Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

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 50 bar (725 psi)
- Degree of protection: up to IP 68

Head transmitters

All Endress+Hauser transmitters are available with enhanced accuracy, reliability and cost effectiveness compared to directly wired sensors. Easy customizing by choosing one of the following outputs and 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)

CE Ex

TI257T/24/ae

Endress+Hauser

People for Process Automation

Function and system design

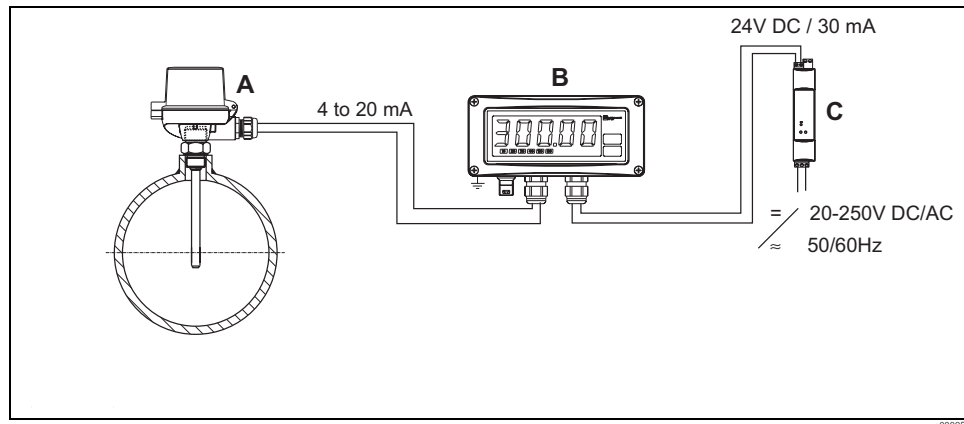
Measuring principle

The Resistance Temperature Detector (RTD) element has an electrical resistance with a value of 100 Ω at 0 °C (32 °F). It is commonly known as Pt100 and complies with IEC 60751. This resistance value increases at higher temperatures according to the characteristics of the resistor material (platinum). These kind of sensors are called Positive Temperature Coefficient elements (PTC).
The coefficient is fixed with $\alpha = 0.00385\ °C^{-1}$, calculated between 0 and 100 °C (32 and 212 °F), according to ITS90 (International Temperature Scale 1990).

Wire wound platinum resistance thermometers (WW) consist of hair thin highly purified platinum wire double wound inside a ceramic carrier. This is then sealed top and bottom with a ceramic protective layer. The measurements achieved by these resistance thermometers are not only highly reproducible, but also show long term resistance/temperature characteristic stability within temperature ranges up to 600 °C (1112 °F). This sensor type is relatively large in its dimensions and is also not very resistant to vibration.

Thin film platinum resistance thermometers (TF) consist of a precise amount of platinum which is vaporized under vacuum onto a ceramic substrate to a thickness of 1 µm. This is then protected by a glass layer. The advantages are: smaller dimensions than wire wound and greatly improved vibration resistance. Thin film resistances (TF) are flat, microscopic versions of the wire wound types (WW) with a measurement relevant difference:
The temperature expansion behavior of the different layers of this structure leads to minimal mechanical stress. Temperature changes in thin film resistances (TF) cause the desired temperature relevant changes of the resistance as well as minimal tension stress related resistance changes. Through this the resistance/temperature characteristic of most thin film platinum resistance thermometers (TF) differs considerably from the standard characteristics at higher temperatures. Thin film resistances are therefore used for temperature measurement in ranges below 500 °C (932 °F).

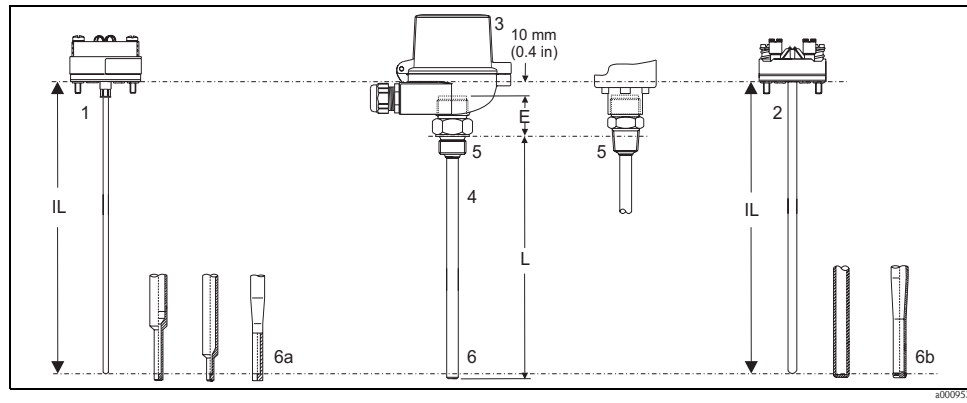
Measuring system



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 Reduced or tapered for inserts with ∅ 3 mm (0.12 in)
6b Straight or tapered for inserts with ∅ 6 mm (0.24 in)
E 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) according to IEC 60751

