Delta OHM®

HD 31

[GB] Handheld multifunction data logger

- Temperature
- Humidity
- Pressure
- Air Speed
- Light
- Air Quality - CO_2

PART OF GHM GROUP

GREISINGER HONSBERG Martens IMTRON TA TELEMETRIE & AUTOMATION

[GB] HD31

- Three independent input channels
- Automatic recognition of the probes
- Colour graphic display
- Graph display of the measures
- Configurable measuring unit
- Data logging function with programming of auto start and auto stop
- Data storing on SD card for long logging duration
- Automatic creation of pdf reports
- Functions: HOLD, REL (relative measure) and DIFF (difference)
- Detection of minimum, average and maximum value
- Password protected configuration
- USB connection to PC
- Serial output for printer
- Rechargeable Battery
- Auto power off (configurable and excludable)

Description

HD31 is a handheld portable multifunction meter and data logger, with a large (43 x 58 mm) graphic color LCD display.

It is equipped with three independent inputs. Each input can be connected to SICRAM probes (intelligent and interchangeable probes with calibration data stored inside the module), both single and combined, for the measurement of a plurality of physical quantities:

- Temperature
- Relative humidity
- Atmospheric and differential pressure
- Air speed
- Illuminance (lux) and Irradiance
- Carbon dioxide (CO_2) – Air Quality
- Direct voltage (VP473 module) and current (IP472 module)

The type of sensor connected to the various inputs is automatically recognized by the instrument.

By connecting a combined temperature and relative humidity probe, the instrument calculates the quantities derived from humidity: dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure, saturated vapor pressure, enthalpy. Moreover, the DI discomfort index and the NET (Net Effective Temperature) index are calculated.

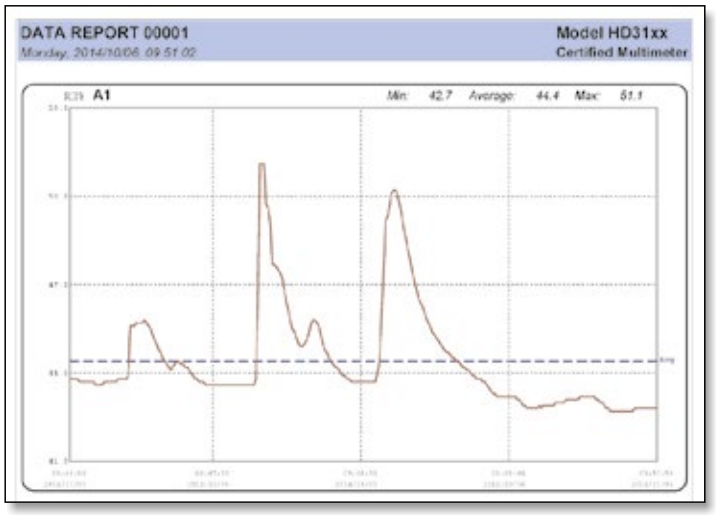
It is also possible to connect not SICRAM probes to the instrument's inputs by using special interface modules to be inserted between the instrument and the probe.

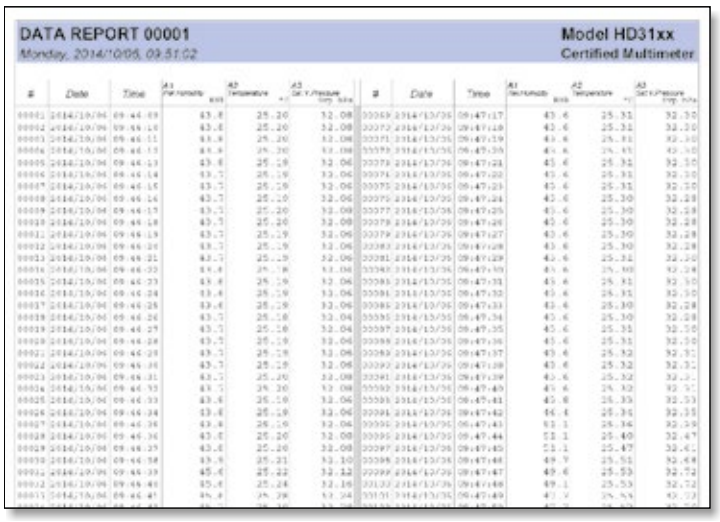
Simultaneous display of three variables in numerical form. Real time visualization on display of the graph of a measured variable.

Measurement units selectable according to the measured physical quantity.

Data logging function with data storing in CSV format directly to the SD type memory card, for a long duration of the logging (for example, with a 4GB SD card, the duration of the logging is in the order of months, even when recording many quantities with the minimum logging interval equal to 1 second). Storage interval configurable by the user. Automatic or manual start and stop of the logging. Storing of date and time of each recorded sample. Automatic creation of measurement reports in PDF format on the memory card.

Manual (it captures the current measurement at simply pushing a key) or automatic (it acquires the current measurement once per second) RECORD function for the calculation of minimum, medium and maximum values measured.





Report in PDF format with graphs and tables

HOLD function (it freezes the current measurements on display), REL function (difference compared to a stored value) and DIFF function (difference between two homogeneous measures, for example between the measurs of two temperature probes).

Password protected functions. A 'Quick Help' on the display helps using the instrument functions.

The USB port with mini USB connector for PC connection is meant for configuration and download of the acquired data. The **DeltaLog9** application software is supplied.

The USB port can operate in “HID” (Human Interface Device) or “Virtual COM” mode. The “HID” mode has the advantage of not requiring the installation of USB drivers: when the instrument is connected to the PC, the Windows® operating system recognizes the instrument automatically and uses the drivers that are already included in the operating system. The “Virtual COM” mode allows communicating with the instrument by sending commands via a generic serial communication program.

It has the MSD (Mass Storage Device) under which the instrument is considered by the PC an SD card reader, thus allowing direct access to the memory card to view, copy or delete the recorded files.

Serial output for printing the visualized measures on a printer with RS232C input. Baud Rate adjustable from 1200 to 115200.

```
HD31
sn 14020975

A SICRAM RH-Pt100
  sn 09002559
  cal factory

B SICRAM Pt100
  sn 20130002
  cal factory

C SICRAM Pt100
  sn 20130003
  cal factory

2016-04-15 16:33:31
A1      50.9     RH%
B1      23.89    °C
C1      24.61    °C
```

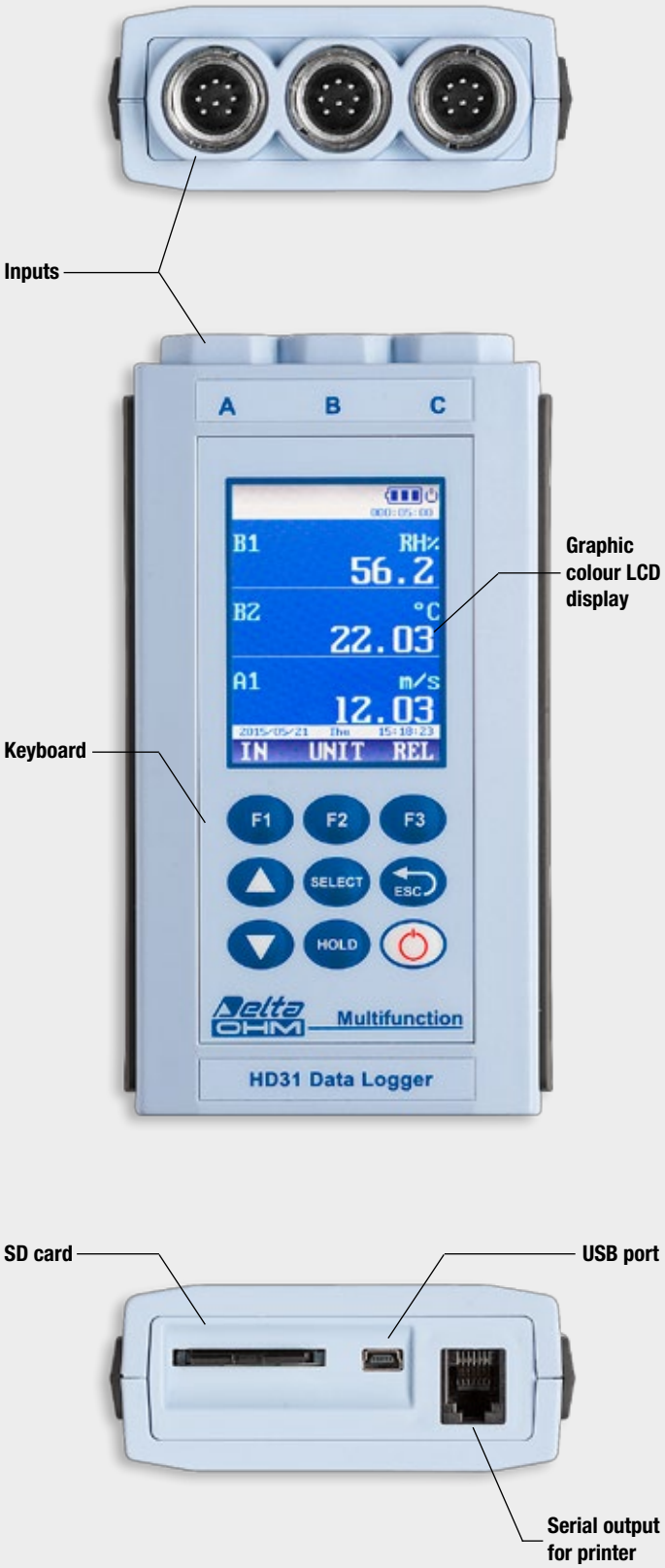
Example of the measurement print out

Rechargeable lithium-ion battery. Auto power off (excludable) after an idle time configurable by the user (2, 5, 10, 15, 20 or 30 minutes) to preserve the battery charge. External power supply through USB port (with mini-USB connector) by connecting a **5 Vdc** adapter or the USB port (at least 500 mA) of a PC. With external power supply connected, the battery is recharged and the auto power off is automatically deactivated.

The probes are factory calibrated and interchangeable. Calibration reports or certificates are available upon request.

A strong and protective rubber housing, provided with a removable back support, is available as **option**.

