

Series AMBtemp, Model TRH 51B

RTD temperature probe

Threaded process connection. With connection head



Application

The model TRH 51B is manufactured with resistance sensor, Pt100, Pt1000 or PTC1000@25°C insulated and encapsulated in a Aisi 316 protective tube.

All process connections are threaded - BSP or NPT, with cooling neck available.

As standard process connection, the TRH 51B can also be supplied with a BSPP, NPT and even metric compression fitting, allowing the user an adjustable in site immersion length.

Are available a wide range of sensor configuration and types, as well temperature connection heads, giving to TRH 51B a huge versatility for a wide industrial branches and environmental conditions.

If requested, can be supplied with temperature transmitter, PC or HART programmable 4...20mA 2 wire technology, according to customer requested range.

Low cost and reliable, ideal for common applications in cement, pulp and paper food and pharmaceutical auxiliary process pipes and tanks, as well in other branches, with process temperature up to +240°C.



Your Advantages



Class A or better



Fully Aisi 316 construction



Up to 240°C



Standard single or double sensor



OEM customization



Informative Signs

	Information	This symbol contains device-oriented information which does not result in personal injury.
	Checking	This symbol contains procedures and other facts to get the most of the device and which do not result in personal injury.
	Caution	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in damaged device and which do not result in personal injury.
	Warning	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	Danger	This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

Product Overview

The AMBItemp TRH 51B is a RTD temperature probe with thread process connection and connection head with sensor installed at the bottom of a protective tube. Inside the connection head or housing is installed the ceramic block and/or the transmitter. The sensor is PFA wired, epoxy sealed and depending on sensor configuration and stem diameter is compacted by mineral powder. This model has no replaceable measuring insert.

The measurement principle of an RTD (Resistance Temperature Detector) consists of the sensor element with an electrical resistance that varies with temperature. In the case of the Pt100 sensor, it has a resistance of 100 Ω at 0°C, increasing this value with increasing temperature, due to the characteristic of the platinum coefficient used in this type of sensor. Extremely linear, it makes temperature probes based on this measurement principle the most used in the industry, by complying with IEC 60751 with a coefficient $\alpha = 3.85 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, calculated between 0 and 100°C.

The sensor element is available in two versions, Thin-film (TF) or ceramic (Wire Wound), the second with a wider measurement range, greater long-term stability and better accuracy.

If there are vibrations, the Thin-film (TF) sensor can offer advantages, but its behaviour depends on the intensity, direction and frequency of the main harmonic of the vibration. This type of sensor also presents a faster response time when assembled in a similar way to the ceramic sensor.

The most used configurations are for single elements with 2, 3 and 4 wires and with redundancy, double elements with 4 and 6 wires. The 4-wire configuration guarantees the best accuracy, due to impedance full compensation introduced by the signal transmission cables, or even by the connections within an extended length immersion sheath, which in the case of the configuration single to two wires or double to 4 wires adds to the resistive value of the Pt100, contributing to the loss of accuracy. In single 3-wire or double 6-wire configurations, the associated error is practically null.

For the range of -200°C to 0°C we have: For the range of 0°C to 850°C we have:

$$R_t = R_0[1 + At + Bt^2 + C(t - 100^\circ\text{C}) t^3] \quad R_t = R_0(1 + At + Bt^2)$$

where:

R_t is the resistance to a temperature t ; R_0 is resistance with $t = 0^\circ\text{C}$

The constants in these equations are:

$$A = 3.9083 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1} \quad B = -5.775 \cdot 10^{-7} \text{ }^\circ\text{C}^{-2} \quad C = -4.183 \cdot 10^{-12} \text{ }^\circ\text{C}^{-4}$$

