. This is then sealed top and bottom with a ceramic protective layer. Such resistance thermometers not only facilitate very reproducible measurements but also offer good long-term stability of the resistance/temperature characteristic within temperature ranges up to 600 °C (1112 °F). This type of sensor is relatively large in size and it is comparatively sensitive to vibrations.
- Thin film platinum resistance thermometers (TF): A very thin, ultrapure platinum layer, approx. 1 µm thick, is vaporized in a vacuum on a ceramic substrate and then structured photolithographically. The platinum conductor paths formed in this way create the measuring resistance. Additional covering and passivation layers are applied and reliably protect the thin platinum layer from contamination and oxidation even at high temperatures.

The primary advantages of thin-film temperature sensors over wire wound versions are their smaller sizes and better vibration resistance. A relatively low principle-based deviation of the resistance/temperature characteristic from the standard characteristic of IEC 60751 can frequently be observed among TF sensors at high temperatures. As a result, the tight limit values of tolerance category A as per IEC 60751 can only be observed with TF sensors at temperatures up to approx. 300 °C (572 °F). For this reason, thin-film sensors are generally only used for temperature measurements in ranges below 400 °C (932 °F).

Measuring system



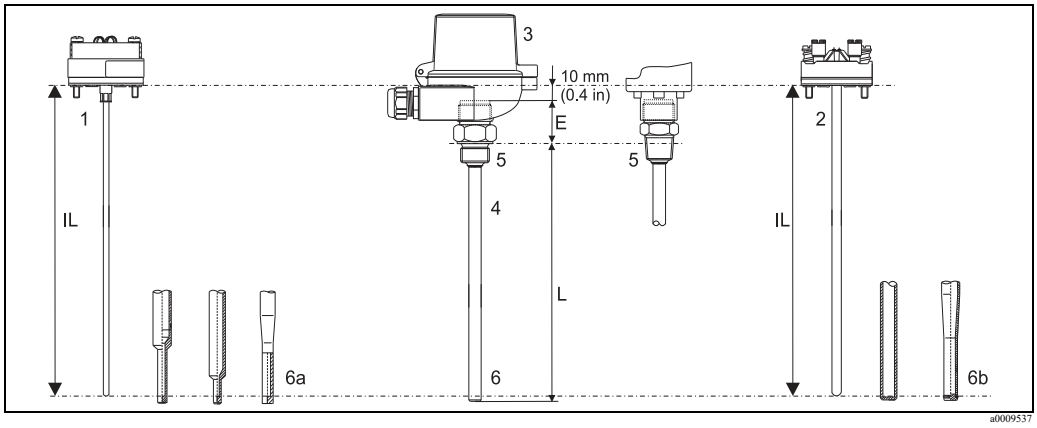
Example of an application

A Built-in RTD assembly TR11 with head transmitter

B RIA261 Field display
- The display measures an analog measurement signal and indicates this on the display. The display is connected in a 4 to 20 mA current loop and also derives its supply from the loop. The voltage drop is almost negligible (< 2.5 V). The dynamic internal resistance (load) makes sure that independently from the loop current, the maximum voltage drop is never exceeded. The analog signal at the input is digitalized, analyzed, and shown in the rear illuminated display. For details see Technical Information (see chapter "Documentation").

C Active barrier RN221N
- The RN221N active barrier (24 V DC, 30 mA) has a galvanically isolated output for supplying voltage to loop powered transmitters. The power supply has a wide-range input for mains power, 20 to 250 V DC/AC, 50/60 Hz to be used in any electrical circuit. For details see Technical Information (see chapter "Documentation").

Equipment architecture



Equipment architecture of the Omnigrad M TR11

1 Insert (∅ 3 mm, 0.12 in) with mounted head transmitter, for example
2 Insert (∅ 6 mm, 0.24 in) with mounted ceramic terminal block, for example
3 Terminal head
4 Protection armature
5 Threads as process connection
6 Various tip shapes - detailed information see chapter 'tip shape':
6a
6b Reduced or tapered for inserts with ∅ 3 mm (0.12 in)
E Straight or tapered for inserts with ∅ 6 mm (0.24 in) Neck tube = 35 mm (1.4 in)
L Immersion length
IL Insertion length = L + 45 mm (1.8 in)

The Omnigrad M TR11 RTD assemblies are modular. The terminal head serves as a connection module for the protection armature in the process as well as for the mechanical and electrical connection of the measuring insert. The actual RTD sensor element is fitted in and mechanically protected within the insert. The insert can be exchanged and calibrated even during the process. Either ceramic terminal blocks or transmitters can be fitted to the internal base washer. TR11 RTD assemblies are constructed without a neck.

Measurement range

-200...+600 °C (-328...+1112 °F)