Instrument description



Technical characteristics

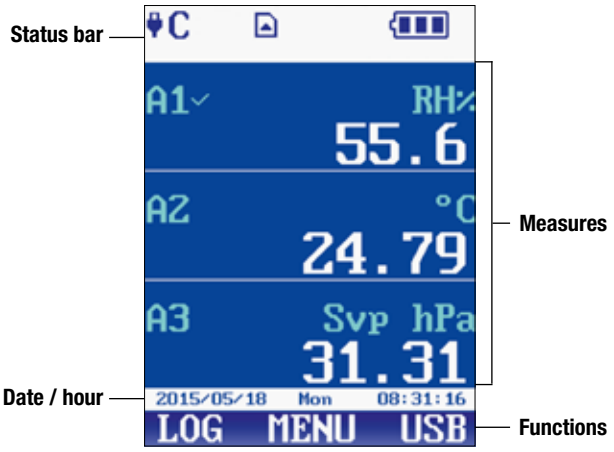
Power supply	**Rechargeable** internal 3.7 V Lithium battery, capacity 2250 mA/h, JST 3-pole connector. **Optional** external 5 Vdc/1A power supply (**SWD05**) to be connected at the mini-USB connector of the instrument. Powered by the PC USB port (at least 500 mA) when connected to the PC.
Battery autonomy	18 hours of continuous operation (typical autonomy with full charge battery and three connected Pt100 probes). **The effective autonomy depends on the number and type of connected sensors.**
Logging interval	1, 5, 10, 15, 30 seconds / 1, 2, 5, 10, 15, 20, 30 minutes / 1 hour
Storage capacity	SD memory card with capacity up to 4 GB. The logging duration depends on the number of logged quantities and on the capacity of the SD card employed. For example: with a 4GB SD card the duration of the logging is in the order of months, even when many quantities are recorded with the minimum logging interval equal to 1 s.
Inputs	3 8-pole DIN45326 connector inputs. Depending on the type of connected probes, the instrument manages up to 36 quantities.
Accuracy @ 20°C	± 0.02 % of the measure **(the instrument only, excluded the accuracy of the probes connected)**
Temperature drift @ 20°C	20 ppm/°C **(the instrument only, excluded the drift of the probes connected)**
Long term stability	0.05 %/year **(the instrument only, excluded the stability of the probes connected)**
Clock stability	1 min/month maximum drift
Display	Color graphic LCD. Visible area 43 x 58 mm.
USB Connection	1 USB port with mini USB connector.
RS232C Connection	1 serial RS232C output with RJ12 (6P6C) connector for connecting to a serial printer. Baud Rate selectable from 1200 to 115200.
Auto power off	Configurable after 2, 5, 10, 15, 20 or 30 minutes from last pressure of a key, with battery supply. It can be disabled. Automatically disabled when powered from external supply.
Operating conditions	-10 … 60 °C, 0 … 85% RH without condensation.
Storage temperature	-25 … 65 °C
Materials	ABS, protective 55 shore rubber bands on the sides. 55 shore rubber protective shell.
Dimensions	165x88x35 mm without rubber protection shell 180x102x46 mm with rubber protection shell
Weight	About 400 g. (including batteries and protection shell)
Protection degree	IP 64

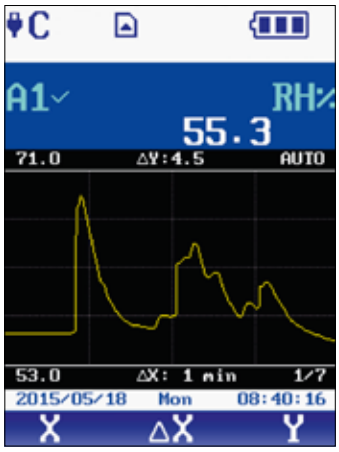
The accuracy and resolution characteristics of the instrument in line with the available SICRAM modules are detailed in the descriptive sections of the modules themselves.

Protection shell with support

Internal rechargeable battery

LCD description

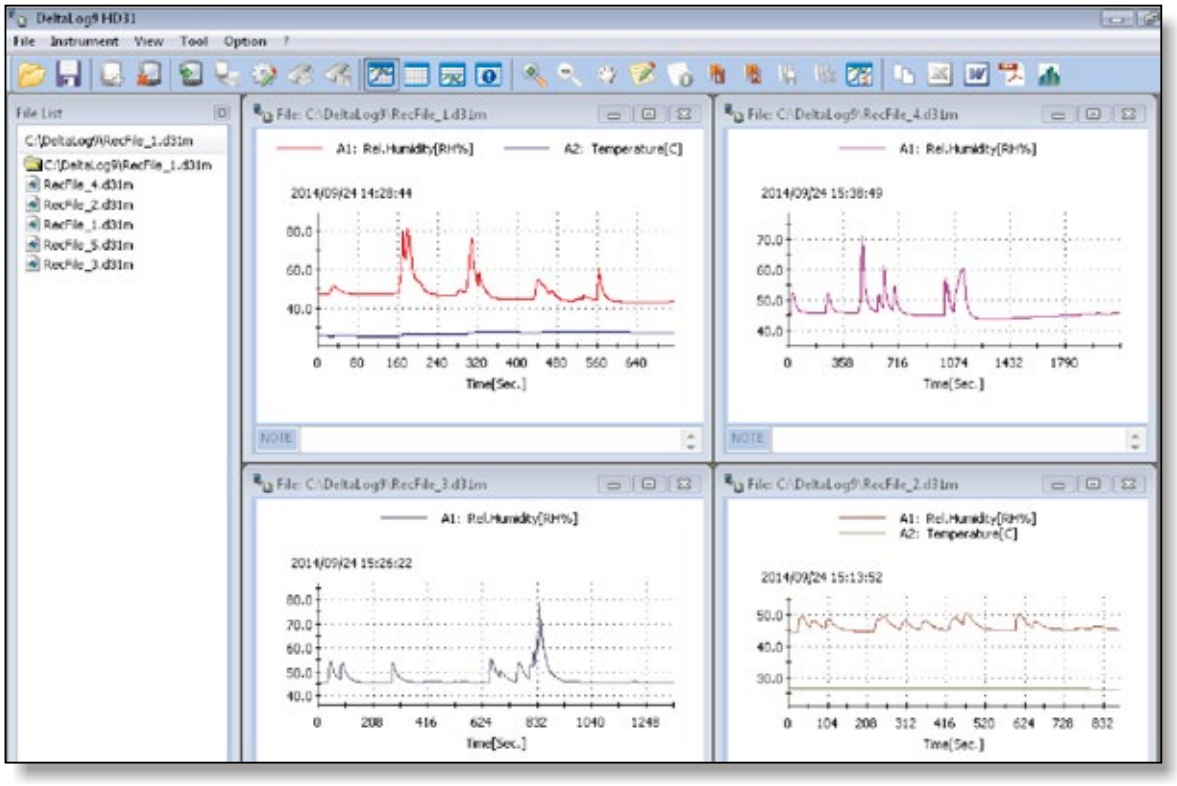




Real time measurement graph

HELP functions on the display

Software DeltaLog 9



TECHNICAL DATA OF SICRAM PROBES AND MODULES IN LINE WITH THE INSTRUMENT

Direct voltage and current

VP473 SICRAM module for the measurement of direct voltage. When connected to a transmitter with voltage output, it can acquire the voltage signal. Measuring range: ±20 Vdc. Input impedance: 1 MΩ.

IP472 SICRAM module for the measurement of direct current. When connected to a transmitter with current output, it can acquire the current signal. Measuring range: 0…24 mA. Input impedance: 25 Ω.

Temperature with Platinum sensors (PRT)

4-wire Pt100 sensor temperature probes equipped with SICRAM module

Model	Type	Application range	Accuracy
TP472I	Immersion	-196 °C…+500 °C	±0.25 °C (-196 °C…+300 °C) ±0.5 °C (+300 °C…+500 °C)
TP472I.0 1/3 DIN – Thin Film	Immersion	-50 °C…+300 °C	±0.25 °C
TP473P.I	Penetration	-50 °C…+400 °C	±0.25 °C (-50 °C…+300 °C) ±0.5 °C (+300 °C…+400 °C)
TP473P.0 1/3 DIN - Thin Film	Penetration	-50 °C…+300 °C	±0.25 °C
TP474C.0 1/3 DIN - Thin Film	Contact	-50 °C…+300 °C	±0.3 °C
TP475A.0 1/3 DIN - Thin Film	Air	-50 °C…+250 °C	±0.3 °C
TP472I.5	Immersion	-50 °C…+400 °C	±0.3 °C (-50 °C…+300 °C) ±0.6 °C (+300 °C…+400 °C)
TP472I.10	Immersion	-50 °C…+400 °C	±0.3 °C (-50 °C…+300 °C) ±0.6 °C (+300 °C…+400 °C)
TP49A.I	Immersion	-70 °C…+250 °C	±0.25 °C
TP49AC.I	Contact	-70 °C…+250 °C	±0.25 °C
TP49AP.I	Penetration	-70 °C…+250 °C	±0.25 °C
TP875.I	Globe-thermometer Ø 150 mm	-30 °C…+120 °C	±0.25 °C
TP876.I	Globe-thermometer Ø 50 mm	-30 °C…+120 °C	±0.25 °C
TP87.0 1/3 DIN - Thin Film	Immersion	-50 °C…+200 °C	±0.25 °C
TP878.0 1/3 DIN - Thin Film	Photovoltaic	+4 °C…+85 °C	±0.25 °C
TP878.1.0 1/3 DIN - Thin Film	Photovoltaic	+4 °C…+85 °C	±0.25 °C
TP879.0 1/3 DIN - Thin Film	Compost	-20 °C…+120 °C	±0.25 °C

Common characteristics

Resolution 0.01 °C from -200 °C to 350 °C / 0.1 °C from 350 °C to 800 °C

Temperature drift @ 20 °C 0.003 %/°C

4-wire Pt100 and 2-wire Pt1000 probes

Model	Type	Application range	Accuracy
TP47.100.0 1/3 DIN – Thin Film	4-wire Pt100	-50…+250 °C	1/3 DIN
TP47.1000.0 1/3 DIN – Thin Film	2-wire Pt1000	-50…+250 °C	1/3 DIN
TP87.100.0 1/3 DIN – Thin Film	4-wire Pt100	-50…+200 °C	1/3 DIN
TP87.1000.0 1/3 DIN – Thin Film	2-wire Pt1000	-50…+200 °C	1/3 DIN

Common characteristics

Resolution 0.01 °C from -200 °C to 350 °C / 0.1 °C from 350 °C to 800 °C

Temperature drift @ 20 °C

Pt100	0.003 %/°C
Pt1000	0.005 %/°C

TP471 Module for **NO** SICRAM temperature probes with Platinum sensor (PRT).

Resistance values of the sensor @ 0 °C	25 Ω, 100 Ω, 500 Ω
Measuring range Pt25, Pt100	-200 °C … +850 °C
Measuring 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	400 μA impulsive, Duration=100 ms, Period=1 s

Temperature with thermocouple sensors

TP471D0 1-input module for **NO** SICRAM probes with thermocouple sensors type K-J-E-T-N-R-S-B. **Without cold joint compensation**.

TP471D 1-input module for **NO** SICRAM probes with thermocouple sensors type K-J-E-T-N-R-S-B. **With internal sensor for cold joint compensation.**

TP471D1 2-input module for **NO** SICRAM probes with thermocouple sensors type K-J-E-T-N-R-S-B. **With internal sensor for cold joint compensation.**

Characteristics of thermocouple temperature measurement (modules TP471D0, TP471D, TP471D1)

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 till full 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

The accuracy is referred to the instrument only, the error due to the thermocouple or the cold joint reference sensor is excluded.

