

Регистраторы данных многофункциональные DELTA OHM DO9847

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D09847



D09847 PORTABLE MULTIFUNCTION DATA-LOGGER INSTRUMENT

D09847 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 individual SICRAM module; calibration data permanent storage inside the probe.

Storage capacity: 32.000 readings per input.

Storage interval and printing can be configured between 1 second and 1 hour.

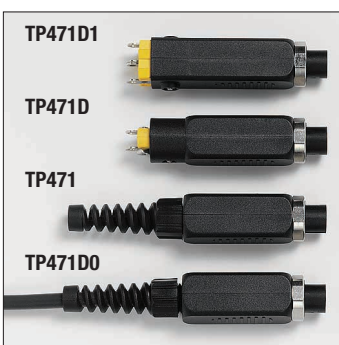
RS232C serial output: from 300 up to 115.200 baud rate.

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 from version 3.0. Different types of SICRAM modules or probes can be connected to the input: Platinum sensor temperature, thermocouple, relative humidity/temperature, Discomfort index, continuous voltage ($\pm 20V$), current (0...24mA), pressure, air speed and light.

TECHNICAL DATA OF THE INSTRUMENT D09847

- Power supply:
 - Battery: 4 1.5V AA alkaline batteries; operating time with high quality batteries: about 60 hours.
 - Mains: through 12Vdc, 300mA external power supply, 2 pole connector.
- Operating conditions:
 - Working temperature: $-10...+60^{\circ}C$. Storage temperature: $-25...+65^{\circ}C$.
 - Relative Humidity: 0...90%R.H., not condensating.
- LCD display: 128x64 pixel (56x38 mm) graphic LCD.
- Keyboard: 18 multifunction 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 of 3 variables or 10.000 samples of 10 variables.
- Storage interval: 1 s...1 h. Time and date, real time.
- Accuracy: 1 minute/month maximum deviation.
- 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.
- IP:64

D09847 - 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.



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

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 M Ω .

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 \varnothing 150 mm	-30 °C...+120 °C	± 0.25 °C
TP876.I	Globe-thermometer \varnothing 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	-40 °C...+85 °C	± 0.25 °C
TP878.1.0 1/3 DIN - Thin Film	Photovoltaic	-40 °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

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 μ A 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

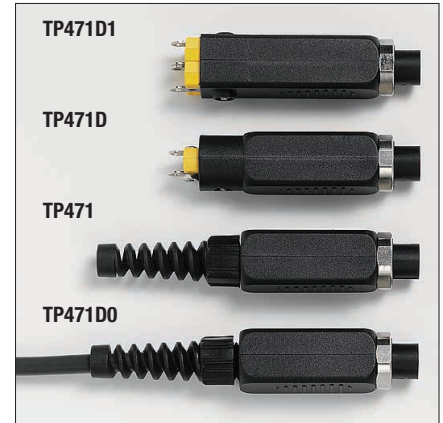
Instrument accuracy:	
Thermocouple K	±0.1 °C up to 600 °C ±0.2 °C above 600 °C
Thermocouple J	±0.05 °C up to 400 °C ±0.1 °C above 400 °C
Thermocouple T	±0.1 °C
Thermocouple N	±0.1 °C up to 600 °C ±0.2 °C above 600 °C
Thermocouple R	±0.25 °C
Thermocouple S	±0.3 °C
Thermocouple B	±0.35 °C
Thermocouple 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**.

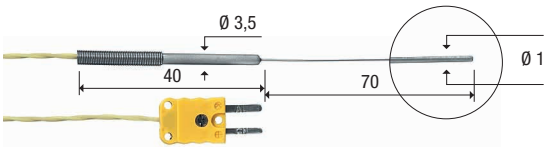
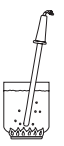
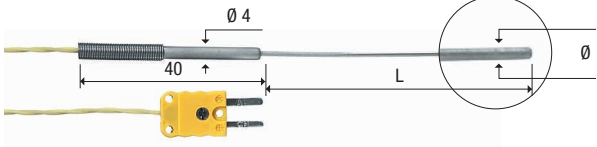
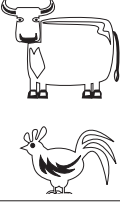


