



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Omnigrad S TR66

Modular RTD assembly, flameproof
Barstock thermowell, with thread or flange



Application

- Heavy duty applications
- Oil & Gas processing industry
- Measuring range: -200...600 °C (-328...1115 °F)
- Static pressure range up to 500 bar (7250 PSI)
- Protection class: 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 based on modular assembly with a terminal head and customized immersion length
- Extension neck for head transmitter heat protection
- Types of protection for use in hazardous locations:
 - Flameproof (Ex d)
 - Intrinsic Safety (Ex ia)
 - Non-Sparking (Ex nA)
 - Dust ignition proof (protection by enclosure)



Function and system design

Measuring principle

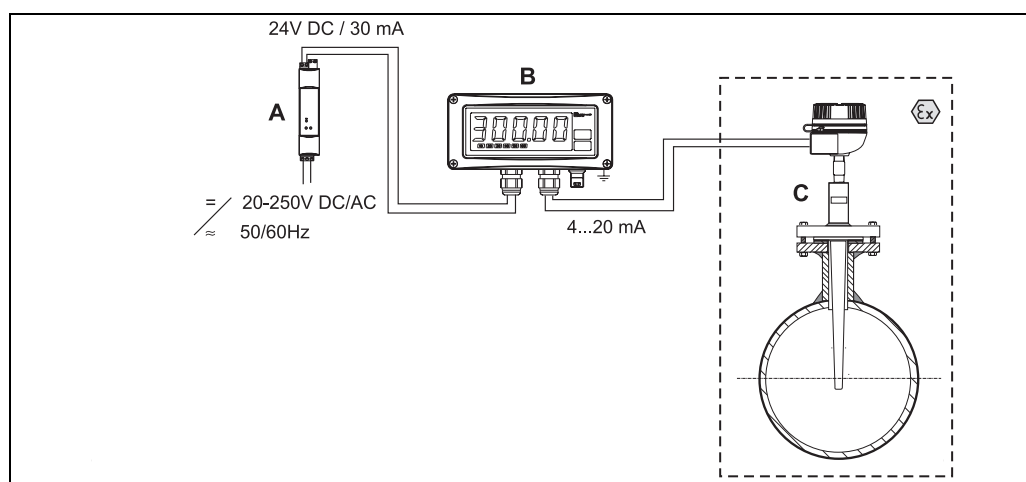
These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. This temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient $\alpha = 0.003851$ °C⁻¹.

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).

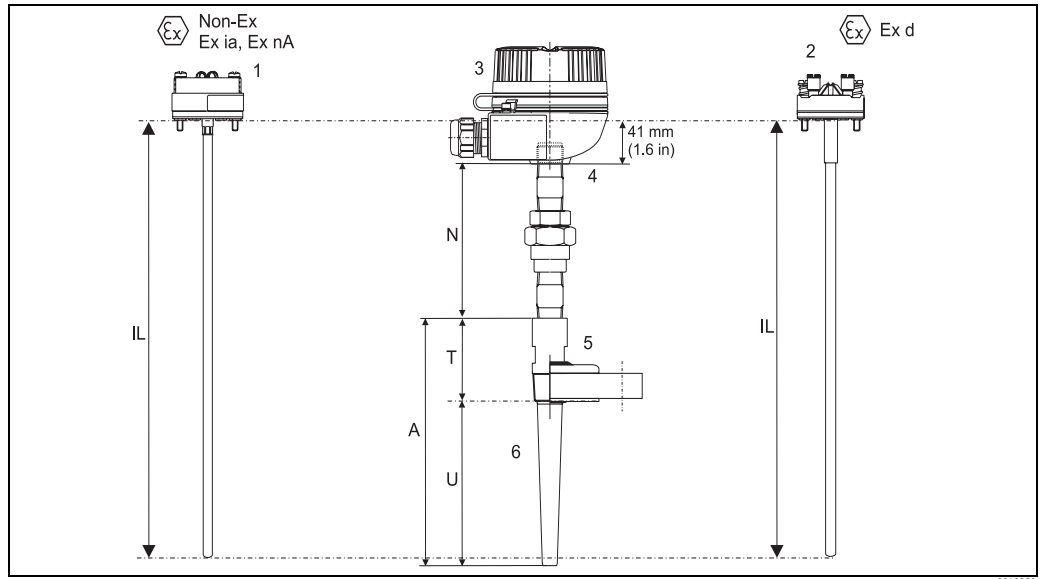
Measuring system



Example of an application

- A *RIA 261 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 volt drop is almost negligible (< 2.5 V). The dynamic internal resistance (load) makes sure that independently from the loop current, the maximum volt drop is never exceeded. The analog signal at the input is digitalized, analyzed and displayed. For details see Technical Information (see "Documentation").
- B *Active barrier RN221N*
 – The RN221N active barrier (24 V DC, 30 mA) has an 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 "Documentation").
- C *Built-in RTD assembly TR66 with head transmitter*

Equipment architecture



Equipment architecture of the Omnigrad S TR66

- | | |
|--|--|
| <ol style="list-style-type: none"> 1 Insert TPR100, \varnothing 6 mm (0.24 in) with mounted head transmitter, for example. For applications in non-hazardous areas (except: Ex ia and Ex nA) 2 Insert TPR300, \varnothing 6 mm (0.24 in) with mounted ceramic terminal block, for example. For applications in hazardous areas (Ex d) 3 Terminal head 4 Extension neck | <ol style="list-style-type: none"> 5 Thread or flange as process connection 6 Thermowell from bar stock material N Extension neck length T Thermowell lag U Immersion length A Thermowell length (= U + T) IL Insertion length = U + T + N + 41 mm (1.6 in) |
|--|--|

The Omnigrad S TR66 RTD assemblies are modular. The terminal head serves as a connection module for the extension neck to the thermowell 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. Where required, threads or flanges can be fixed onto the thermowell.