Performance characteristics

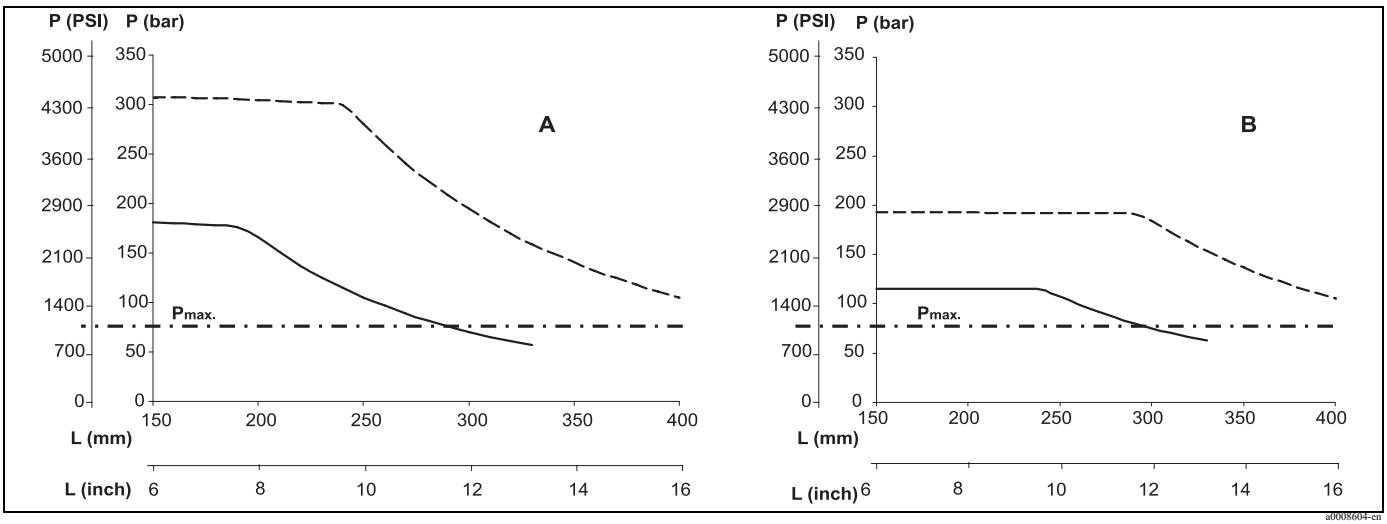
Operating conditions

Ambient temperature

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, → 🖹 10
With mounted head transmitter	-40 to 85 °C (-40 to 185 °F)
With mounted head transmitter and display	-20 to 70 °C (-4 to 158 °F)

Process pressure

The pressure values to which the actual protection tube can be subjected at the various temperatures and maximum permitted flow velocity are illustrated by the figure below. Occasionally, the pressure loading capacity of the process connection can be considerably lower. The maximum allowable process pressure for a specific thermometer is derived from the lower pressure value of the thermowell and process connection.

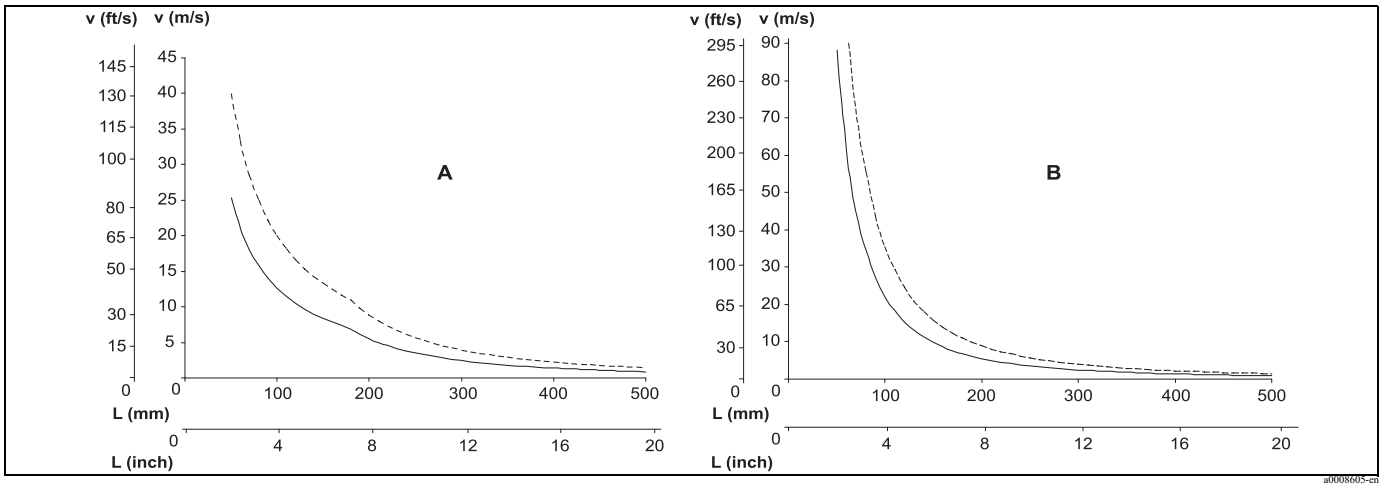


Maximum permitted process pressure for tube diameter, limited to 75 bar (1088 psi) by the threaded process connection
- *Protection tube diameter 9 x 1 mm (0.35 in) ----------*
- *Protection tube diameter 12 x 2.5 mm (0.47 in) - - - - - -*

A	Medium water at T = 50 °C (122 °F)	P	Process pressure
B	Medium superheated steam at T = 400 °C (752 °F)	$P_{max.}$	Maximum permitted process pressure, limited by the process connection
L	Immersion length		

Maximum flow velocity

The highest flow velocity tolerated by the protection tube diminishes with increasing immersion length exposed to the stream of the fluid. Detailed information may be taken from the figures below.



Flow velocity depending on the immersion length
- *Protection tube diameter 9 x 1 mm (0.35 in) ----------*
- *Protection tube diameter 12 x 2.5 mm (0.47 in) - - - - - -*

A	Medium water at T = 50 °C (122 °F)	L	Immersion length
B	Medium superheated steam at T = 400 °C (752 °F)	v	Flow velocity