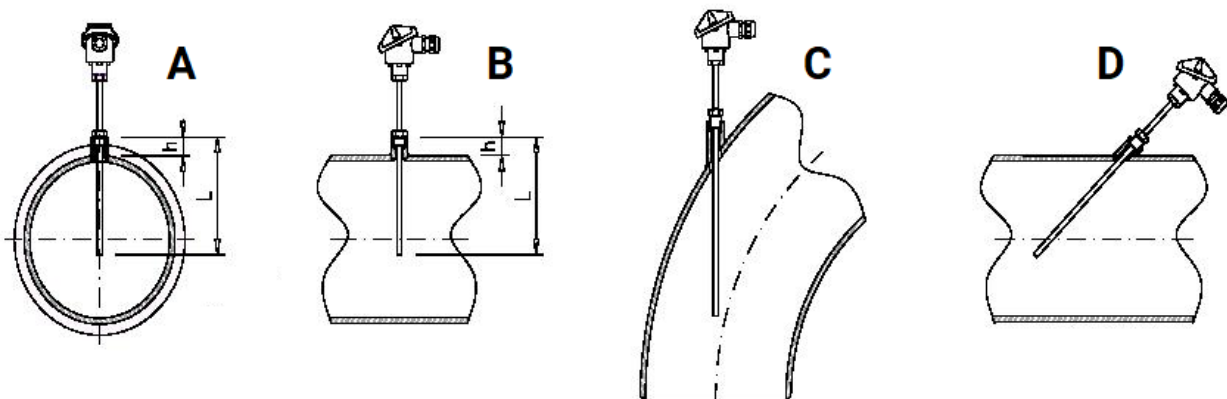


Installation

The thermometers AMBItemp TRH 51B are suitable for pipes, tanks or other parts of the process if required. The immersion length has big influence in the instrument accuracy. If the immersion length is small, an additional error may occur and might not be negligible, if there is a big difference between process temperature and ambient temperature. The temperature dissipation happens between process connection and immersed length.

To minimize this error is recommendable as a rule of thumb, the immersion length should be at least 10 times the thermowell diameter. Considering the AMBItemp probes, the sensor element is installed in 5-10 mm at end of the tip. According that is recommendable to select an immersion length of 100 mm for a temperature thermowell of 6 mm. If this is not possible, should be selected a diameter or immersion length to comply with the rule.

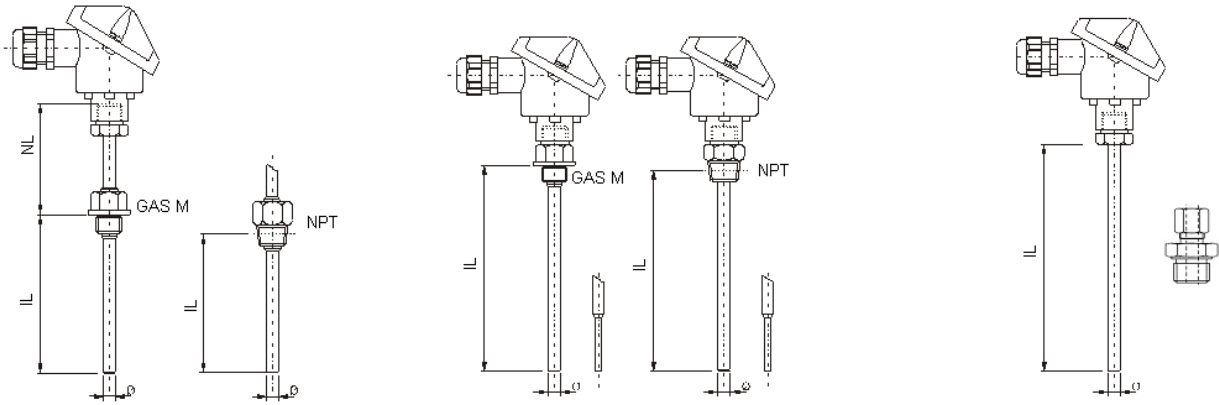
If possible, the immersion length must be slightly greater than pipe radius (see fig. A and B). In the other side, an appropriate thermal insulation can compensate a reduced immersion length or simply mount the assembly on a pipe curve (see fig. C). Other possibility to grant a correct measurement is the assembly mounting with appropriate angle (see fig. D). Be advised if the assembly is to be mounted according fig. C or fig. D, the assembly should be installed against fluid flow.



	This product is not intended to be used in oxygen service or in classified zones under ATEX directive.
	This device is intended to be installed in pipes and tanks with moderate or non-corrosive fluids. If is not the case, we recommend also the use of a thermowell of our BPtemp series.
	Please note ambient temperature cannot be greater than measuring insert sealing.
	If the measuring fluid has a low temperature and the environment contains high relative humidity, please consider the use of a polypropylene or polyamide connection head.
	Make sure the probe has the correct immersion length when used in conjunction with a thermowell.
	Please pay attention to measuring point if you are measuring a two phased fluid.