Performance characteristics

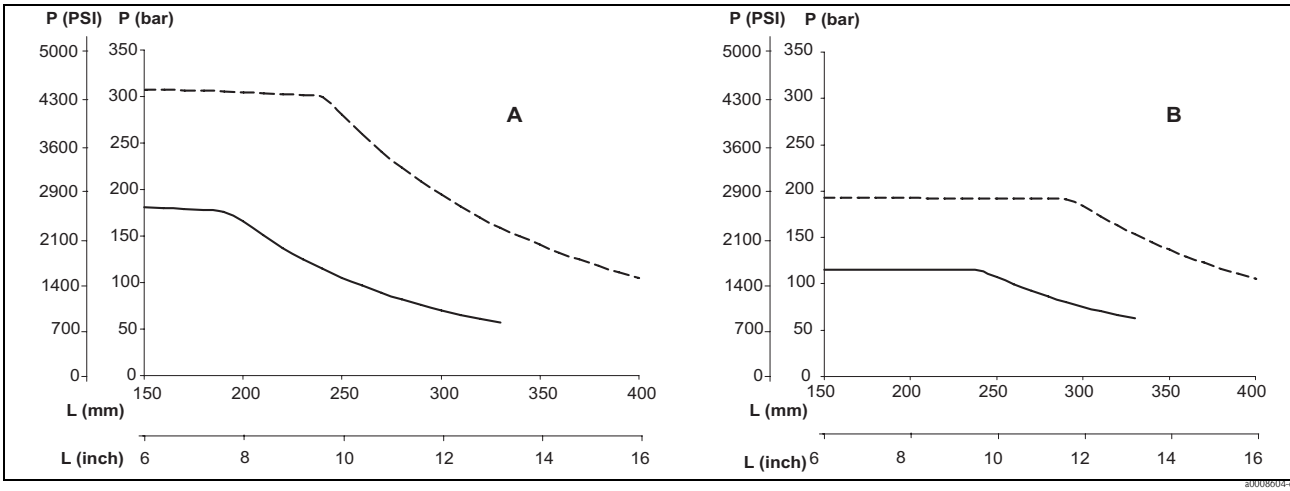
Operating conditions

Ambient temperature

Terminal head	Temperature in °C (°F)
Without mounted head transmitter	■ Housing, material aluminum -40 to 100 °C (-40 to 212 °F) ■ Housing, material polyamide -40 to 85 °C (-40 to 185 °F)
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 protection tube can be subjected at the various temperatures are illustrated by the figures below.

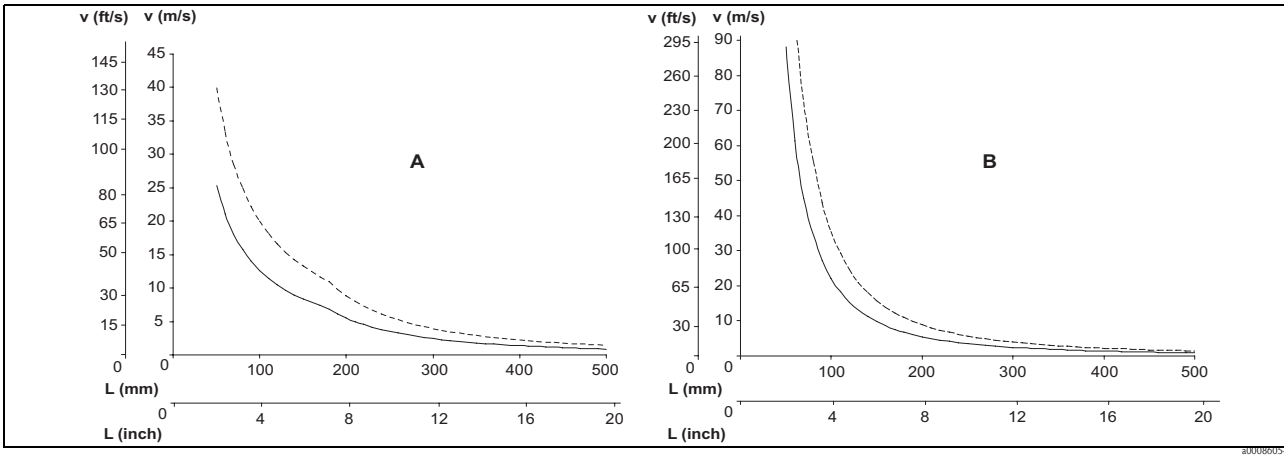


Maximum permitted process pressure for tube diameter
– Tube diameter 9 x 1 mm (0.35 in) ----------
– Tube diameter 12 x 2.5 mm (0.47 in) - - - - - -

A Medium water at T = 50 °C (122 °F)
B Medium superheated steam at T = 400 °C (752 °F)
L Immersion length
P Process pressure

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
– Tube diameter 9 x 1 mm (0.35 in) ----------
– Tube diameter 12 x 2.5 mm (0.47 in) - - - - - -