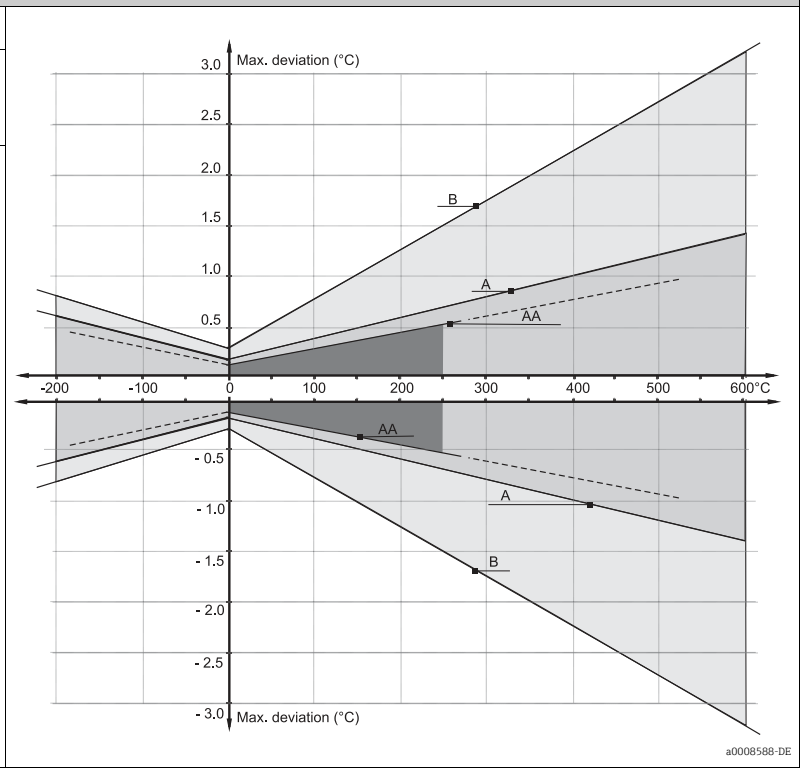
Shock and vibration resistance

Endress+Hauser inserts comply the IEC 60751 requirements stating a shock and vibration resistance of 3g within a range of 10…500 Hz.
The vibration resistance of the measurement point depends on sensor type and construction. Refer to the following table:

Sensor type	Vibration resistance for the thermowell tip
▪ Pt100 (WW or TF))	▪ 30 m/s² (3g) [1]
▪ iTHERM® StrongSens Pt100 (TF) ▪ iTHERM® QuickSens Pt 100 (TF), version Ø 6 mm (0.24 in)	▪ > 600 m/s² (60g)

1) Vibration resistance valid also for iTherm Quickneck.

Accuracy RTD corresponding to IEC 60751

Class	max. Tolerances (°C)	Characteristics
RTD max. error type TF - range:		
Cl. A	± (0,15 + 0,002 · |t| [1])	
Cl. AA, former 1/3 Cl. B	± (0,1 + 0,0017 · |t| [1])	
Cl. B	± (0,3 + 0,005 · |t| [1])	

1) |t| = absolute value °C

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

Response time

Tests in water at 0.4 m/s (1.3 ft/s), according to IEC 60751; 10 K temperature step change. Measuring probe Pt100, TF/WW:

Protection tube				
Diameter	**Response time**	**Reduced tip ∅ 5.3 mm (0.2 in)**	**Tapered tip ∅ 6.6 mm (0.26 in) or ∅ 9 mm (0.35 in)**	**Straight tip**
9 x 1 mm (0.35 in)	t_{50} t_{90}	7.5 s 21 s	11 s 37 s	18 s 55 s
11 x 2 mm (0.43 in)	t_{50} t_{90}	7.5 s 21 s	not available not available	18 s 55 s
12 x 2.5 mm (0.47 in)	t_{50} t_{90}	not available not available	11 s 37 s	38 s 125 s

Response time for the sensor assembly without transmitter.

Insulation resistance

Insulation resistance ≥100 MΩ at ambient temperature.
Insulation resistance between each terminal and the sheath is measured with a voltage of 100 V DC.

Self heating

RTD elements are passive resistances that are measured using an external current. This measurement current causes a self heating in the RTD element itself which in turn creates an additional measurement error. In addition to the measurement current the size of the measurement error is also affected by the temperature conductivity and flow velocity of the process. This self heating error is negligible when an Endress+Hauser iTEMP® temperature transmitter (very small measurement current) is connected.

Calibration specifications

Endress+Hauser provides comparison temperature calibration from -80 to +600 °C (-110 °F to 1112 °F) based on the International Temperature Scale (ITS90). Calibrations are traceable to national and international standards. The calibration report is referenced to the serial number of the thermometer. Only the measurement insert is calibrated.

Insert-Ø: 6 mm (0.24 in) and 3 mm (0.12 in)	**Minimum insertion length IL in mm (in)**	
Temperature range	**without head transmitter**	**with head transmitter**
-80 °C to -40 °C (-110 °F to -40 °F)	200 (7.87)	
-40 °C to 0 °C (-40 °F to 32 °F)	160 (6.3)	
0 °C to 250 °C (32 °F to 480 °F)	120 (4.72)	150 (5.9)
250 °C to 550 °C (480 °F to 1020 °F)	300 (11.81)	
550 °C to 650 °C (1020 °F to 1202 °F)	400 (15.75)	

Material

Protection tube, measuring insert.
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 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1200 °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
AISI 316Ti/ 1.4571	X6CrNiMoTi17-12-2	700 °C (1292 °F)[1)]	▪ Properties comparable to AISI316L ▪ Addition of titanium means increased resistance to intergranular corrosion even after welding ▪ Broad range of uses in the chemical, petrochemical and oil industries as well as in coal chemistry ▪ Can only be polished to a limited extent, titanium streaks can form

1) Can be used to a limited extent up to 800 °C (1472 °F) for low compressive loads and in non-corrosive media. Please contact your Endress+Hauser sales team for further information.

Transmitter specifications

	TMT180 PCP Pt100	TMT181 PCP Pt100, TC, Ω, mV	TMT182 HART® Pt100, TC, Ω, mV	TMT84 PA / TMT85 FF Pt100, TC, Ω, mV
Measurement accuracy	0.2 °C (0.36 °F), optional 0.1 °C (0.18 °F) or 0.08% % is related to the adjusted measurement range (the larger value applies)	0.2 °C (0.36 °F) or 0.08%		0.1 °C (0.18 °F)
Sensor current	I ≤ 0.6 mA		I ≤ 0.2 mA	I ≤ 0.3 mA
Galvanic isolation (input/ output)	-	U = 2 kV AC		

Transmitter long-term stability

≤ 0.1 °C/year (≤ 0.18 °F / year) or ≤ 0.05% / year
Data under reference conditions; % relates to the set span. The larger value applies.