Generic Configuration



Left: Device with cooling neck and welded thread

Middle: Device without cooling neck, welded process thread at temperature head

Right: Device with adjustable immersion length by compression fitting



The reduced tip is not available for stem diameters less than 4mm.



Double sensors are not available for stem diameters less than 4mm.




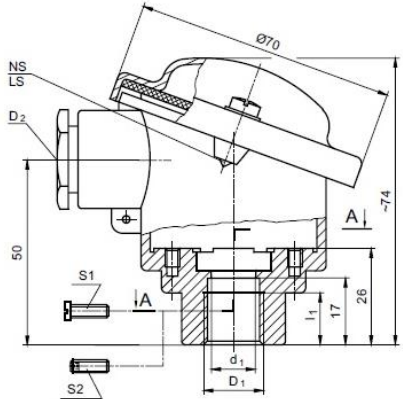

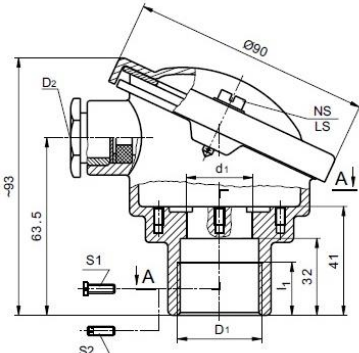

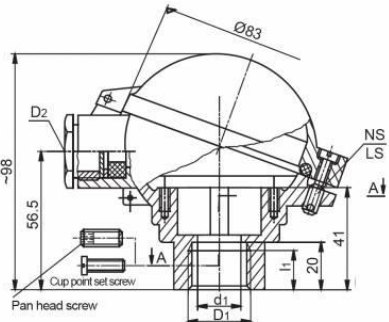

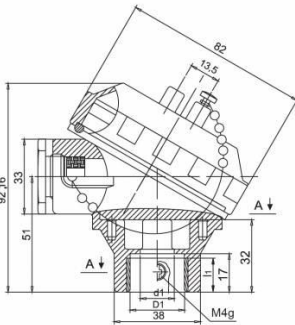
The temperature heads are not orientable. Do not attempt to remove from process the temperature by turning the temperature head.