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

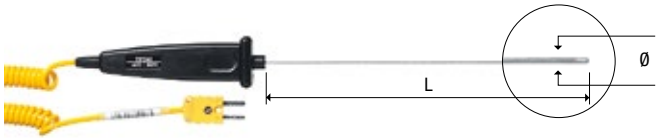
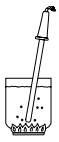
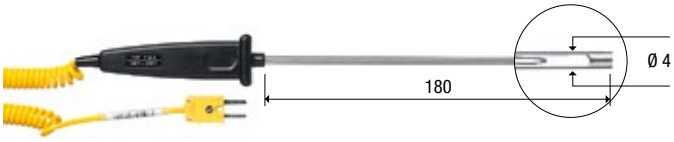
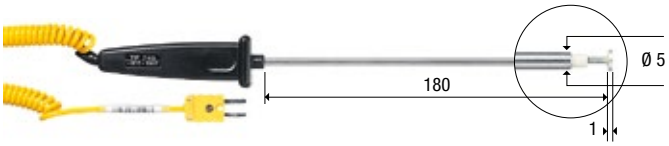
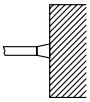
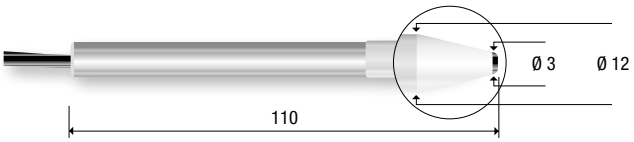
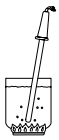
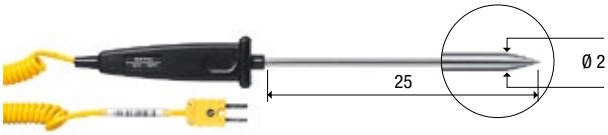
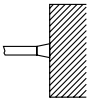
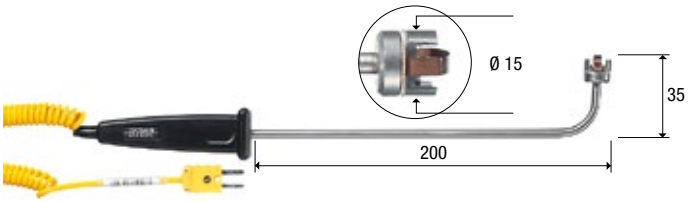
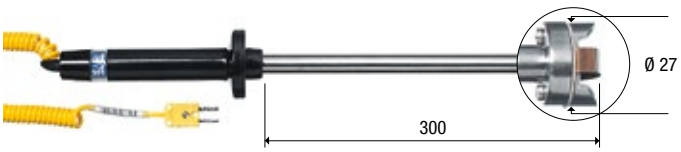
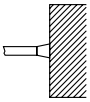
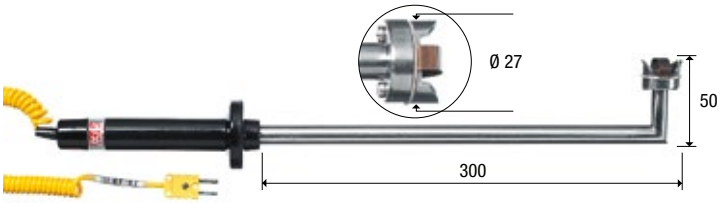
Tolerance of the thermocouple probes:
The tolerance of a type of thermocouple corresponds to the maximum allowed deviation from the e.m.f. of any thermocouple of that type, with reference junction at 0°C. The tolerance is expressed in Celsius degrees, preceded by the sign. The tolerances refer to the operating temperature for which the thermocouple is provided, depending on the diameter of the thermo elements.

THERMOCOUPLE TOLERANCE CLASSES

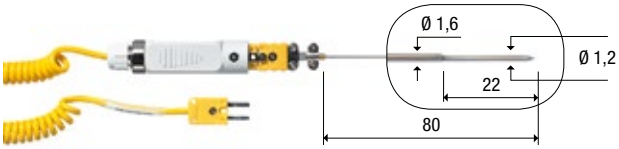
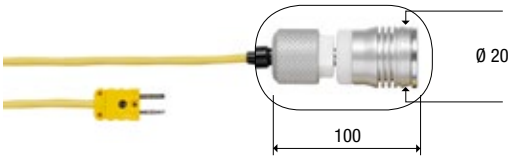
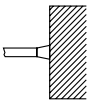
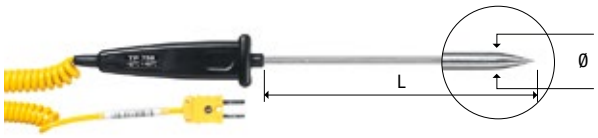
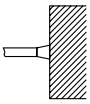
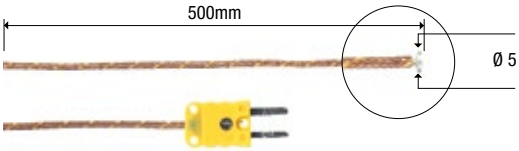
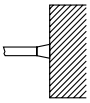
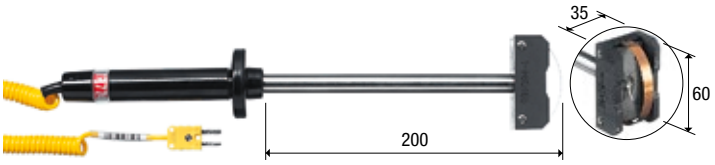
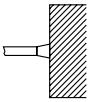
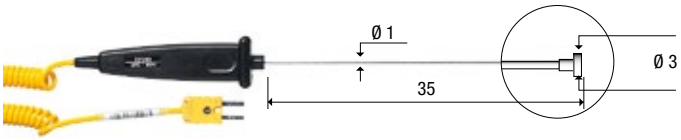
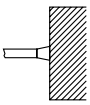
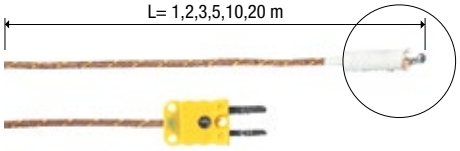
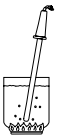
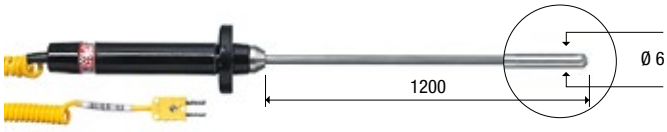
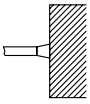
Tolerances according to the standard **IEC 60584-2**.
The values are referred to **thermocouples with reference junction at 0 °C**.

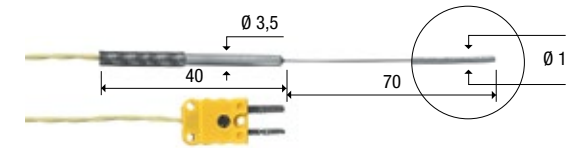
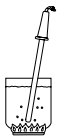
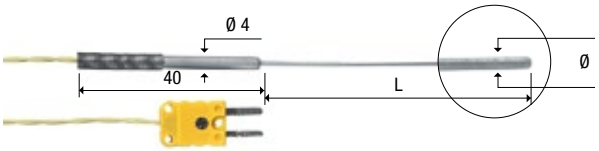
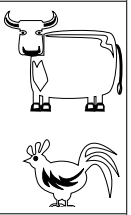
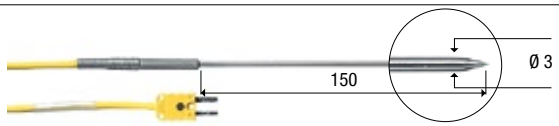
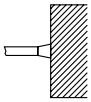
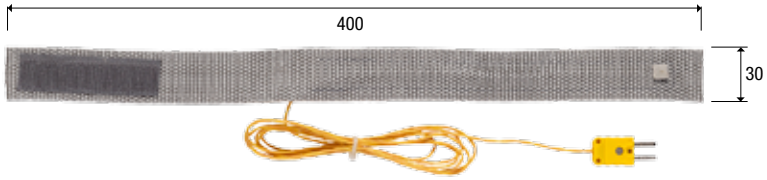
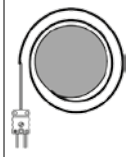
	Class 1 tolerance		Class 2 tolerance		Class 3 tolerance	
Type of thermo-couple	**Temperature interval (°C)**	**Tolerance (°C)**	**Temperature interval (°C)**	**Tolerance (°C)**	**Temperature interval (°C)**	**Tolerance (°C)**
B	---	---	+600…+1700	± 0.0025 × t	+600…+800	± 4
	---	---	---	---	+800…+1700	± 0.005 × t
E	-40…+375	± 1.5	-40…+333	± 2.5	-167…+40	± 2.5
	+375…+800	± 0.004 × t	+333…+900	± 0.0075 × t	-200…-167	± 0.015 × t
J	-40…+375	± 1.5	-40…+333	± 2.5	---	---
	+375…+750	± 0.004 × t	+333…+750	± 0.0075 × t	---	---
K , N	-40…+375	± 1,5	-40…+333	± 2.5	-167…+40	± 2.5
	+375…+1000	± 0.004 × t	+333…+1200	± 0.0075 × t	-200…-167	± 0.015 × t
R , S	0…+1100	± 1	0…+600	± 1.5	---	---
	+1100…+1600	± [1+0.003 × (t-1100)]	+600…+1600	± 0.0025 × t	---	---
T	-40…+125	± 0.5	-40…+133	± 1	-67…+40	± 1
	+125…+350	± 0.004 × t	+133…+350	± 0.0075 × t	-200…-67	± 0.015 × t

Note: t = temperature of the measuring junction in °C.

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION						
CODE	**°C max**	**τ s**	**DIMENSIONS (mm)**			**USE**
TP 741	800	2s	**L**=180	∅=1.5		
TP 741/1	400	2s	**L**=90	∅=1.5		
TP 741/2	800	2s	**L**=230	∅=1.5		
TP 742	800	2s	**L**=180	∅=2		
TP 742/1	400	2s	**L**=90	∅=2		
TP 742/2	800	2s	**L**=230	∅=2		
TP 743	800	3s	**L**=180	∅=3		
TP 744	400	4s				
TP 745	500	5s				
TP 746	250	2s				
TP 750	-196 +1000	3s	**L**=500	∅=3		
TP 750.0	-196 +800	3s	**L**=300	∅=3		
TP 751	200	2s				
	500	2s				
TP 754/9	500	2s				
TP 754 **TP 755**	800	2s				
TP 755/9	800	2s				

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION

CODE	°C max	τ s	DIMENSIONS (mm)			USE
TP 756	200	2s				
TP 757	180	30s	MAGNETIC PROBE FOR CONTACT MEASUREMENTS ON MAGNETIC METALLIC SURFACES 			
TP 758	400	4s	**L**=150	∅=4		
TP 758.1	400	4s	**L**=90	∅=4		
TP 772	400	3s				
TP 774	250	2s				
TP 776	200	2s				
TP 777	200	3s				
TP 647	300	2s	ACCREDIA calibration up to max. 300°C. 			
TP 647/2	300	2s				
TP 647/3	300	2s				
TP 647/5	300	2s				
TP 647/10	300	2s				
TP 647/20	300	2s				
TP 651	1200	6s	**L**=1200	∅=6		
TP 652	1200	6s	**L**=700	∅=6		
TP 655	180	2s	 Cable L = 2m			

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION						
CODE	**°C max**	**τ s**	**DIMENSIONS (mm)**			**USE**
TP 656	200	1s	**L**=70	∅=1	 Cable L = 3m	
TP 656/1	1000	1s	**L**=500	∅=2		
TP 656/2	1000	1s	**L**=1000	∅=2		
TP 657/1	100	5s	 Flexible			
TP 659	400	3s	**L**=150	∅=3		
TP 660	400	4s	**L**=150	∅=4.5		
TP 661	-60 +50	30s				
TP 662	110	120s	TAPE PROBES WITH VELCRO FOR MEASUREMENTS ON PIPES MAX DIAM. 110  Certification up to 58°C			
CM **CS**	"K" "K"					
PW	"K"					

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

The response time **τs** is the response time of the sensor to a temperature variation, with a corresponding variation of the measured signal to a given percentage (63%) of the variation.

