

RTD temperature sensor omnigrad S TST 264

*Thermometer, with EEx d certification
Lamination nipple and/or 3 elements coupling
Matchable with bar stock thermowells*



The Omnigrad S TST 264 is an industrial thermometer with a Pt 100 thermoresistance, developed for the use in the chemical, petrochemical and energy industries but suitable also for other generic applications.

The TST 264 is supplied with EEx d certification, in compliance with European standards EN 50014 and EN 50018, and is therefore particularly suitable also for industrial areas with potentially explosive environments.

The TST 264, which is available in several standard versions and different configurations, can also be configured with specific dimensions and characteristics depending on process requirements. Installation in EEx d systems requires separately ordered bar stock thermowell.

Features and benefits

- Transmitters with 2-wire technology (PCP 4...20 mA, HART®, PROFIBUS-PA®)
- Customisable immersion length
- Head/thermowell connection fitting in SS 304 (nipple + 3 elements coupling)
- Explosion-proof enclosure with EEx d certification (explosion-proof) and lamination coupling on the insert
- Mineral oxide replaceable insert (MgO)
- Pt 100 sensing element with class B and A accuracy (DIN EN 60751)

Endress + Hauser

The Power of Know How



Areas of application

The TST 264 can also be used in generic industrial applications but is particularly suitable for EEx d certified applications like:

- chemical industry
- petrochemical industry
- energy industry
- gas processing industry.

Function and system design

Measuring principle

In RTD (Resistance Temperature Detector) thermometers, the sensing element consists of an electrical resistance with value of 100 ohm at 0°C (called Pt 100, in compliance with standard DIN EN 60751) which increases at higher temperatures according to a coefficient characteristic of the resistor material (Platinum). In industrial thermometers compliant with the DIN EN 60751 standard, the value of this coefficient is $\alpha = 3.85 \cdot 10^{-3} \text{ } ^\circ\text{C}^{-1}$, calculated between 0 and 100°C.

Equipment architecture

The TST 264 thermometer with thermoresistance comprises:

- an EEx d certified aluminium housing
- an insert with thermoresistance Pt 100, insulated with mineral oxide (MgO), with overshooth and terminals on a ceramic support
- lamination nipple and 3 elements coupling.

Dimensions are determined as follows (fig. 1):

- N = length of the head/thermowell connection fitting
- ML = insert immersion length.