Measurement range -200 ... 600 °C (-328...1112 °F)

Performance characteristics

Operating conditions

Ambient temperature

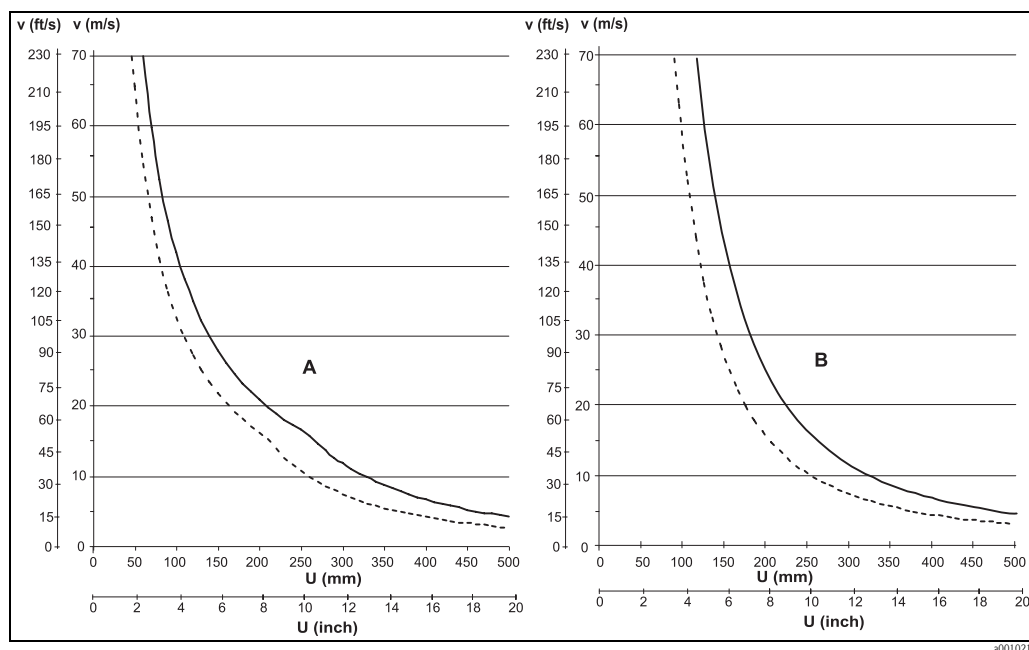
Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector, see 'Terminal heads' section, → 8
With mounted head transmitter	-40 to 85 °C (-40 to 185 °F)
With mounted head transmitter and display	-20 to 70 °C (-4 to 158 °F)

Process pressure (static)

Process connection	Standard	Max. process pressure
Thread	ANSI B1.20.1	75 bar (1088 psi)
Flange	ASME B16.5	Depending on flange pressure stage 150, 300 or 600 psi

Permitted flow velocity depending on the immersion length

The highest flow velocity tolerated by the thermometer diminishes with increasing immersion length exposed to the stream of the fluid. In addition it is dependent on the diameter of the thermometer tip, on the kind of measuring medium, on the process temperature and on the process pressure. The following figures exemplify the maximum permitted flow velocities in water and superheated steam at a process pressure of **4 MPa (40 bar = 580 PSI)**.



Maximum flow velocity

———— Thermowell $\varnothing D1 = 35 \text{ mm (1.38 in)}$, $\varnothing Q1 = 25 \text{ mm (0.98 in)}$, $\varnothing Q2 = 18 \text{ mm (0.71 in)}$
 - - - - - Thermowell $\varnothing D1 = 30 \text{ mm (1.18 in)}$, $\varnothing Q1 = 20 \text{ mm (0.8 in)}$, $\varnothing Q2 = 14 \text{ mm (0.55 in)}$

A Medium water at $T = 50 \text{ °C (122 °F)}$

B Medium superheated steam at $T = 400 \text{ °C (752 °F)}$

U Immersion length thermowell, material 1.4401 (316)

v Flow velocity



Note!

Information on the thermowell dimensions $\varnothing Q1$, $\varnothing Q2$, $\varnothing D1$, $\varnothing Df$ and U , → 10.

