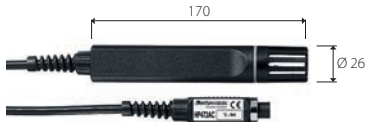
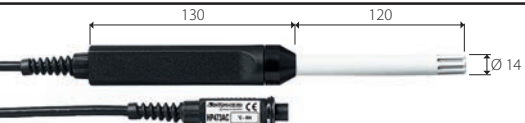
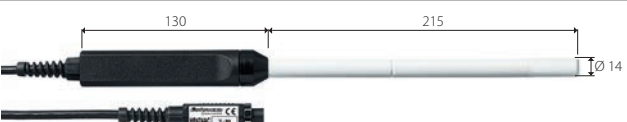

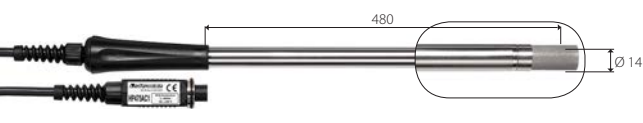
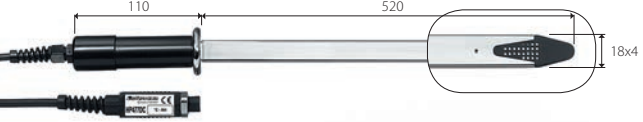



COMBINED DEW POINT AND TEMPERATURE PROBES WITH SICRAM MDOULE

CODE	SENSORS	RANGE RH - TEMP	DIMENSIONS
HP472ACR	RH Pt100	0...100% RH -20 °C...+80 °C	
HP473ACR			
HP474ACR		0...100% RH -40 °C...+150 °C	
HP475ACR			
HP475AC1R			
HP477DCR			
HP478ACR		0...100% RH -40 °C...+150 °C	
HP480 / HP481	Pt100	0...100%RH -40...+60 °C	For the technical specifications of these probes please see page 12-13

PROBES COMMON CHARACTERISTICS

Relative humidity

Sensor	Capacitive
Temperature drift @ 20 °C	Max 0.02%RH/°C
Response time %RH at constant temperature	10 sec (10÷80%RH; air speed=2m/s) at constant temperature








Temperature with sensor Pt100

Temperature drift @20 °C	0.003%/°C
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Accuracy

%RH	±1.5% RH (0...90%RH) ±2.0% RH (90...100%) @ T=15...35°C ±(1.5 + 1.5% of the displayed value)% RH in the remaining temperature range
Temperature	± 0.3°C

PROBES PROTECTION

	P1	P2	P3	P4	P6	P7	P8
Operating Temperature	-40...80 °C	-40...80 °C	-40...150 °C.	-40...80 °C	-40...180 °C	-40...150 °C	-40...120 °C
Material	Technopolymer and 34µm stainless steel grid protection	Technopolymer and 20µm sintered PE protection	20µm sintered bronze protection	20µm sintered PE protection	10µm sintered stainless steel protection	20µm PTFE protection	PBT and 10µm stainless steel grid protection
View							
Technical Spec.	suitable for probes Ø 26 - thread M 24x1,5				suitable for probes Ø 14 - thread M 12x1		

HP480, HP481



HP480, HP481 - PROBES FOR TEMPERATURE, RELATIVE HUMIDITY AND DEW POINT MEASUREMENT IN PIPES.

Compressed air is used for several purposes, many of which require compressed air with a low humidity level, and so comes the need to know the dew point (DP) of water vapour in the compressed air that circulates in the system. The **HP480** and **HP481** probes are designed specifically for this purpose.