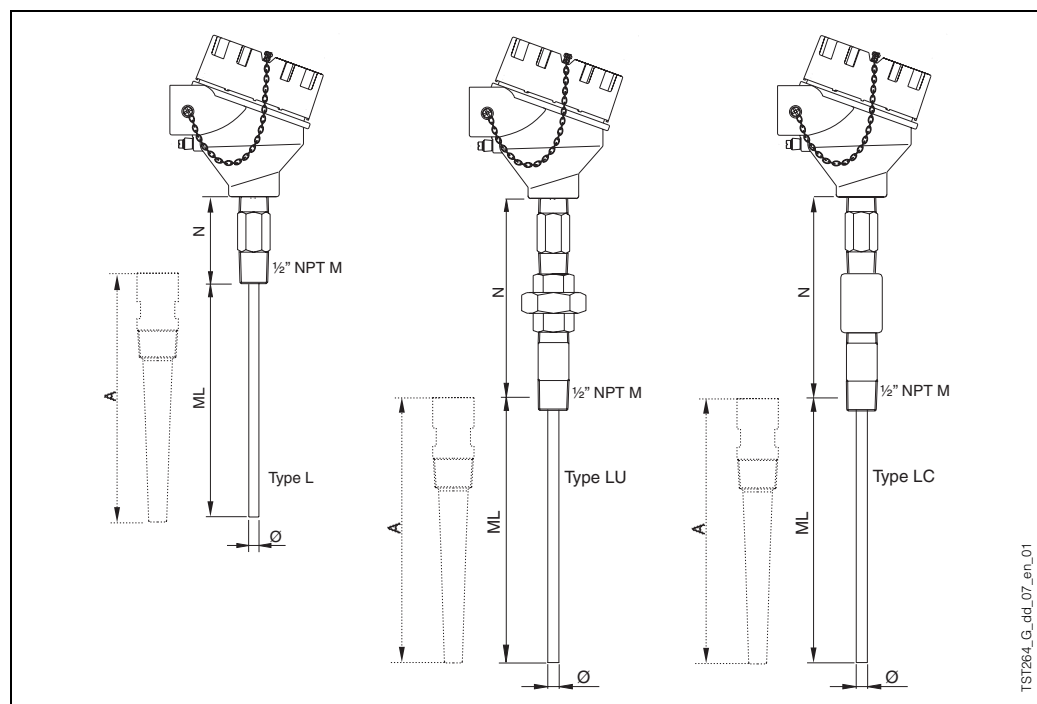


Fig. 1: General information on sizes

Material

Housing: treated and painted aluminium alloy.

Measuring insert: external sheath in SS 316L/1.4404

Head/thermowell connection: SS 304/1.4301

Weight

From 1 to 1.5 Kg for standard options.

Electronics

The required type of output signal can be obtained by choosing the correct head-mounted transmitter.

Endress+Hauser supplies "state-of-the-art" transmitters (the iTEMP® series) built in 2-wire technology and with 4...20 mA output signal, HART® or PROFIBUS-PA®. All transmitters can be easily programmed using a personal computer and the ReadWin® 2000 public domain software (for transmitters 4...20 mA and HART®) or the Commuwin II software (for PROFIBUSPA® transmitters). HART® transmitters can also be programmed with the hand-held operating module DXR 275 (Universal HART® Communicator).

For more detailed information on the transmitters, see the related documentation (codes TI at the end of this document).

If no head transmitter is used, it is also possible to connect the thermoresistance to a remote transmitter DIN-rail.

Performance

Operating conditions

Ambient temperature

- Metal head with terminal block and without transmitter -40÷130°C
- Metal head without terminal block and with transmitter -40÷85°C

Shock and vibration resistance

According to DIN EN 60751 3 g peak / 10÷500 Hz

Accuracy

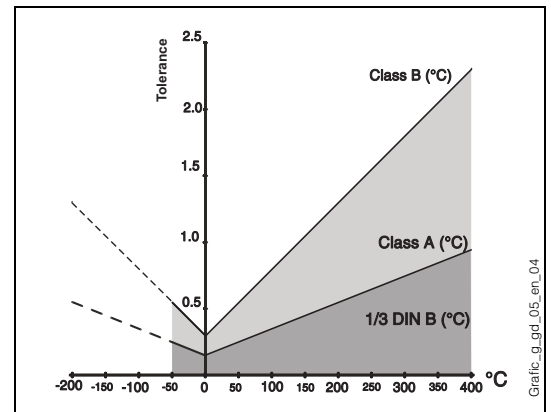
Maximum probe error

- cl. B
 $3\sigma = 0.30 + 0.0050|t|$
- cl. A
 $3\sigma = 0.15 + 0.0020|t|$

(|t|=absolute temperature value in °C)

Transmitter maximum error

See the corresponding documentation (codes are shown at the end of this document).



Measurement range

-50...400°C

Response time

Tests in water at 0.4 m/s (according to DIN EN 60751; temperature variation from 23 to 33°C), only on the RTD thermometer insert:

- t_{50} 3.5 s
- t_{90} 8.0 s

Insulation

Insulation resistance between the conductors and the probe sheath (in accordance with DIN EN 60751, test voltage 250 V) 100 MΩ at 25°C
10 MΩ at 300°C

Self heating

Negligible when the E+H iTEMP® transmitters are employed.

Installation

The Omnigrad S TST 264 can be installed on pipes or tanks by means of bar stock thermowells with connections usually threaded or flanged.