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			
Cl. A	$\pm (0.15 + 0.002 \cdot t ^{1.1})$	-50 °C to +250 °C	
Cl. AA, former 1/3 Cl. B	$\pm (0.1 + 0.0017 \cdot t ^{1.1})$	0 °C to +150 °C	
Cl. B	$\pm (0.3 + 0.005 \cdot t ^{1.1})$	-50 °C to +400 °C	
RTD max. error type WW - range: -200 to +600 °C			
Cl. A	$\pm (0.15 + 0.002 \cdot t ^{1.1})$	-200 °C to +600 °C	
Cl. AA, former 1/3 Cl. B	$\pm (0.1 + 0.0017 \cdot t ^{1.1})$	0 °C to +250 °C	
Cl. B	$\pm (0.3 + 0.005 \cdot t ^{1.1})$	-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 change. Measuring probe Pt100, TF/WW:

Ø Q1 thermowell	Response time		Ø Q2 tapered tip
20 mm (0.79 in)	t ₅₀	34 s	14 mm (0.55 in)
	t ₉₀	105 s	
25 mm (0.98 in)	t ₅₀	37 s	18 mm (0.71 in)
	t ₉₀	115 s	



Note!
Response time for the RTD insert without transmitter.

Insulation resistance

Insulation resistance $\geq 100 \text{ M}\Omega$ 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

The manufacturer provides comparison temperature calibration from -80 to +600 °C (-110 °F to 1112 °F) 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 measuring insert is calibrated.

Insert: Ø 6 mm (0.24 in)	Minimum insertion length (IL) in mm (inch)	
	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 (5.91)
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

Extension neck and thermowell

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⁾	<ul style="list-style-type: none"> ■ 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) ¹⁾	<ul style="list-style-type: none"> ■ 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)	-		Û = 2 kV AC	

System 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 	<ul style="list-style-type: none"> ■ Material: Housing (PC), Potting (PUR) ■ Terminals: Cable up to max. max. $\leq 2.5 \text{ mm}^2 / 16 \text{ AWG}$ (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

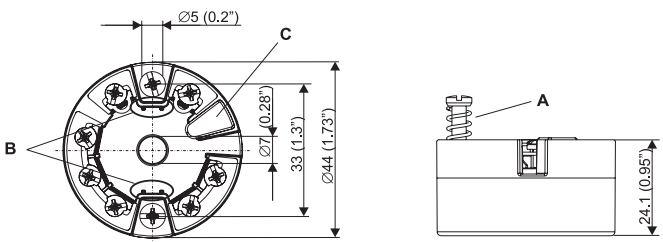
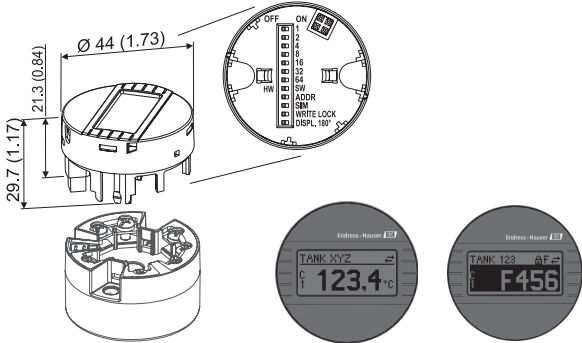

Universally programmable head transmitter with PROFIBUS® PA communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. 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
<p>iTEMP® TMT84 and TMT85</p>  <p style="text-align: right; font-size: small;">a0007301-en</p>	<ul style="list-style-type: none"> ■ Spring range $L \geq 5 \text{ mm (0.2")}$, 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. $\leq 2.5 \text{ mm}^2 / 16 \text{ AWG}$) or spring terminals (e. g. from 0.25 mm^2 to $0.75 \text{ mm}^2 / 24 \text{ AWG}$ to 18 AWG for flexible wires with wire-end ferrules with plastic ferrule) ■ Degree of protection NEMA 4 (see also type of terminal head) <p>Details see Technical Information (see chapter 'Documentation')</p>
<p>Pluggable display TID10 as option</p>  <p style="text-align: right; font-size: small;">a0009955</p>	<ul style="list-style-type: none"> ■ 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 <p> Note! Display is only available with suitable terminal head with display window, e.g. TA30</p>

Terminal head

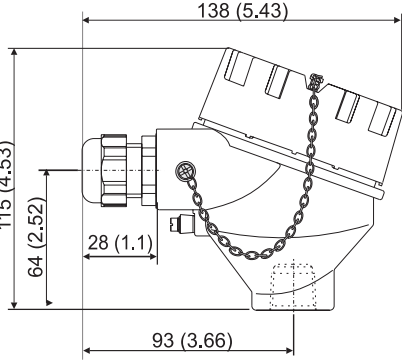
Internal geometry according to DIN 43729, form B. It is compliant with EN 50014/18 and EN 50281-1-1 standards (EEx-d certification for explosion proof type of protection).

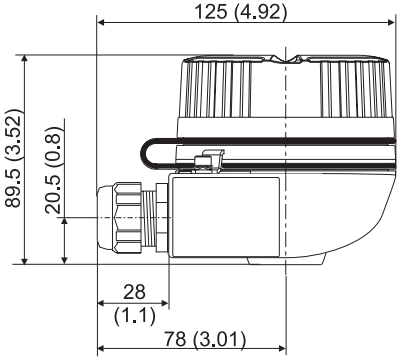


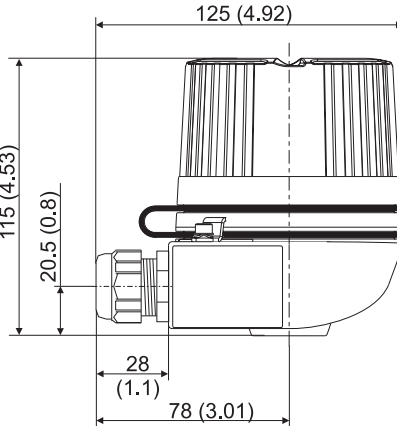
Note!