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

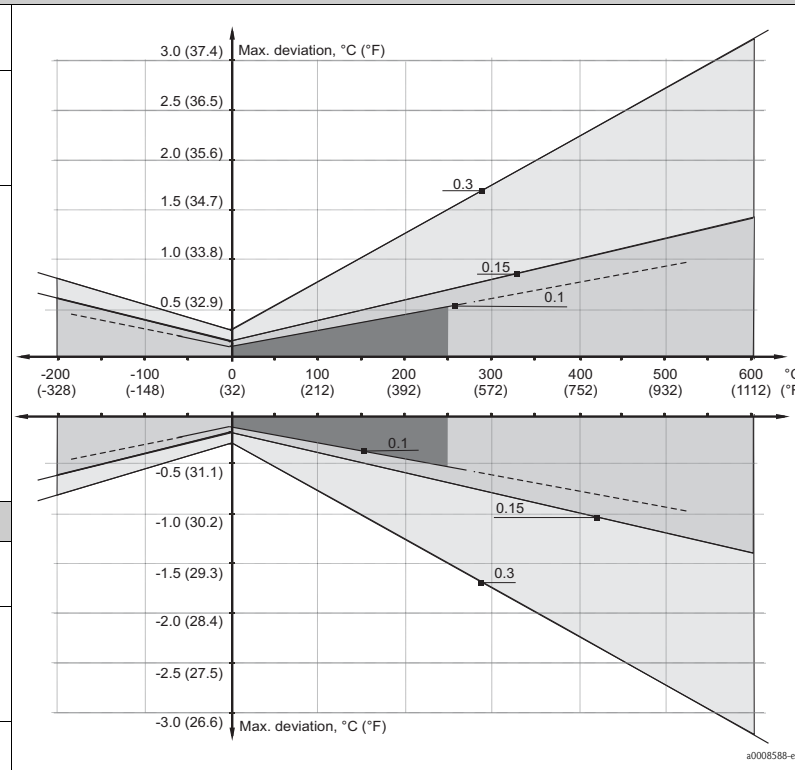
Shock and vibration resistance

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

Accuracy

RTD corresponding to IEC 60751

Class	max. Tolerances (°C)	Temperature range	Characteristics
RTD max. error type TF - range: -50 to +400 °C			
F0.15 (Cl. A)	0.15 ± 0.002 · |t|[1)]	-50 °C to +250 °C	
F0.1 (Cl. AA, former 1/3 Cl. B)	0.10 ± 0.0017 · |t|[1)]	0 °C to +150 °C	
F0.3 (Cl. B)	0.3 ± 0.005 · |t|[1)]	-50 °C to +400 °C	
RTD max. error type WW - range: -200 to +600 °C			
W0.15 (Cl. A)	0.15 ± 0.002 · |t|[1)]	-200 °C to +600 °C	
W0.1 (Cl. AA, former 1/3 Cl. B)	0.10 ± 0.0017 · |t|[1)]	0 °C to +250 °C	
W0.3 (Cl. B)	0.3 ± 0.005 · |t|[1)]	-200 °C to +600 °C	



1) |t| = absolute value °C

Note!
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 changes:

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

Note!
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 tested with a voltage of 100 V DC.

Self heating

RTD elements are not self-powered and require a small current be passed through the device to provide a voltage that can be measured. Self-heating is the rise of temperature within the element itself, caused by the

current flowing through the element. This self-heating appears as a measurement error and is affected by the thermal conductivity and velocity of the process being measured; it is negligible when an Endress+Hauser iTEMP® temperature transmitter is connected.

Calibration specifications

The manufacturer provides comparison temperature calibration from -80 to +600 °C (-110 °F to 1112 °F) based on the International Temperature Scale of 1990 (ITS90). Calibrations are traceable to national and international standards. The calibration report is referenced to the serial number of the thermometer.

Insert-Ø: 6 mm (0.24 in) and 3 mm (0.12 in)	**Minimum insertion length IL in mm (inch)**	
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

Material	**Short description**	**max. application temperature**	**Features and benefits**
SS 316L/1.4404	X2CrNiMo 17 13 2	800 °C (1472 °F)	■ Austenitic, stainless steel ■ High corrosion resistance ■ High resistance at low temperatures ■ Optimal corrosion resistance in an acid, non oxydizing environment (e.g. phosphorous and sulphuric acids in low concentration and at low temperatures) ■ Not resistant to chloride at high temperatures
SS 316Ti/1.4571	X6CrNiMoTi 17 12 2	800 °C (1472 °F)	■ Austenitic, stainless steel ■ High corrosion resistance ■ High resistance at low temperatures ■ Optimal corrosion resistance in an acid, non oxydizing environment (e.g. phosphorous and sulphuric acids in low concentration and at low temperatures) ■ Not resistant to chloride at high temperatures

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)	-	Û = 3.75 kV AC	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.

System components

Family of temperature transmitters

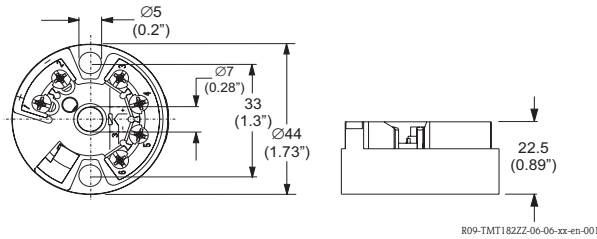
Measurement assemblies with iTEMP® transmitters are an installation ready solution to improve the functionality of temperature measurement by increasing accuracy and reliability when compared to direct wired sensors. Overall installation costs are lower than with direct wired sensors, since an inexpensive pair of signal (4 to 20 mA) wires can be run over long distances.