Response time is referred:

- Immersion probes in water at 100 °C
- Surface probes in contact with metals surface at 200 °C
- Air probes in air temperature at 100 °C

Relative humidity and temperature

Relative humidity and temperature probes equipped with SICRAM module

Model	Temperature sensor	Application range		Accuracy	
		%RH	Temperature	%RH	Temp
HP472ACR	Pt100	0…100%UR	-20 °C…+80 °C	±1.5% (0…85%RH) ±2.5% (85…100%RH) @T=15…35 °C (2 + 1.5% measure)% @T= remaining field	±0.3 °C
HP473ACR	Pt100	0…100%UR	-20 °C…+80 °C		±0.3 °C
HP474ACR	Pt100	0…100%UR	-40 °C…+150 °C		±0.3 °C
HP475ACR	Pt100	0…100%UR	-40 °C…+150 °C		±0.3 °C
HP475AC1R	Pt100	0…100%UR	-40 °C…+180 °C		±0.3 °C
HP477DCR	Pt100	0…100%UR	-40 °C…+150 °C		±0.3 °C
HP478ACR	Pt100	0…100%UR	-40 °C…+150 °C		±0.3 °C
HP480	Pt100	0…100%UR	-40 °C…+60 °C		±0.25 °C

Common characteristics

Relative Humidity

Sensor	Capacitive
Resolution	0.1%RH
Temperature drift @ 20 °C	0.02 %RH/°C
Response time %RH at constant temperature	10 s (10→80 %RH; air speed=2 m/s)

Temperature with Pt100 sensor

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

Protections and solutions for relative humidity and temperature probes

P1 200µm stainless steel grid protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P2 20µm PE sintered polythene protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P3 20µm sintered bronze protection for probes Ø26, thread M24x1.5. For temperatures up to 150 °C.

P4 20µm sintered PE complete cap for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P6 10µm sintered stainless steel protection for probes Ø14, thread M12x1. For temperatures up to 180 °C.

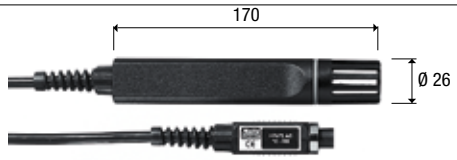
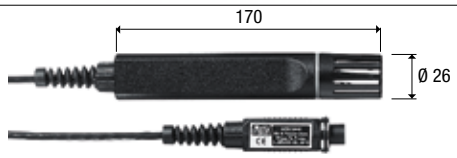
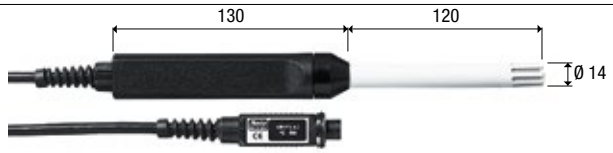
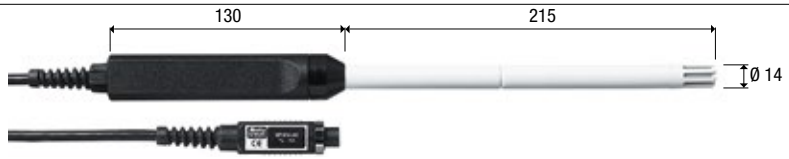
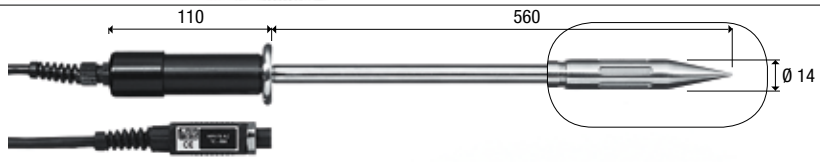
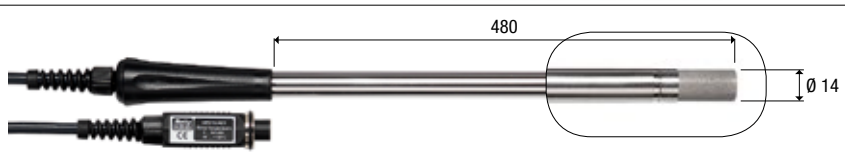
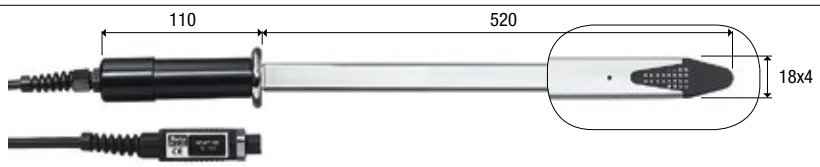
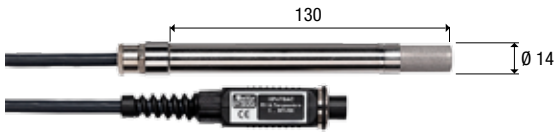
P7 20µm PTFE protection for probes Ø14, thread M12x1. For temperatures up to 150 °C.

P8 20µm stainless steel grid and Pocan protection for probes Ø14, thread M12x1. For temperatures up to 100 °C.

HD75 75% RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø14, M12×1 thread.

HD33 33% RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø14, M12×1 thread.

RELATIVE HUMIDITY AND TEMPERATURE PROBES

COD.	Sensors	Range RH - Temp.	USE
HP472ACR	RH Pt100	0…100% RH -20°C…+80°C	
HP572ACR	RH TC.K		
HP473ACR	RH Pt100		
HP474ACR		0…100% RH -40°C…+150°C (-40°C…+180°C for HP475AC1R)	
HP475ACR			
HP475AC1R			
HP477DCR			
HP478ACR			
HP480	RH Pt100	0…100% RH -40°C…+60°C	

SATURATED SOLUTIONS AND PROBE PROTECTIONS

COD.			USE
HD75 HD33	Threaded ring nut M24 x 1.5 for probes Ø 26 Threaded ring nut M12 x 1 for probes Ø 14		
P1 P2 P3 P4	Ø 26	M 24x1.5	 **P1** **P2** **P3** **P4**
P6 P7 P8	Ø 14	M 12x1	 **P6** **P7** **P8**

PP471

SICRAM module for the measurement of absolute, relative and differential pressure. It works with pressure probes of the series TP704 and TP705. It gives the instantaneous value and the peak of the pressure. The module is supplied with cable L=2m and 8-pole female DIN 45326 connector.

Accuracy	±0.05% of the full scale (f.s.)
Duration of the peak	≥ 5 ms
Accuracy of peak	±0.5% f.s.
Dead band of peak	≤ 2% f.s.

PP472

SICRAM probe for the measurement of barometric pressure

Measuring range	600...1100 mbar
Resolution	0.1 mbar
Accuracy @ 20 °C	±0.3 mbar
Operating temperature	-10...+60 °C

Pressure probes of the series TP704 and TP705 to be connected to the PP471 module

Full scale pressure	Maximum over-pressure	Resolution	ORDERING CODES			Accuracy from 20 to 25°C	Working temperature	Connection
			Differential pressure	Relative pressure (with respect to atmosphere)	Absolute pressure			
			NON insulated Membrane	Insulated membrane	Insulated membrane			
10.0 mbar	20.0 mbar	0.01 mbar	**TP705-10MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
20.0 mbar	40.0 mbar	0.01 mbar	**TP705-20MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
50.0 mbar	100 mbar	0.01 mbar	**TP705-50MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
100 mbar	200 mbar	0.1 mbar	**TP705-100MBD**			0.25 % FSO	0…60 °C	Tube ∅ 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 ∅ 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 ∅ 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 ∅ 5 mm
					TP705BARO	0.25 % FSO	0…60 °C	Tube ∅ 5 mm
				TP704-1BGI		0.25 % FSO	-40…125 °C	¼ BSP
					TP704-1BAI	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 ∅ 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
10.0 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 bar		**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 bar		**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

PP473 S1...PP473 S8

SICRAM probes for the measurement of differential pressure.

Measuring range	**S1**=f.s. 10 mbar	**S2**=f.s. 20 mbar	**S3**=f.s. 50 mbar
	S4=f.s. 100 mbar	**S5**=f.s. 200 mbar	**S6**=f.s. 500 mbar
	S7=f.s. 1 bar	**S8**=f.s. 2 bar	
Maxuimum overpressure	**S1,S2,S3**=200 mbar	**S4**=300 mbar	**S5,S6**=1 bar
	S7=3 bar	**S8**=6 bar	
Accuracy @ 25 °C	**S1,S2,S3**=0.5% f.s.	**S4**=0.25% f.s.	**S5,S6,S7,S8**=0.15% f.s.
Operating temperature	-10...+60 °C		
Fluid in contact with the membrane	non-corrosive dry gas or air		
Connection	Ø 5 mm Tube		

Air speed

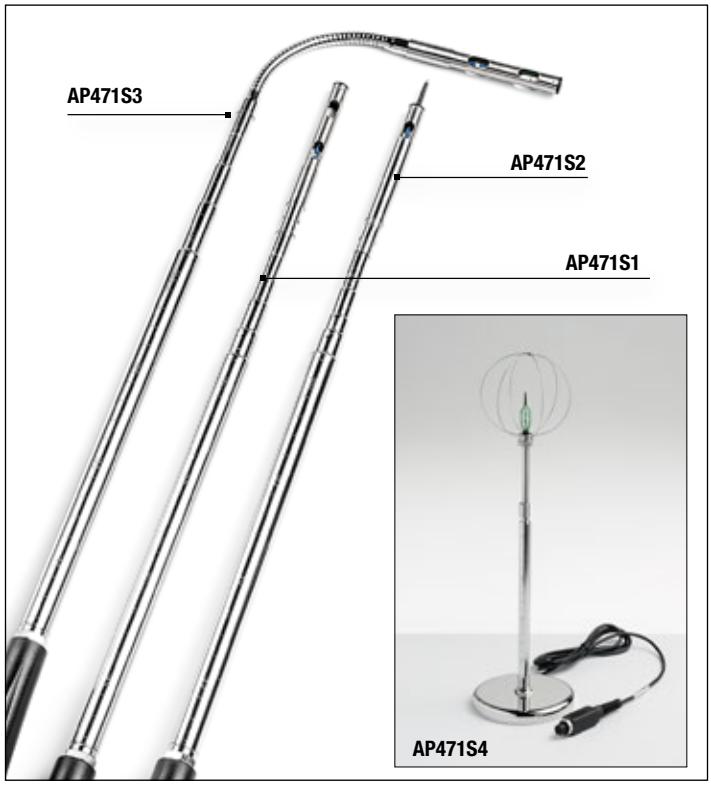
Air speed probes equipped with SICRAM module

	AP471 S1 AP471 S3	AP471 S2	AP471 S4
Type of measure	Wind speed, calculated flow rate, air temperature		
Type of sensor			
Speed	NTC thermistor	Omnidirectional NTC thermistor	
Temperature	NTC thermistor	NTC thermistor	
Measuring range			
Speed	0.1…40 m/s	0.1…5 m/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	±0.2 m/s (0.10…0.99 m/s) ±0.4 m/s (1.00…9.99 m/s) ±0.8 m/s (10.00…40.00 m/s)	±0.05 m/s (0.10…0.99 m/s) ±0.15 m/s (1.00…5.00 m/s)	
Temperature	±0.8°C (-25…+80°C)	±0.8°C (-10…+80°C)	
Minimum speed	0.1 m/s		
Air temperature compensation	0…80°C		
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 equipped with SICRAM module