Components

Family of temperature transmitters

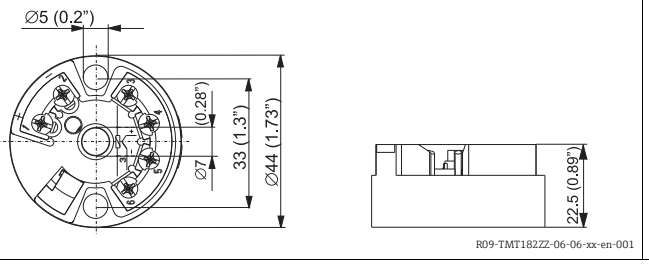
Thermometers fitted with iTEMP® transmitters are an installation ready complete solution to improve temperature measurement by increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable head transmitter TMT180 and TMT181

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. Endress+Hauser offers the ReadWin® 2000 configuration software for this purpose. This software can be downloaded free of charge at www.readwin2000.com. More information can be found in the Technical Information (see "Documentation" section).

HART® TMT182 head transmitter

HART® communication is all about easy, reliable data access and getting additional information about the measurement point more inexpensively. iTEMP® transmitters integrate seamlessly into your existing control system and provide painless access to numerous diagnostic information.
Configuration with a hand-held (Field Xpert SFX100 or DXR375) or a PC with configuration program (FieldCare, ReadWin® 2000) or configure with AMS or PDM. Details see Technical Information (see chapter 'Documentation').

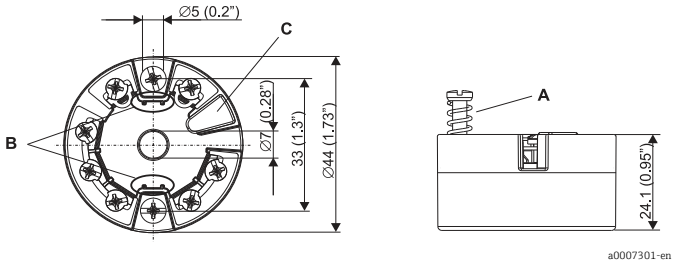
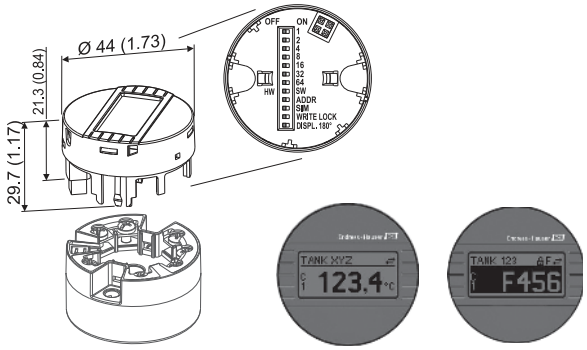
Type of transmitter	Specification
iTEMP® TMT18x  	▪ Material: Housing (PC), Potting (PUR) ▪ Terminals: Cable up to max. ≤ 1.75 mm² / 16 AWG (secure screws) or with wire end ferrules ▪ Eyelets for easy connection of a HART®-handheld terminal with alligator clips ▪ Degree of protection NEMA 4 (see also type of terminal head) Details see Technical Information (see chapter 'Documentation')

PROFIBUS® PA TMT84 head transmitter

Universally programmable head transmitter with PROFIBUS® PA communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as FieldCare, Simatic PDM or AMS.
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar-Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').

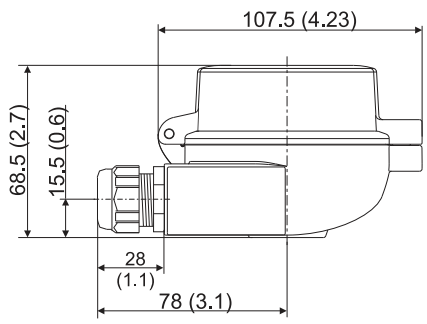
FOUNDATION Fieldbus™ TMT85 head transmitter

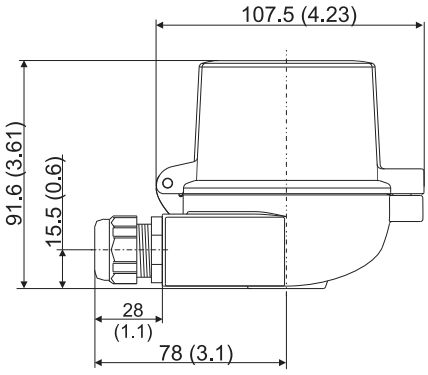
Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as ControlCare from Endress+Hauser or the NI Configurator from National Instruments.
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar-Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').

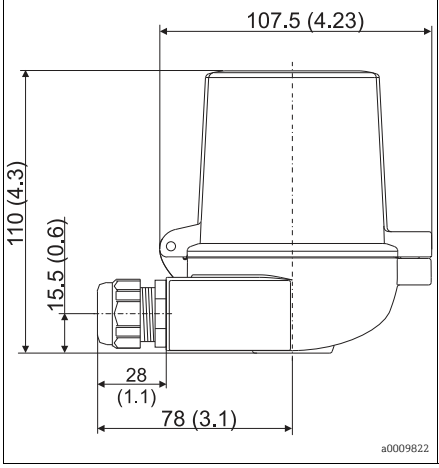
Type of transmitter	Specification
iTEMP® TMT84 and TMT85  	▪ Spring range L ≥ 5 mm (0.2"), see Pos. A ▪ Fixing elements for pluggable measured value display, see Pos. B ▪ Interface for contacting measured value display, see Pos. C ▪ Material (RoHS-compliant) Housing: PC Potting: PU ▪ Terminals: Screw terminals (cable up to max. ≤ 2.5 mm^2 / 16 AWG) or spring terminals (e. g. from 0.25 mm^2 to 0.75 mm^2/ 24 AWG to 18 AWG for flexible wires with wire-end ferrules with plastic ferrule) ▪ Degree of protection NEMA 4 (see also type of terminal head) Details see Technical Information (see chapter 'Documentation')
Pluggable display TID10 as option  	▪ Displays the actual measured value and the measurement point identification ▪ Displays fault events in inverse color with channel ident and diagnostics code ▪ DIP-switches on the rear for hardware set-up, e. g. PROFIBUS® PA bus address Display is only available with suitable terminal head with display window, e.g. TA30.