In the XP version, the thermometer is available without a cable gland or fieldbus connector.

All dimensions in mm (inch).

TA21H	Specification
 <p style="text-align: right; font-size: small;">a0010194</p>	<ul style="list-style-type: none"> ■ Protection class: IP66 to IP68 ■ Max. temperature: 100 °C (212 °F) rubber (observe max. permitted temperature of the cable gland!) ■ Material: aluminum alloy; rubber seal under the cover ■ Double threaded cable entry: $\frac{1}{2}$" NPT, $\frac{3}{4}$" NPT, M20 or G$\frac{1}{2}$" ■ Extension neck / thermowell connection: M24x1.5, G$\frac{1}{2}$" or $\frac{1}{2}$" NPT ■ Head color: blue ■ Cap color: grey ■ Weight: 600 g (21.16 oz)

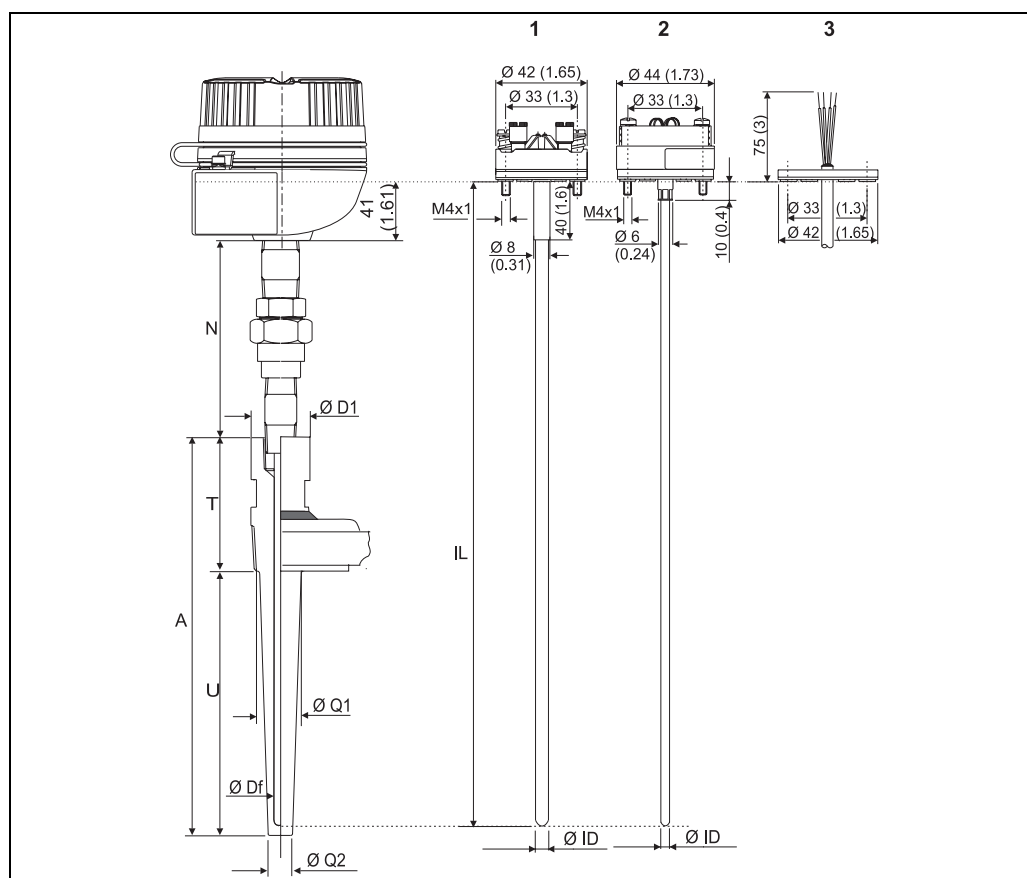
TA30H	Specification
 <p style="text-align: right; font-size: small;">a0009832</p>	<ul style="list-style-type: none"> ■ Flameproof (XP) version, explosion-protected, captive screw cap ■ Protection class: IP 66/68 ■ Max. temperature: 150 °C (300 °F) for rubber seal (observe max. permitted temperature of the cable gland!) ■ Material: aluminum; polyester powder coated ■ Cable entry glands: ½" NPT, ¾" NPT, M20x1.5, only thread G½"; plug: M12x1 PA, 7/8" FF ■ Neck tube/thermowell connection: ½" NPT ■ Color of head: blue, RAL 5012 ■ Color of cap: gray, RAL 7035 ■ Weight: 640 g (22.6 oz)

TA30H with display window in cover	Specification
 <p style="text-align: right; font-size: small;">a0009831</p>	<ul style="list-style-type: none"> ■ Flameproof (XP) version, explosion-protected, captive screw cap ■ Protection class: IP 66/68 ■ Max. temperature: 150 °C (300 °F) for rubber seal (observe max. permitted temperature of the cable gland!) ■ Material: aluminum; polyester powder coated ■ Cable entry glands: ½" NPT, ¾" NPT, M20x1.5, only thread G½"; plug: M12x1 PA, 7/8" FF ■ Neck tube/thermowell connection: ½" NPT ■ Color of head: blue, RAL 5012 ■ Color of cap: gray, RAL 7035 ■ Weight: 860 g (30.33 oz) ■ Head transmitter optionally available with TID10 display

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)

Thermowell

All dimensions in mm (inches).