	AP472 S1	AP472 S2
Type of measurements	Wind speed, calculated flow rate, air temperature	Wind speed, calculated flow rate
Diameter	100 mm	60 mm
Type of measurement		
Speed	Vane	Vane
Temperature	Tc K	----
Measuring range		
Speed	0.6…25 m/s	0.5…20 m/s
Temperature	-25…+80 °C (*)	-25…+80 °C (*)
Resolution		
Speed	0.01 m/s – 0.1 km/h - 1 ft/min – 0.1 mph – 0.1 knot	
Temperature	0.1 °C	----
Accuracy		
Speed	±(0.4 m/s + 1.5% f.s.)	±(0.4 m/s + 1.5% f.s.)
Temperature	±0.8 °C	----
Minimum speed	0.6 m/s	0.5 m/s
Units 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	~2 m	

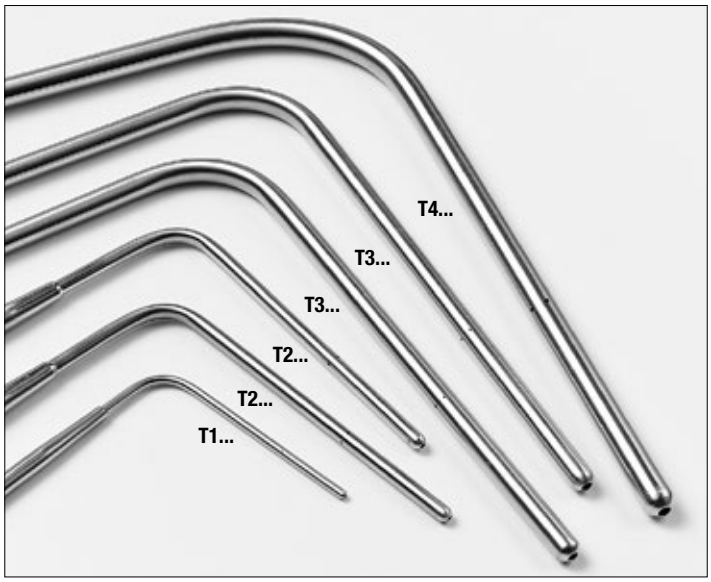
(*)The indicated value refers to the vane's working range.



SICRAM modules for Pitot tubes

	AP473 S1	AP473 S2	AP473 S3	AP473 S4
Type of measure	Air speed, calculated flow rate, differential pressure, air temperature			
Measuring range				
Differential pressure	10 mbar	20 mbar	50 mbar	100 mbar
Air speed (*)	2 … 40 m/s	2 … 55 m/s	2 … 90 m/s	2 … 130 m/s
Temperature	-200…+600 °C	-200…+600 °C	-200…+600 °C	-200…+600 °C
Resolution				
Air speed	0.1 m/s - 1 km/h - 1 ft/min - 1 mph - 1 knots			
Temperature	0.1°C			
Accuracy				
Air speed	±0.4% f.s. of pressure		±0.3% f.s. of pressure	
Temperature	±0.8 °C		±0.8 °C	
Minimum air speed	2 m/s			
Compensation of air temperature	-200…+600 °C (with K type thermocouple connected to the module)			
Measuring unit				
Air speed	m/s – km/h – ft/min – mph - knots			
Flow rate	l/s – m^3/s – m^3/min – ft^3/s – ft^3/min			
Pipeline section for flow rate calculation	100…100000 cm^2 0.01…10 m^2			

(*) At 20 °C, 1013 mbar and negligible Ps (Static Pressure).

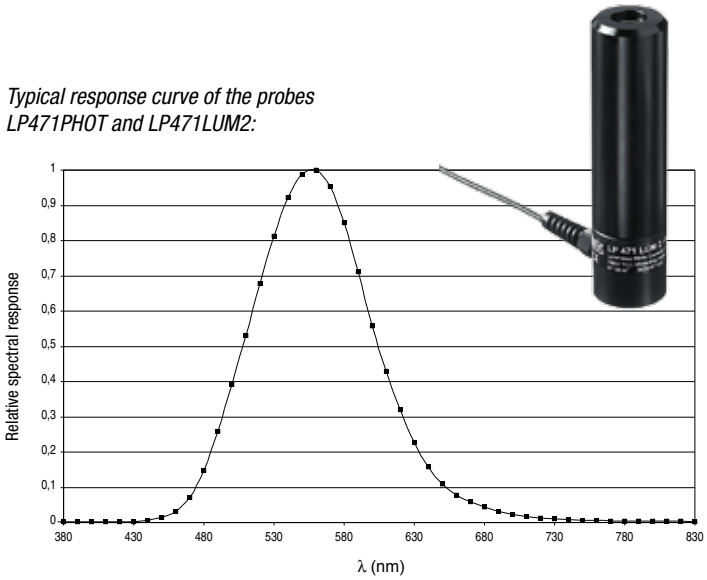


Photometry and Radiometry

LP471PHOT Probe for the measurement of **illuminance**, equipped with SICRAM module.				
Measuring range (lux)	0.10…199.99	…1999.9	…19999	…199.99x10^3
Resolution (lux)	0.01	0.1	1	0.01 x 10^3
Spectral range	In agreement with standard photopic curve V(λ)			
α (temperature coefficient) $f_6(T)$	<0.05% K			
Calibration uncertainty	<4%			
f'_1 (in agreement with photopic response V(λ))	<6%			
f_2 (response according to cosine law)	<3%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	B			
Drift after one year	<1%			
Working temperature	0…50 °C			
Reference standard	CIE n°69 – UNI 11142			

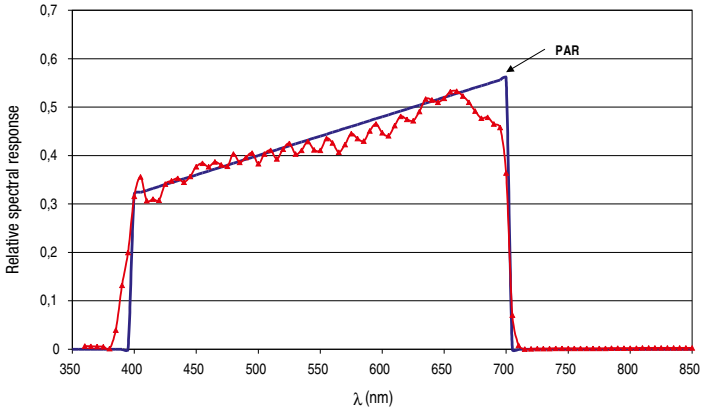
LP471LUM2 Probe for the measurement of **luminance**, equipped with SICRAM module.				
Measuring range (cd/m²)	0.1…1999.9	…19999	…199.99x10³	…1999.9x10³
Resolution (cd/ m²)	0.1	1	0.01 x 10³	0.1 x 10³
Optical angle	2°			
Spectral range	In agreement with standard photopic curve V(λ)			
α (temperature coefficient) f6(T)	<0.05% K			
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%			
Class	C			
Drift after 1 year	<1%			
Working temperature	0…50 °C			
Reference standard	CIE n°69 – UNI 11142			

Typical response curve of the probes LP471PHOT and LP471LUM2:



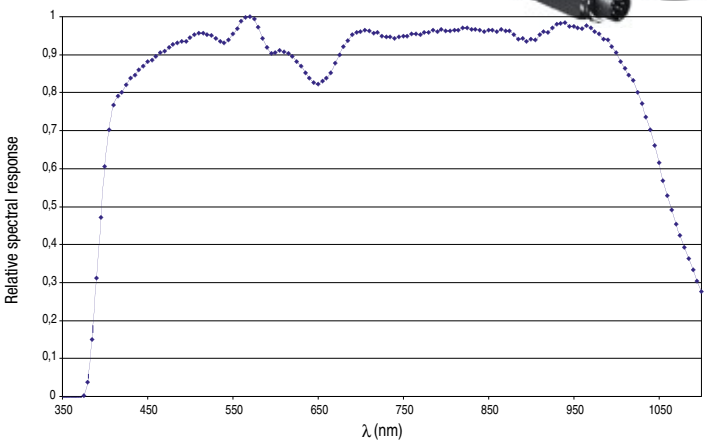
LP471PAR Quantum radiometric probe for the measurement of the **photon flow across the chlorophyll range PAR**, equipped with SICRAM module.			
Measuring range (μmol/m²s)	0.01… 199.99	200.0…1999.9	2000…10000
Resolution (μmol/m²s)	0.01	0.1	1
Spectral range	400 nm…700 nm		
Calibration uncertainty	<5%		
f_2 (response according to cosine law)	<6%		
f_3 (linearity)	<1%		
f_4 (instrument reading error)	±1digit		
f_5 (fatigue)	<0.5%		
Drift after one year	<1%		
Working temperature	0…50 °C		

Typical response curve of the probe LP471PAR:



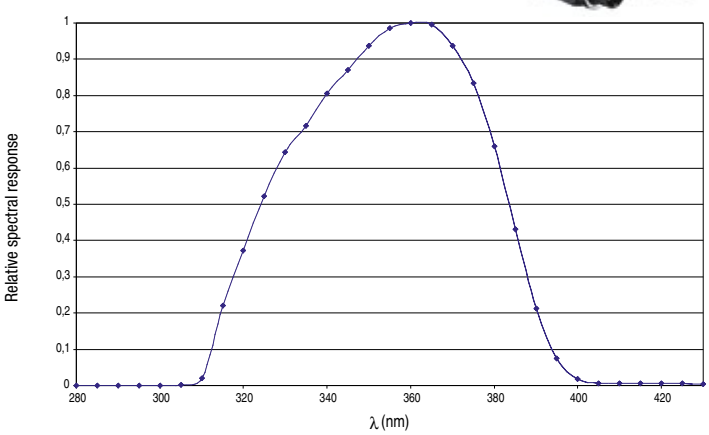
LP471RAD Probe for the measurement of **irradiance**, equipped with SICRAM module.				
Measuring range (W/m²)	0.1x10⁻³…999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution (W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	400 nm…1050 nm			
Calibration uncertainty	<5%			
f_2 (response according to cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<1%			
Working temperature	0…50 °C			

Typical response curve of the probe LP471RAD:



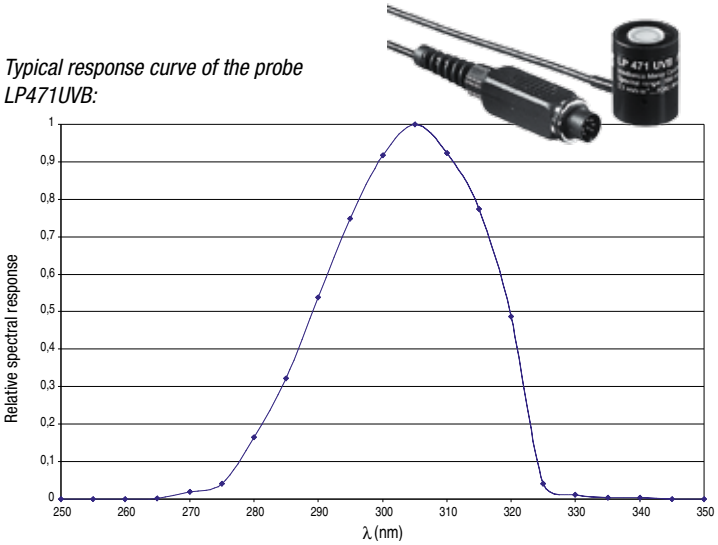
LP471UVA Probe for the measurement of **UVA irradiance**, equipped with SICRAM module.				
Measuring range (W/m²)	1x10⁻³… 999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution(W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	315 nm…400 nm (Peak 360 nm)			
Calibration uncertainty	<5%			
f_2 (response according to cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument measuring error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0…50 °C			