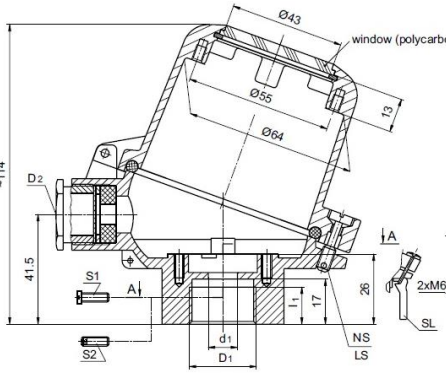

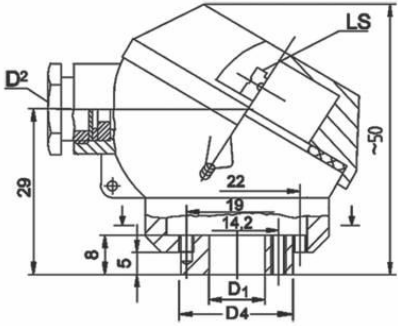

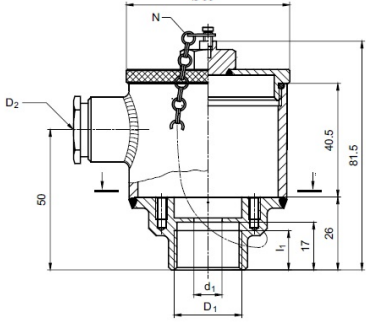

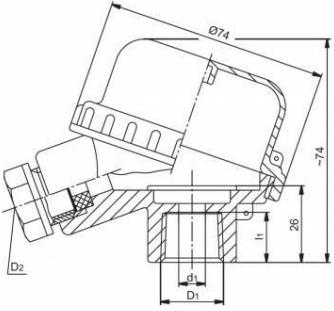

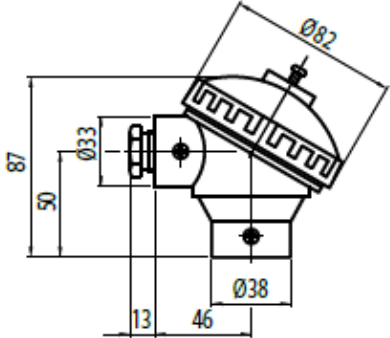
Connection Heads/Housings

These housings allow accommodate and connect up to two temperature transmitters or ceramic blocks, or one of each type. Are available in different materials and are standard with one cable entry M20x1.5. If you require a different cable entry an/cable gland, please contact us.



A temperature transmitter is required if the housing has a display, because it is powered by current loop.

		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN B Ingress Protection: IP65 Process Entry: ½" G Process Entry: Bore 15.3 mm Cable Entry: M20x1.5 Local Display: No Type: AB1</p> <p>Order Code Option B1 (½" G) F0 (Bore 15.3 mm)</p>
		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN A Ingress Protection: IP65 Process Entry: ½" G Cable Entry: M20x1.5 Local Display: No Type: AA1</p> <p>Order Code Option A1</p>
		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN B Ingress Protection: IP65 Process Entry: ½" G Cable Entry: M20x1.5 Local Display: No Type: AL2</p> <p>Order Code Option L2</p>
		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN B Ingress Protection: IP65 Process Entry: ½" G Cable Entry: M20x1.5 Local Display: No Type: AT1</p> <p>Order Code Option T1</p>

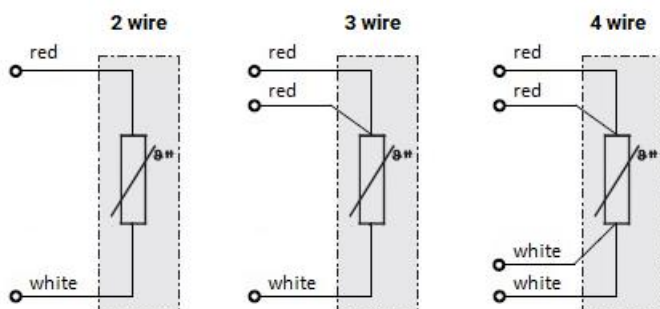
		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN D Ingress Protection: IP65 Process Entry: ½" G Cable Entry: M20x1.5 Local Display: Available, at top cover Type: AD2</p> <p>Order Code Option D2 (without display) D3 (with display)</p>
		<p>Material: Aluminium, Epoxy coated Approval: Non-hazardous area Form: DIN M Ingress Protection: IP65 Process Entry: ¼" G Cable Entry: M16x1.5 Local Display: No Type: AM1</p> <p>Order Code Option M1</p>
		<p>Material: AISI 316L Approval: Non-hazardous area Form: DIN B Ingress Protection: IP65 Process Entry: ½" G Cable Entry: 1 x M20x1.5 Local Display: No Type: SB1</p> <p>Order Code Option B4</p>
		<p>Material: Polyamide Approval: Non-hazardous area Form: DIN B Ingress Protection: IP66 Process Entry: M24x1.5 Cable Entry: 1 x M20x1.5 Local Display: No Type: PB2</p> <p>Order Code Option B5</p>
		<p>Material: Polypropylene Approval: Non-hazardous area, FDA Form: DIN B Ingress Protection: IP66 Process Entry: ½" G Cable Entry: 1 x M20x1.5 Local Display: No Type: PB1</p> <p>Order Code Option B6</p>



