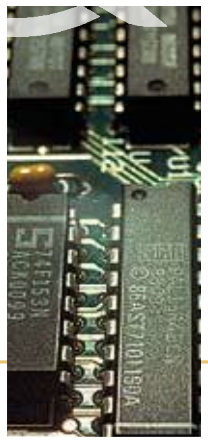


Multifunction

DO 9847
PORTABLE MULTIFUNCTION DATA-LOGGER INSTRUMENT

Is a multifunctional handheld board instrument and datalogger.
It is provided with a 128x64 pixel (56x38 mm) graphic display and three independent inputs. Each input can be connected to one channel or two channel dual probes (ex. two thermocouples, relative humidity/temperature, etc.).
The instrument automatically recognises SICRAM probes connected to the input (memory equipped and configurable intelligent probe).
Functions: watch, hold, max., min., average, record, immediate or deferred start record logging, difference between the two inputs, relative measures, three input channel measurement and inside reference temperature display.
Sampling time: one per second/input.
Probe calibration through SICRAM module; calibration data permanent storage inside the probe.
Storage capacity: 32.000 readings per input.
Storage interval and printing can be configured between one second and 1 hour.
RS232C serial output: from 300 up to 115.200 baud rate.
Immediate or deferred print-out.
Stored data can be displayed and stored data blocks can be deleted.
Automatic shutout after 8 minutes can be disabled.

Units of measurement can be selected according to the physical quantity of the connected probe.
Firmware update through RS232C serial port. Different types of SICRAM modules or probes can be connected to the input: Platinum sensor temperature, thermocouple, relative humidity/temperature, Discomfort index, continuous voltage (±20V), current (0…24mA), pressure, air speed and light.

TECHNICAL DATA OF THE INSTRUMENT DO9847

- Power supply:
  Battery: 4 1.5V AA alkaline batteries; operating time with high quality batteries: about 60 hours.
  Mains: through 9Vdc, 250mA external power supply, 2 pole connector.
- Operating conditions:
  Working temperature: -10...+50°C. Storage temperature: -25...+65°C.
  Relative Humidity: 0...90%R.H., not condensating.
- LCD display: 128x64 pixel (56x38 mm) graphic LCD.
- Keyboard: 18 multifuction Keys and 3 function keys.
- Recorded data safety: independently from batteries charging conditions.
- Measured values storage: on 16 files divided into 16-sample pages.
- Quantity: 32.000 samples per input channel.
- Storage interval: 1 s...1 h. Time and date, real time.
  Accuracy: 1 minute/month maximum error margin.
- Serial interface:
  RS232C type galvanically insulated — SUB D 9 male connector.
  Baud rate: 300...115.200 baud. — Data bit: 8.
  Parity: none. — Stop bit: 1.
  Flow control: Xon/Xoff. — RS232C cable max.length: 15 m.
- immediate printing interval: 1 s...1 h.
- Firmware can be updated through PC using the instrument serial port.
- Probes connections: n° 3 DIN45326 8 pole connectors
- Dimensions and weight: 245x100x50 mm - 300 gr.
- Case: ABS - Protection: rubber.

DO 9847 - CHARACTERISTICS OF THE SICRAM MODULES
When the instrument is used together with the available SICRAM modules, its accuracy and resolution are stated in the section where these modules are described.

SICRAM MODULES FOR DO 9847

TP471 Temperature measure through PRT Platinum sensor

PRT resistance values @ 0°C	25Ω, 100Ω, 500Ω
temperature range Pt25, Pt100	-200°C … +850°C
temperature range Pt500	-200°C … +500°C
Accuracy with Pt25, Pt100 sensor	±0.03°C up to 350°C
	±0.3°C up to 850°C
Accuracy with Pt500 sensor	±0.5°C up to 500°C
Resolution	0.01°C from -200°C to 350°C
	0.1°C from 350°C to 800°C
Temperature drift @20°C	0.002%/°C
Excitation current	400µA impulse, length=100ms,

time=1sTemperature measure for thermocouple with cold joint (inside ice at 0°C)

TP471D0 Temperature measure for 1 input thermocouple

TP471D1 Temperature measure for 2 input thermocouple

VP472 module to connect pyranometers or albedometers. The measurements produced during the time by a pyranometer or an albedometer can be taken, verified and stored. The signal produced by the thermopile can be read in mV or in W/m², the net radiation of the albedometer is read in W/m². The thermopile sensitivity can be set from 5000 to 30000nV/(Wm^{-2}) that is between 5 and 30µV/(Wm^{-2}).

VP473 module for reading the continuous voltage. When connected to the output of a transmitter with voltage signal it can read and take the relevant value. Measuring range: ±20Vdc. Input impedance: 1MΩ.

IP472 module for mA reading of continuous current. When connected to the output of a trasmitter with current signal, it can read and take the relevant value. Measuring range: 0…24mA. Input impedance: 25Ω.

PP471 module for measuring absolute, relative and differential pressure. It can be connected with pressure probes andseries. It measure the instantaneous value and peak value of pressure. The module is complete with 2m cable and DIN 45326 8 pole female connector.

Accuracy: ±0.05% of full scale	Peak time ≥ 5ms
Peak accuracy: ±0.5% f.s.	Peak dead band ≤ 2% f.s.

PROBES AND MODULES TECHNICAL DATA EQUIPPED WITH INSTRUMENT

Temperature probes Pt100 sensor using SICRAM module

Model	Type	Application range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+350°C) ±0.4°C (+350°C…+500°C)
TP472I.0	Immersion	-50°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP473P	Penetration	-50°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP473P.0	Penetration	-50°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP474C	Contact	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP474C.0	Contact	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP475A.0	Air	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	Immersion	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP472I.10	Immersion	-50°C…+400°C	±0.30°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP49A	Immersion	-70°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP49AC	Contact	-70°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP49AP	Penetration	-70°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP875	Globe thermometer Ø 150mm	-30°C…+120°C	±0.25°C
TP876	Globe thermometer Ø 150mm	-30°C…+120°C	±0.25°C
TP87	Immersion	-50°C…+200°C	±0.25°C
TP878 TP878.1	For solar panel	+5°C…+80°C	±0.25°C
TP879	For compost	-20°C…+120°C	±0.25°C

Common characteristics

Temperature drift @ 20°C 0.003%/°C

4 wire Pt100 and 2 wire Pt1000 Probes

Model	Type	Application range	Accuracy
TP47.100	Pt100 4 wires	-50…+400°C	Classe A
TP47.1000	Pt1000 2 wires	-50…+400°C	Classe A

Common characteristics

Temperature drift @ 20°C

Pt100	0.003%/°C
Pt1000	0.005%/°C

UNCERTAINTY AND RESOLUTION OF THE INSTRUMENT IN MEASURING WITH THERMOCOUPLES

Temperature measurement of the instrument

Measuring range Tc: K	-200…+1370°C
Measuring range Tc: J	-100…+750°C
Measuring range Tc: T	-200…+400°C
Measuring range Tc: N	-200…+1300°C
Measuring range Tc: R	+200…+1480°C
Measuring range Tc: S	+200…+1480°C
Measuring range Tc: B	+200…+1800°C
Measuring range Tc: E	-200…+750°C

Resolution	**0.05°C up to 199.95°C**
	0.1°C from 200.0°C to end scale

Instrument accuracy

Thermocouple K	±0.1°C up to 600°C
	±0.2°C above 600°C
Thermocouple J	±0.05°C up to 400°C
	±0.1°C above 400°C
Thermocouple T	±0.1°C
Thermocouple N	±0.1°C up to 600°C
	±0.2°C above 600°C
Thermocouple R	±0.25°C
Thermocouple S	±0.3°C
Thermocouple B	±0.35°C
Thermocouple E	±0.1°C up to 300°C
	±0.15°C above 300°C

Accuracy is referred to the instrument only, error due to the thermocouple or to the cold junction reference sensor is not included.