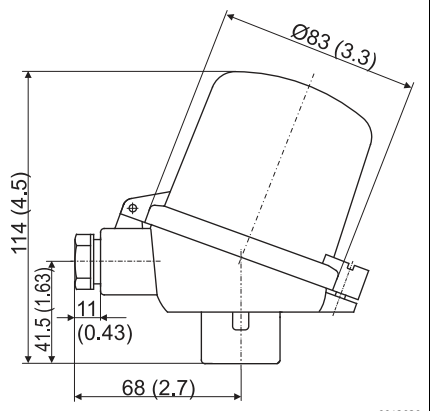
Terminal heads

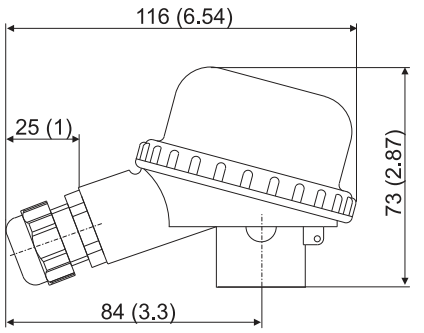
All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face and a thermometer connection of M24x1.5.
All dimensions in mm (in). The cable glands in the diagrams correspond to M20x1.5 connections.
Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see 'Operating conditions' section.

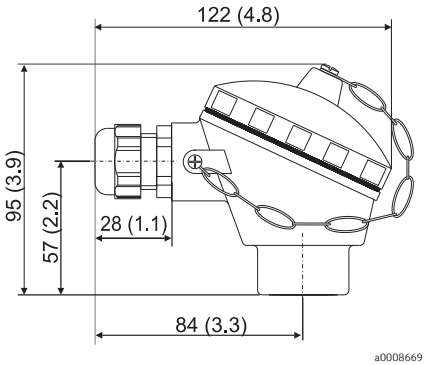
TA30A	Specification
	▪ Degree of protection: IP66/68 ▪ Degree of protection: IP66/67 (for ATEX) ▪ Max. temperature: 150 °C (300 °F) ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ▪ Protection armature connection: M24x1.5 ▪ Head color: blue RAL 5012 ▪ Cap color: grey RAL 7035 ▪ Weight: 330 g (11.64 oz)

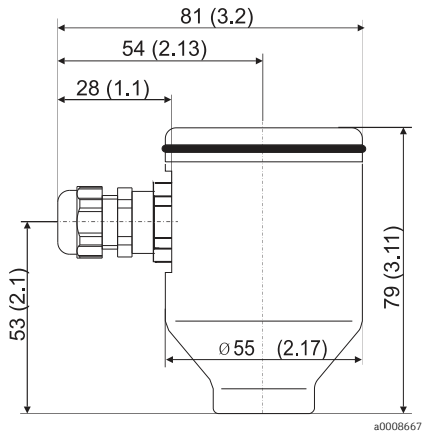
TA30A with display window	Specification
	▪ Degree of protection: IP66/68 ▪ Degree of protection: IP66/67 (for ATEX) ▪ Max. temperature: 150 °C (300 °F) ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ▪ Protection armature connection: M24x1.5 ▪ Head color: blue RAL 5012 ▪ Cap color: grey RAL 7035 ▪ Weight: 420 g (14.81 oz) ▪ Head transmitter optional with TID10 display

TA30D	Specification
	▪ Degree of protection: IP66/68 ▪ Degree of protection: IP66/67 (for ATEX) ▪ Max. temperature: 150 °C (300 °F) ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ▪ 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: grey RAL 7035 ▪ Weight: 390 g (13.75 oz)

TA30P	Specification
	▪ Degree of protection: IP65 ▪ Max. temperature: 120 °C (248 °F) ▪ Material: polyamide (PA), antistatic Seals: silicone ▪ Cable entry: M20x1.5 ▪ Head and cap color: black ▪ Weight: 135 g (4.8 oz) ▪ Types of protection for use in hazardous locations: Intrinsic Safety (Ex ia)

TA20B	Specification
	▪ Degree of protection: IP65 ▪ Max. temperature: 80 °C (176 °F) ▪ Material: polyamide (PA) ▪ Cable entry: M20x1.5 ▪ Head and cap color: black ▪ Weight: 80 g (2.82 oz) ▪ 3-A® marked