Typical response curve of the probe LP471UVA:



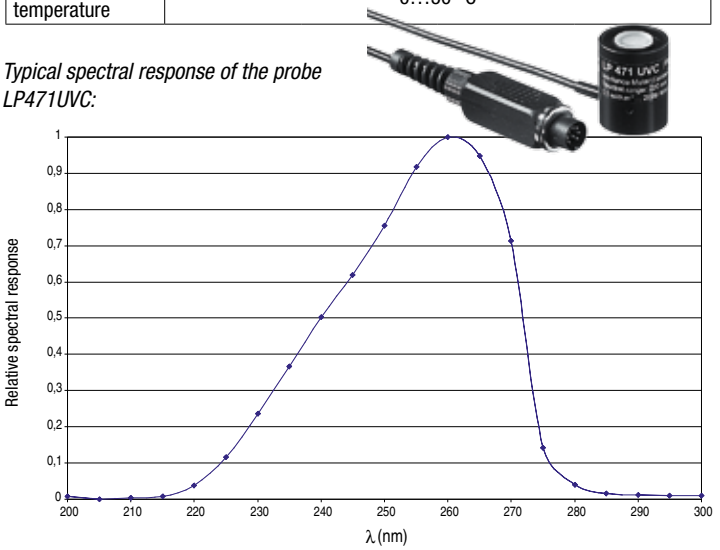
LP471UVB Probe for the measurement of the **UVB irradiance**,equipped with SICRAM module.				
Measuring range (W/m²)	1x10⁻³…999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution (W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	280 nm…315 nm (Peak 305 nm)			
Calibration uncertainty	<5%			
f_2 response according to cosine law)	<6%			
f_3 (linearity)	<2%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0…50 °C			

Typical response curve of the probe LP471UVB:



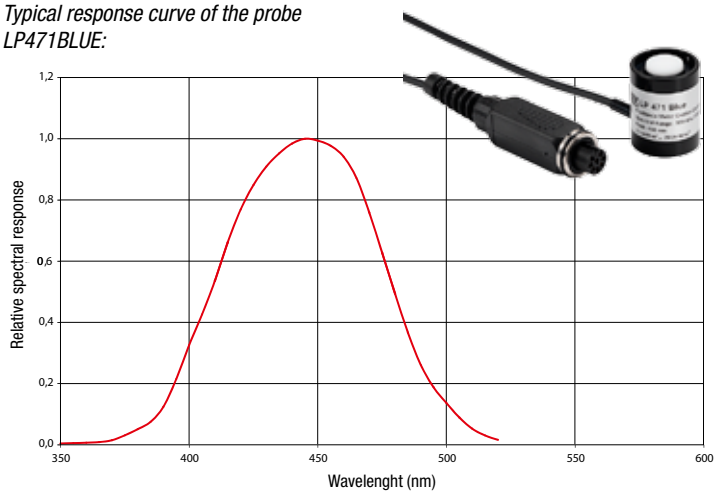
LP471UVC Probe for the measurement of the **UVC irradiance**, equipped with SICRAM module.				
Measuring range (W/m²)	1x10⁻³…999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution (W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	220 nm…280 nm (Peak 260 nm)			
Calibration uncertainty	<5%			
f_2 (response according to cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0…50 °C			

Typical spectral response of the probe LP471UVC:



LP471BLUE Probe for the measurement of **effective irradiance in the blue light spectrum**, equipped with SICRAM module.				
Measuring range (W/m²)	0.1x10⁻³…999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution (W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	380 nm…550 nm. Effective irradiance for blue light hazard B(λ)			
Calibration uncertainty	<10%			
f_2 (response according to cosine law)	<6%			
f_3 (linearity)	<3%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0…50 °C			

Typical response curve of the probe LP471BLUE:



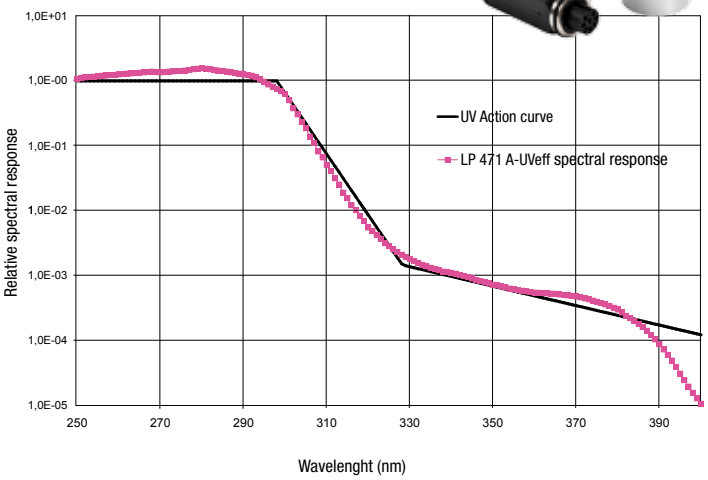
The radiometric probe LP 471 BLUE measures the irradiance (W/m²) in the spectral range of Blue light. The probe consists of a photodiode with an appropriate filter and is provided with a diffuser for correct measurement according to the cosine law.The spectral response curve of the probe allows measuring the effective irradiance for blue light hazard (curve B (λ) according to the standards ACGIH/ICNIRP) in the spectral range from 380 nm to 550 nm. Optical radiations in this range can produce photochemical retinal injury. Another field of application is the monitoring of the blue light irradiance in the treatment of neonatal jaundice.

LP471P-A Two sensors combined probe for the measurement of **illuminance** and **UVA irradiance,** equipped with SICRAM module.				
Illuminance				
Measuring range (lux)	0.3…199.99	…1999.9	…19999	…199.99x10³
Resolution (lux)	0.01	0.1	1	0.01x10³
Spectral range	In agreement with photopic standard curve V(λ)			
α (temperature coefficient) f_6(T)	<0.05% K			
Calibration uncertainty	<4%			
f'$_1$ (in agreement with photopic response V(λ))	<6%			
f_2 (response according to cosine law)	<3%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	B			
Drift after one year	<1%			
Working temperature	0…50 °C			
Reference standard	CIE n°69 – UNI 11142			
Response curve	see response curve of the probe LP471PHOT			

UVA irradiance				
Measuring range (µW/cm²)	0.10…199.99	…1999.9	…19999	…199.99x10³
Resolution (µW/cm²)	0.01	0.1	1	0.01x10³
Spectral range	315 nm…400 nm (Peak 360 nm)			
Calibration uncertainty	<5%			
f_2 (response according to cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0…50 °C			
Response curve	see response curve of the probe LP471UVA			

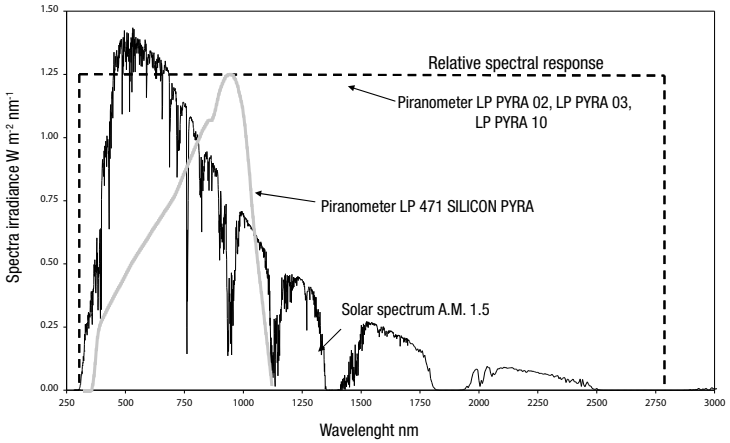
LP471A-UVeff Probe for the measurement of **total effective irradiance according to UV weighting curve**, equipped with SICRAM module.	
Total effective irradiance	
Measuring range (W_{eff}/m²)	0.010…19.999
Resolution (W_{eff}/m²)	0.001
Spectral range	UV action curve for erythema measurement (250 nm…400 nm)
Calibration uncertainty	<15%
f_3 (linearity)	<3%
f_4 (instrument reading error)	±1digit
f_5 (fatigue)	<0.5%
Drift after one year	<2%
Working temperature	0…50 °C
Reference standard	CEI EN 60335-2-27
UVA irradiance	
Measuring range (W_{eff}/m²)	0.1… 1999.9
Resolution (W_{eff}/m²)	0.1
Spectral range	315 nm…400 nm
UV-BC irradiance	
Measuring range (W_{eff}/m²)	0.010… 19.999
Resolution (W_{eff}/m²)	0.001
Spectral range	250 nm…315 nm

Typical response curve of the probe LP471A-UVeff:



LP471 SILICON-PYRA Probe for the measurement of **global solar irradiance**, equipped with SICRAM module.				
Measuring range (W/m²)	0.1x10⁻³… 999.9x10⁻³	1.000…19.999	20.00…199.99	200.0…1999.9
Resolution (W/m²)	0.1x10⁻³	0.001	0.01	0.1
Spectral range	400 nm…1100 nm			
Calibration uncertainty	<3%			
f_2 (response according to cosine law)	<3%			
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			

Typical response curve of the probe LP471 SILICON-PYRA:



VP472 SICRAM module for the connection of pyranometers (e.g. "secondary-standard" LP PYRA 10, first class LP PYRA 02 and second class LP PYRA 03) or albedometers (e.g. first class LP PYRA 05 and second class LP PYRA 06).

Measuring range	-25...+25 mV
Resolution	1 W/m² , 1 µV
Accuracy	±1 W/m² , ±3 µV
Sensitivity	selectable from 5 to 30 µV/Wm⁻²

CO_2 (carbon dioxide)

HD31.B3	Probe for CO2 measurement, equipped with SICRAM module.
Sensor	Dual wavelength NDIR
Measuring range	0…5000 ppm
Sensor operating temperature	-5…50 °C
Accuracy	±(50 ppm + 3% of measure) @ (25 °C, 1013 mbar)
Resolution	1 ppm
Temperature dependence	1 ppm/°C
Response time (T90)	< 120 s (wind speed = 2 m/s)
Long-term stability	5% of measure / 5 years

Ordering codes

HD31 Handheld portable multifunction instrument and data logger instrument. Color graphic LCD. Three independent inputs for single channel or double channel combined probes or SICRAM modules. Records directly on SD memory card. USB port for PC connection or external power supply (**optional**). RS232C output for the connection to a serial printer. Supplied with: rechargeable Lithium battery, SD card, software DeltaLog9, instruction manual and carrying case.

Modules, probes, USB and serial connection cables, external power supply and rubber protection shell HD31.28 have to be ordered separately.

Accessories

DeltaLog9 Additional copy of CD-ROM with software DeltaLog 9 for configuration, data download, monitor and PC data management. For Windows® operating systems.

CP31 PC connecting cable with male mini-USB connector on instrument side and male A type USB connector on PC side

CP31RS RS232C connecting cable for serial printer. RJ12 connector on instrument side and 9-pole female Sub-D connector on printer side.

SWD05 100-240 Vac / 5 Vdc - 1 A power adapter.

HD31.28 Protection shell in 55 shore rubber, with extractable back support. Colour dark grey.

HD35-BAT1 3.7 V lithium-ion **rechargeable** battery, capacity 2250 mA/h, 3-pole JST connector.

HD40.1 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.