PC programmable devices TMT180 and TMT181

PC programmable head transmitters offer you extreme flexibility and help control costs with the ability to stock one device and program it for your needs. Regardless of your choice of output, all iTEMP® transmitters can be configured quickly and easily with a PC. To help you with this task, Endress+Hauser offers free software ReadWin® 2000 which can be downloaded from our website. Go to **www.readwin2000.com** to download ReadWin® 2000 today. Details see Technical Information (see chapter 'Documentation').

HART® TMT182 head transmitter

HART® communication is all about easy, reliable data access and getting better information more inexpensively. iTEMP® transmitters integrate seamlessly into your existing control system and provide painless access to preventative diagnostic information.
Configuration with a DXR275 or 375 hand-held 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. max. ≤ 2.5 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')

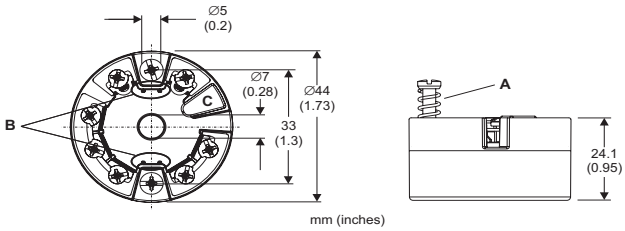
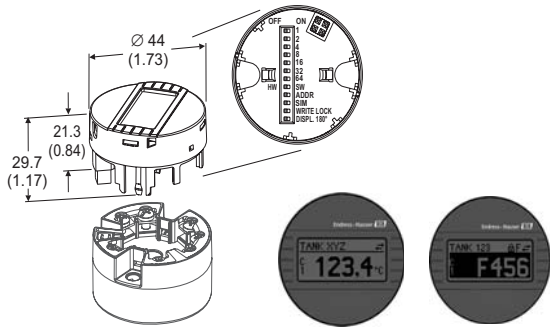
PROFIBUS® PA TMT84 head transmitter

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. DIP switch for address setting, makes start up and maintenance safe and reliable.
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').

Note!
The previous model PROFIBUS PA TMT184 head transmitter will be available for a transition time.

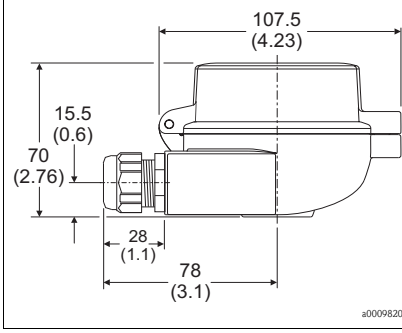
FOUNDATION™ Fieldbus TMT85 head transmitter

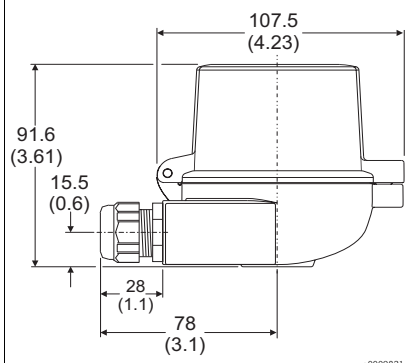
Universally programmable head transmitter with FOUNDATION fieldbus communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, 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').

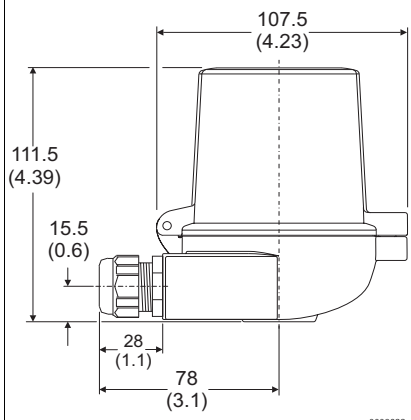
Type of transmitter	Specification
iTEMP® TMT84 and TMT85  	■ Spring range L ≥ 5 mm (0.2"), see Pos. A ■ Fixing elements for pluggable measured value display, see Pos. B ■ Interface for contacting measured value display, see Pos. C ■ Material (RoHS-compliant) Housing: PC Potting: PU ■ Terminals: Screw terminals (cable up to max. ≤ 2.5 mm² / 16 AWG) or spring terminals (e. g. from 0.25 mm² to 0.75 mm²/ 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 ■ Miniature switches on the rear for hardware set-up

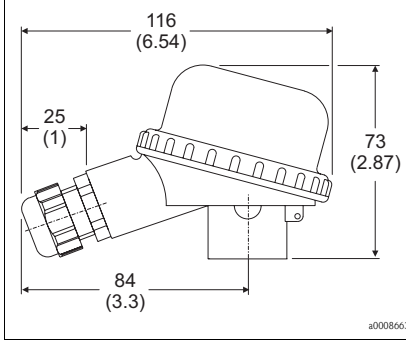
Terminal heads

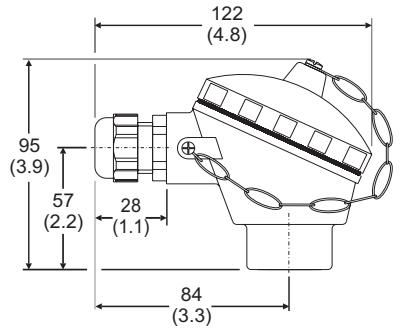
All terminal heads have internal geometry according to DIN 43729, form B and thermometer connection M24x1.5.
All dimensions in mm (inch). All cable gland dimensions in the graphics are based on SKINTOP ST M20x1.5