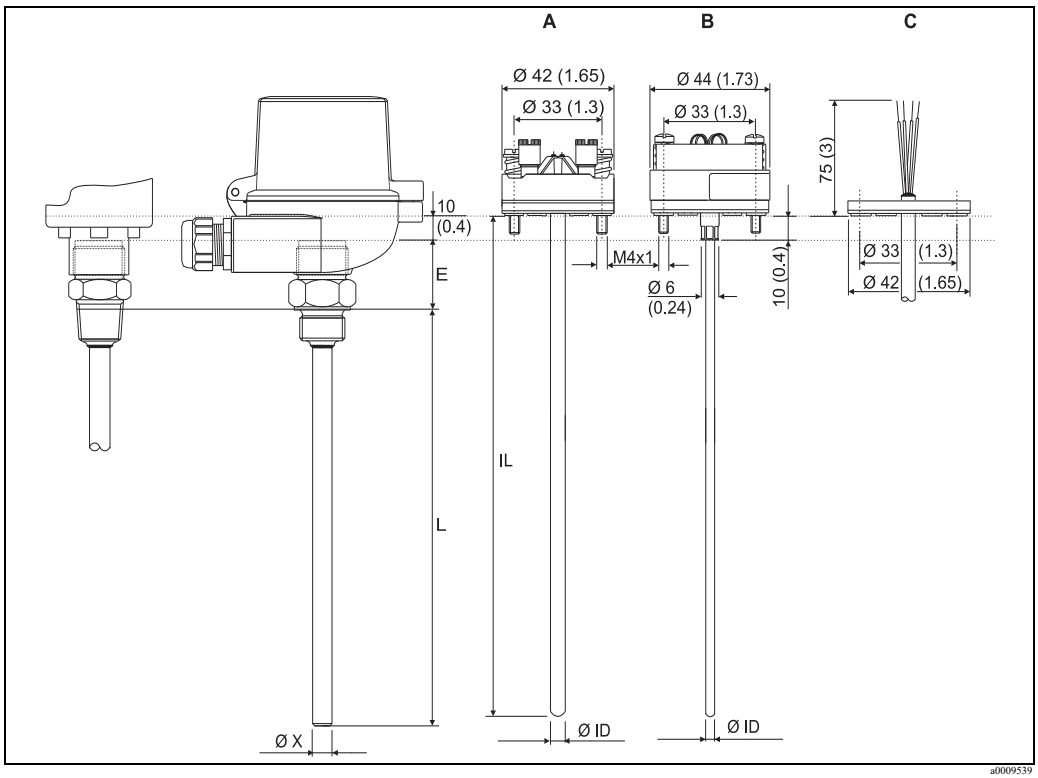
TA21E	Specification
	▪ Degree of protection: IP65 ▪ Max. temperature: 130 °C (266 °F) silicone, 100 °C (212 °F) rubber (observe max. permitted temperature of the cable gland!) ▪ Material: aluminum alloy with polyester or epoxy coating; rubber or silicone seal under the cover ▪ Cable entry: M20x1.5 or plug M12x1 PA ▪ Protection armature connection: M24x1.5, G ½" or NPT ½" ▪ Head color: blue RAL 5012 ▪ Cap color: grey RAL 7035 ▪ Weight: 300 g (10.58 oz) ▪ 3-A® marked

TA20R	Specification
	▪ Degree of protection: IP66/67 ▪ Max. temperature: 100 °C (212 °F) ▪ Material: SS 316L (1.4404) stainless steel ▪ Cable entry: ½" NPT, M20x1.5 or plug M12x1 PA ▪ Head and cap color: stainless steel ▪ Weight: 550 g (19.4 oz) ▪ LABS - free 3-A® marked

Maximum ambient temperatures for cable glands and fieldbus connectors	
Type	**Temperature range**
Cable gland ½" NPT, M20x1.5 (non Ex)	-40 to +100 °C (-40 to +212 °F)
Cable gland M20x1.5 (for dust ignition-proof area)	-20 to +95 °C (-4 to +203 °F)
Fieldbus connector (M12x1 PA, 7/8" FF)	-40 to +105 °C (-40 to +221 °F)

Protection tube

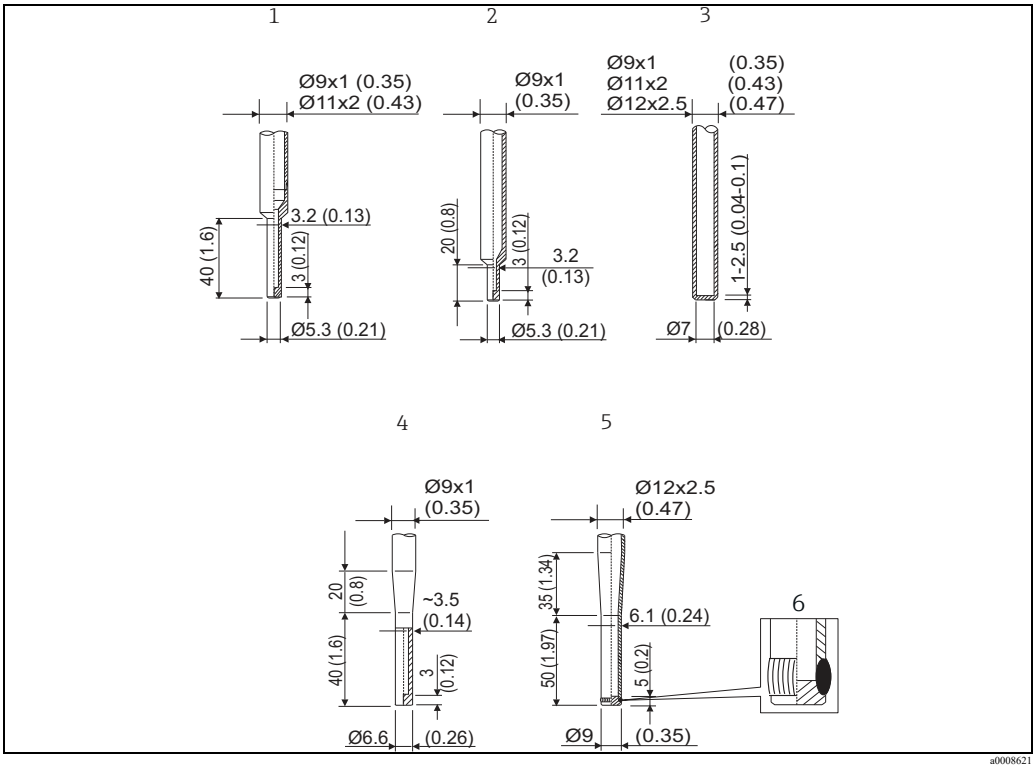
All dimensions in mm (in).