The immersion length must take into account all the parameters of the thermometer and thermowell in the process to measure. If the immersion is too low, an error may be generated in the temperature recorded due to the lower temperature of the process fluid near to the walls and heat transfer, which takes place through the sensor stem. The incidence of such an error can be not negligible if there is a big difference between the process temperature and the ambient temperature. To prevent measuring errors of this kind, it is advisable to use small diameter thermowells with an immersion length (U) of at least 100÷150 mm if possible.

In small section ducts the tubing's axis must be reached and preferably slightly exceeded by the tip of the probe (see fig. 2A-2C). Insulation of the outer part of the sensor reduces the effect produced by a low immersion. Alternatively, it is also possible to adopt a tilted installation (see fig. 2B-2D).

For corrosion problems, it is important to carefully select the material of the thermowell; Endress+Hauser supplies a wide range of thermometric wells suitable to all types of applications. Even the nipples and 3 elements coupling supplied with the connection fitting of the instrument are able to withstand a wide range of aggressive substances. For further information on specific applications, contact the E+H Customer Service Department.

Disassembled components of the sensors must be reassembled with the recommended clamping torques in order to ensure the appropriate IP protection class within the sensor-housing coupling.

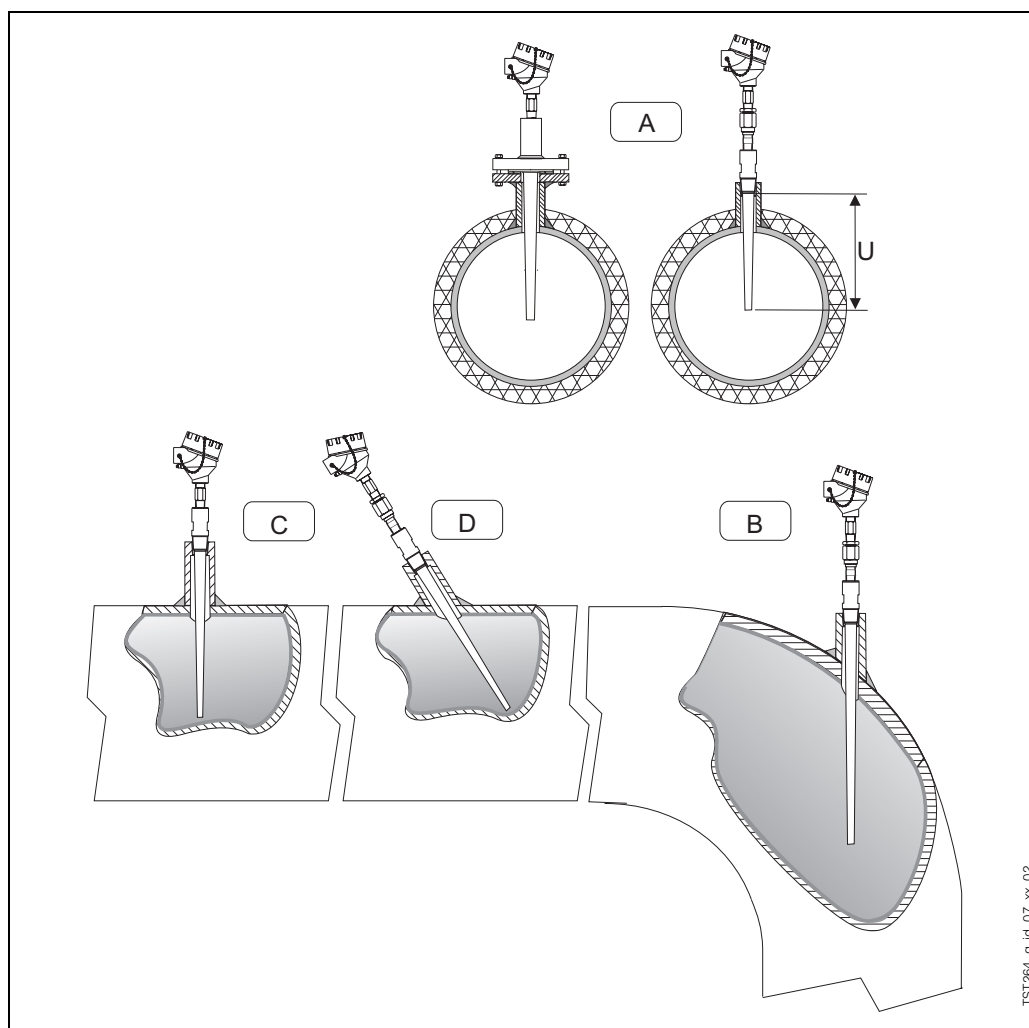


Fig. 2: Installation on pipes and tanks by means of flanged or threaded process connections