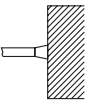
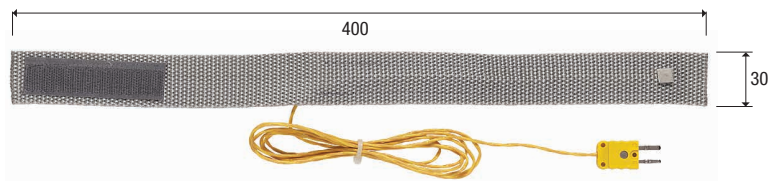
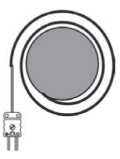


Type of thermo-couple	Class 1 tolerance		Class 2 tolerance		Class 3 tolerance	
	Temperature interval (°C)	Tolerance (°C)	Temperature interval (°C)	Tolerance (°C)	Temperature interval (°C)	Tolerance (°C)
B	---	---	+600...+1700	± 0.0025 × t	+600...+800	± 4
	---	---	---	---	+800...+1700	± 0.005 × t
E	-40...+375	± 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
TP741	800	2s	L=180	$\varnothing=1.5$	
TP741/1	400	2s	L=90	$\varnothing=1.5$	
TP741/2	800	2s	L=230	$\varnothing=1.5$	
TP742	800	2s	L=180	$\varnothing=2$	
TP742/1	400	2s	L=90	$\varnothing=2$	
TP742/2	800	2s	L=230	$\varnothing=2$	
TP743	800	3s	L=180	$\varnothing=3$	
TP744	400	4s			
TP745	500	5s			
TP746	250	2s			
TP750	-196 +1000	3s	L=500	$\varnothing=3$	
TP750.0	-196 +800	3s	L=300	$\varnothing=3$	
TP751	200	2s			
TP754	500	2s			
TP754/9	500	2s			
TP755	800	2s			
TP755/9	800	2s			

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION					
CODE	°C max	τ s	DIMENSIONS (mm)		USE
TP756	200	2s			
TP757	180	30s	<p>MAGNETIC PROBE FOR CONTACT MEASUREMENTS ON MAGNETIC METALLIC SURFACES</p>		
TP758	400	4s	L=150	$\varnothing=4$	
TP758.1	400	4s	L=90	$\varnothing=4$	
TP772	400	3s			
TP774	250	2s			
TP776	200	2s			
TP777	200	3s			
TP647	300	2s	<p>ACCREDIA calibration up to max. 300°C.</p>		
TP647/2	300	2s			
TP647/3	300	2s			
TP647/5	300	2s			
TP647/10	300	2s			
TP647/20	300	2s			
TP651	1200	6s	L=1200	$\varnothing=6$	
TP652	1200	6s	L=700	$\varnothing=6$	
TP655	180	2s	<p>Cable L = 2m</p>		

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION						
CODE	°C max	τ s	DIMENSIONS (mm)			USE
TP656	200	1s	L=70	$\varnothing=1$		
TP656/1	1000	L=500	$\varnothing=2$			
TP656/2	1000	L=1000	$\varnothing=2$	Cable L = 3m		
TP657/1	100	5s			 <p>Flexible</p>	
TP659	400	3s	L=150	$\varnothing=3$		
TP660	400	4s	L=150	$\varnothing=4.5$		
TP661	-60 +50	30s				
TP662	110	120s			<p>TAPE PROBES WITH VELCRO FOR MEASUREMENTS ON PIPES MAX DIAM. 110</p>  <p>Certification up to 58°C</p>	
CM CS	"K" "K"					
PW	"K"					

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

The response time τ s 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%RH	-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%RH	-20 °C...+80 °C		±0.3 °C
HP474ACR	Pt100	0...100%RH	-40 °C...+150 °C		±0.3 °C
HP475ACR	Pt100	0...100%RH	-40 °C...+150 °C		±0.3 °C
HP475AC1R	Pt100	0...100%RH	-40 °C...+180 °C		±0.3 °C
HP477DCR	Pt100	0...100%RH	-40 °C...+100 °C		±0.3 °C
HP478ACR	Pt100	0...100%RH	-40 °C...+150 °C		±0.3 °C
HP480	Pt100	0...100%RH	-40 °C...+60 °C		±0.25 °C
HP481	Pt100	0...100%RH	-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