Temperature drift @20°C	0.02%/°C
Drift after 1 year	0.1°C/year

Type K Thermocouple probes

Accuracy of the thermocouple probes

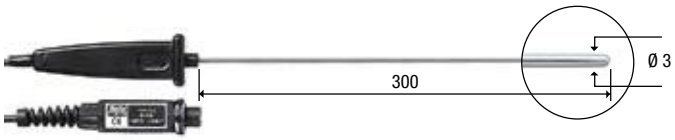
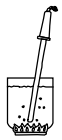
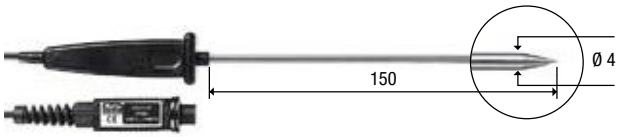
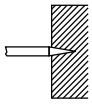
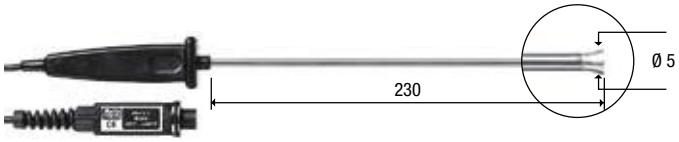
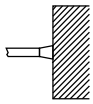
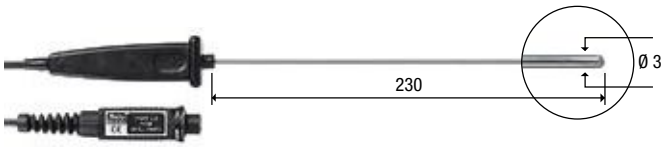
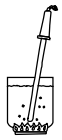
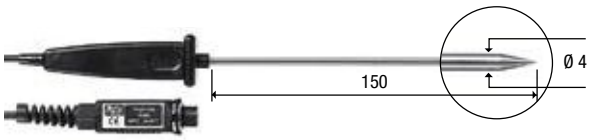
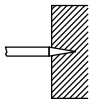
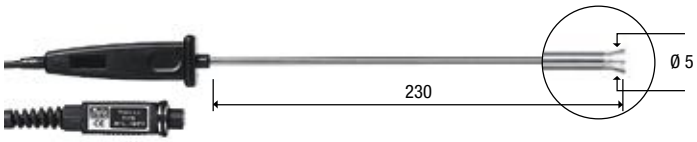
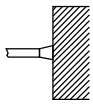
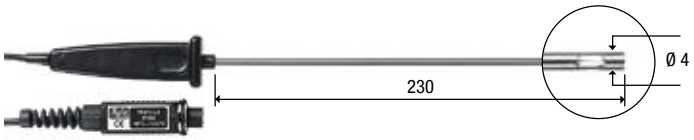
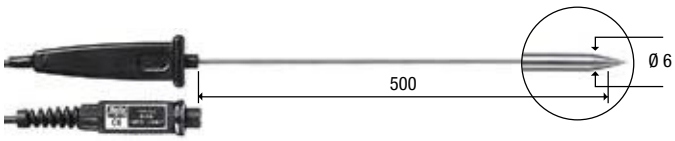
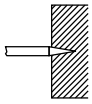
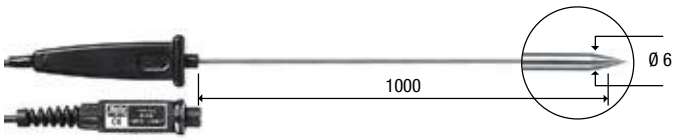
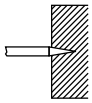
The tolerance of a type of thermocouple corresponds to the maximum acceptable departure from the e.m.f. of any thermocouple of that type, with reference junction at 0°C. The tolerance is expressed in degrees Celsius, preceded by the sign. The percentage tolerance is given by the ratio between the tolerance expressed in degrees Celsius and the measurement junction temperature, multiplied by one hundred.

Tolerance classes for thermocouples (reference junction at 0°C)

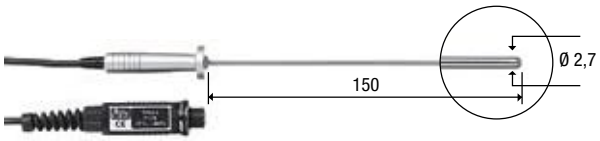
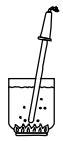
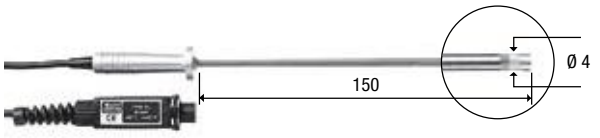
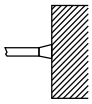
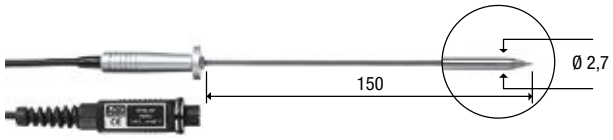
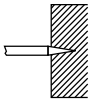
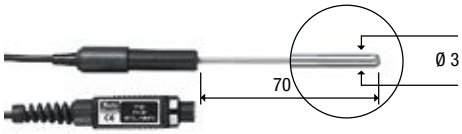
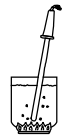
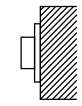
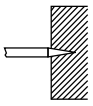
Type of Thermocouple	Tolerance Class 1	Tolerance Class 2	Tolerance Class 3 [1]
T Type Temperature interval Tolerance Temperature interval Tolerance	from -40 to +125°C ± 0.5°C from 125 to 350°C ± 0.004 · Itr	from -40 to +133°C ± 1°C from 133 to 350°C ± 0.0075 · Itr	from -67 to +40°C ± 1°C from -200 to -67°C ± 0.015 · Itr
E Type Temperature interval Tolerance Temperature interval Tolerance	from -40 to +375°C ± 1.5°C from 375 to 800°C ± 0.004 · Itr	from -40 to +333°C ± 2.5°C from 333 to 900°C ± 0.0075 · Itr	from -167 to +40°C ± 2.5°C from -200 to -167°C ± 0.015 · Itr
J Type Temperature interval Tolerance Temperature interval Tolerance	from -40 to +375°C ± 1.5°C from 375 to 750°C ± 0.004 · Itr	from -40 to +333°C ± 2.5°C from 333 to 750°C ± 0.0075 · Itr	- - - -
K Type, N Type Temperature interval Tolerance Temperature interval Tolerance	from -40 to +375°C ± 1.5°C from 375 to 1000°C ± 0.004 · Itr	from 40 to +333°C ± 2.5°C from 333 to 1200°C ± 0.0075 · Itr	from -167 to +40°C ± 2.5°C from -200 to -167°C ± 0.015 · Itr
R Type, S Type Temperature interval Tolerance Temperature interval Tolerance	from 0 to +1100°C ± 1°C from 1100 to 1600°C ± [1 + 0.003 (t-1 100)] °C	from 0 to +600°C ± 1.5°C from 600 to 1600°C ± 0.0025 · Itr	- - - -
B Type Temperature interval Tolerance Temperature interval Tolerance	- - - -	- - from 600 to 1700 °C ± 0.0025 · Itr	from +600 to +800C + 4°C from 800 to 1700°C ± 0.005 · Itr

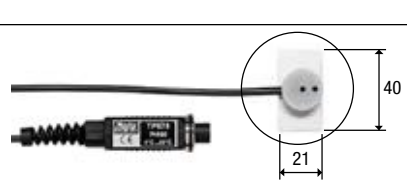
[1] The materials used for thermocouples are generally supplied so to comply with the production tolerances specified in the table for temperatures over -40°C. Nevertheless, these materials may not comply with the production tolerances for low temperatures reported under Class 3, for T, E, K and N thermocouples when the thermocouples have to comply at the same time with the limits of Class 3 and those of Class 1 and/or Class 2.

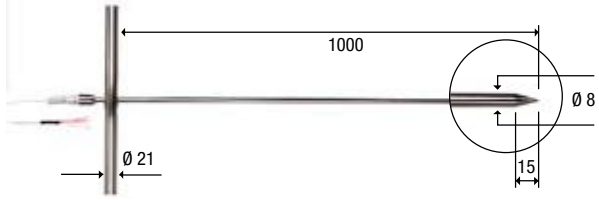
PT100 PROBES WITH SICRAM MODULE FOR PORTABLE INSTRUMENTS

CODE	°C max	τ s	DIMENSIONS	USE
TP 472 I	-196 +500	3s		
TP 473 P	-50 +400	5s		
TP 474 C	-50 +400	5s		
TP 472 I.0	-50 +400	3s		
TP 473 P.0	-50 +400	5s		
TP 474 C.0	-50 +400	5s		
TP 475 A.0	-50 +250	12s		
TP 472 I.5	-50 +400	3s		
TP 472 I.10	-50 +400	3s		

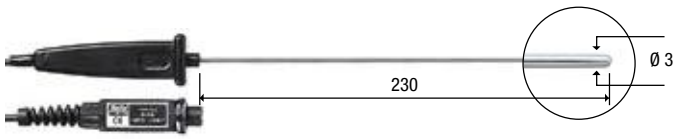
PT100 PROBES WITH SICRAM MODULE FOR PORTABLE INSTRUMENTS

CODE	°C max	τ s	DIMENSIONS	USE
TP 49 A	-70 +400	3,5s		
TP 49 AC	-70 +400	5,5s		
TP 49 AP	-70 +400	4s		
TP 87	-50 +200	3s		
TP 878	+5 +80	60s	Contact probe for solar panels. Cable L = 2m.	
TP 878.1	+5 +80	60s	Contact probe for solar panels. Cable L = 5m.	
TP879	-20 +120	60s	Penetration probe for compost. Cable L = 2m	
TP 875	-30 +120	15s	Globe-thermometer probe for measuring radiant heat ø150 mm. (ISO7243, ISO7726). 4 wires Pt100 Sensor cable L=2m. **Equipped with SICRAM module.**	
TP 876	-30 +120	15s	Globe-thermometer probe for measuring radiant heat ø50 mm. (ISO7243, ISO7726). 4 wires Pt100 Sensor cable L=2m. **Equipped with SICRAM module.**	