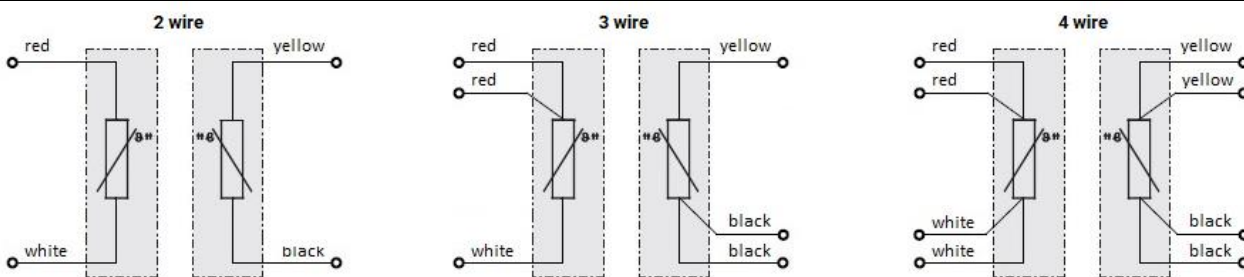
Wirings

The AMBltemp TRH 51B is available with 1 single Pt100/Pt1000 or double Pt100 sensor or with 2 single Pt100/Pt1000 sensors. The PTC versions are only available with single sensor 2-wire.

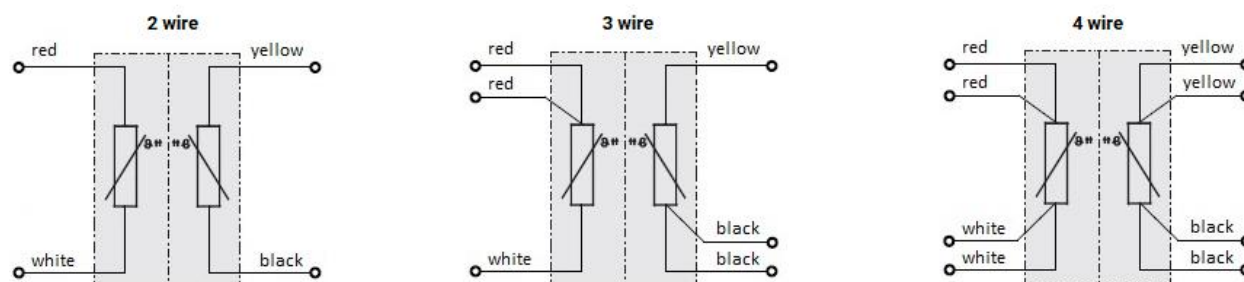
Single Sensor Pt100/Pt1000/PTC1000-2W



2x Single Sensors Pt100/Pt1000



Double Sensor Pt100



Are available different temperature transmitters, with 4-20mA analogue output or with digital communication. Please refer to specific product datasheet to check wiring configurations.



With temperature transmitter assembled, make sure power supply is switched off during wiring procedures.



This device assembled with PTC/KTY81 is sensitive to Electro Static Discharge (ESD).



With temperature transmitter assembled, make sure power supply is according to specification on device label.



Check if connection cable is according device connector requirements.



For protective tubes of 6mm and over the version with two Pt100 sensors are available.

	Technical Data
---	-----------------------

Device				
Application	Temperature measurement			
Principle	Resistance			
Types	Pt100, Pt1000; PTC1000@25°C			
Accuracy	Class A IEC60751; Class AA on demand (RTD's only)			
Configuration	Single or double; 2, 3 and 4 wires			
Operating temperature	Pt100 and Pt1000	Absolute Min	-196°C	
		Absolute Max	240°C	
	PTC1000	Absolute Min	-55°C	
		Absolute Max	150°C	
Electrical Specifications				
Output signal	Resistance	18,49...190,45 (390,26) Ω		
	PTC KTY81/110	490 (475) ...2211 (2277) Ω		
	4-20 mA	Loop power 2 wires		
	4-20mA HART	Loop power 2 wires		
Temperature Transmitter	Mounting	Housings with Ø 33mm fixing 2 x M4 threads		
	Power supply	12 to 30 Vdc		
	Input	Pt100, Pt1000		
	Minimum span	25 K		
	Load [RL]	$RL \leq (UB - 8V) / 0.025 A$		
	Galvanic insulation	Min 500 VAC		
Sensor insulation Resistance	>100 MΩ/250 Vdc @room temp. or according to IEC 60751, whichever is greater			
Mechanical Characteristics				
Materials	Wetted parts	Aisi 316(L)		
	Cooling/extension neck	Aisi 316(L)		
	Connection head/Housing	Aluminium, polypropylene, polyamide, Aisi 316L		
	Ceramic terminal block	Types A and M	Steatite C 220	
		Type B	45% Al2O3	
	Cable entry washer / Cable gland (optional)	Zinc-plated press steel seal oil resistant rubber (-40...100°C) / Polyamide; nickel plated brass HT up to 200°C		
Protective Tube Dimensions	Length	30 to 2000 mm, customized; over 2000 mm on request		
	Diameter	From 3 mm to 12 mm		
	RTD Wall thickness	OD 3 mm	0.25 mm	
		OD 4 mm	Min 0.35 mm	
		OD > 4 mm	Min 1.0 mm	
	PTC Wall thickness	OD 6 mm	0.5 mm	
OD > 6 mm		Min 1.0 mm		
Terminal Block	Number of poles	2 to 8 poles		
	Type of pole	Post type, screwed, nickel plated brass		
Environmental Conditions				
Storage temperature	-30 to 80°C			
Relative humidity	0 to 95 %RH, non-condensing			
Calibration units	°C, °F, K			
Weight	Depending on material, diameter and length + block/transmitter			
Protection class (complying with EN 60529)	Refer to assembly housing			
Approvals, Certifications	RoHS 2, CE			