Dimensions of the Omnigrad M TR11

A Model with terminal block mounted
B Model with head transmitter mounted
C Model with flying leads
∅ ID Insert diameter
∅ X Protection tube diameter
E Neck tube = 35 mm (1.4 in)
L Immersion length
IL Insertion length = L + 45 mm (0.4 in)

Tip shape



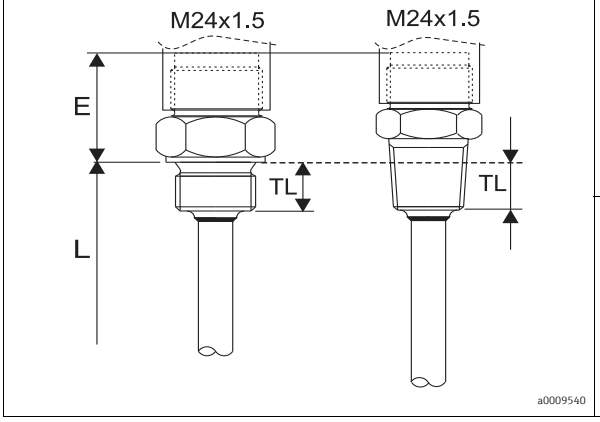
Available versions of protection tube tips (reduced, straight, tapered). Maximum surface roughness ≤Ra 0.8 µm (31.5 µin)

Pos. No.	Tip shape, L = Immersion length	Insert diameter
1	Reduced, L ≥ 65 mm (2.56 in)	∅ 3 mm (0.12 in)
2	Reduced, L ≥ 45 mm (1.77 in)	∅ 3 mm (0.12 in)
3	Straight as per DIN43772	∅ 6 mm (0.24 in)
4	Tapered, L ≥ 85 mm (3.35 in)	∅ 3 mm (0.12 in)
5	Tapered as per DIN43772, L ≥ 110 mm (4.33 in)	∅ 6 mm (0.24 in)
6	Welded tip, weld quality according to EN ISO 5817 - quality class B	

Weight

From 0.5 to 2.5 kg (1 to 5.5 lbs) for standard options.

Process connection

Process connection		Version		Thread length TL in mm (inch)	Width across flats SW / AF	Length E in mm (inch)
Cylindrical (version G, M)	Conical (version NPT, R)	M	M20x1.5	14 (0.55)	27	35 (1.4)
		G	G3/8" BSP	12 (0.47)	27	
			G½" DIN / BSP	15 (0.6)	32	
			G¾" BSP			
		NPT	NPT ½"	8 (0.32)	22	
			NPT ¾"	8.5 (0.33)	27	

Spare parts

- A thermowell is available as spare part TW11 (see Technical Information in chapter 'Documentation').
- The RTD insert is available as spare part TPR100 (see Technical Information in chapter 'Documentation').

If spare parts are required, refer to the following equation: Insertion length IL = L + 45 mm (1.8 in)

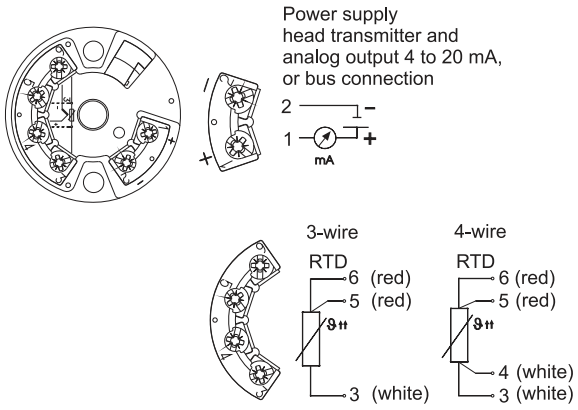
Spare part	Material-No.
Gasket M21-G½", copper	60001328
Gasket M27-G¾", copper	60001344
Gasket set M24x1.5, aramid+NBR (10 pieces)	60001329

Wiring

Wiring diagrams

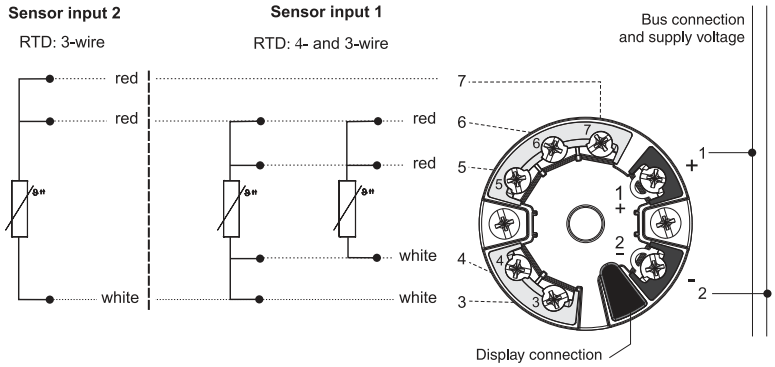
Type of sensor connection

Head mounted transmitter TMT18x (single input)