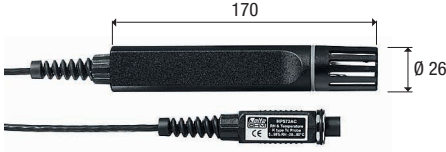
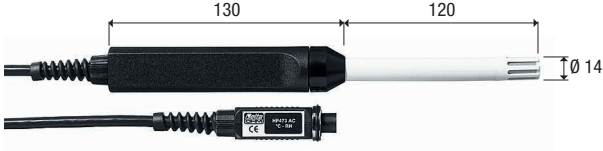
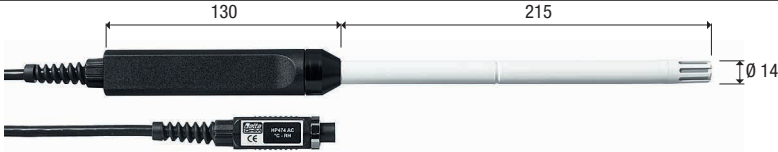

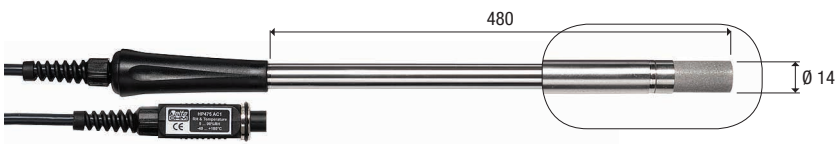
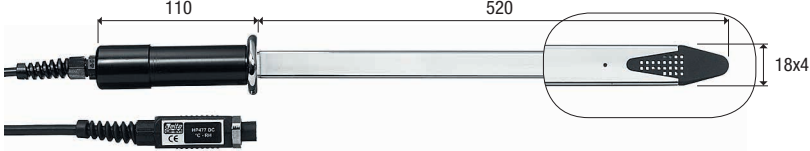
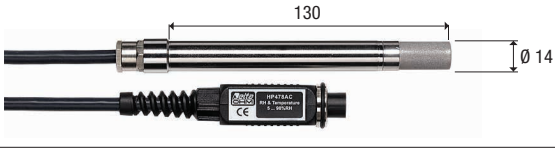
Resolution	0.1 °C
Temperature drift @ 20 °C	0.003 %/°C

Protections and solutions for relative humidity and temperature probes


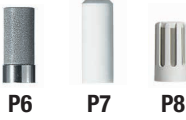
- P1** 200µm stainless steel grid protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.
- P2** 20µm PE sintered polythene protection for probes Ø26, thread M24x1.5. For temperatures up to 80 °C.
- P3** 20µm sintered bronze protection for probes Ø26, thread M24x1.5. For temperatures 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 PBT 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			
HP474ACR		0...100% RH -40°C...+150°C (-40°C...+180°C for HP475AC1R)	
HP475ACR	RH Pt100		
HP475AC1R			
HP477DCR			
HP478ACR			
HP480 HP481	RH Pt100		0...100% RH -40°C...+60°C

SATURATED SOLUTIONS AND PROBE PROTECTIONS

COD.			USE
HD75 HD33 HD11	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	
P6 P7 P8	Ø 14	M 12x1	

Pressure

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.

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 Ø 5 mm
20.0 mbar	40.0 mbar	0.01 mbar	TP705-20MBD			0.50 % FSO	0...+60 °C	Tube Ø 5 mm
50.0 mbar	100 mbar	0.01 mbar	TP705-50MBD			0.50 % 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	-40...+125 °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
				TP704-1BGI		0.25 % FSO	-40...+125 °C	¼ BSP
2.00 bar	4.00 bar	1 mbar			TP704-1BAI	0.25 % FSO	-40...+120 °C	¼ BSP
			TP705-2BD			0.25 % FSO	0...+60 °C	Tube Ø 5 mm
				TP704-2BGI		0.25 % FSO	-40...+125 °C	¼ BSP
5.00 bar	10.00 bar	1 mbar			TP704-2BAI	0.25 % FSO	-25...+85 °C	¼ BSP
				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

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

PP473 S0 SICRAM probe for the measurement of relative pressure with respect to the atmosphere or differential pressure in the range ± 250 Pa. The probe uses a silicon piezoresistive sensor with high accuracy and temperature compensation, which has excellent linearity, repeatability and stability over the time. A special **auto-zero** circuit periodically equalizes the differential pressure at the sensor input and corrects the offset; this feature makes the probe insensitive to the mounting position and compensates the sensor aging and the deviation of the zero with temperature changes, virtually eliminating maintenance operations. A typical application of the probe is clean rooms monitoring.