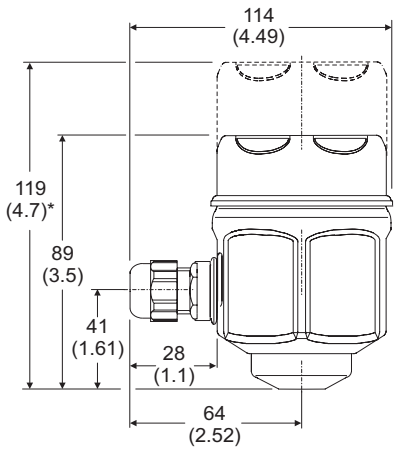
TA30A	Specification
 	■ Degree of protection: IP66/68 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: EPDM-70 ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ Protection armature connection: M24x1.5 ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 330 g (11.64 oz) ■ LABS – free

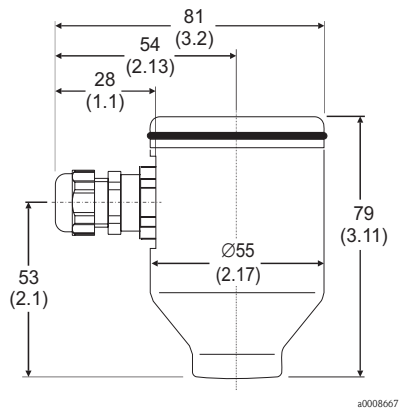
TA30A with display window cover	Specification
	■ Degree of protection: IP66/68 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: EPDM-70 ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G 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 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: EPDM-70 ■ 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 ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 390 g (13.75 oz) ■ LABS – free

TA20B	Specification
	■ Degree of protection: IP65 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 80 °C (176 °F) ■ Material: polyamide (PA) ■ Cable entry: M20x1.5 ■ Head and cap color: black ■ Weight: 80 g (2.82 oz)

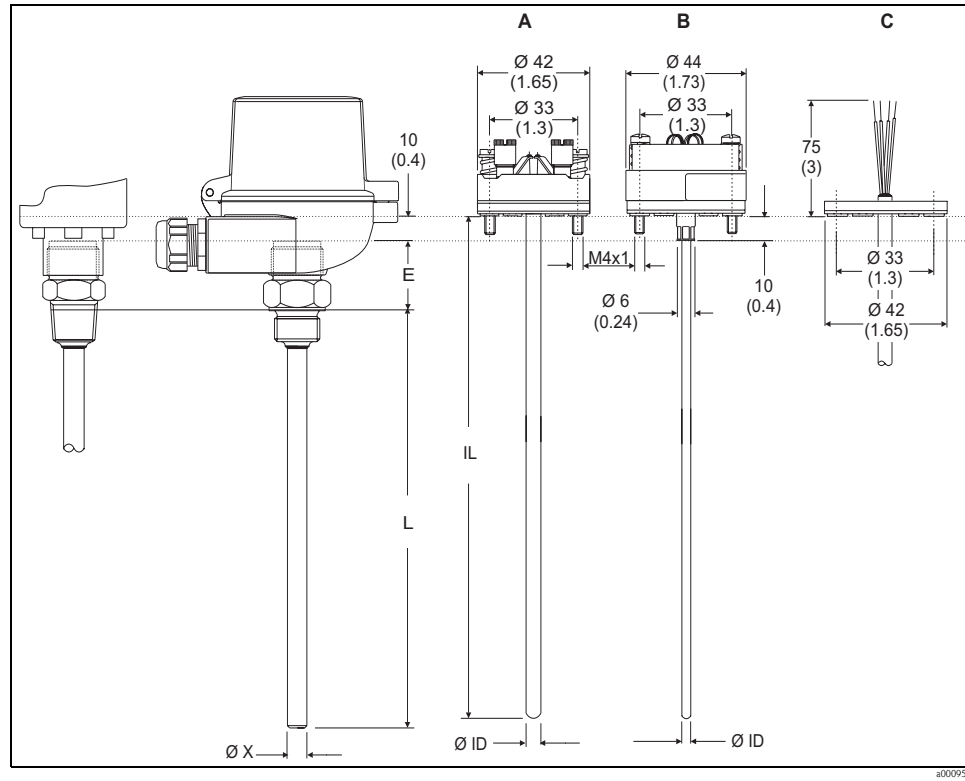
TA21E	Specification
	■ Degree of protection: IP65 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 130 °C (266 °F) silicone, 100 °C (212 °F) rubber (observe max. permitted temperature of the cable gland!) ■ Material: aluminum alloy with polyester or epoxy coating; rubber 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)

TA20J	Specification
 * dimensions with optional display	■ Degree of protection: IP66/IP67 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Material: 316L (1.4404) stainless steel, rubber seal under the cover (hygienic design) ■ 4 digits 7-segments LC display (loop powered) ■ Cable entry: ½" NPT, M20x1.5 or plug M12x1 PA ■ Protection armature connection: M24x1.5 or ½" NPT ■ Head and cap color: stainless steel, polished ■ Weight: 650 g (22.93 oz) with display ■ Humidity: 25 to 95%, no condensation The programming is executed through 3 keys at the bottom of the display.