 **Tolerance Classes**

The validity temperature ranges of the tolerance classes are classified in the following table. These tolerances apply to RTD thermometers, according to IEC60751 and for any value of R_0 .

Tolerance Class	Validity Temperature Range [°C]		Tolerance Values 1) [°C]
	Ceramic Sensors WW (Wire Wound)	TF (Thin-Film)	
AA	-50 to +250	0 to +150	$\pm(0.10 + 0.0017 t)$
A	-100 to +450	-30 to +300	$\pm(0.15 + 0.0020 t)$
B	-196 to +600	-50 to +500	$\pm(0.30 + 0.0050 t)$
C	-196 to +600	-50 to +600	$\pm(0.60 + 0.0100 t)$

1) |t| Temperature modulus in °C.

 **Additional Information**

Maintenance

The RTD probes of AMBItemp series do not require a specific maintenance. The only recommendation is to check periodically the sensor integrity and perform an annual recalibration.

Factory Calibration Protocol

This factory quality protocol is supplied with every unit. This acts as an inspection report that shows compliance with DIN/EN 60751 essential points. One measurement point is issued for the effect.

Factory Calibration Certificate

The factory calibration certificate must be ordered with the device. The measurement points according to customer specifications and inside device operating temperature range.

Accessories

As accessories or spare parts, we have available cable glands, ceramic terminal blocks and PC programming temperature transmitters and interface kit with software.

Delivery Time

For small quantities, less than 10 pieces with basic options, the delivery times are likely 4 to 5 working days or express manufacturing (48h) with feasibility according configuration and required quantities.



How to Order

Sign		Instruction
Tick	✓	Single option selection field necessary
Double tick	✓✓	Multiple option selection field available
Added extra	⊕	Not mandatory selection field

Order Code		Description
TRH 51B-		Temperature Probe Series AMBtemp Model TRH 51B
010	✓	Type of RTD Sensor, Class, Wiring
A2		1xPt100 single/WW, Cl. A IEC60751, 3 wires
A3		1xPt100 single/TF, Cl. A IEC60751, 3 wires
B3		1xPt100 single/TF, Cl. A IEC60751, 4 wires
C1		1xPt100 double/WW, Cl. A IEC60751, 2x2 wires
C2		1xPt100 double/WW, Cl. A IEC60751, 2x3 wires
D2		2xPt100 single/TF, Cl. A IEC60751, 2x3 wires
D3		2xPt100 single/TF, Cl. A IEC60751, 2x4 wires
K3		1xPt100 single/TF, Cl. A IEC60751, 2 wires
L3		1xPt100 single/TF, Cl. A IEC60751, 3 wires, for cryogenic applications
L4		1xPt100 single/TF, Cl. A IEC60751, 4 wires, for cryogenic applications
M2		1xPt1000 single/TF, Cl. A IEC60751, 2 wires
P2		1xPTC 1000@25 °C, 2 wires, -55... 150 °C
Y9		Special version on request
020	✓	Shape of the Tip
S		Straight, standard response
R		Swagged tip, length with 30 mm
D		Swagged tip, length with 50 mm
Y		Special version on request
030	✓	Neck Length NL
0		Without
1		75 mm
2		100 mm
3		120 mm
4		150 mm
X		Customized length
9		Special version on request
040	✓	Process Immersion Length IL
1		50 mm
2		100 mm
3		150 mm
4		200 mm
5		250 mm
6		300 mm
7		350 mm
8		400 mm
X		Customized length
9		Special version on request