The use of dew point measurement in order to limit moisture in compressed air distribution systems has many advantages:

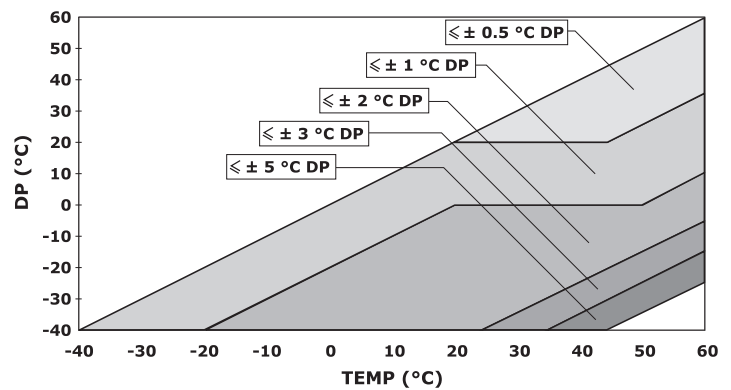
- prevents corrosion of metal pipes;
- in cold areas, prevents the formation of ice inside the pipes leading to obstruction of the pipes themselves;
- prevents bacterial growth in plants for medical use
- reduces maintenance costs of pneumatic drives, maintaining the proper lubrication of moving parts;
- improves the quality of products coming into contact with air, for example in the drying process of granulates.

Typical installation HP480

The probe can be installed in any position. The connection to the compressed air can be achieved with a threaded connection or with a quick connection.

The connection allows for quick installation and removal of the probe without stopping the system. There are 3 different couplings supplied: 1/4" Italian, German and American standard.

The probe is equipped with a filter made of sintered steel, stainless steel measuring chamber and control valve of the air flow. Suitable for measurement of compressed air with dew point up to class 3 according to standard ISO8573-1.



Graph 1: accuracy of the dew point measurement (DP)

Typical installation HP481

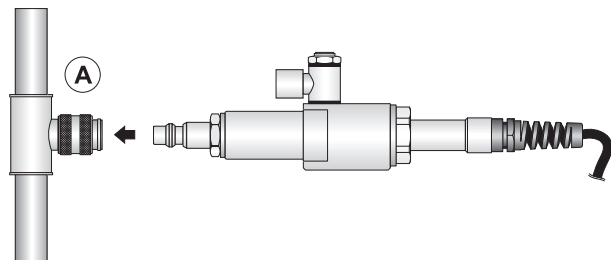
HP481 is a combined relative humidity and temperature probe suitable for in-line installation. The probe can be used in pressurized pipes, or in which vacuum is required. It is equipped with a G 1/2" threading for the connection to the system and can be installed in any position. The probe is equipped with a sintered steel filter.

Connections

The probes can be connected to the pipe in three ways:

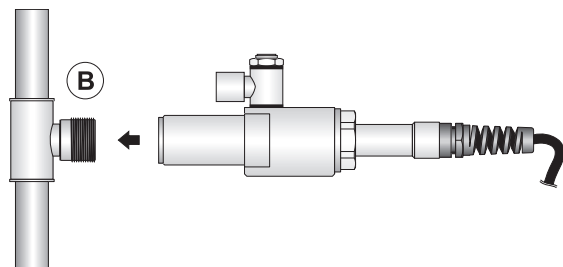
- by using the measuring chamber with a quick coupling (only HP480);
- by using the measuring chamber with a threaded G 1/4" connection (only HP480);
- directly (without measuring chamber) with a threaded G 1/2" connection.

Connection with measuring chamber and quick coupling:



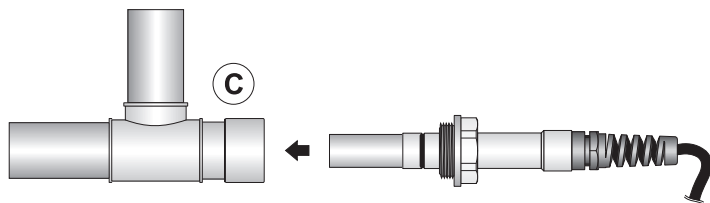
To connect with quick coupling, you can use one of the standard 1/4" couplings provided. Other couplings than those supplied can be used, provided that they have a G 1/4" thread on the side that fits into the probe.

Connection with measuring chamber and threaded connection:



For the connection by threaded coupling, the connection must have an external G 1/4" thread on the side which will be placed in the probe. The connection must be airtight. When installing or removing the probe, it is necessary to depressurize the system.