TA20R	Specification
	■ Degree of protection: IP66/67 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ 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

Protection tube

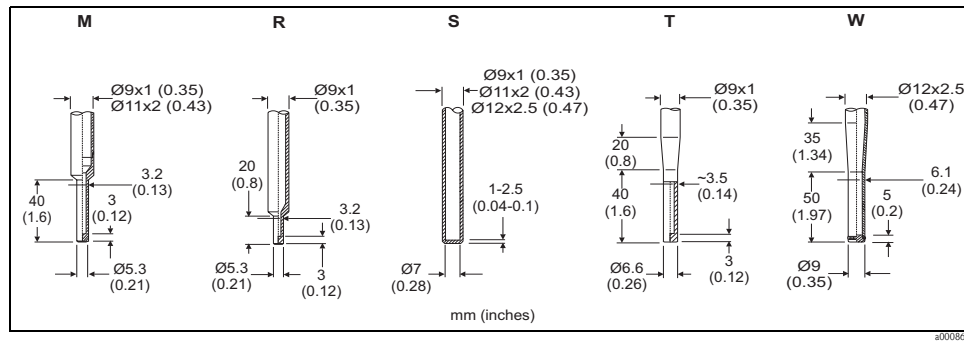
All dimensions in mm (inches).



Dimensions of the Omnigrad M TR11

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

Tip shape



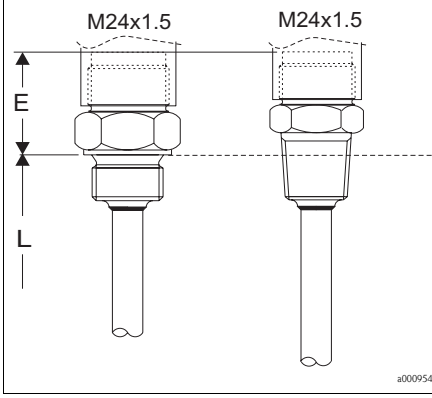
Available versions of protection tube tips (reduced, straight or tapered)

Pos. No.	Tip shape, L = Immersion length	Insert diameter
M	Reduced, L ≥ 65 mm (2.56 in)	∅ 3 mm (0.12 in)
R	Reduced, L ≥ 45 mm (1.77 in)	∅ 3 mm (0.12 in)
S	Straight as per DIN43772	∅ 6 mm (0.24 in)
T	Tapered, L ≥ 85 mm (3.35 in)	∅ 3 mm (0.12 in)
W	Tapered as per DIN43772, L ≥ 110 mm (4.33 in)	∅ 6 mm (0.24 in)

Weight

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

Process connection

Process connection		Version		Thread length in mm (inch)	Length E in mm (inch)
Cylindrical	Conical	M	M20x1.5	14 (0.55)	35 (1.4)
		G	G3/8" BSP	12 (0.47)	
			G½" DIN / BSP	15 (0.6)	
			G¾" BSP	15 (0.6)	
		NPT	NPT ½"	8 (0.32)	
			NPT ¾"	8.5 (0.33)	

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)**

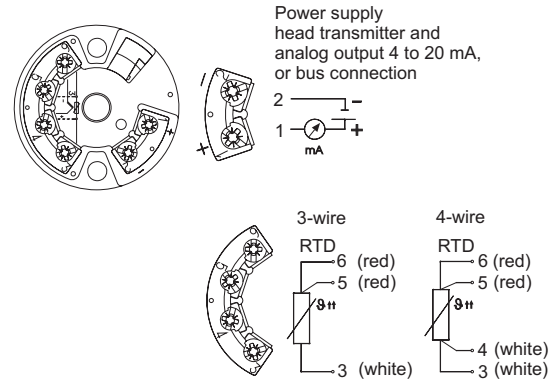
Spare part	Material-No.
Gasket M21-G½", copper	60001328
Gasket M27-G¾", copper	60001344
Gasket set M24x1.5, aramid+NBR (10 pieces)	60001329

Wiring

Wiring diagrams

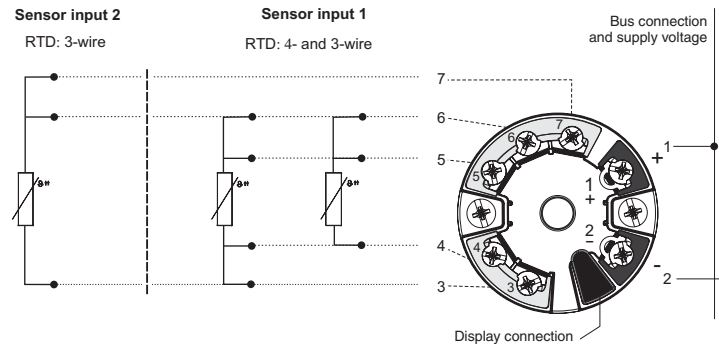
Type of sensor connection

Head mounted transmitter TMT18x (single input)