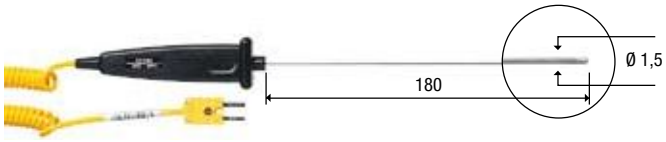
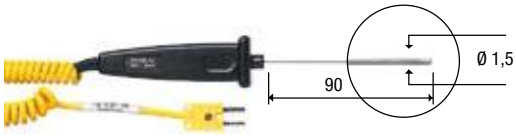
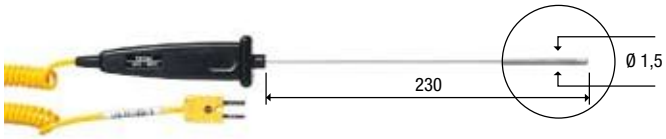
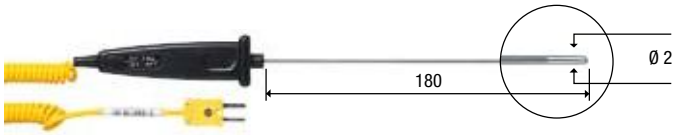
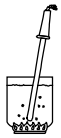
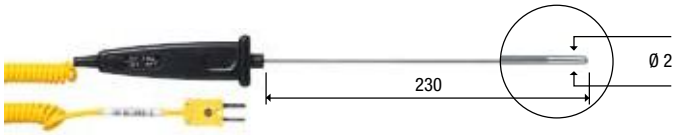
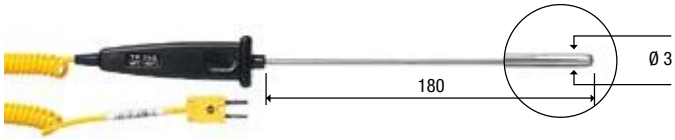
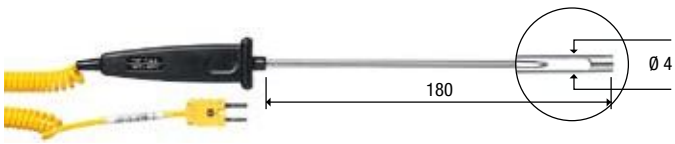


SONDE SENSORE Pt100 / Pt1000 CON MODULO TP 47

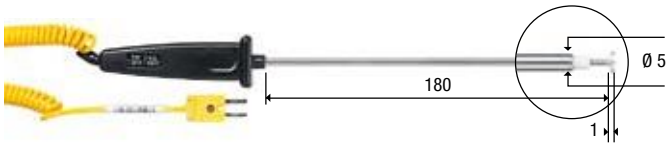
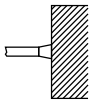
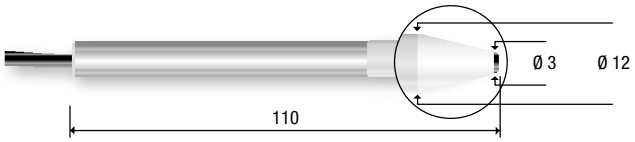
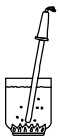
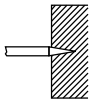
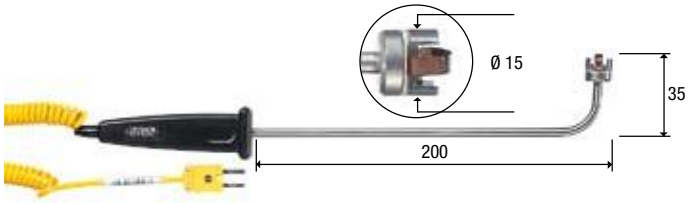
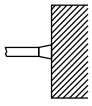
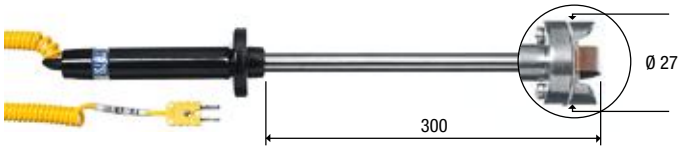
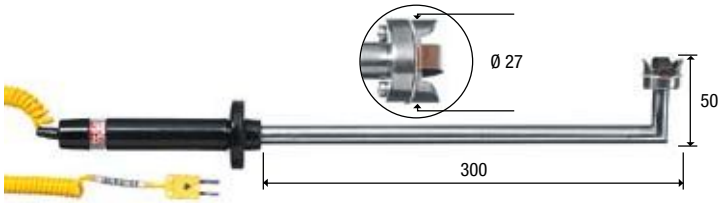
CODE	°C max	τ s	DIMENSIONS	USE
TP 47.100 (Pt100) **TP 47.1000 (Pt1000)**	-50 +400	3s		
TP 47	Only connector for connection of probes without SICRAM module: direct 3 and 4 wires Pt100, 2 wires Pt1000.			

THERMOCOUPLE PROBES FOR PORTABLE INSTRUMENTS

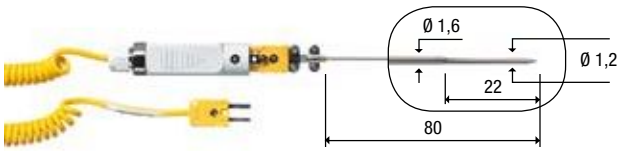
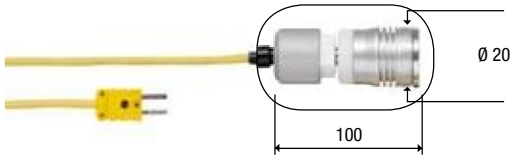
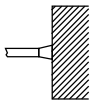
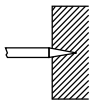
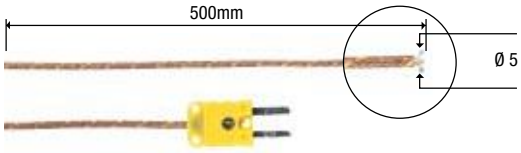
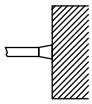
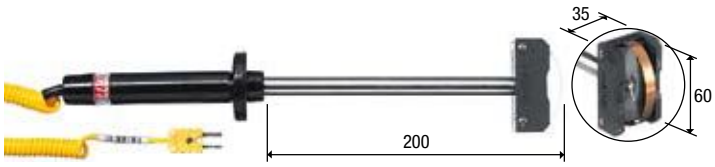
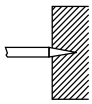
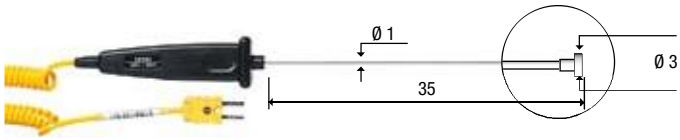
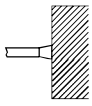
THERMOCOUPLE K TYPE PROBES (CHROMEL - ALUMEL)

CODE	°C max	τ s	DIMENSIONS	USE
TP 741	800	2s		
TP 741/1	400	2s		
TP 741/2	800	2s		
TP 742	800	2s		
TP 742/1	400	2s		
TP 742/2	800	2s		
TP 743	800	3s		
TP 744	400	4s		

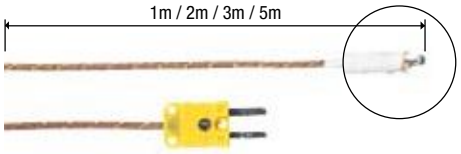
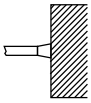
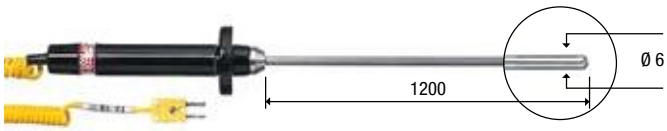
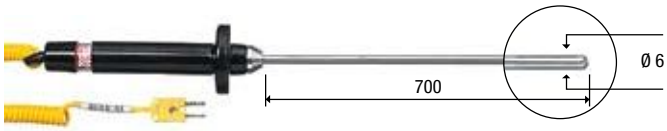
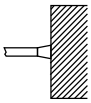
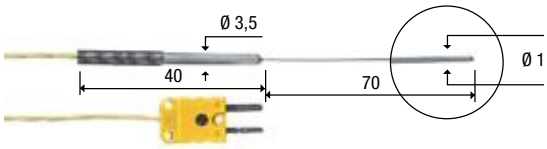
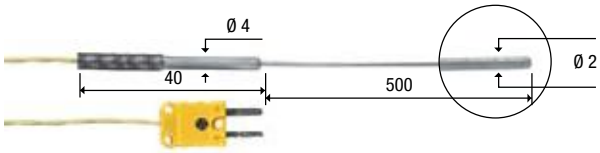
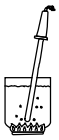
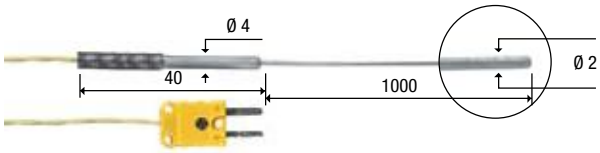
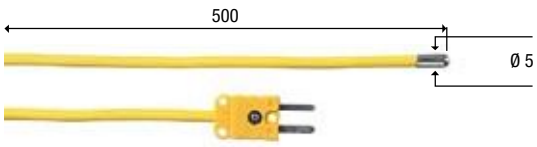
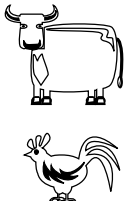
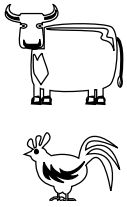
THERMOCOUPLE K TYPE PROBES (CHROMEL - ALUMEL)

CODE	°C max	τ s	DIMENSIONS	USE
TP 745	500	5s		
TP 746	250	2s		
TP 750	1000	3s		
TP 750.0	800	3s		
TP 751	200	2s		
TP 754	500	2s		
TP 754/9	500	2s		
TP 755	800	2s		
TP 755/9	800	2s		

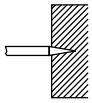
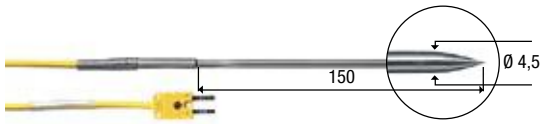
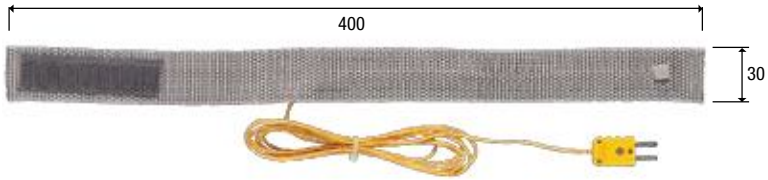
THERMOCOUPLE K TYPE PROBES (CHROMEL - ALUMEL)