BAT-40 Spare battery pack for HD40.1 printer with built-in temperature sensor.

RCT Four rolls of thermal paper, width 57mm, diameter 32mm.

Pt100 temperature probes equipped with SICRAM module

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

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

TP473P.I Penetration probe, Pt100 sensor. Stem Ø 4 mm, length 150 mm. Cable length 2 m.

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

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

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

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

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

TP49A.I Immersion probe, Pt100 sensor. Stem Ø 2.7 mm, length 150 mm. Cable length 2 m. Aluminium handle.

TP49AC.I Contact probe, Pt100 sensor. Stem Ø 4 mm, length 150 mm. Cable length 2 m. Aluminium handle.

TP49AP.I Penetration probe, Pt100 sensor. Stem Ø 2.7 mm, length 150 mm. Cable length 2 m. Aluminium handle.

TP875.I Globe thermometer Ø 150 mm with handle, complete with SICRAM module. Cable length 2 m.

TP876.I Globe thermometer Ø 50 mm with handle, complete with SICRAM module. Cable length 2m.

TP87.0 Immersion probe, Pt100 sensor. Stem Ø 3 mm, length 70 mm. Cable length 2 m.

TP878.0 Contact probe for solar panels. Cable length 2 m.

TP878.1.0 Contact probe for solar panels. Cable length 5 m.

TP879.0 Penetration probe for compost. Stem Ø 8 mm, length 1 m. Cable length 2 m.

Pt100 and Pt1000 temperature probes without SICRAM module

TP47.100.0 Direct 4 wires Pt100 sensor immersion probe. Probe's stem Ø 3mm, length 230 mm. Connection cable 4 wires with connector, length 2 m.

TP47.1000.0 Pt1000 sensor immersion probe. Probe's stem Ø 3 mm, length 230 mm. Connection cable 2 wires with connector, length 2 m.

TP87.100.0 Direct 4 wires Pt100 sensor immersion probe. Probe's stem Ø 3 mm, length 70 mm. Connection cable 4 wires with connector, length 2 m.

TP87.1000.0 Pt1000 sensor immersion probe. Probe's stem Ø 3 mm, length 70 mm. Connection cable 2 wires with connector, length 2 m.

Modules for NON SICRAM temperature probes

TP47 Module for the connection of **NO** SICRAM probes with Platinum sensor (PRT). Works with Pt25, Pt100 and Pt500 probes. Designed for the connection of 4-wire sensors.

TP471 Module for the connection of **NO** SICRAM probes with Platinum (PRT) sensor: Works with Pt25, Pt100 and Pt500 probes. Designed for the connection of 4-wire sensors.

TP471D0 1-input module for **NO** SICRAM thermocouple probes type K-J-E-T-N-R-S-B. **Without cold junction compensation**.

TP471D 1-input module for **NO** SICRAM thermocouple probes type K-J-E-T-N-R-S-B. **With internal temperature sensor for cold junction compensation.**

TP471D1 2-input module for **NO** SICRAM thermocouple probes type K-J-E-T-N-R-S-B. **With internal temperature sensor for cold junction compensation.**

Thermocouple temperature probes

TP741 Type K thermocouple immersion probe. Stem Ø 1.5 mm, length 180 mm. Maximum temperature 800 °C.

TP741/1 Type K thermocouple immersion probe. Stem Ø 1.5 mm, length 90 mm. Maximum temperature 400 °C.

TP741/2 Type K thermocouple immersion probe. Stem Ø 1.5 mm, length 230 mm. Maximum temperature 800 °C.

TP742 Type K thermocouple immersion probe. Stem Ø 2 mm, length 180 mm. Maximum temperature 800 °C.

TP742/1 Type K thermocouple immersion probe. Stem Ø 2 mm, length 90 mm. Maximum temperature 400 °C.

TP742/2 Type K thermocouple immersion probe. Stem Ø 2 mm, length 230 mm. Maximum temperature 800 °C.

TP743 Type K thermocouple immersion probe. Stem Ø 3 mm, length 180 mm. Maximum temperature 800 °C.

TP744 Type K thermocouple air probe. Stem Ø 4 mm, length 180 mm. Maximum temperature 400 °C.

TP745 Type K thermocouple contact probe. Probe terminal Ø 5 mm, stem length 180 mm Maximum temperature 500 °C.

TP746 Type K thermocouple contact probe. Stem Ø 12 mm. Probe terminal Ø 3 mm, stem length 110 mm. Maximum temperature 250 °C.

TP750 Type K thermocouple immersion probe. Stem Ø 3 mm, length 500 mm. Temperature -196...+1000 °C.

TP750.0 Type K thermocouple immersion probe. Stem Ø 3 mm, length 300 mm. Temperature -196...+800 °C.

TP751 Type K thermocouple penetration probe. Stem Ø 2 mm, length 25 mm. Maximum temperature 200 °C.

TP754 Type K thermocouple contact probe. Probe terminal Ø 15 mm, stem length 200 mm. Maximum temperature 500 °C.

TP754/9 Type K thermocouple contact probe. Probe terminal Ø 15 mm, stem length 200 mm. End bent at 90° with respect to the stem. Maximum temperature 500 °C.

TP755 Type K thermocouple contact probe. Probe terminal Ø 27 mm, stem length 300 mm. Maximum temperature 800 °C.

TP755/9 Type K thermocouple contact probe. Probe terminal Ø 27 mm, stem length 300 mm. End bent at 90° with respect to the stem. Maximum temperature 800 °C.

TP756 Type K thermocouple penetration probe. Stem Ø 1.6 mm x 80 mm. Probe terminal Ø 1.2 mm x 22 mm. Maximum temperature 200 °C.

TP757 Type K thermocouple contact probe. For measurements on metallic surfaces. Ø 20 mm x 100 mm. Maximum temperature 180 °C.

TP758 Type K thermocouple penetration probe. Stem Ø 4 mm, length 150 mm. Maximum temperature 400 °C.

TP758.1 Type K thermocouple penetration probe. Stem Ø 4 mm, length 90 mm. Maximum temperature 400 °C.

TP772 Type K thermocouple contact probe. Probe terminal Ø 5 mm, cable length 500 mm. Maximum temperature 400 °C.

TP774 Type K thermocouple contact probe. Probe terminal 60 x 35 mm, stem length 200 mm. Maximum temperature 250 °C.

TP776 Type K thermocouple penetration probe. Stem Ø 2 mm, length 90 mm. Maximum temperature 200 °C.

TP777 Type K thermocouple contact probe. Probe terminal Ø 3 mm, stem length 350 mm. Maximum temperature 200 °C.

TP647 Type K thermocouple immersion probe. Cable length 1 m. Maximum temperature 300 °C.

TP647/2 Type K thermocouple immersion probe. Cable length 2 m. Maximum temperature 300 °C.

TP647/3 Type K thermocouple immersion probe. Cable length 3 m. Maximum temperature 300 °C.

TP647/5 Type K thermocouple immersion probe. Cable length 5 m. Maximum temperature 300 °C.

TP647/10 Type K thermocouple immersion probe. Cable length 10 m. Maximum temperature 300 °C.

TP647/20 Type K thermocouple immersion probe. Cable length 20 m. Maximum temperature 300 °C.

TP651 Type K thermocouple immersion probe. Stem Ø 6 mm, length 1200 mm. Maximum temperature 1200 °C.

TP652 Type K thermocouple immersion probe. Stem Ø 6 mm, length 700 mm. Maximum temperature 1200 °C.

TP655 Type K thermocouple contact probe. For measurements on tubes Ø 6...25 mm. Cable length 2 m. Maximum temperature 180 °C.

TP656 Type K thermocouple immersion probe. Stem Ø 1 mm, length 70 mm. Cable length 3 m. Maximum temperature 200 °C.

TP656/1 Type K thermocouple immersion probe. Stem Ø 2 mm, length 500 mm. Cable length 3 m. Maximum temperature 1000 °C.

TP656/2 Type K thermocouple immersion probe. Stem Ø 2 mm, length 1000 mm. Cable length 3 m. Maximum temperature 1000 °C.

TP657/1 Type K thermocouple flexible probe. Probe terminal Ø 5 mm. Cable length 500 mm. Maximum temperature 100 °C.

TP659 Type K thermocouple penetration probe. Stem Ø 3 mm, length 150 mm. Maximum temperature 400 °C.

TP660 Type K thermocouple penetration probe. Stem Ø 4.5 mm, length 150 mm. Maximum temperature 400 °C.

TP661 Type K thermocouple penetration probe. Stem length 85 mm. Temperature -60...+50 °C.

TP662 Type K thermocouple tape probe. With Velcro, for measurements on tubes up to Ø 110 mm. Maximum temperature 110 °C.

CM Standard male K thermocouple connector.

CS Standard female K thermocouple connector.

PW Type K thermocouple extension cable with male connector on one side and female connector on the other side. Available lengths: 2, 5, 10, 15, 20 m.

Combined relative humidity and temperature probes equipped with SICRAM MODULE

HP472ACR %RH and temperature combined probe, dimensions Ø 26x170 mm. Connection cable length 2 metres.

HP473ACR %RH and temperature combined probe. Handle dimensions Ø 26x130 mm, probe Ø 14x120 mm. Connection cable length 2 metres.

HP474ACR %RH and temperature combined probe. Handle dimensions Ø 26x130 mm, probe Ø 14x215 mm. Connection cable length 2 metres.

HP475ACR %RH and temperature combined probe. Connection cable length 2 metres. Handle Ø 26x110mm. Stainless steel stem Ø 12x560 mm. Tip Ø 13.5x75 mm.

HP475AC1R %RH and temperature combined probe. Connection cable length 2 metres. Handle Ø 80 mm. Stainless steel stem Ø 14x480 mm.

HP477DCR %RH and temperature combined sword probe. Connection cable length 2 metres. Handle Ø26x110 mm. Probe's stem 18x4 mm, length 520 mm

HP478ACR %RH and temperature combined probe. Connection cable length 5 metres. Stem made of stainless steel Ø14x130 mm.

HP480 Temperature and humidity probe for compressed air systems. Complete with SICRAM module. Connection cable length 2m. Fitted with sintered AISI 316 15µm filter, measuring chamber, air flow regulation valve and 3 quick couplings 1/4" (Italian, German and American standard).

P1 200µm stainless steel grid protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P2 20µm PE sintered polythene protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P3 20µm sintered bronze protection for probes Ø26, thread M24x1.5. For temperatures up to 150 °C.

P4 20µm sintered PE complete cap for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.

P6 10µm sintered stainless steel protection for probes Ø14, thread M12x1. For temperatures up to 180 °C.

P7 20µm PTFE protection for probes Ø14, thread M12x1. For temperatures up to 150 °C.

P8 20µm stainless steel grid and Pocan protection for probes Ø14, thread M12x1. For temperatures up to 100 °C.

HD75 75% RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø14, M12×1 thread.

HD33 33% RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø14, M12×1 thread.

Probes and Modules for pressure measurement

PP471 SICRAM module for the measurement of absolute, relative and differential pressure. Works with the pressure probes of the series TP704 and TP705. Supplied with cable L=2m and 8-pole DIN 45326 female connector.

Pressure probes of the series TP704 and TP705

PP472 SICRAM probe for the measurement of barometric pressure. Measuring range 600...1100 mbar. Resolution 0.1 mbar. Operating temperature -10...+60 °C.

PP473 S1 SICRAM probe for the measurement of differential pressure. Full scale 10 mbar. Operating temperature -10...+60 °C.