System components

Housing

The protection housing, commonly referred to as "connection head", is used to contain and protect the terminal block or the transmitter and to join the electric connections to the mechanical component.

The head used for the TST 264 is compliant with DIN 43729 (form B) and EN 50014/50018 standards (Ex certification for explosion-proof instruments).

The matching of the head with the extension below the head and the cover (threaded) ensures an IP66 class of protection.

The head also has a chain to connect the body to the cover, which facilitates the use of the instrument during the maintenance on systems.

The single or double electrical cable input has M20x1.5, 1/2" NPT or 3/4" NPT threading.

Head transmitter

Available head transmitters include (see also section "Electronics"):

- | | |
|-----------|---------------|
| • TMT 180 | PCP 4...20 mA |
| • TMT 181 | PCP 4...20 mA |
| • TMT 182 | Smart HART® |
| • TMT 184 | PROFIBUS-PA® |

The TMT 180 and TMT 181 are transmitters that can be programmed by means of a PC. TMT 180 is also available in an enhanced accuracy version (0.1°C vs. 0.2°C) with an operating temperature range of -50...250°C.

The TMT 180 can also have a fixed measurement range (the limit values of the range must be specified by the customer in order phase).

The TMT 182 output consists of 4...20 mA and HART® superimposed signals.

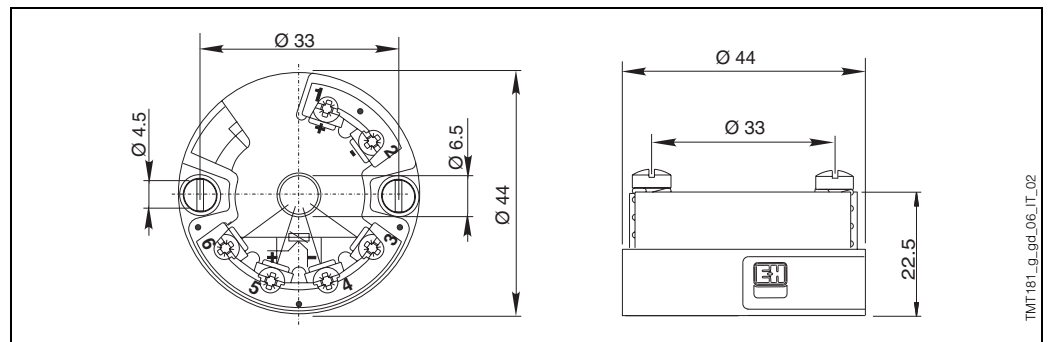


Fig. 3: TMT 180-181-182

In the TMT 184, with a PROFIBUS-PA® output signal, the communication address can be set via software or by means of a mechanical dip-switch (the configuration must be specified by the customer in order phase).