CODE	°C max	τ s	DIMENSIONS	USE
TP 756	200	2s		
TP 757	180	30s	MAGNETIC PROBE FOR CONTACT MEASURE ON MAGNETIC METALLIC SURFACES 	
TP 758	400	4s		
TP 758.1	400	4s		
TP 772	400	3s		
TP 774	250	2s		
TP 776	200	2s		
TP 777	200	3s		

THERMOCOUPLE K TYPE PROBES (CHROMEL - ALUMEL)

CODE	°C max	τ s	DIMENSIONS	USE
TP 647 **TP 647/2** **TP 647/3** **TP 647/5**	300 300 300 300	2s 2s 2s 2s	SIT calibration up to 300°C. 	
TP 651	1200	6s		
TP 652	1200	6s		
TP 655	180	2s		
TP 656	200	1s		
TP 656/1	1000	1s		
TP 656/2	1000	1s		
TP 657/1	100	5s		
TP 658	100	2s		

THERMOCOUPLE K TYPE PROBES (CHROMEL - ALUMEL)

CODE	°C max	τ s	DIMENSIONS	USE
TP 659	400	3s		
TP 660	400	4s		
TP 661	-60 +50	30s		
TP 662	110	120s	PROBE WITH VELCRO TAPE FOR MEASURES ON PIPES MAX 110 DIAM. 	
CM **CS**	"K" "K"			
PW	"K"			

Response time for a 63% variation ($\tau_{0.63}$)

The response time τ **s** is the reaction time of the sensor to a temperature variation, with a signal variation when measuring that corresponds to a given percentage (63%) of the variation.
Response time is referred:

For immersion probes in water at 100°C
For surface probes in contact with metals surface at 200°C
For air probe at an air temperature of 100°C

Temperature and relative humidity probes with SICRAM module

Model	Temperature sensor	Campo d'impiego		Accuracy	
		%RH	Temperature	%RH	Temp
HP472ACR	Pt100	0…100%RH	-20°C…+80°C	±2%RH (5…90%RH) ±2,5%RH (remaining range)	±0.3°C
HP572ACR	Thermocouple K	0…100%RH	-20°C…+80°C		±0.5°C
HP473ACR	Pt100	0…100%RH	-20°C…+80°C		±0.3°C
HP474ACR	Pt100	0…100%RH	-40°C…+150°C	-40°C…150°C (180°C) ±(1,5+0,02 times the displayed value)	±0.3°C
HP475ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP475AC1R	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP477DCR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP478ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C

Common characteristics

Relative Humidity

Sensor	Capacitive
Typical capacity @30%RH	300pF
Probe temperature working range	-40°C…+150°C
Working range	0 … 100%RH
Accuracy	±1,5%RH (5…90%RH), ±2,5 remaining range
Resolution	0.1%RH
Temperature drift @20°C	0.02%RH/°C
%RH response time at	10sec (10→80%RH; air speed=2m/s) constant temperature

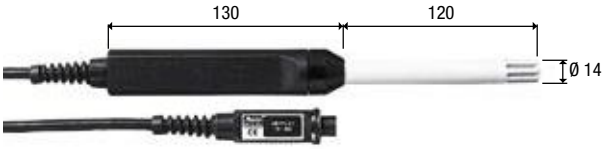
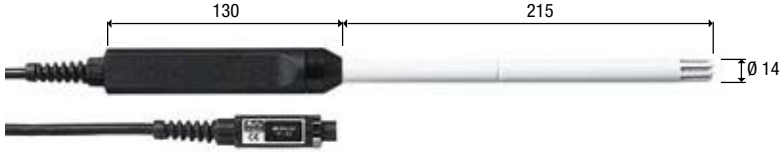
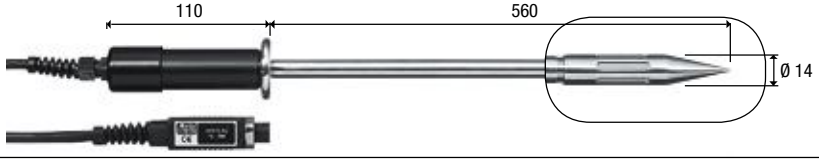
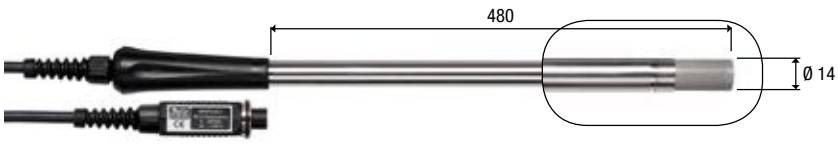
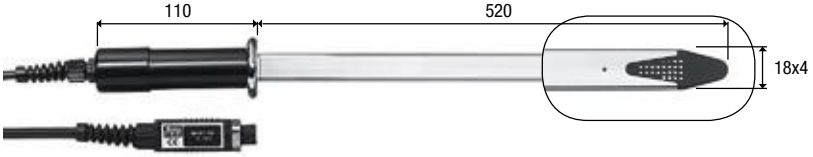
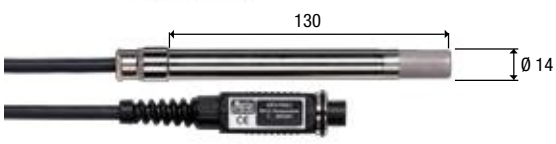
Temperature with Pt100 sensor

Resolution	0.1°C
Temperature drift @20°C	0.003%/°C

Temperature with thermocouple K-HP572AC

Resolution	0.1°C
Temperature drift @20°C	0.02%/°C

RELATIVE HUMIDITY AND TEMPERATURE PROBES

Code	Sensors	Range RH - Temp.	DIMENSIONS
HP472ACR	RH Pt100	5 ÷ 98% RH -20°C…+80°C	
HP572ACR	RH TC.K		
HP473ACR	RH Pt100		
HP474ACR		5 ÷ 98% RH -40°C…+150°C	
HP475ACR			
HP475AC1R			
HP477DCR			
HP478ACR			

PROBES FOR PRESSURE MEASUREMENT

Probes complete with SICRAM module

PP471: SICRAM module interface between instrument and pressure probes of the series TP704 and TP705.

PP472: Barometric probe, measuring range 600…1100mbar. Resolution: 0.1mbar Accuracy @ 20°C: ±0.3mbar. Temperature range: -10 … +60°C

PP473S1…S8: Differential pressure probes.

Working range	**S1**=f.s.10mbar,	**S2**=f.s.20mbar,	**S3**=f.s.50mbar,
	S4=f.s.100mbar,	**S5**=f.s.200mbar,	**S6**=f.s.500mbar,
	S7=f.s.1bar,	**S8**=f.s.2bar	
Maximum overpressure	**S1,S2,S3**=200mbar	**S4**=300mbar	**S5,S6**=1bar
	S7=3bar	**S8**=6bar	
Accuracy @ 25°C	±0.5%f.s. (10, 20, 50mbar)	±0.25%f.s. (100mbar)	±0.12% f.s. (200, 500, 1000, 2000mbar)
Temperature range	-10 … +60°C		
Fluid in contact with the membrane	non-corrosive dry gas or air		
Connection	tube Ø 5mm		

Probes to couple to the module to measure the absolute, relative or differential pressure.

TP704…/TP705…: Probes to connect to SICRAM module PP471 for measuring relative, absolute or differential pressure.

PRESSURE PROBE TABLE

Bottom scale pressure	Maximum overpressure	Resolution	ORDER CODES			Accuracy From 20 to 25°C	Working temperature	Connection
			Differential pressure	Relative pressure (compared to atmosphere)	Absolute pressure			
			NON insulated membrane	Insulated membrane	Insulated membrane			
10.0 mbar	20.0 mbar	0.01 mbar	• **TP705-10MBD**			0.5 % FSO	0..60 °C	Tube Ø 5 mm
20.0 mbar	40.0 mbar	0.01 mbar	• **TP705-20MBD**			0.5 % FSO	0..60 °C	Tube Ø 5 mm
50.0 mbar	100 mbar	0.01 mbar	**TP705-50MBD**			0.5 % FSO	0..60 °C	Tube Ø 5 mm
100 mbar	200 mbar	0.1 mbar	**TP705-100MBD**			0.25 % FSO	0..60 °C	Tube Ø 5 mm
				TP704-100MBGI		0.25 % FSO	-10..+80 °C	¼ BSP
200 mbar	400 mbar	0.1 mbar	**TP705-200MBD**			0.25 % FSO	0..60 °C	Tube Ø 5 mm
				TP704-200MBGI		0.25 % FSO	-10..+80 °C	¼ BSP
400 mbar	1000 mbar	0.1 mbar		**TP704-400MBGI**		0.25 % FSO	-10..+80 °C	¼ BSP
500 mbar	1000 mbar	0.1 mbar	**TP705-500MBD**			0.25 % FSO	0..60 °C	Tube Ø 5 mm
600 mbar	1000 mbar	0.1 mbar		**TP704-600MBGI**		0.25 % FSO	-40..125 °C	¼ BSP
1.00 bar	2.00 bar	1 mbar	**TP705-1BD**			0.25 % FSO	0..60 °C	Tube Ø 5 mm
					TP705BARO	0.25 % FSO	0..60 °C	Tube Ø 5 mm
						0.25 % FSO	-40..125 °C	¼ BSP
					TP704-1BA	0.25 % FSO	-40..120 °C	¼ BSP
2.00 bar	4.00 bar	1 mbar	**TP705-2BD**			0.25 % FSO	0..60 °C	Tube Ø 5 mm
				TP704-2BGI		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-2BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
5.00 bar	10.00 bar	1 mbar		**TP704-5BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-5BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
10.00 bar	20.0 bar	0.01 bar		**TP704-10BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-10BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
20.0 bar	40.0 bar	0.01 bar		**TP704-20BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-20BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
50.0 bar	100.0 bar	0.01 bar		**TP704-50BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-50BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
100 bar	200 bar	0.1 mbar		**TP704-100BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-100BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
200 bar	400 bar	0.1 mbar		**TP704-200BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
					TP704-200BAI *	0.25 % FSO	-25..+85 °C	¼ BSP
500 bar	1000 bar	0.1 mbar		**TP704-500BGI**		0.25 % FSO	-40..+125 °C	¼ BSP
	700 bar	0.1 mbar			**TP704-500BAI ***	0.25 % FSO	-25..+85 °C	¼ BSP