Dimensions of the Omnigrad S TR66

1	Insert with mounted terminal block	IL	Insertion length = $U + T + N + 41$ mm (1.61 in)
2	Insert with head transmitter mounted	N	Extension neck length
3	Flying leads	T	Thermowell lag
Ø ID	Insert diameter	U	Immersion length
A	Thermowell length		
Ø D1	Thermowell diameter at the thermometer connection	Ø Df	Thermowell internal hole
Ø Q1	Thermowell external diameter at the flange or thread connection	Ø Q2	Thermowell tip external diameter

The thermowell is the component of the RTD assembly that must tolerate most of the mechanical stress transmitted by the process. It is made from a round bar and supplied in different materials and dimensions, according to the chemical/physical characteristics of the process: corrosion, temperature, pressure and speed of the fluid.

The thermowell consists of three parts:

- The lag, usually with a cylindrical shape and standard diameters of 30 or 35 mm (1.18 or 1.38 in) and lengths of 70/100 mm (2.76/3.94 in), represents the external part of the thermowell and is connected with the terminal head by means of a neck (usually a nipple, type N or nipple-union-nipple, type NUN).
- The immersed part (identified as U), with a conical or cylindrical shape is situated next to the process connection in direct contact with the process fluid. The standard diameter of the area below the fitting is 20 or 25 mm (0.79 or 0.98 in).
- The threaded or flanged process connection is the part inserted between the lag and the immersed part and guarantees the mechanical and hydraulic sealing of the assembly and plant.

The surface of the wetted part of the thermowell is available with a surface roughness rating of $R_a = 1.6 \mu\text{m}$ as standard (other surface versions available on request).

**Caution!**

The maximum total length A of the thermowell (maximum drilling limit) is 1200 mm (47.3 in). Higher lengths are available only on request.

Weight From 1.5 to 5.5 kg (3.3 to 12.1 lbs) for standard options.

Process connection The standard process connections are threaded or flanged. When the process connection is threaded, the connection material is the same as that of the thermowell.
Standard material flange: SS 316/1.4401 or ASTM A105/St 52.3 U.
On request, it is possible to select different materials, finishings and connections.

Type and dimension of the process connections (ASME B16.5, ANSI B1.20.1). All dimensions in mm (inch).

Type		$\varnothing d$	$\varnothing D$	$\varnothing L$	No. of holes	f	b	$\varnothing D1$	A	A1	
	Flange	1" ANSI 150 RF SO ¹⁾	50.8 (2)	107.9 (4.25)	4	1.6 (0.06)	14.2 (0.56)	-	-	-	
		1" ANSI 300 RF SO		124 (4.9)			19.1 (0.75)	17.5 (0.69)	-	-	-
		1" ANSI 600 RF SO	73 (2.9)		155.4 (6.1)	22.4 (0.85)	6.4 (0.25)	-	-	-	
		1½" ANSI 150 RF SO		92.1 (3.6)			165.1 (6.5)	19.1 (0.75)	1.6 (0.06)	17.5 (0.69)	-
		1½" ANSI 300 RF SO	8		25.4 (1)	20.6 (0.81)			-	-	-
		1½" ANSI 600 RF SO		6.4 (0.25)		-	-	-			
		2" ANSI 300 RF SO	8	25.4 (1)	19.1 (0.75)	1.6 (0.06)	22.4 (0.88)	-	-	-	
		2" ANSI 600 RF SO				6.4 (0.25)	25.4 (1)	-	-	-	
	Thread	¾" NPT	-	-	-	-	-	-	≥ 21.4 (0.84)	19.9 (0.78)	8.1 (0.32)
		1" NPT	-	-	-	-	-	-	≥ 26.7 (1.1)	20.2 (0.79)	8.6 (0.34)

1) RF SO: Raised Face Slip On flange (flat flange with sealing face).

Further information you can find in the Technical Information 'Flanges' (TI432F/00).

Spare parts

Measuring probe (Pt100):

- TPR100 for general purpose and intrinsically safe model
- TPR300 for explosion-proof model

Both of the probes are made in mineral insulated cable (MgO), with a sheath in 316L/1.4401 stainless steel. The insertion length (IL) of the insert can be chosen within a standard range from 50 to 1000 mm (1.97 to 39.4 in), see "Caution" on Page 9. Inserts with a insertion length IL > 1000 mm (39.4 in) can be supplied after a technical verification of the specific application by a Endress+Hauser service organization.