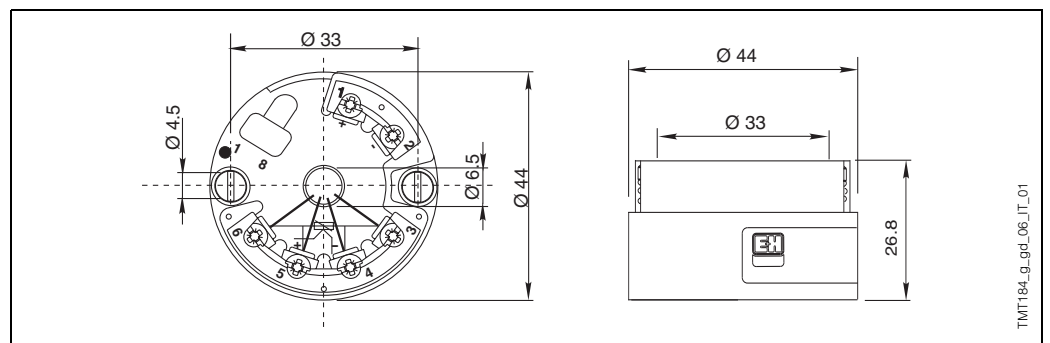


Fig. 4: TMT 184

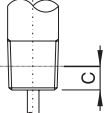


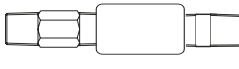
Extension neck

The extension neck is the part between the thermowell and the transmitter housing. To prevent the process temperature from overheating the area of the transmitter, a special extension "neck" is inserted between the sensor, exposed to high temperature processes, and the transmitter. This enables to limit the operating temperature of the transmitter.

It normally consists of hydraulic connections (nipples or joints) that adapt the sensor to the thermowell.

The standard lengths (N) and the versions of the extension neck can be selected among the following options:

- 52 mm (only 1/2" NPT threaded nipple, type L)
- 148 mm (nipple+3 elements coupling+nipple, type LUN)
- 148 mm (nipple+coupling+nipple, type LCN).

Threaded thermowell connections					
Type	Thread	Length N (mm)	C (mm)	Detail	Type of neck
Male	1/2" NPT	52	8	 ConNPT_G_dd_09_XX_01	 L* nckLxx_g_d_15_xx_01
		148			 LUN nckLUN_g_d_15_xx_03
		148			 LCN nckLCN_g_d_15_xx_01



Attention! * This neck is available only for 1/2" NPT threads

"LUN" connections enable to orient the housing of the transmitter.

As illustrated by the chart in figure 5, the length of the sensor + thermowell extension may influence the temperature in the head. It is necessary that this temperature is kept within the limit values defined in the paragraph "Operating conditions".

In addition to the standard versions listed above, it is also possible to order the extension neck by specifying the desired length (see "Sales structure" chart).