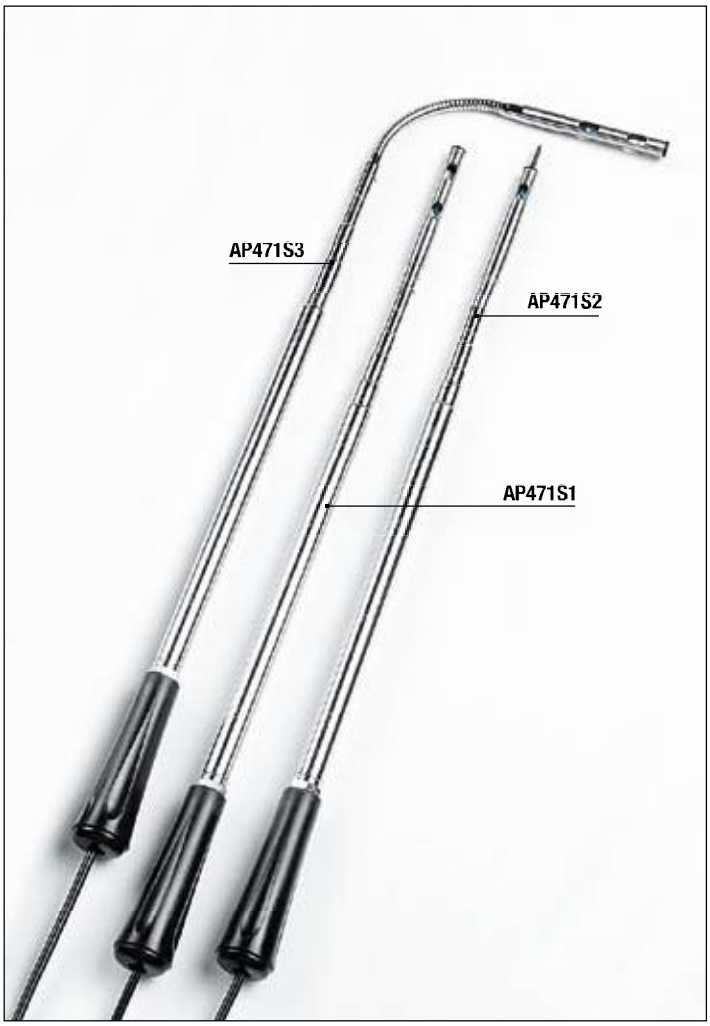
* Ceramic diaphragm
• Only report of calibration, no SIT certificate

PROBES AND MODULES TECHNICAL DATA EQUIPPED WITH INSTRUMENT

Wind speed measurement probes

Hot-wire probes: AP471 S1 - AP471 S2 - AP471 S3 - AP471 S4

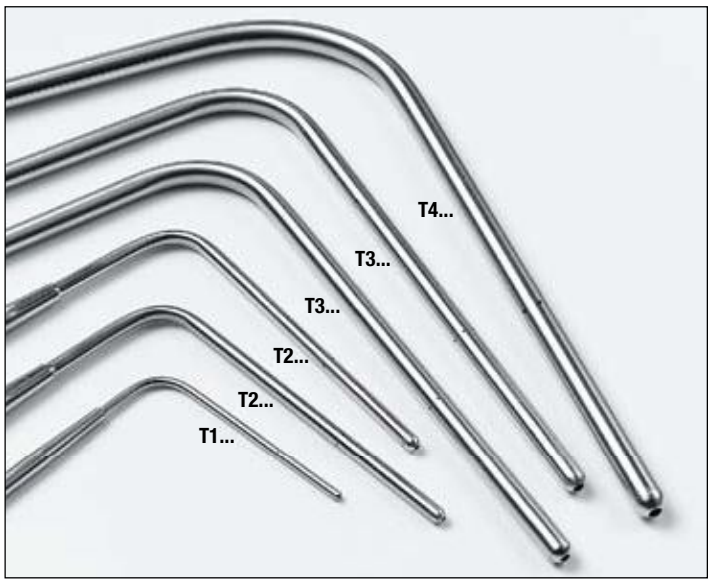
	AP471 S1 - AP471 S3	AP471 S2	AP471 S4
Type of measure	Air speed, calculated flow rate, air temperature		
Type of sensor			
Speed	NTC thermistor	Omnidirectional NTC thermistor	
Temperature	NTC thermistor	NTC thermistor	
Measurement range			
Speed	0,1…40m/s	0,1…5m/s	
Temperature	-25…+80°C	-25…+80°C	0…80°C
Measurement resolution:			
Speed	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot		
Temperature	0.1°C		
Measurement accuracy:			
Speed	±0.1 m/s (0…0.99 m/s)	±0.05m/s (0…0.99 m/s)	
	±0.3 m/s (1.00…9.99 m/s)	±0.15m/s (1.00…5.00 m/s)	
	±0.8 m/s (10.00…40.0 m/s)		
Temperature	±0.8°C (-10…+80°C)	±0.8°C (-10…+80°C)	
Minimum speed	0.1 m/s		
Air temperature compensation	0…80°C		
Sensor working conditions	Clean air, RH<80%		
Battery life	Approx. 20 hours @ 20 m/s with alkaline batteries	Approx. 30 hours @ 5 m/s with alkaline batteries	
Unit of Measurement			
Speed	m/s – km/h – ft/min – mph – knot		
Flow rate	l/s - m^3/s - m^3/min - m^3/h - ft^3/s - ft^3/min		
Pipeline section for flow rate calculation	0.0001…1.9999 m^2		
Cable length	~2m		



Vane probes: AP472 S1… - AP472 S2 - AP472 S4…

	AP472 S1…	AP472 S2	AP472 S4…			
			L	LT	H	HT
Type of measure	Air speed, calculated flow rate, air temperature	Air speed, calculated flow rate	Air speed, calculated flow rate.	Air speed, calculated flow rate, air temperature.	Air speed, calculated flow rate.	Air speed, calculated flow rate, air temperature.
Diameter	100mm	60mm	16mm			
Type of measurement						
Speed	Vane	Vane	Vane			
Temperature	K thermocouple	----	----	K thermo couple	----	K thermo couple
Measurement range						
Speed (m/s)	0.6…25	0.5…20	0.8…20		10…40	
Temperature (°C)	-25…+80 (*)		-25...+80 (*)			
Resolution						
Speed	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot					
Temperature	0.1°C	----	----	0.1°C	----	0.1°C
Accuracy						
Speed	±(0.3 m/s +1.5%f.s.)	±(0.3m/s +1.5%f.s.)	±(0.4 m/s +1.5%f.s.)			
Temperature	±0.8°C	----	----	±0.8°C	----	±0.8°C
Minimum speed	0.6m/s	0.5m/s	0.8m/s		10m/s	
Unit of Measurement						
Speed	m/s – km/h – ft/min – mph – knot					
Flow rate	l/s - m^3/s - m^3/min - m^3/h - ft^3/s - ft^3/min					
Pipeline section for flow rate calculation	0.0001…1.9999 m^2					
Cable length	~2m					

(*) The indicated value refers to the vane's working range.



Pitot tube probes: AP473 S1 - AP473 S2 - AP473 S3 - AP473 S4

	AP473 S1	AP473 S2	AP473 S3	AP473 S4
Kind of measurement	Air speed, calculated flow, differential pressure, Air temperature			
Working range				
Diff. pressure	10 mbar f.s.	20mbar f.s.	50mbar f.s.	100mbar f.s.
Speed (*)	2 … 40m/s	2 … 55m/s	2 … 90m/s	2 … 130m/s
Temperature	-200…+600°C	-200…+600°C	-200…+600°C	-200…+600°C
Resolution				
Speed m/s	0.1			
km/h	1			
ft/min	$1 \cdot 10^3$			
mph	1			
Knots	1			
Temperature	0.1°C			
Accuracy				
Speed	±0.4%f.s. of pressure		±0.3%f.s. of pressure	
Temperature	±0.8°C		±0.8°C	
Minimum speed	2 m/s			
Air temperature compensation	-200…+600°C (if K thermocouple is connected to the module)			
Unit of measurement				
Speed	m/s - km/h - ft/min - mph - Knots			
Flow rate	l/s - m^3/h - m^3/min - ft^3/s - ft^3/min			
Duct section for flow calculation	.001…1.999 m^2			

(*) A 20°C, 1013mbar and Ps negligible.