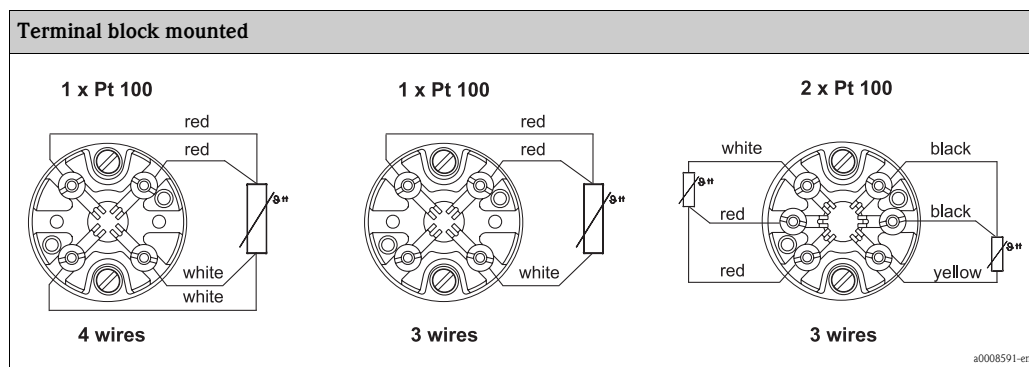
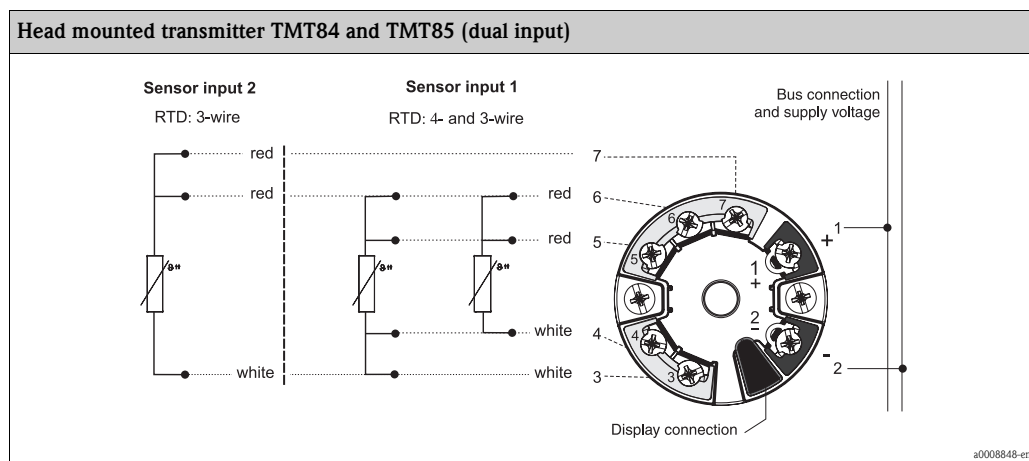
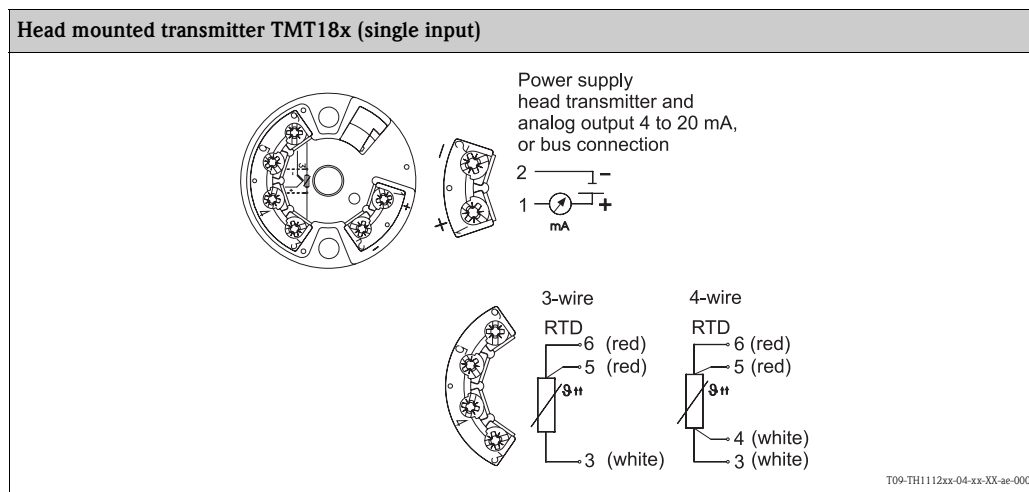
When replacing the insert it is necessary to refer to the following table to obtain the correct insertion length IL (applicable only to thermowells with standard bottom thickness). It is calculated by adding the total thermowell length (immersion length U + lag T) to the extension neck length (N) used.