Direct connection (without measuring chamber) only for HP481 and threaded connection:



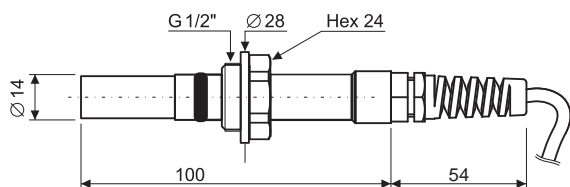
For direct connection of the probe, use a fitting with internal G 1/2" thread on the side which will be placed in the probe. The connection must be airtight. When installing or removing the model HP480, it is necessary to depressurize the system. Ensure that the probe does not obstruct the normal flow of air through the distribution line.

In all modes of installation, it is recommended that you place in the plant, upstream of the sensor, a safety valve to be closed manually in case of maintenance of the probe.

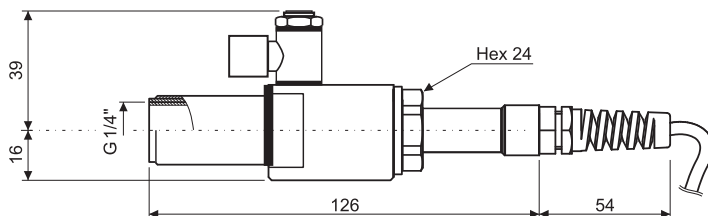
Periodically check the cleanliness of the sintered filter of the probe, in order to maintain optimum response characteristics of the probe. The filter can be washed with a detergent that leaves no traces.

DIMENSIONS

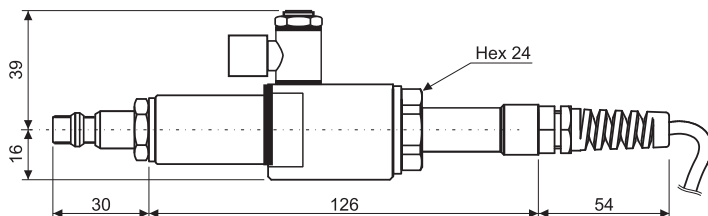
Dimensions (mm) of the probe without measuring chamber:



Dimensions (mm) of the probe with measuring chamber, without quick coupling (only HP480):



Dimensions (mm) of the probe with measuring chamber and quick coupling (only HP480):



ORDERING CODES

HP480: Interchangeable temperature and relative humidity probe, complete with SICRAM module. Connection cable 2m. Equipped with 15µ sintered AISI 316 stainless steel filter, measuring chamber, air flow regulation valve, and three 1/4" quick couplings (standard Italian, German, and American).

HP481: Interchangeable temperature and relative humidity combined probe, complete with SICRAM module. Connection cable 2 m. Equipped with 15µ sintered AISI 316 stainless steel filter, G 1/2" threading.

Technical specifications	HP480	HP481
Relative humidity		
Sensor	capacitive	
Measuring range	0...100%RH	
Accuracy (@ T = 15...35 °C)	± 1,5%RH (0..90%RH), ± 2%RH (remaining field)	
Accuracy (@ T = -40...+60 °C)	± (1,5 + 1,5% of the measured value)%RH	
Long term stability	< 1%RH/year	
Temperature		
Sensor	Pt100	
Measuring range	-40...+60 °C	
Accuracy	± 0,25 °C	
Dew point		
Sensor	Parameter calculated from the measurement of temperature and relative humidity	
Measuring range	-40...+60 °C DP	
Accuracy (@ T = 20 °C)	± 2 °C DP (-40...0 °C DP) ± 1 °C DP (0...+20 °C DP)	
Accuracy (@ T = -40...+60 °C)	see graph 1	
General features		
Connection	G ½" or G ¼" or quick coupling	G ½"
Regulation of the air flow	From 0,2 to 3 l/min	
Cable length	2m	2m (other lenghts on request)
Filter	Sintered 15µ AISI 316 steel	
Material of the measuring chamber	AISI 304 stainless steel	
Operating temperature of the probe	-40...+80 °C	
Operating pressure of the probe	0...16 bar	-1...16 bar
Protection degreee	IP65	
Compatibility with ethylene oxide (C2H4O)	The maximum allowed concentration in continuous operation which causes a deviation within 2% is 3 ppm	