PHOTOMETRIC AND RADIOMETRIC PROBES

Technical characteristics of photometric and radiometric probes complete with SICRAM module equipped with the instruments

ILLUMINANCE measurement probe LP 471 PHOT				
Measurement range (lux):	0.01…199.99	…1999.9	…19999	…199.99·10^3
Resolution (lux):	0.01	0.1	1	0.01·10^3
Spectral range:	in agreement with standard photopic curve V(λ)			
Class	C (B on request)			
Calibration uncertainty:	<4%			
f'1 (in agreement with photopic response V(λ)):	<8%			
f_2 (response according to the cosine law):	<3%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	<0.5%			
f_5 (fatigue):	<0.5%			
α (temp. coefficient) f_6 (T)	<0.05%K			
Drift after 1 year:	<1%			
Functioning temperature:	0…50°C			
Reference Standards	CIE n.69 - UNI 11142			

Photometric probe for **ILLUMINANCE** measurement, spectral response in agreement with standard photopic vision, diffuser for cosine correction. Measurement range: 0.01 lux…200·10^3 lux.

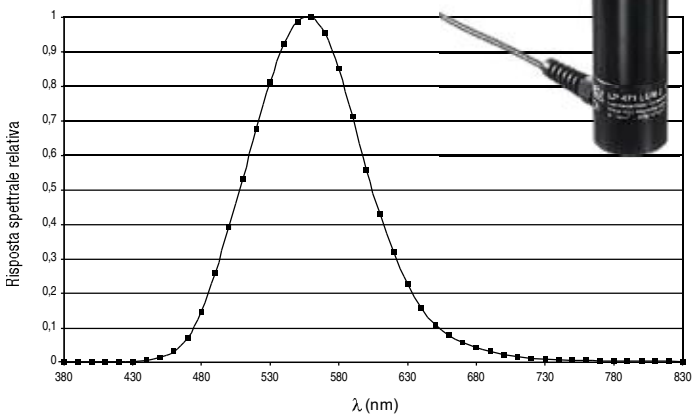
AP471S4

LP471LUM2
LP471PHOT
LP471RAD
LP471PAR
LP471UVA
LP471UVB
LP471UVC

LUMINANCE measurement probe LP 471 LUM 2				
Measurement range (cd/m²):	0.1…1999.9	…19999	…199.99·10³	…1999.9·10³
Resolution (cd/m²):	0.1	1	0.01·10³	0.1·10³
Optical angle:	2°			
Spectral range:	in agreement with standard photopic curve V(λ)			
Class	C			
Calibration uncertainty:	<5%			
f'1 (in agreement with photopic response V(λ)):	<8%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	<0.5%			
f_5 (fatigue):	<0.5%			
α (temp. coefficient) f_6 (T)	<0.05%K			
Drift after 1 year:	<1%			
Functioning temperature:	0…50°C			
Reference Standards	CIE n.69 - UNI 11142			

Photometric probe for **LUMINANCE** measurement, spectral response in agreement with standard photopic vision, vision angle 2°.
Measurement range: 0.1 cd/m²…2000·10³ cd/m².

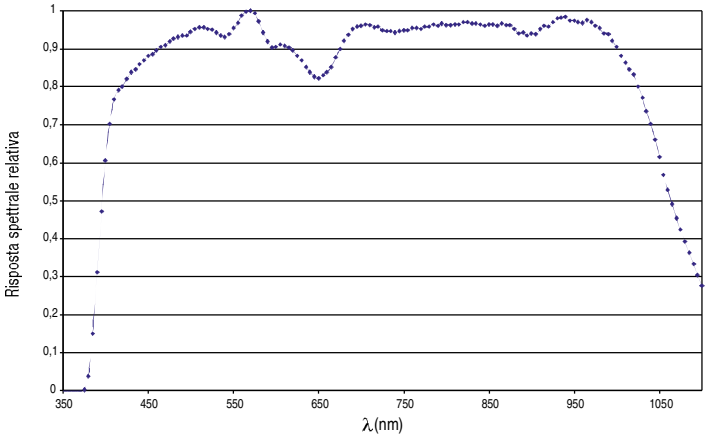
Typical response curve: LP 471 PHOT and LP471 LUM 2



IRRADIANCE measurement probe LP 471 RAD				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	400nm…1050nm			
Calibration uncertainty:	<5%			
f'1 (response according to the cosine law):	<6%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<1%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement in the spectral range 400nm…1050nm, diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m² …2000 W/m².

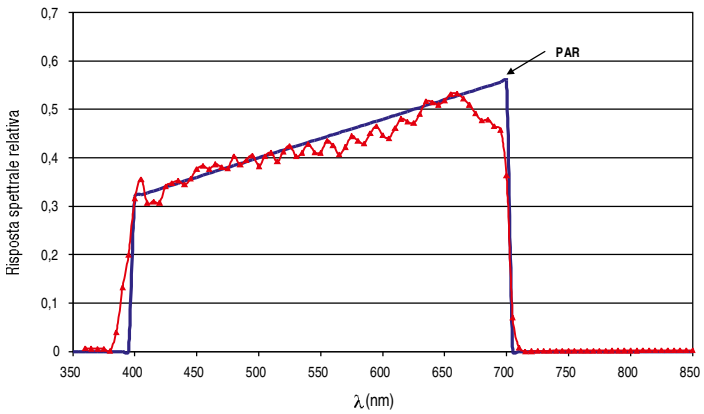
Typical response curve: LP 471 RAD



Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range PAR LP 471 PAR			
Measurement range (μmolm⁻²s⁻¹):	0.01… 199.99	200.0…1999.9	2000…10000
Resolution (μmolm⁻²s⁻¹):	0.01	0.1	1
Spectral range:	400nm…700nm		
Calibration uncertainty:	<5%		
f'1 (response according to the cosine law):	<6%		
f_3 (linearity):	<1%		
f_4 (instrument reading error):	±1digit		
f_5 (fatigue):	<0.5%		
Drift after 1 year:	<1%		
Working temperature:	0…50°C		

Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range **PAR** (Photosynthetically Active Radiation 400nm…700nm), measurement in μmol/m²s. Measurement range: 0.01μmol/m⁻²s⁻¹…10·10³μmol/m⁻²s⁻¹.

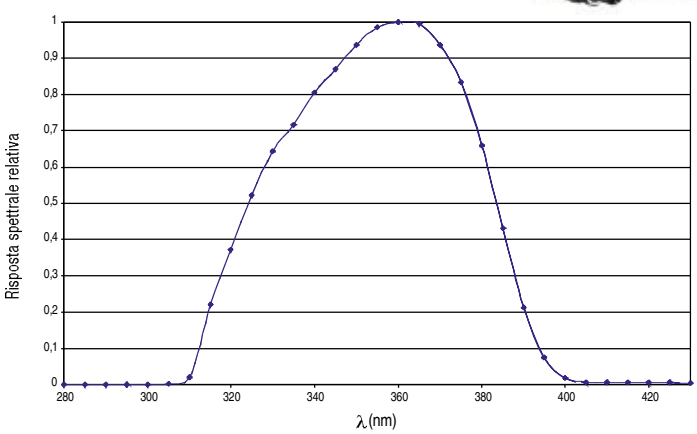
Typical response curve: LP 471 PAR



IRRADIANCE measurement probe LP 471 UVA				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	315nm…400nm (**Peak 360nm**)			
Calibration uncertainty:	<5%			
f'1 (response according to the cosine law):	<6%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<2%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement, in the 315nm…400nm, peak 360nm, **UVA** spectral range.
Measurement range: 0.1·10⁻³W/m²…2000 W/m².

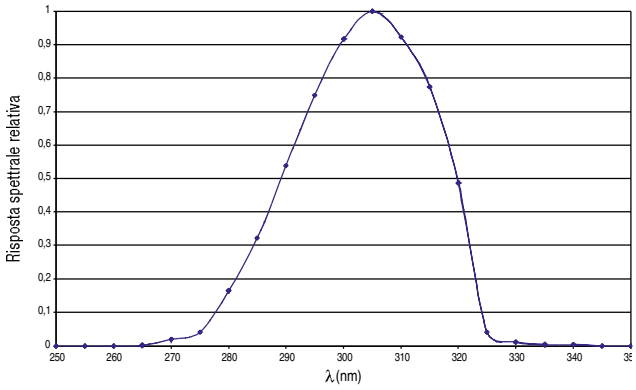
Typical response curve: LP 471 UVA



IRRADIANCE measurement probe LP 471 UVB				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	280nm…315nm (**Peak 305nm**)			
Calibration uncertainty:	<5%			
f'_1 (response according to the cosine law):	<6%			
f_3 (linearity):	<2%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<2%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement, in the spectral range 280nm…315nm, peak 305nm, **UVB.** Measurement range: 0.1·10⁻³W/m²…2000 W/m².