How to Order (continuation)







050	✓	Protective Tube Diameter and Material
F3		3 mm, Aisi 316
F4		4 mm, Aisi 316
F6		6 mm, Aisi 316
F8		8 mm, Aisi 316
F0		9 mm, Aisi 316
FA		10 mm, Aisi 316
FC		12 mm, Aisi 316
Not all options are listed here. Please contact us know current production plan for this device		
060	✓	Process Connection
00		Without process connection
A1		Welded G 1/2", SS316L
A2		Welded G 3/4", SS316L
A3		Welded G 1", SS316L
A4		Welded 1/2" NPT, SS316L
A5		Welded 3/4" NPT, SS316L
A6		Welded 1" NPT, SS316L
B1		Compression fitting G 1/2" SS316
B2		Compression fitting NPT 1/2" in SS316
B3		Compression fitting G 1/4" SS316
B4		Compression fitting NPT 1/4" in SS316
B5		Compression fitting G 1/8" SS316
B6		Compression fitting NPT 1/8" in SS316
Y9		Special version on request
Not all options are listed here. Please contact us know current production plan for this device		
070	✓	Connection Head; Cable Entry
A1		Aluminium head DIN form A, IP65, cable entry M20x1.5
B1		Aluminium head form DIN B, IP65, cable entry M20x1.5
B4		SS316L head form DIN B, IP66, cable entry M20x1.5
B5		Polyamide head form DIN B, IP66, cable entry M20x1.5
B6		Polypropylene, FDA approval, head form DIN B, IP66, cable entry M20x1.5
D2		Aluminium head form DIN B high lid, to fit both terminal block and temperature transmitter, IP65, cable entry M20x1.5
D3		Aluminium head form DIN B high lid, with LED display, cable entry M20x1.5
M1		Aluminium head form mignon, cable entry M16x1.5
T1		Aluminium head form DIN B threaded cover and chain, max. IP68, cable entry M20x1.5
Y9		Special version on request
Not all options are listed here. Please contact us know current production plan for this device		
080	✓	Terminal Block
S		Not included, free end wires to temperature connection
A		Terminal block DIN form A (max. 4 poles)
B		Terminal block DIN form B (max. 6 poles)
M		Terminal block DIN Mignon type (max. 4 poles)
Y		Special version on request

	How to Order (continuation)
---	------------------------------------



090	✓	Temperature Transmitter
A0		Not selected
W5		Universal input, output 4-20mA
W9		2x Universal input, output 2x 4-20mA
S2		Universal input, output 4-20mA HART
Y9		Special version on request
⊕ 100	✓	Electrical Accessory Mounted
16N		Cable gland skintop M16x1.5, polyamide IP67
20B		Cable gland skintop M20x1.5, blue polyamide IP68
20N		Cable gland skintop M20x1.5, polyamide IP67
2ST		Cable gland M20S16 M20x1.5 HT (200°C), nickel plated brass, IP66
M12		M12 Connector 4 poles, Steel, IP67
99Y		Special version on request
⊕ 110	✓	Label and Product Documentation Language
EN		English
FR		French
PT		Portuguese

Selection Example	
Temperature probe with class A sensor, 3-wire configuration with 215 mm of immersion length, stem of 6mm; adjustable fitting of G ½", aluminium head with temperature transmitter configured for range 0...150C/4-20mA	
Order code	TRH 51B-A3S0XF6B1B1SW5+20NEN/215 mm/0...150°C/4-20mA

	Contact
---	----------------

	Parque Empresarial Baía do Tejo, Rua 48 N°11 Apartado 5056 2830-571 Barreiro, Portugal		+351 212 070 802 +351 212 070 803 +351 210 900 148
	38.663817, -9.066176		+351 212 070 804
	www.deltasensor.pt		commercial@deltasensor.pt

Subject to modification. All rights reserved to Delta Sensor, Lda

 Antes de imprimir este documento pense bem se é mesmo necessário fazê-lo: O meio ambiente é de todos.
 Please consider the environment before printing this document.