TEMPERATURE PROBES – RESISTANCE THERMOMETERS

Delta OHM offers a wide choice of Platinum resistance thermometers with resistance equal to 100 Ω at 0 °C and temperature coefficient α as defined by the IEC 60751 standard: Pt100, $R_0=100\ \Omega$, $\alpha= 3.851 \cdot 10^{-3}\ ^\circ\text{C}^{-1}$.

For particular applications, probes with Pt1000 sensor or with a thermistor sensor are available. The response time $\tau_{0.63}$ indicated for each probe is the response time of the sensor to a temperature variation, with a variation of the measured signal corresponding to the 63% of the total variation. The response times are referred:

- in water at 100 °C for immersion probes;
- to the contact with a metal surface at 200 °C for surface probes;
- to an air temperature of 100 °C for air probes.

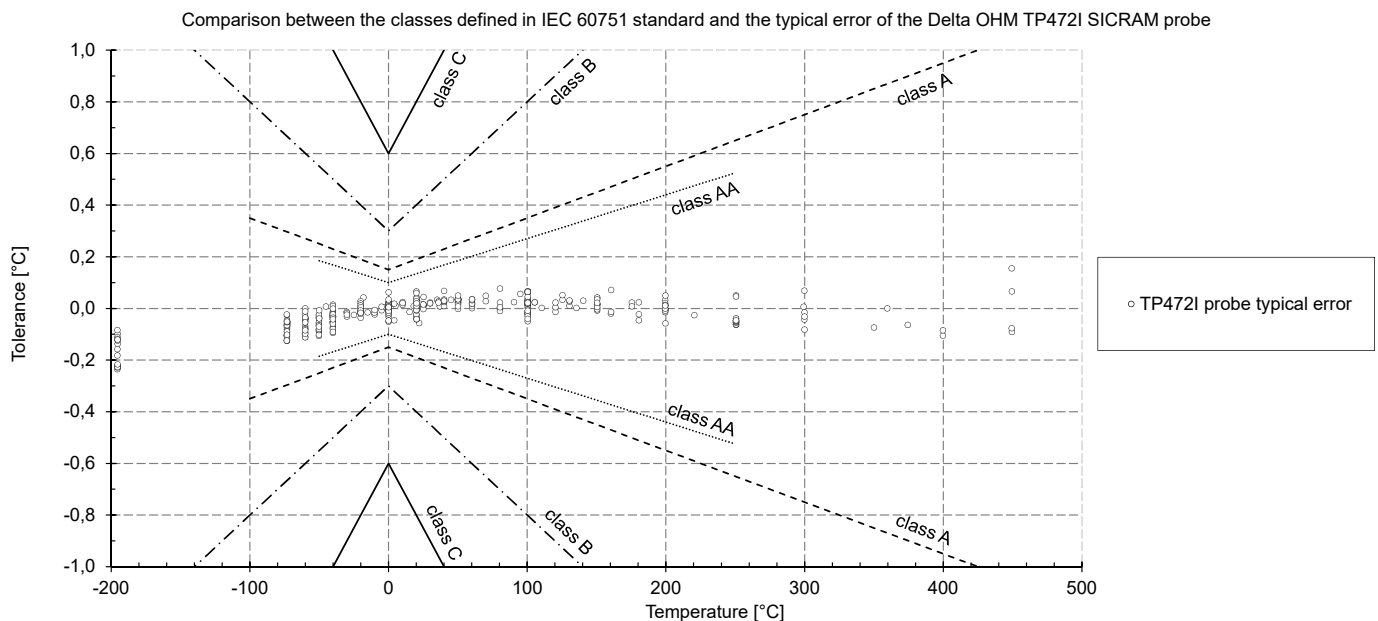
The IEC 60751:2008 standard defines the tolerance classes of the resistance thermometers as summarized in the following table:

Tolerance class	Temperature Range		Tolerance [°C]
	WIRE WOUND sensor	THIN FILM sensor	
classe AA (1/3 DIN)	from -50 °C to 250 °C	from 0 °C to 150 °C	$\pm(0.1+0.0017 \cdot t)$
classe A	from -100 °C to 450 °C	from -30 °C to 300 °C	$\pm(0.15+0.002 \cdot t)$
classe B	from -196 °C to 600 °C	from -50 °C to 500 °C	$\pm(0.3+0.005 \cdot t)$
classe C	from -196 °C to 600 °C	from -50 °C to 600 °C	$\pm(0.6+0.01 \cdot t)$

On request, the probes can be assembled with a compatible connector chosen from TP471 and TP47.

The TP471 connector developed by Delta OHM contains an electronic module (SICRAM) that allows the probe error to be adjusted. During the Quality Control, the probes provided with this module are individually checked in our laboratories, linearizing the characteristic and allowing more stringent accuracy over the entire working range.

The following graph shows the Delta OHM SICRAM module probe TP472I typical error values obtained from the calibrations performed in our ISO17025 calibration laboratory. The graph highlights the effectiveness of the linearization performed on the probes.



Tolerance as a function of temperature. The temperature range refers to the platinum wire wound probes.

Tolerance [°C]	Temperature [°C]										
	-196	-100	-50	0	100	250	300	350	450	500	600
class AA	---	± 0.27	± 0.19	± 0.10	± 0.27	± 0.53	± 0.61	± 0.70	---	---	---
class A	---	± 0.35	± 0.25	± 0.15	± 0.35	± 0.65	± 0.75	± 0.85	± 1.05	---	---
class B	± 1.28	± 0.80	± 0.55	± 0.30	± 0.80	± 1.55	± 1.80	± 2.05	± 2.55	± 2.80	± 3.30
class C	± 2.56	± 1.60	± 1.10	± 0.60	± 1.60	± 3.10	± 3.60	± 4.10	± 5.10	± 5.60	± 6.60
accuracy TP472I	± 0.30	± 0.30	± 0.20	± 0.10	± 0.20	± 0.20	± 0.30	± 0.30	± 0.30	± 0.30	---

By means of the calibration, the purchased instrument can be metrologically characterized, determining the systematic error of the thermometer and ensuring at the same time the traceability to international standards. Delta OHM Laboratories are able to provide this service by issuing calibration reports according to ISO 9001 or ACCREDIA LAT certificates in compliance with ISO/IEC 17025 standard, recognized internationally through ILAC MRA agreements.

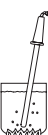


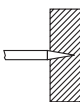





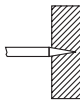



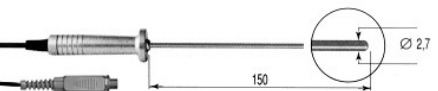
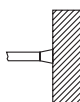

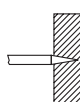
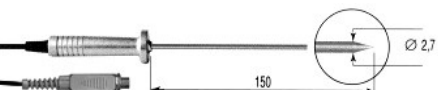

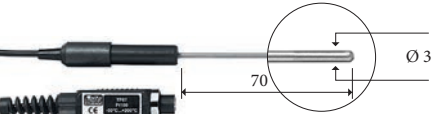


LAT N° 124

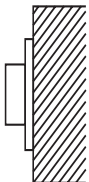
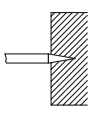
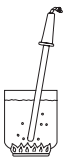

Temperature - Humidity - Pressure - Air speed
Photometry/Radiometry - Acoustics

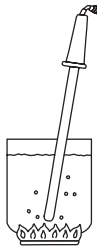
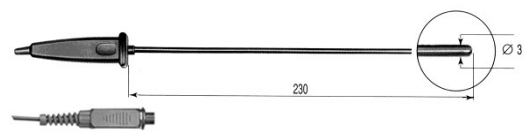
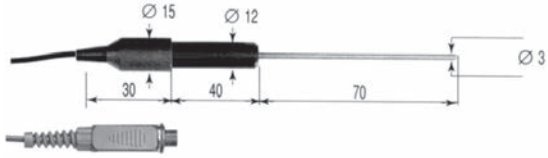