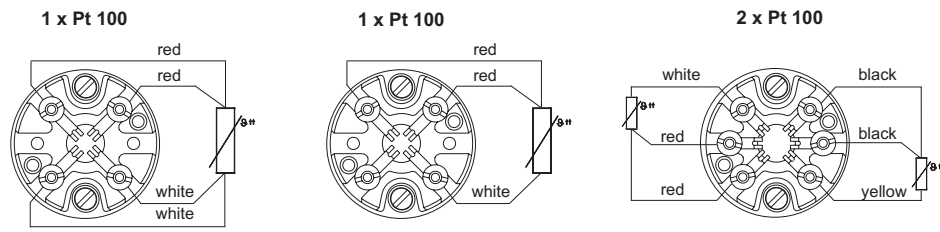
T09-TH1112xx-04-xx-XX-ae-000

Head mounted transmitter TMT84 and TMT85 (dual input)



a0008848-en

Terminal block mounted



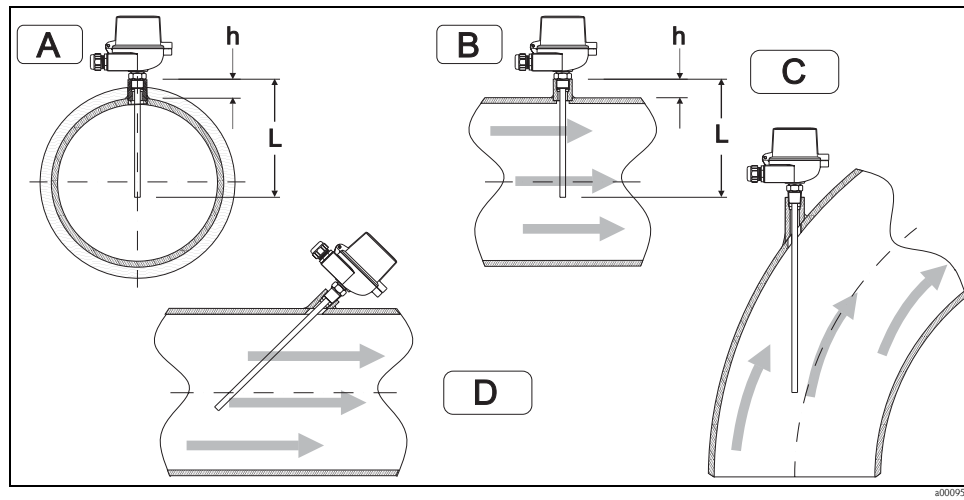
a0008591-en

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 at least half of the pipe diameter.

- Installation possibilities: Pipes, tanks or other plant components
- Minimum immersion length = 80 to 100 mm (3.15 to 3.94 in)
  The immersion length must be at least 8 times the protection tube diameter. Example: Protection tube diameter 12 mm (0.47 in) x 8 = 96 mm (3.8 in). Recommended standard immersion length according to DIN 43772: 120 mm (4.72 in)
- ATEX certification: Always take note of the installation regulations!

Note!
When operating in small nominal bore pipes it must be guaranteed that the protection tube tip is long enough to extend 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 Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies from us or your Endress+Hauser sales organization.

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:
  Protection tubes
- EN 50014/18, DIN 47229:
  Terminal heads
- IEC 61326-1:
  Electromagnetic compatibility (EMC requirements)

PED approval

The Pressure Equipment Directive (97/23/CE) is respected. As paragraph 2.1 of article 1 is not applicable to these types of instruments, the CE mark is not requested for the RTD assembly destined for general use.

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 protection tube

The pressure tests are carried out at ambient temperature in order to verify the resistance of the protection tube to the specifications indicated by the norm DIN 43772. With regards to the protection tubes that do not comply with this norm (with a reduced tip, a tapered tip on a 9 mm (0.35") tube, special dimensions, ...), the pressure of the corresponding straight tube with similar dimensions is verified. The sensors certified for use in Ex Zones, are always tested to pressure according to the same criterions. Tests at different pressures can be carried out upon request. The liquid penetrant test verifies the absence of crevices on the weldings of the protection tube.

Test report and calibration

With regards to the tests and calibration, the "Inspection Report" consists of a compliance declaration for the essential points of the standard IEC 60751.
The "Factory calibration" is carried out in an EA (European Accreditation) authorized laboratory of Endress+Hauser according to an internal procedure. A calibration may be requested separately according to an EA accredited procedure (SIT calibration). Calibration is carried out on the thermometer insert.