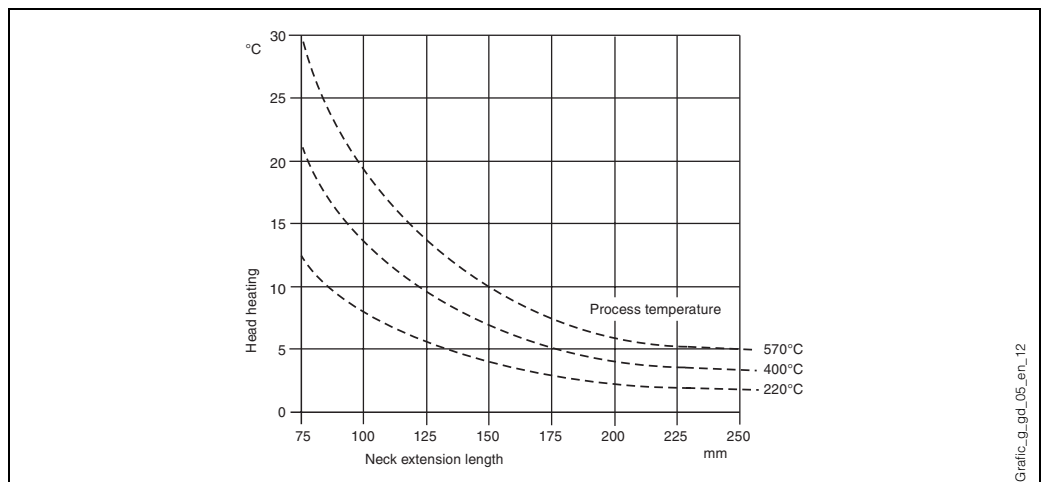


Fig. 5: Heating of the head cause by the process temperature

Probe

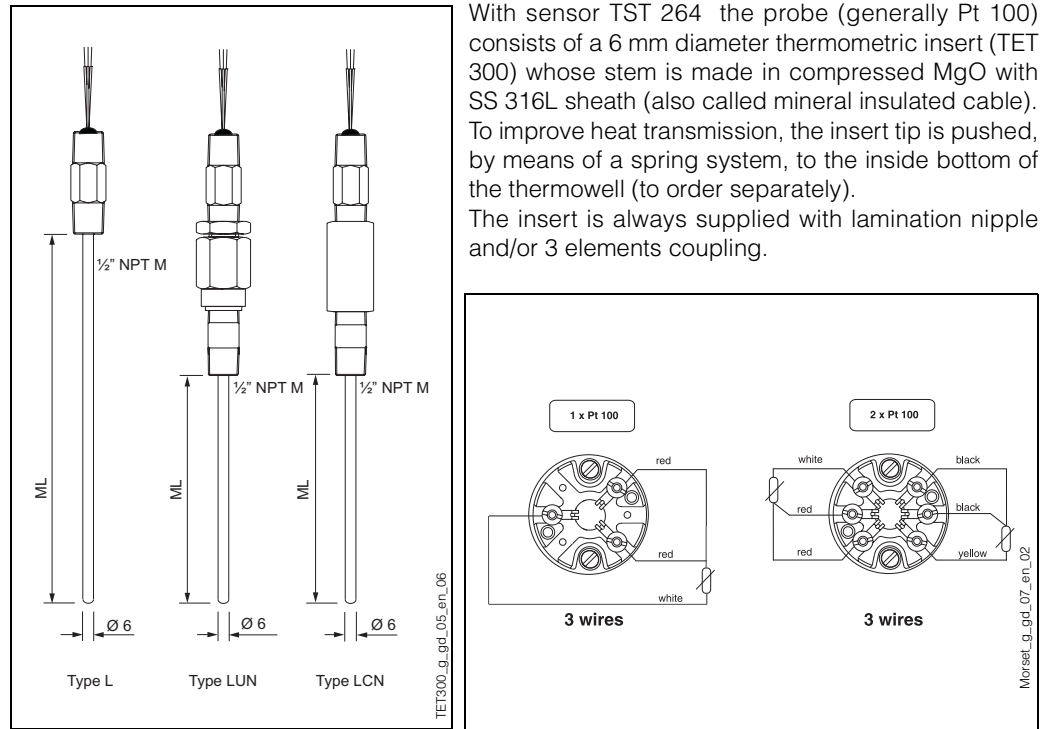


Fig. 6: Probe, dimensions and internal wiring

The length of the sensor can be chosen within a range of 50...4000 mm. Sensors with a length above 4000 mm can also be ordered and supplied after a technical analysis of the application and thermowell in which the sensor will be used. The immersion length (ML) must be calculated according to the total length of the thermowell (A) and the type of thermowell used. Also if spare part inserts are necessary, consult the following table (applicable to standard thickness well bottoms):

Type of thermowell	ML	Type of thermowell	ML	Type of thermowell	ML
TA 550	ML = A - 11	TA 560	ML = A - 11	TA 570	ML = A - 11
TA 555	ML = A - 10	TA 562	ML = A - 11	TA 571	ML = A - 11
TA 557	ML = A - 10	TA 565	ML = A - 11	TA 572	ML = A - 11
		TA 566	ML = A - 11	TA 575	ML = A - 11
				TA 576	ML = A - 10

In the case of thermowells with non-standard bottoms, use the following formula:
 $ML = A - D - 5$
 where D = thickness of bottom.