PP473 S2 SICRAM probe for the measurement of differential pressure. Full scale 20 mbar. Operating temperature -10...+60 °C.

PP473 S3 SICRAM probe for the measurement of differential pressure. Full scale 50 mbar. Operating temperature -10...+60 °C.

PP473 S4 SICRAM probe for the measurement of differential pressure. Full scale 100 mbar. Operating temperature -10...+60 °C.

PP473 S5 SICRAM probe for the measurement of differential pressure. Full scale 200 mbar. Operating temperature -10...+60 °C.

PP473 S6 SICRAM probe for the measurement of differential pressure. Full scale 500 mbar. Operating temperature -10...+60 °C.

PP473 S7 SICRAM probe for the measurement of differential pressure. Full scale 1 bar. Operating temperature -10...+60 °C.

PP473 S8 SICRAM probe for the measurement of differential pressure. Full scale 2 bar. Operating temperature -10...+60 °C.

Full scale pressure	Maximum over-pressure	Resolution	ORDERING CODES			Accuracy from 20 to 25°C	Working temperature	Connection
			Differential pressure	Relative pressure (with respect to atmosphere)	Absolute pressure			
			NON insulated Membrane	Insulated membrane	Insulated membrane			
10.0 mbar	20.0 mbar	0.01 mbar	**TP705-10MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
20.0 mbar	40.0 mbar	0.01 mbar	**TP705-20MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
50.0 mbar	100 mbar	0.01 mbar	**TP705-50MBD**			0.50 % FSO	0…60 °C	Tube ∅ 5 mm
100 mbar	200 mbar	0.1 mbar	**TP705-100MBD**			0.25 % FSO	0…60 °C	Tube ∅ 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 ∅ 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 ∅ 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 ∅ 5 mm
					TP705BARO	0.25 % FSO	0…60 °C	Tube ∅ 5 mm
				TP704-1BGI		0.25 % FSO	-40…125 °C	¼ BSP
					TP704-1BAI	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 ∅ 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
10.0 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 bar		**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 bar		**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

Modules for Pitot tubes

AP473 S1 SICRAM module for **Pitot tubes**. Differential pressure up to 10 mbar, air speed from 2 to 40 m/s. The Pitot tube has to be ordered separately.

AP473 S2 SICRAM module for **Pitot tubes**. Differential pressure up to 20 mbar, air speed from 2 to 55 m/s. The Pitot tube has to be ordered separately.

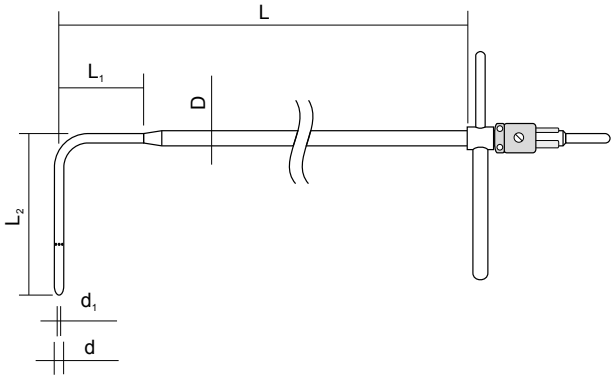
AP473 S3 SICRAM module for **Pitot tubes**. Differential pressure up to 50 mbar, air speed from 2 to 90 m/s. The Pitot tube has to be ordered separately.

AP473 S4 SICRAM module for **Pitot tubes**. Differential pressure up to 100 mbar, air speed from 2 to 130m/s. The Pitot tube has to be ordered separately.

PW Extension cable with standard mignon male-female connectors for connecting the K type thermocouple of the Pitot tube to the modules AP473S.... Length 2 m.

Pitot tubes

Stainless steel Pitot tubes to measure air speed and temperature (only for models provided with K thermocouple). Equipped with silicon tube external ∅ 6 mm, internal ∅ 4 mm, length 2 m. **PW cable has to be ordered separately**.



Code	d mm	d_1 mm	D mm	L mm	L_1 mm	L_2 mm	Temperature	Thermocouple 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	

Hot-wire probes equipped with SICRAM module for the measure of air speed

AP471 S1 Hot-wire telescopic probe, measuring range: 0.1…40m/s. Cable length 2 m.

AP471 S2 Omnidirectional hot-wire probe, measuring range: 0.1…5m/s. Cable length 2 m.

AP471 S3 Hot-wire telescopic probe with terminal tip for easy position, measuring range: 0.1…40m/s. Cable length 2 m.

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

Vane probes equipped with SICRAM module for the measure of air speed

AP472 S1 Vane probe with K type thermocouple, Ø100 mm. Measuring range 0,6…25 m/s; temperature from -25 to 80 °C. Cable length 2 m.

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

AST.1 Telescopic shaft (minimum length 210 mm, maximum length 870 mm) for AP472S1 and AP472S2 vane probes.

AP471S1.23.6 Fixed extension shaft Ø 16 x 300 mm, M10 male thread on a side, female on the other. For vane probes AP472 S1 and AP472 S2

AP471S1.23.7 Fixed extension shaft Ø 16 x 300 mm, M10 female thread on a side only. For vane probes AP472 S1, AP472 S2.

Photometric and radiometric probes with sicram module

IP471PHOT Photometric probe equipped with SICRAM module for measuring illuminance, spectral response according to the standard photopic vision, diffuser for cosine correction. Measuring range: 0.1 lux…200×10³ lux.

LP471RAD Radiometric probe equipped with SICRAM module for measuring **irradiance** in the 400 nm…1050 nm spectral range, complete with diffuser for cosine correction. Measuring range: 0.1x10^{-3} W/m² …2000 W/m².

LP471PAR Quantum radiometric probe equipped with SICRAM module for measuring photon flow across the chlorophyll range PAR (Photosynthetically Active Radiation 400 nm…700 nm) in μmol/m²s, with diffuser for cosine correction. Measuring range: 0.01 μmol/m²s…10x10³ μmol/m²s.

LP471UVA Radiometric probe equipped with SICRAM module for measuring **irradiance** in the 315 nm…400 nm UVA spectral range, peak 360 nm, complete with quartz diffuser for cosine correction. Measuring range: 1x10^{-3} W/m²…2000 W/m².

LP471UVB Radiometric probe equipped with SICRAM module for measuring **irradiance** in the 280 nm…315 nm UVB spectral range, peak 305 nm, complete with quartz diffuser for cosine correction. Measuring range: 1x10^{-3} W/m²…2000 W/m².

LP471UVC Radiometric probe equipped with SICRAM module for measuring **irradiance** in the 220 nm…280 nm UVC spectral range, peak 260 nm, complete with quartz diffuser for cosine correction. Measuring range: 1x10^{-3} W/m²…2000 W/m².

LP471LUM2 Photometric probe equipped with SICRAM module for measuring **luminance**, spectral response in agreement with standard photopic vision, vision angle 2°. Measuring range: 0.1 cd/m²…2000×10³ cd/m².

LP471BLUE Radiometric probe equipped with SICRAM module for measuring the **effective irradiance** in the spectral range of **Blue** light. Spectral range 380 nm…550 nm, diffuser for cosine correction. Measuring range: 0.1x10^{-3} W/m² …2000 W/m².

LP471P-A Combined probe equipped with SICRAM module for measuring the illuminance (lux), with standard photopic spectral response, and the irradiance (μW/cm²) in the UVA spectral range (315-400 nm, with peak at 365 nm). Both sensors are equipped with diffuser for the correction according to the cosine law. Illuminance measuring range: 0.3 lux…200x103 lux. Irradiance measuring range: 1 mW/m²…2000 W/m². The probe provides the ratio of the UVA irradiance and the illuminance in μW/lumen (quantity of interest in the museums field). Supplied with 2 m cable.

LP471A-UVeff Combined probe equipped with SICRAM module for measuring the **total effective irradiance** according to the weighting curve UV. The two sensors are used to correctly measure the total effective irradiance in the range 250-400 nm. Both sensors are equipped with diffuser for the correction according to the cosine law. The probe provides the total effective irradiance (E_{eff}), the effective irradiance in the range UV-CB and the UVA irradiance. Total effective irradiance measuring range: 0.01 W/m²… 20 W/m². B_C effective irradiance measuring range: 0.01 W/m²…20 W/m². UVA irradiance measuring range: 0.1 W/m²… 2000 W/m². Supplied with 2 m cable.

LP471Silicon-Pyra Pyranometer with silicon photodiode equipped with SICRAM module for measuring the **global solar irradiance**, with diffuser for cosine correction. Spectral range: 400…1100 nm. Measuring range: 0…2000 W/m2. Fixed cable 5m long.

LP 471 PYRA 02.5 Probe consisting of a first class pyranometer LP PYRA 02 and a 5 m long cable equipped with SICRAM module.

LP 471 PYRA 02.10 Probe consisting of a first class pyranometer LP PYRA 02 and a 10 m long cable equipped with SICRAM module.

LP 471 PYRA 03.5 Probe consisting of a second class pyranometer LP PYRA 03 and a 5 m long cable equipped with SICRAM module.

LP 471 PYRA 03.10 Probe consisting of a second class pyranometer LP PYRA 03 and a 10 m long cable equipped with SICRAM module.

LP BL Base with leveling device for photo and radiometric probes (excluding LP471LUM2 and LP471PYRA...). It has to be assembled to the probe at our factory, before shipment.

LP BL3 Adjustable wall support for photometric and radiometric probes (excluding LP471LUM2 and LP471PYRA...).

VP472 SICRAM module for the connection of pyranometers or albedometers. Measuring range: -25…+25 mV.

Probes and accessories for CO_2 measurement

HD31.B3 CO_2 probe with SICRAM module. Measuring range 0…5000 ppm. Operating temperature -5…+50 °C.

HD31.B3A Adapter for the calibration of the CO_2 sensor of the HD31.B3 probe with the nitrogen can.

MINICAN.12A Nitrogen can for CO_2 calibration at 0 ppm. 20 litres volume. With regulating valve.

MINICAN.12A1 Nitrogen can for CO_2 calibration at 0 ppm. 20 litres volume. Without regulating valve.

HD37.37 Connection tube kit between instrument and MINICAN.12A for CO_2 calibration.

Modules for direct voltage and current measurement

VP473 SICRAM module for the measurement of direct voltage. When connected to a transmitter with voltage output, it can acquire the voltage signal. Measuring range: ±20 Vdc. Input impedance: 1 MΩ.

IP472 SICRAM module for the measurement of direct current. When connected to a transmitter with current output, it can acquire the current signal. Measuring range: 0…24 mA. Input impedance: 25 Ω.

MANUFACTURE OF PORTABLE, BENCH TOP AND PROCESS SCIENTIFIC INSTRUMENTS
Current and voltage loop transmitters and regulators
Temperature - Humidity, Dew point - Pressure - CO, CO_2
Air speed - Light - Optical Radiation
Acoustics - Vibration
Data logger - Data logger wireless
Microclimate
pH - Conductivity - Dissolved Oxygen - Turbidity
Elements for weather stations

LAT N° 124 Signatory of EA, IAF and ILAC Mutual Recognition Agreements
Temperature - Humidity - Pressure - Air speed
Photometry/Radiometry - Acoustics

CE CONFORMITY
Directives:

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- RoHS Directive 2011/65/EU

Harmonised standards:

- Safety EN 61010-1:2010
- EMC EN 61326-1:2013
- RoHS EN 50581:2012

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