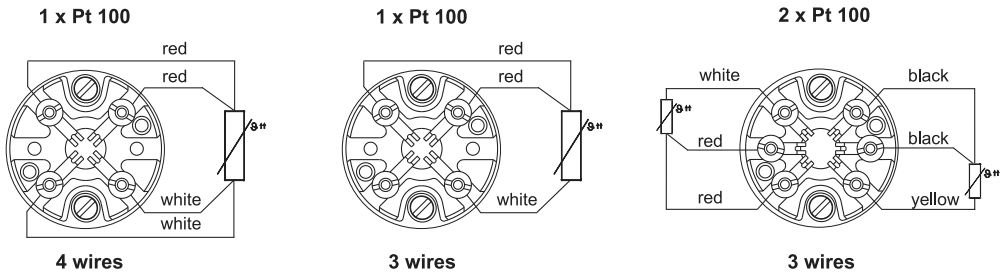
T09-TH1112xx-04-xx-XX-ae-000

Head mounted transmitter TMT84 and TMT85 (dual input)



a0008848-en

Terminal block mounted



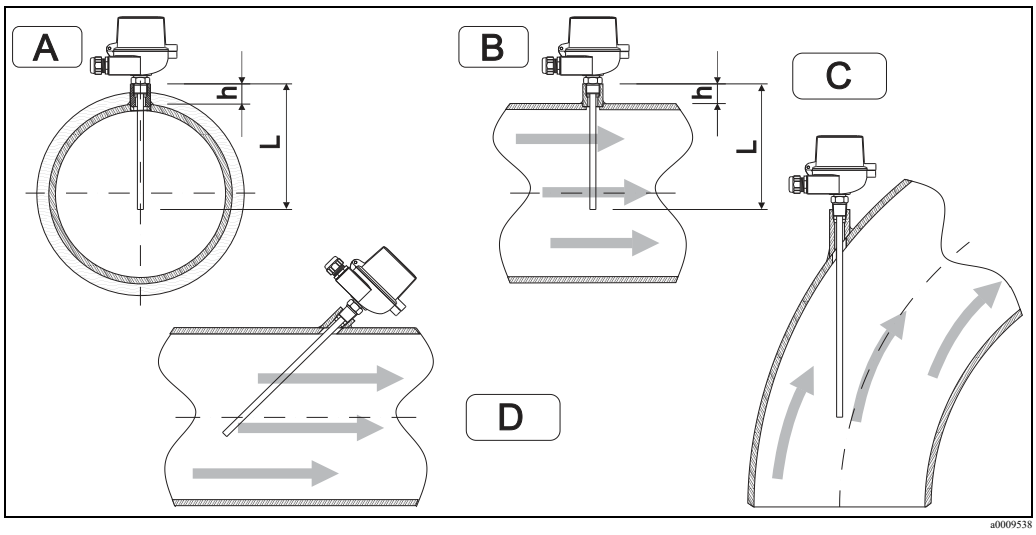
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Installation conditions

Orientation

No restrictions.

Installation instructions



Installation examples

A - B: In pipes with a small cross section the sensor tip should reach or extend slightly past the center line of the pipe (= L).
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 must be half of the pipe diameter, ideally.

- Installation possibilities: Pipes, tanks or other plant components
- Minimum immersion length = 80 to 100 mm (3.15 to 3.94 in)
  The immersion length should correspond to at least 8 times of the thermowell diameter. Example: Thermowell diameter 12 mm (0.47 in) x 8 = 96 mm (3.8 in). A standard immersion length of 120 mm
  (4.72 in) is recommended
- ATEX certification: Always take note of the installation regulations!

When operating in small nominal bore pipes it must be guaranteed that the thermowell tip is extending far enough into the process to reach out past the pipe center line (see Pos. A and B). A further solution could be an angled (tilted) installation (see Pos. C and 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).

Certificates and approvals

CE Mark

The device meets the legal requirements of the EC directives if applicable. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Hazardous area approvals

For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your nearest Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies.

Other standards and guidelines

- IEC 60529:
  Degrees of protection by housing (IP-Code).
- IEC 61010-1:
  Safety requirements for electrical measurement, control and laboratory instrumentation.
- IEC 60751:
  Industrial platinum resistance thermometer
- DIN43772:
  Thermowells
- DIN EN 50446, DIN 47229:
  Terminal heads
- IEC 61326-1:
  Electromagnetic compatibility (EMC requirements)

PED approval

The thermometer complies with paragraph 3.3 of the Pressure Equipment Directive (97/23/CE) and is not marked separately.

Material certification

The material certificate 3.1 (according to standard EN 10204) can be directly selected from the sales structure of the product and refers to the parts of the sensor in contact with the process fluid. Other types of certificates related to materials can be requested separately. The "short form" certificate includes a simplified declaration with no enclosures of documents related to the materials used in the construction of the single sensor and guarantees the traceability of the materials through the identification number of the thermometer. The data related to the origin of the materials can subsequently be requested by the client if necessary.

Test on thermowell

Thermowell pressure tests are carried out in accordance with the specifications in the DIN 43772 standard. With regards to thermowells with tapered or reduced tips that do not comply with this standard these are tested using the pressure of corresponding straight thermowells. Sensors certified for use in Ex Zones, are always tested to pressures according to the same criteria. Tests according to other specifications can be carried out on request. Dye penetration tests verify the absence of cracks on the thermowell welding.

Test report and calibration

The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by the European Accreditation Organization (EA) to ISO/IEC 17025. A calibration which is performed according to EA guidelines (SIT or DKD calibration) may be requested separately. The calibration is performed on the replaceable insert of the thermometer. In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide

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

Documentation

Technical Information:
- RTD Insert for Temperature Sensor Omniset TPR100 (TI268t/02/en)
- Thermowell for temperature sensors Omnigrad M TW11 (TI262t/02/en)
- Temperature head transmitter:
  - iTEMP® PCP TMT181 (TI070r/09/en)
  - iTEMP® Pt TMT180 (TI088r/09/en)
  - iTEMP® HART® TMT182 (TI078r/09/en)
  - iTEMP® TMT84 PA (TI138r/09/en)
  - iTEMP® TMT85 FF (TI134r/09/en)

Hazardous area supplementary documentation:
- Omnigrad TRxx RTD Thermometer ATEX II1GDor II 1/2GD (XA072r/09/a3)
- Omnigrad TRxx, Omniset TPR100, TET10x, TPC100, TEC10x ATEX II 3GD EEx nA (XA044r/09/a3)

Application example

Technical Information:
- Field display RIA261 (TI083r/09/en)
- Active barrier with power supply RN221N (TI073R/09/en)

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