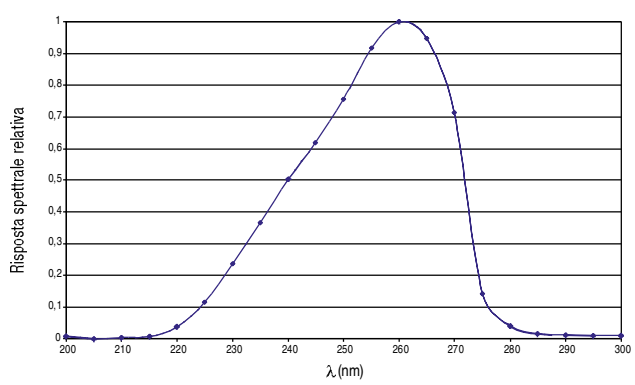
Typical response curve: LP 471 UVB



IRRADIANCE measurement probe LP 471 UVC				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	220nm…280nm (**Peak 260nm**)			
Calibration uncertainty:	<5%			
f'_1 (response according to the cosine law):	<6%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<2%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement, in the spectral range 220nm…280nm, peak 260nm, **UVC**. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

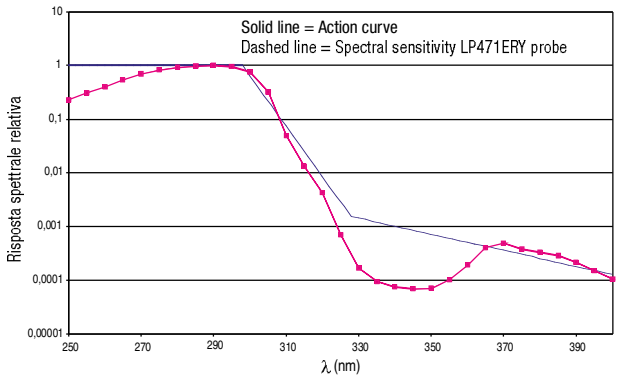
Typical response curve: LP 471 UVC



Measurement probe LP 471ERY of TOTAL EFFECTIVE IRRADIANCE (W/m²) according to the UV action curve UV (CEI EN 60335-2-27)				
Measurement range (W_{eff}/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W_{eff}/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	UV action curve for erythema measurement (250nm…400nm)			
Calibration uncertainty:	<15%			
f_3 (linearity):	<3%			
f_4 (instrument reading error	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year	<2%			
Working temperature:	0…50°C			
Reference standard	CEI EN 60335-2-27			

Radiometric probe for **EFFECTIVE TOTAL IRRADIANCE** (W_{eff}/m²) according to the UV action curve (CIE EN 60335-2-27). Spectral range: 250 nm…400 nm, Measurement range: 0.1·10⁻³W_{eff} /m² … 2000 W_{eff} /m²

Typical response curve. TOTAL EFFECTIVE IRRADIANCE LP 471 ERY



The probe LP 471 ERY measures the total effective irradiance (W_{eff}/m²) according to the UV action curve (CEI EN 60335-2-27). A particular type of photodiode and a combination of special filters bring the spectral response closer to the UV action curve.
CEI EN 60335-2-27 standards estabilish a maximum allowable dose of 100J/m² for first-time exposure and an annual dose of 15000J/m².
The typical spectral response curve of LP 471 ERY is shown in the Figure together with the UV action curve.
The good accordance between the two curves enables the instrument to take reliable measurements of different types of lamps (and filters) used at present for tanning machines.
Each probe is individually calibrated at DeltaOhm photo-radiometry laboratory by means of a double monochrome. **Calibration is performed at 290 nm through a SIT calibrated reference photodiode.**

ORDERING CODES

DO 9847K: The kit is provided with multifunctional instrument, 9CPRS232 serial output cable, 4 1.5V alkaline batteries, instruction manual and carrying case. **Modules and probes have to be ordered separately .**

9CPRS232: Female/female sub D 9 pole extension cable for RS232C (null modem).

DeltaLog3: Software for downloading and PC data management.

TP471: Measures the temperature with PRT Platinum sensors

Resistance values of the PRT @ 0°C	25Ω, 100Ω, 500Ω
Measuring range Pt25, Pt100	-200°C…+850°C
Measuring range Pt500	-200°C…+500°C
Accuracy	
with Pt25, Pt100 sensor	±0.03°C till 350°C
	±0.3°C till 500°C
Accuracy with Pt500 sensor	±0.5°C till 500°C
Resolution	0.01°C from -200°C till 350°C
	0.1°C from 350°C till 850°C
Temperature drift @20°C	0.02%/°C
Excitation current	400µA impulse, length=100ms, time=1s

TP471D0: Measures the temperature with thermocouple, cold junction at 0°C inside ice.

TP471D: Measures the temperature with thermocouple, 1 input

TP741D1: Measures the temperature with thermocouple, 2 inputs

VP472: Module for connecting pyranometers or albedometers. For acquisition, verification, and storage of the values generated by a pyranometer or albedometer. The generated value can be read in mV or in W/m², the net radioation of the albedometer is read in W/m². The sensitivity can be set between 5000 and 30000nV/(W/m²), or rather between 5 and 30µV/(W/m²).

VP473: Module for reading continuous voltage. Reads and acquires values when connected to a transmitter with voltage signal. Measuring range ±20Vdc. Input impedance: 1MΩ.

IP472: Module for reading continuous current. Reads and acquires current values when connected to a transmitter with current output. Measuring range 0…24mA Input impedance: 25Ω.

PP471: Module for the measurement of absolute, relative, and differential pressure. Works with pressure probes of the series TP704 and TP705. Provides instantaneous value and pressure peak value. Includes cable L=2 and 8-pole DIN 45326 female connector.

Accuracy: ±0.05% of f.s.	Peak time: ≥ 5ms
Accuracy of the peak: ±0.5% f.s	Peak dead band: ≤ 2% f.s.

Probes complete with SICRAM module
TEMPERATURE MEASUREMENT PROBES

TP472I: Immersion probe, sensor Pt100. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.

TP472I.0: Immersion probe, sensor Pt100. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.

TP473P: Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.

TP473P.0: Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.

TP474C: Contact probe, sensor Pt100. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.

TP474C.0: Contact probe, sensor Pt100. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.

TP475A.0: Air probe, sensor Pt100. Stem Ø 4mm, length 230mm. Cable length 2 metres.

TP472I.5: Immersion probe, sensor Pt100. Stem Ø 6mm, length 500 mm. Cable length 2 metres.

TP472I.10: Immersion probe, sensor Pt100. Stem Ø 6mm, length 1,000mm. Cable length 2 metres.

TP49A: Immersion probe, Pt100 sensor. Stem Ø 2.7 mm, Length 150 mm. Cable 2 meters long. Aluminium handle.

TP49AC: Contact probe, Pt100 sensor. Stem Ø 4 mm, Length 150 mm. Cable 2 meters long. Aluminium handle.

TP49AP: Penetration probe, Pt100 sensor. Stem Ø 2.7 mm, Length 150 mm. Cable 2 meters long. Aluminium handle.

TP875: Globe thermometer Ø 150 mm with handle. Cable 2 metres

TP876: Globe thermometer Ø 50 mm with handle. Cable 2 metres.

TP87: Immersion probe, Pt100 sensor. Stem Ø 3 mm, lenght 70 mm. Cable 2 metres.

TP878: Contact probe for solar panels. Cable 2 metres.

TP878.1: Contact probe for solar panels. Cable 5 metres.

TP879: Penetration probe for compost. Stem Ø 8 mm, Length 1 m. Cable 2 meters.

Temperature probes without SICRAM module

TP47.100: Immersion probe, 4 wire direct Pt100 sensor. Stem Ø 3mm, length 230mm. 4 wire connecting cable with connector, length 2 metres.

TP47.1000: Immersion probe, 4 wire direct Pt1000 sensor. Stem Ø 3mm, length 230mm. 4 wire connecting cable with connector, length 2 metres.

TP47: Connector for probes connection: 4 wire direct Pt100.

Relative humidity and temperature probes complete with SICRAM module

HP472ACR: %RH and temperature combined probe, dimensions Ø 26x170 mm. 2 m connecting cable.

HP572ACR: %RH and temperature combined probe, **K thermocouple sensor**. Dimensions Ø 26x170 mm. 2 m connecting cable.

HP473ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x110 mm. 2m connecting cable.

HP474ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x210 mm. 2m connecting cable.

HP475ACR: %RH and temperature combined probe. 2 m connecting cable. Handle Ø 26x110 mm. Stainless-steel tube Ø 12x560 mm. Terminal tip Ø 13.5x75 mm.

HP475AC1R: %RH and temperature combined probe. 2 m connection cable. Handle Ø 26x110 mm. Stainless steel stern Ø 14x480 mm.

HP477DCR: %RH and temperature combined sword probe. 2 m connecting cable. Handle Ø 26x110 mm. Probe tube 18x4 mm, length 520 mm.

HP478ACR: %RH and temperature combined probe. Dimensions Ø 14x130 mm. 5m connection cable.

PROBES FOR PRESSURE MEASUREMENT
Probes complete with SICRAM module

PP471: SICRAM module interface between instrument and pressure probes of the series TP704 and TP705.

PP472: Barometric probe, measuring range 600…1100mbar. Resolution: 0.1mbar Accuracy @ 20°C: ±0.3mbar. Temperature range: -10 … +60°C

PP473S1…S8: Differential pressure probes.

Working range	**S1**=f.s.10mbar,	**S2**=f.s.20mbar,	**S3**=f.s.50mbar,
	S4=f.s.100mbar,	**S5**=f.s.200mbar,	**S6**=f.s.500mbar,
	S7=f.s.1bar,	**S8**=f.s.2bar	
Maximum overpressure	**S1,S2,S3**=200mbar	**S4**=300mbar	**S5,S6**=1bar
	S7=3bar	**S8**=6bar	
Accuracy @ 25°C	±0.5%f.s. (10, 20, 50mbar)	±0.25%f.s. (100mbar)	±0.12% f.s. (200, 500, 1000, 2000mbar)
Temperature range	-10 … +60°C		
Fluid in contact with the membrane	non-corrosive dry gas or air		
Connection	tube Ø 5mm		

Probes to couple to the module to measure the absolute, relative or differential pressure.

TP704…/TP705…: Probes to connect to SICRAM module PP471 for measuring relative, absolute or differential pressure.