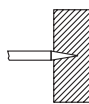
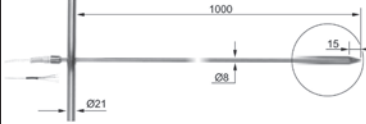
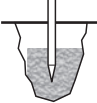
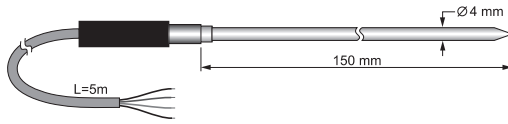
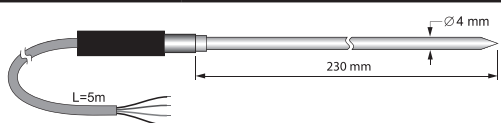
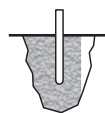
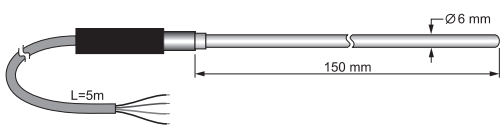
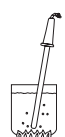
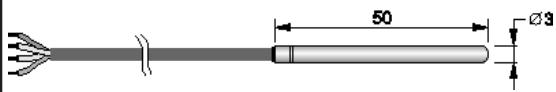


Pt100 PROBES WITH TP471 SICRAM MODULE


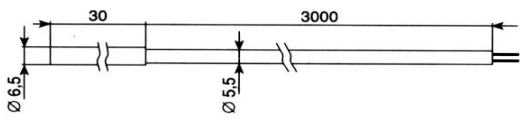

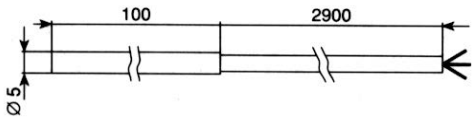
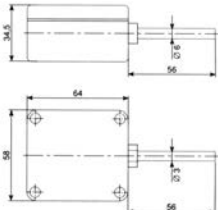
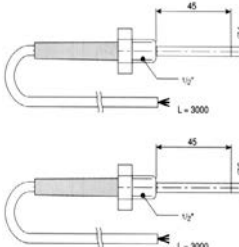
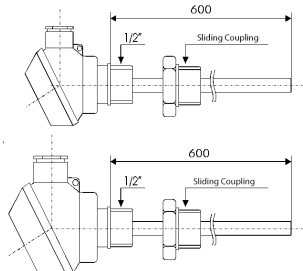
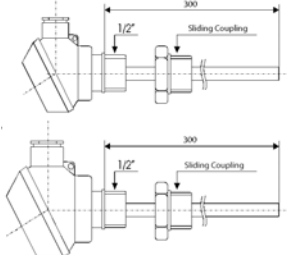

CODE	T (°C)	ACCURACY	USE	$\tau_{0.63}$	DIMENSIONS
TP472I	-196 +500	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3s	
TP472I.O	-50 +300	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3s	
TP473P.I	-50 +400	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		5s	
TP473P.O	-50 +300	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)			
TP474C.O	-50 +300	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		5s	
TP475A.O	-50 +250	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$)		12s	
TP472I.5	-50 +400	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3s	
TP472I.10	-50 +400	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3s	
TP49A.I	-70 +250	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3,5s	
TP49AC.I	-70 +250	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		5,5s	
TP49AP.I	-70 +250	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$)		4s	
TP87.O	-50 +200	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq t \leq 250^{\circ}\text{C}$)		3s	