Certificates & Approvals

Ex approval Certificate CESI 03 ATEX 114, 2 G IIC EEx d T5/T6.

PED approval The Pressure Equipment Directive (97/23/CE) is respected. As paragraph 2.1 of Article 1 is not applicable to this kind of instrument, the marking **CE** is not mandatory for TST 264 models used for generic applications.

Further details

Maintenance The TST 264 does not require specific maintenance.

Delivery time For small orders (5 to 10 units) and standard options, the delivery time is 10 working days.

Ordering information

Sales structure

TST 264		Neck length N, material and type of connection			
	0	52 mm	SS304	Type L	1/2" NPT-M
	3	148 mm	SS304	Type LUN	1/2" NPT-M
	5	148 mm	SS304	Type LCN	1/2" NPT-M
	9	Extension length to be specified			
		Insert length ML (50 to 4000 mm)			
	XX	mm	insert length to be specified		
	YY	mm	special insert length		
		Insert diameter and material			
	3	Diam. 6 mm, SS 316L/1.4404			
		Type of electrical connection			
	1	Flying wires			
	2	Ceramic terminal block			
		Type and class of insert			
	B	1	Pt 100	class B,	3 wires
	H	1	Pt 100	class A,	3 wires
	Y	Type and class to specify			
		Head cable entry			
	A	Head cable entry: single, 1/2" NPT			
	C	Head cable entry: double, 1/2" NPT			
	B	Head cable entry: single, 3/4" NPT			
	D	Head cable entry: double, 3/4" NPT			
	E	Head cable entry: single, M20x1.5			
	F	Head cable entry: double, M20x1.5			
		Built-in head transmitter			
	0	Without built-in head transmitter			
	2	Transmitter with fixed range TMT180-A21, from ...to...°C - Accuracy 0.2K, span limit: -200...650°C			
	3	Transmitter with fixed range TMT180-A22, from ...to...°C - Accuracy 0.1K, span limit: -50...250°C			
	4	Programmable transmitter TMT180-A11, from ...to...°C - Accuracy 0.2K, span limit: -200...650°C			
	5	Programmable transmitter TMT180-A12, from ...to...°C - Accuracy 0.1K, span limit: -50...250°C			
	P	2-wire transmitter PCP TMT181-A, galvanically insulated, adjustable range from ...to... °C			
	R	2-wire transmitter HART® TMT182-A, galvanically insulated, adjustable range from ...to... °C			
	S	2-wire transmitter PROFIBUS-PA®, TMT184-A			
	1	Built-in head transmitter THT1, to be ordered separately			
TST264-					Complete order code

Supplementary documentation

<input type="checkbox"/> General technical information on TST thermometers	TI 088T/02/en
<input type="checkbox"/> General technical information on TA thermowells	TI 138T/02/en
<input type="checkbox"/> Temperature transmitter - iTEMP® Pt TMT 180	TI 088R/09/en
<input type="checkbox"/> Temperature transmitter - iTEMP® PCP TMT 181	TI 070R/09/en
<input type="checkbox"/> Temperature transmitter - iTEMP® HART® TMT 182	TI 078R/09/en
<input type="checkbox"/> Temperature transmitter - iTEMP® PA TMT 184	TI 079R/09/en
<input type="checkbox"/> Insert Pt 100 - Omnigrad TET 300	TI 226T/02/en
<input type="checkbox"/> Safety instructions for use in hazardous areas	XA 007T/02/z1
<input type="checkbox"/> E+H Laboratory Calibration certifications for industrial thermometers. <i>RTD and thermocouples</i>	TI 236T/02/en

Subject to modification

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