PROBES FOR AIR SPEED MEASUREMENTS
Probes equipped with SICRAM modules

HOT-WIRE PROBES

AP471 S1: Hot-wire telescopic probe, measuring range: 0.1…40m/s.

AP471 S2: Omni-directional hot-wire probe, measuring range: 0.1…5m/s.

AP471 S3: Hot-wire telescopic probe with terminal tip for easy position, measuring range: 0.1…40m/s.

AP471 S4: Omnidirectional hot-wire telescopic probe with base, measuring range: 0.1…5m/s. Cable length 2 metres.

Vane probes:

AP472 S1: Vane probe with thermocouple, Ø 100mm. Speed from 0.6 to 25m/s; temperature from -25 to 80°C. Cable length 2 metres.

AP472 S2: Vane probe, Ø 60mm. Measurement range: 0.5…20m/s. Cable length 2 metres.

AP472 S4L: Vane probe, Ø 16mm. speed from 0.8 to 20m/s. Cable length 2 metres.

AP472 S4LT: Vane probe with thermocouple, Ø 16mm, speed from 0.8 to 20m/s. Temperature from -25 to 80°C with thermocouple K sensor(*). Cable length 2 metres.

AP472 S4H: Vane probe, Ø 16mm speed from 10 to 40m/s. Cable length 2 metres.

AP472 S4HT: Vane probe with thermocouple, Ø 16mm speed from 10 to 40m/s. Temperature from -25 to 80°C with thermocouple K sensor(*). Cable length 2 metres.

MODULES FOR PITOT TUBES

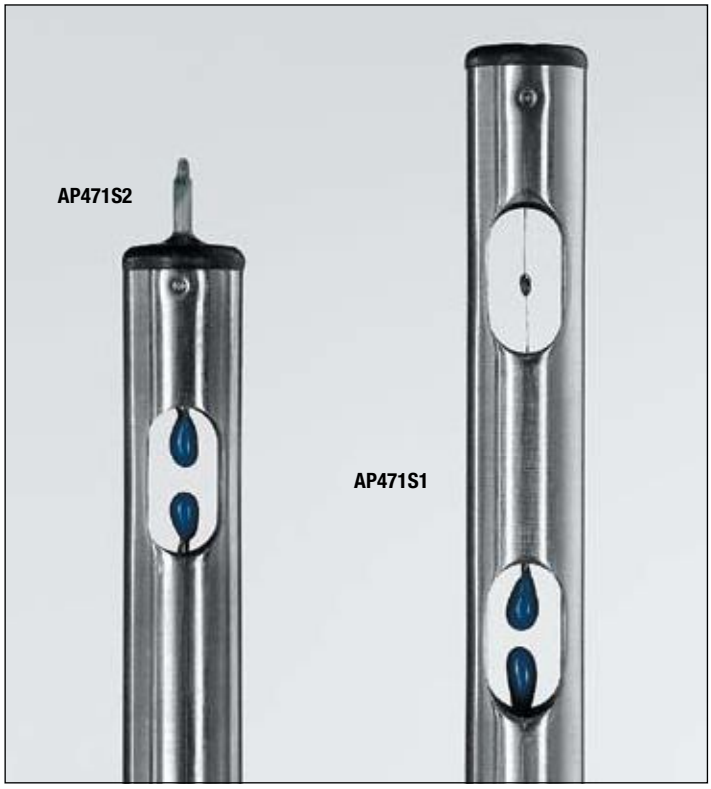
AP473 S1: Pitot tube probe, differential pressure 10mbar f.s. Air speed from 2 to 40m/s. The Pitot tube has to be ordered separately.

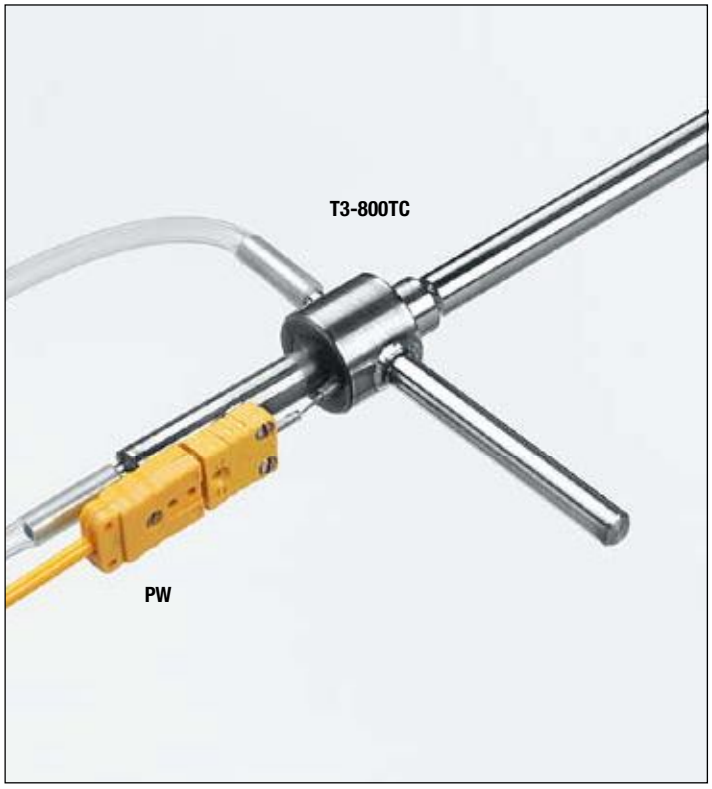
AP473 S2: Pitot tube probe, differential pressure 20mbar f.s. Air speed from 2 to 55m/s. The Pitot tube has to be ordered separately.

AP473 S3: Pitot tube probe, differential pressure 50mbar f.s. Air speed from 2 to 90m/s. The Pitot tube has to be ordered separately.

AP473 S4: Pitot tube probe, differential pressure 100mbar f.s. Air speed from 2 to 130m/s. The Pitot tube has to be ordered separately.

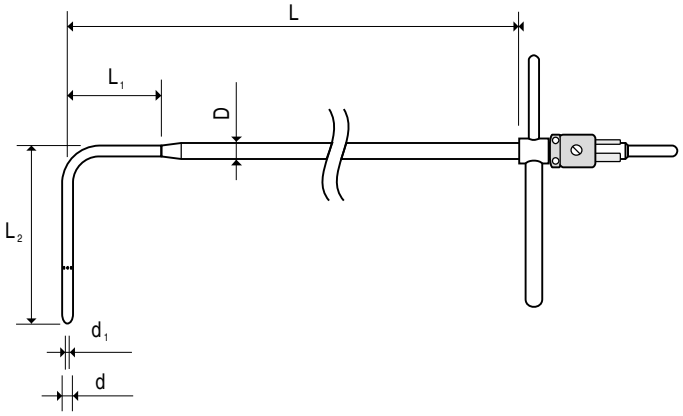
PW: Connection cable between AP473S… module and **Pitot tube**.





PITOT TUBES

Stainless steel Pitot tubes to measure air speed and temperature for models provided with 'K' thermocouple. They can be connected to the SICRAM modules AP473S1, AP473S2, AP473S3 and AP473S4



	d mm	d1 mm	D mm	L mm	L1 mm	L2 mm	Temp.°C	Thermo-couple K	Material
T1-300	3	1	6	300	30	72	0…600°C	---	AISI 316
T2-400	5	2	8	400	45	120		---	
T2-600	5	2	8	600	45	120		---	
T3-500	8	3.2	8	500	---	192		---	
T3-800	8	3.2	8	800	---	192		---	
T3-800TC	8	3.2	8	800	---	192		TC	
T4-500	10	4.0	10	500	---	240		---	
T4-800	10	4.0	10	800	---	240		---	
T4-800TC	10	4.0	10	800	---	240		TC	
T4-1000	10	4.0	10	1000	---	240		---	
T4-1000TC	10	4.0	10	1000	---	240		TC	

PROBES FOR LIGHT MEASUREMENT

Probes complete with SICRAM module

LP 471 PHOT: Photometric probe for **ILLUMINANCE** measurement complete with SICRAM module, spectral response in agreement with standard photopic vision, diffuser for cosine correction. Measurement range: 0.01 lux…200·10³ lux.

LP 471 LUM 2: Photometric probe for **LUMINANCE** measurement complete with SICRAM module, spectral response in agreement with standard photopic vision, vision angle 2°. Measurement range: 0.1 cd/m²…2000·10³ cd/m².

LP 471 PAR: Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range **PAR** (Photosynthetically Active Radiation 400nm…700nm) complete with SICRAM, measurement in µmol/m²s, diffuser for cosine correction. Measurement range: 0.01µmol/m²s…10·10³µmol/m²s.

LP 471 RAD: Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module; in the 400nm…1050nm spectral range, diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

LP 471 UVA: Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module; in the 315nm…400nm, peak 360nm, **UVA** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

LP 471 UVB: Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module, in the 280nm…315nm, peak 305nm, **UVB** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

LP 471 UVC: Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module, in the 220nm…280nm, peak 260nm, **UVC** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

LP 471 ERY: Radiometric probe for **TOTAL EFFECTIVE IRRADIANCE** (W_{eff}/m^2) according to the UV action curve (CEI EN 60335-2-27) complete with SICRAM module. Spectral range: 250 nm…400 nm, quartz diffuser for cosine correction. Measurement range: 0.1·10⁻³W_{eff} /m² … 2000 W_{eff} /m².

LP BL: Base with levelling device for the probes (except LP 471 LUM2).

LP BL

AP472S1

AP471S1

LP 471 LUM 2