Insert model	\varnothing	Extension neck type	Extension neck length N	Insertion length IL
TPR100 / TPR300	6 mm (0.24 in)	N	69 mm (2.71 in)	IL = U+T+ N + 41 mm (1.61 in)
		N	109 mm (4.3 in)	
		NUN	148 mm (5.8 in)	

Wiring

Wiring diagrams

Type of sensor connection

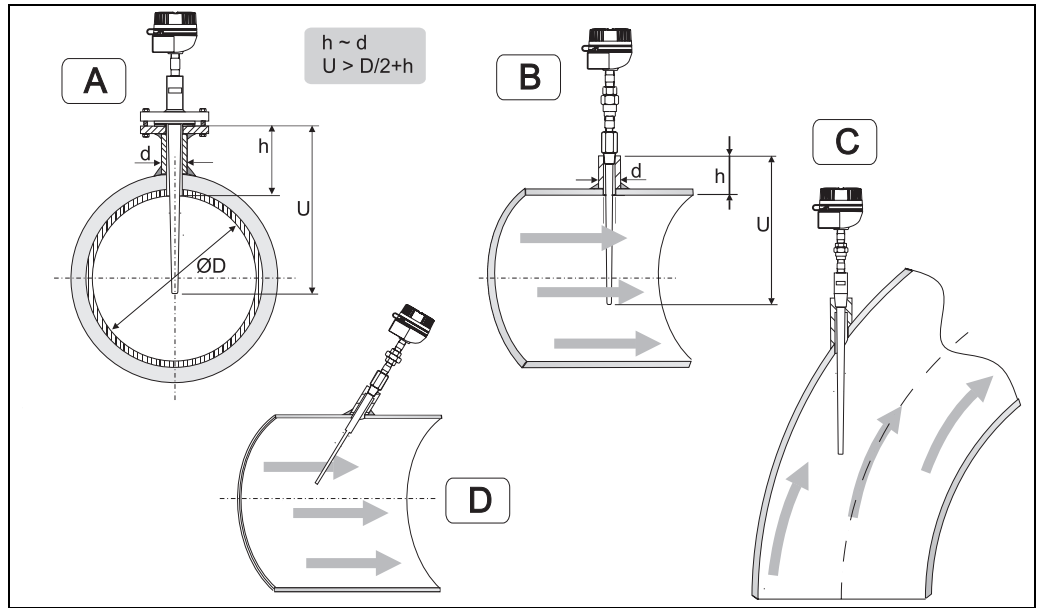


Installation conditions

Orientation

No restrictions.

Installation instructions



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: Angled 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.

For best installation follow the rule: $h \sim d$; $U > D/2 + h$. As far as corrosion is concerned, the base material for parts in contact with the fluid is able to withstand the most common corrosive agents up to the highest temperatures. For further information on specific applications, contact a Endress+Hauser service organization.



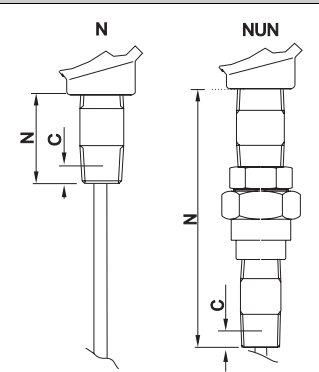
Note!

When operating in small nominal bore pipes it must be guaranteed that the thermowell tip is long enough to go over the pipe centre line (see figure above, A and B). A further solution could be an angled (tilted) installation (see figure above, 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 → 4).

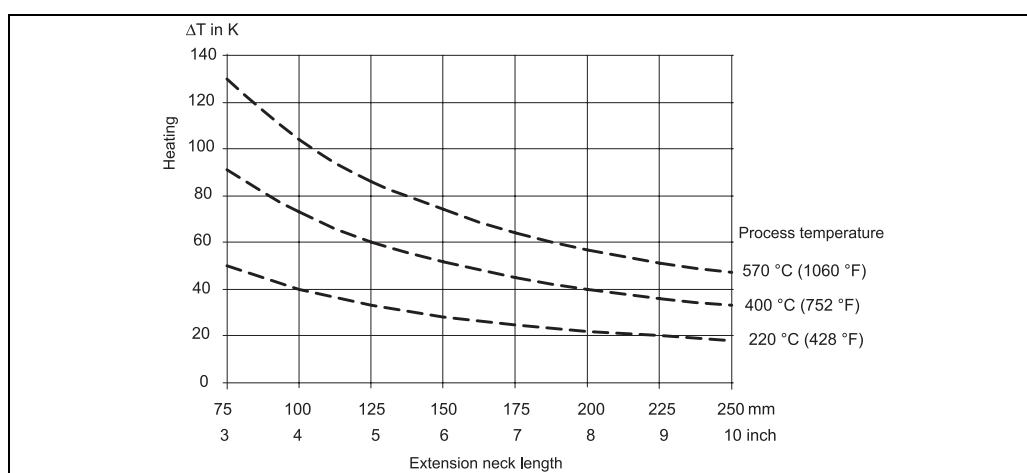
The counterparts for process connections and gaskets, when required, are not supplied with the sensor and must be purchased separately.

Extension neck length

The extension neck is the part between the thermowell connection and the terminal head. The connection situated in the upper part of the neck allows for orientation of the terminal head. The neck is constituted by a tube assembled to hydraulic hardware (nipples or joints) that is suitable to allow the adjustment of the sensor to the thermowell. In addition to the standard versions listed below, it is also possible to order the extension neck by specifying the desired length (see "Product structure" at the end of this document):

Neck version	Material	Neck length N	Thread	Thread length C
	SS 316 or A 105	69 mm (2.72 in)	½" NPT M	8 mm (0.31 in)
		109 mm (4.3 in)		
		148 mm (5.83 in)		

As illustrated in the following figure, the extension neck length may influence the temperature in the terminal head. It is necessary that this temperature is kept within the limit values defined in the chapter "Operating conditions".