Pt100 PROBES WITH TP471 SICRAM MODULE

CODE	T (°C)	ACCURACY	USE	$\tau_{0.63}$	DIMENSIONS
TP878.O	-40 +85	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C)		60s	Contact probe for solar panels, with SICRAM module. Cable L = 2 m
TP878.1.O	-40 +85	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C)			Contact probe for solar panels, with SICRAM module. Cable L = 5 m
TP879.O	-20 +120	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C)		60s	Penetration probe for compost, with SICRAM module. Cable L = 5 m
TP880/300.I	-50 +450	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C) $\pm 0.3\text{ }^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		60s	Mignon head, cable length = 2m
TP880/600.I	-50 +450	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C) $\pm 0.3\text{ }^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)			Mignon head, cable length = 2m
TP35.5AF.5S	-110 +180	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C) $\pm 0.3\text{ }^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)		3s	Cable L = 5 m. Shield in Inox + PTFE
TP875.I	-30 +120	$\pm 0.1\text{ }^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2\text{ }^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C)		15'	Globe-thermometer probe for measurement of radiant heat with $\varnothing 150\text{ mm}$. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m. Supplied with SICRAM module.
TP876.I					Globe-thermometer probe for measurement of radiant heat with $\varnothing 50\text{ mm}$. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m. Supplied with SICRAM module.

Pt100/Pt1000 PROBES WITH TP47 CONNECTOR WITHOUT SICRAM MODULE											
CODE	T (°C)	CLASS	USE	$\tau_{0.63}$	DIMENSIONS						
TP47.100.O (Pt100)	-50 +250	Class A		3s							
TP47.1000.O (Pt1000)											
TP87.100.O (Pt100)	-50 +200										
TP87.1000.O (Pt1000)											
Pt100 PROBES ENDING WITH FREE WIRES											
TP875.1.I	-30 +120	Class A		15s	Globe-thermometer probe for measurement of radiant heat with Ø150mm. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m .						
TP876.1.I					Globe-thermometer probe for measurement of radiant heat with Ø50mm. Accuracy according to ISO 7243 - ISO 7726. Pt100 sensor, 4-wire cable L=2 m.						
TP878.1SS.O	-40 +85	Class A		60s	Contact probe for solar panels 4-wire cable L = 5 m						
TP879.1.O	-20 +120	Class A		60s	Penetration probe for compost 4-wire cable L = 5 m						
TP32MT.1P.I	-40 +100	Class A		40s							
TP32MT.1P.2	-50 +250	Class A		40s							
TP32MT.2.I	-40 +100	Class A		60s							
TP35.5AF.5	-110 +180	Class A		3s	 Cable L = 5 m. Shield in Inox + PTFE						

TEMPERATURE PROBES FOR INDUSTRIAL USE

CODE	T (°C)	CLASS	USE	τ _{0.63}	DIMENSIONS
HD882/EK (KTY81)	-40 +150	Not applicable		5s	
HD882/ E/100 (Pt100)	-50 +300	Class A		5s	
HD882/GK (KTY81)	-50 +100	Not applicable	Environmental	5s	
HD882/G100 (Pt100)	-50 +100	Class A	Environmental	5s	
HD882/L104 (Pt100)	0 +250	Class A	Process Thread	7s	
HD882/L106 (Pt100)	0 +250	Class A	Process Thread	15s	
HD882M100/600 (Pt100)	-50 +450	Class A	Process Thread - Miniature Head	15s	
HD882DM100/600 (Pt100)	-50 +450	Class A	Process Thread - DIN B Head	15s	
HD882M100/300 (Pt100)	-40 +100	Class A	Process Thread - Miniature Head	15s	
HD882DM100/300 (Pt100)	-50 +250	Class A	Process Thread - DIN B Head	15s	
CONNECTORS					
TP47	Connector without SICRAM module. It can be connected to 4-wire Pt100 probes (and 3-wire with some instruments) or 2-wire Pt1000 probes.				
TP471	Connector with SICRAM electronic module for the connection of resistance thermometers and the correction of the characteristic of the sensor. It can be connected to 3-wire or 4-wire Pt100Ω platinum temperature probes. assembling and calibration only in Delta OHM				