Ordering information

Product structure

RTD thermometer TR11

Approval:									
A	Non-hazardous area								
B	ATEX II 1 GD EEx ia IIC								
E	ATEX II 1/2 GD EEx ia IIC								
G	ATEX II 1 G EEx ia IIC								
H	ATEX II 3 GD EEx nA II								
K	TIIS Ex ia IIC T4								
L	TIIS Ex ia IIC T6								
	Head; Cable Entry:								
	B	TA30A Alu, IP66/IP68; M20							
	C	TA30A Alu, IP66/IP68; NPT ½"							
	D	TA30A Alu, IP66/IP67; M12 plug PA							
	E	TA21E Alu, screw cap IP65; M12 plug PA							
	F	TA30A Alu+display, IP66/IP68; M20							
	G	TA30A Alu+display, IP66/IP68; NPT ½"							
	H	TA30A Alu+display, IP66/IP67; M12 plug PA							
	J	TA20J 316L, IP66/IP67; M20							
	K	TA20J 316L, + display, IP66/IP67; M20							
	M	TA20J 316L, IP66/IP67; M12 plug PA							
	N	TA20R 316L, screw cap IP66/IP67; M20 silicone free							
	O	TA30D Alu, high cover, IP66/IP68; M20							
	P	TA30D Alu, high cover, IP66/IP68; NPT ½"							
	Q	TA30D Alu, IP66/IP67; M12 plug PA							
	R	TA20R 316L screw cap IP66/IP67; M20							
	S	TA20R 316L screw cap IP66; M12 plug							
	T	TA30A Alu, IP66/IP67; 7/8" plug FF							
	U	TA30A Alu+display, IP66/IP67; 7/8" plug FF							
	V	TA30D Alu, IP66/IP67; 7/8" plug FF							
	7	TA20B PA black, IP65; M20							
		Pipe Diameter; Material:							
		A	9 mm; 316L, DIN43772						
		B	11 mm; 316L, DIN43772						
		D	9 mm; 316Ti, DIN43772						
		E	11 mm; 316Ti, DIN43772						
		F	12 mm; 316Ti, DIN43772						
			Process Connection:						
			BG	Thread M20; 316Ti					
			BH	Thread G½" DIN43772; 316Ti					
			CA	Thread G½"; 316L					
			CB	Thread G¾"; 316L					
			CD	Thread NPT ½"; 316L					
			CE	Thread NPT ¾"; 316L					
			CL	Thread NPT 3/8"; 316L					
			JA	Thread R ½"; JIS B 0203, 316L					
			JB	Thread R ¾"; JIS B 0203; 316L					
				Tip Shape:					
				M	Reduced, L ≥ 65 mm				
				R	Reduced, L ≥ 45 mm				
				S	Straight				
				T	Tapered, L ≥ 85 mm				
				W	Tapered DIN43772-3G, L ≥ 110 mm				
					Immersion Length L:				
					B	170 mm			
					C	230 mm			
					D	270 mm			
					E	330 mm			
					F	390 mm			
					K	510 mm			
					U	100 mm			
					X	..... mm			
					Y	..... mm, as specified			
					1	50 mm			

Immersion Length L:	
2	60 mm
3	70 mm
4	80 mm

Head Transmitter; Range:	
B	TMT84 PA
C	Terminal block
D	TMT85 FF
F	Flying leads
G	TMT181 (PCP); temp. range to be specified
H	TMT182 (HART); temp. range to be specified
2	TMT180-A21 fix; 0.2 K, temp. range to be specified, Span limit -200/650 °C
3	TMT180-A22 fix; 0.1 K, temp. range to be specified, Span limit -50/250 °C
4	TMT180-A11 PCP; 0.2 K, temp. range to be specified, Span limit -200/650 °C
5	TMT180-A12 PCP; 0.1 K, temp. range to be specified, Span limit -50/250 °C

RTD; wire; meas. range; class; validity:	
A	1x Pt100 WW; 3; -200/600 °C; A: -200/600 °C
B	2x Pt100 WW; 3; -200/600 °C; A: -200/600 °C
C	1x Pt100 WW; 4; -200/600 °C; A: -200/600 °C
F	2x Pt100 WW; 3; -200/600 °C; 1/3B; 0/250 °C
G	1x Pt100 WW; 3; -200/600 °C; 1/3B; 0/250 °C
Y	Special version, to be specified
2	1x Pt100 TF; 3; -50/400 °C; A; -50/250 °C increas. vibr. resistance
3	1x Pt100 TF; 4; -50/400 °C; A; -50/250 °C increas. vibr. resistance
6	1x Pt100 TF; 3; -50/400 °C; 1/3B; 0/150 °C increas. vibr. resistance
7	1x Pt100 TF; 4; -50/400 °C; 1/3B; 0/150 °C increas. vibr. resistance

Material Certificate:	
0	Not needed
1	EN10204-3.1 Material
2	EN10204-3.1 Material, shortform

Test Report:	
A	Internal hydrost. pressure test
B	External hydrost. pressure test
C	Dye penetrant test
0	Not needed

Test/Calibration:	
A	0, 100 °C, RTD-Signal
B	0, 100 °C, RTD-Signal, 4-20 mA/loop
C	0, 100 °C, RTD-Signal, 2 Sensors
E	0, 100, 150 °C, RTD-Signal
F	0, 100, 150 °C, RTD-Signal, 4-20 mA/loop
G	0, 100, 150 °C, RTD-Signal, 2 Sensors
0	Not needed

TR11-	**← Order code (complete)**

This ordering information can give an overview about the available order options. The Endress+Hauser sales organization can provide detailed ordering information and information on the order code.

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/24/ae)
- Temperature head transmitter iTEMP® Pt TMT180 (TI088r/24/ae)
- Temperature head transmitter iTEMP® HART® TMT182 (TI078r/24/ae)
- Temperature head transmitter iTEMP® TMT84 PA (TI138r/24/ae)
- Temperature head transmitter iTEMP® TMT85 FF (TI134r/24/ae)

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/24/ae)
- Active barrier with power supply RN221N (TI073r/24/ae)

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