Heating of the terminal head consequent to the process temperature.
 Temperature in terminal head = ambient temperature 20 °C (68 °F) + ΔT

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	<ul style="list-style-type: none"> ■ 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 ■ EN 50014/18: Electrical apparatus for potentially explosive atmospheres - General requirements/flameproof enclosure 'd' ■ EN 50281-1-1: Electrical apparatus protected by enclosures ■ 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 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. Tests according to other specifications can be carried out on request.
Test report and calibration	For the tests and calibration, the "Acceptance report" comprises a declaration of conformity with the primary points as per IEC 60751. 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

Product structure

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

RTD thermometer TR66				
Approval:				
A				Non-hazardous area
C				ATEX II 1/2 GD EEx ia IIC
E				ATEX II 2 GD EEx d IIC
H				ATEX II 3 GD EEx nA II
K				TIIS Ex ia IIC T4
L				TIIS Ex ia IIC T6
M				ATEX II 1/2 GD EEx d IIC
Head:				
A				TA21H Alu, IP66
B				TA30H Alu, IP66/68
C				TA30H Alu, IP66/68 + Display
Y				Special version, to be specified
Cable Entry:				
A				1x 1/2" NPT
B				2x 1/2" NPT
C				1x 3/4" NPT
D				2x 3/4" NPT
E				1x M20x1.5
F				2x M20x1.5
Y				Special version, to be specified
Neck Length N; Material; Fitting:				
B				69 mm; 316; N 1/2" NPT M
C				109 mm; 316; N 1/2"NPT M
E				148 mm; 316; N 1/2" NPT M
F				69 mm; A105; N 1/2" NPT M
G				109 mm; A105; N 1/2" NPT M
J				148 mm; A105; N 1/2" NPT M
Y			 mm, as specified
Thermowell Material:				
B				316Ti
C				316
D				316L
Y				Special version, to be specified
Extension T; D1; Df; Q1; Q2:				
1				70 mm; 30 mm; 7 mm; 20 mm; 14 mm
2				75 mm; 35 mm; 7 mm; 24 mm; 14 mm
6				100 mm; 35 mm; 8 mm; 25 mm; 18 mm
9			 mm, as specified
Immersion length U:				
X			 mm
Y			 mm, as specified
Process Connection:				
CA				Flange 1" ANSI 150 RF SO; A105
CB				Flange 1" ANSI 150 RF SO; B16.5;JPI; 316
CC				Flange 1" ANSI 300 RF SO; A105
CD				Flange 1" ANSI 300 RF SO; B16.5;JPI; 316
CE				Flange 1" ANSI 600 RF SO; A105
CF				Flange 1" ANSI 600 RF SO; 316
CG				Flange 1 1/2" ANSI 150 RF SO; A105
CH				Flange 1 1/2" ANSI 150 RF SO; B 16.5; JPI; 316
CJ				Flange 1 1/2" ANSI 300 RF SO; A105
CK				Flange 1 1/2" ANSI 300 RF SO; B 16.5; JPI; 316
CL				Flange 1 1/2" ANSI 600 RF SO; A105
CM				Flange 1 1/2" ANSI 600 RF SO; 316
CQ				Flange 2" ANSI 300 RF SO; A105
CS				Flange 2" ANSI 600 RF SO; A105

										Process Connection:	
										CT	Flange 2" ANSI 600 RF SO; 316
										CV	Flange 2" ANSI 300 RF SO; 316
										JA	Flange 10K25A RF, JIS B 2220, 316
										JB	Flange 10K40A RF, JIS B 2220, 316
										JC	Flange 10K50A RF, JIS B 2220, 316
										JD	Flange 20K25A RF, JIS B 2220, 316
										JE	Flange 20K40A RF, JIS B 2220, 316
										JF	Flange 20K50A RF, JIS B 2220, 316
										YY	Special version, to be specified
										11	Thread ¾" NPT-M
										22	Thread 1" NPT-M
										44	Thread R ¾", JIS B 0203, 316
										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, SIL2); 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; 4; -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
										3	1x Pt100 TF; 4; -50/400 °C; A: -50/250 °C
										6	1x Pt100 TF; 3; -50/400 °C; 1/3B: 0/150 °C
										7	1x Pt100 TF; 4; -50/400 °C; 1/3B: 0/150 °C
										Additional option:	
										Y	Special version, to be specified
										0	Not needed
TR66-										← Order code (complete)	

Documentation

Technical Information:

- RTD Insert for Temperature Sensor Omniset TPR100 (TI268t/02/en)
- Temperature head transmitter iTEMP® PCP TMT181 (TI070r/09/en)
- Temperature head transmitter iTEMP® Pt TMT180 (TI088r/09/en)
- Temperature head transmitter iTEMP® HART® TMT182 (TI078r/09/en)
- Temperature head transmitter iTEMP® TMT84 PA (TI138r/09/en)
- Temperature head transmitter iTEMP® TMT85 FF (TI134r/09/en)

Hazardous area supplementary documentation:

- Omnigrad TRxx RTD Thermometer ATEX II1GD or II 1/2GD (XA072r/09/a3)
- Omnigrad S TR/TC 6x Thermometer ATEX II1/2, 2GD or II2G EEx d IIC T5, T6 (XA014t/02/a3)

Application example

Technical Information:

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

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