Measuring range	± 250 Pa (± 2.5 mbar)
Maximum overpressure	50 kPa
Resolution	0.1 Pa
Accuracy @ 25 °C	± (0.2 Pa + 1.5% of the measure)
Accuracy @ 0...50 °C	± (0.2 Pa + 3% of the measure)
Operating temperature	-10...+60 °C
Response time	0.125 s
Long-term stability	± 0.5% f.s. nominal (1000 h @ 25 °C)
Fluid in contact with the membrane	Non-corrosive dry gas or air
Connection	Ø 5 mm Tube

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	
Maximum 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 <i>Speed</i>	NTC thermistor	Omnidirectional NTC thermistor	
<i>Temperature</i>	NTC thermistor	NTC thermistor	
Measuring range			
<i>Speed</i>	0.1...40 m/s	0.1...5 m/s	
<i>Temperature</i>	-25...+80°C	-25...+80°C	0...80°C
Measurement resolution: <i>Speed</i>	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot		
<i>Temperature</i>	0.1°C		
Measurement accuracy: <i>Speed</i>	±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)	
<i>Temperature</i>	±0.8°C (-25...+80°C)		
Minimum speed	0.1 m/s		
Air temperature compensation	0...80°C		
Unit of Measurement <i>Speed</i> <i>Flow rate</i>	m/s – km/h – ft/min – mph – knot l/s - m³/s - m³/min - m³/h - ft³/s - ft³/min		
Pipeline section for flow rate calculation	0.0001...1.9999 m²		
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 <i>Speed</i> <i>Temperature</i>	Vane Tc K	Vane ----
Measuring range		
<i>Speed</i>	0.6...25 m/s	0.5...20 m/s
<i>Temperature</i>	-25...+80 °C (*)	-25...+80 °C (*)
Resolution		
<i>Speed</i>	0.01 m/s – 0.1 km/h - 1 ft/min – 0.1 mph – 0.1 knot	
<i>Temperature</i>	0.1 °C	----
Accuracy		
<i>Speed</i>	±(0.4 m/s + 1.5% f.s.)	±(0.4 m/s + 1.5% f.s.)
<i>Temperature</i>	±0.8 °C	----
Minimum speed	0.6 m/s	0.5 m/s
Units of measurement <i>Speed</i> <i>Flow Rate</i>	m/s – km/h – ft/min – mph – knot l/s - m³/s - m³/min - m³/h - ft³/s - ft³/min	
Pipeline section for flow rate calculation	0.0001...1.9999 m²	
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				
<i>Differential pressure</i>	10 mbar	20 mbar	50 mbar	100 mbar
<i>Air speed (*)</i>	2 ... 40 m/s	2 ... 55 m/s	2 ... 90 m/s	2 ... 130 m/s
<i>Temperature</i>	-200...+600 °C	-200...+600 °C	-200...+600 °C	-200...+600 °C
Resolution				
<i>Air speed</i>	0.1 m/s - 1 km/h - 1 ft/min - 1 mph - 1 knots			
<i>Temperature</i>	0.1°C			
Accuracy				
<i>Air speed</i>	±0.4% f.s. of pressure		±0.3% f.s. of pressure	
<i>Temperature</i>	±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 <i>Air speed</i> <i>Flow rate</i>	m/s – km/h – ft/min – mph - knots l/s – m³/s – m³/min – ft³/s – ft³/min			
Pipeline section for flow rate calculation	100...100000 cm² 0.01...10 m²			

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

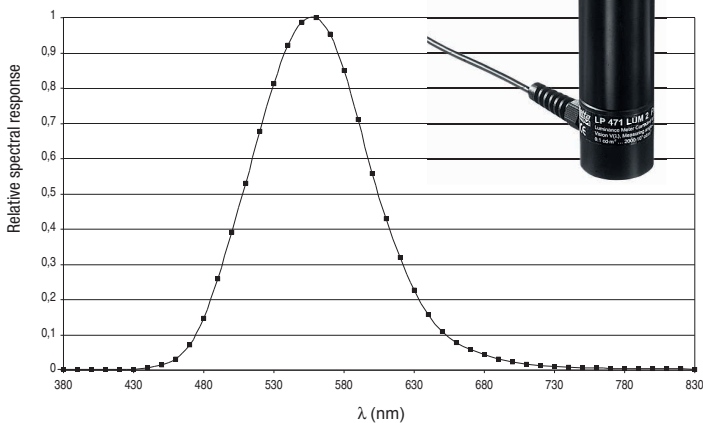
Photometry and Radiometry

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/m ²)	0.1...1999.9	...19999	...199.99x10 ³	...1999.9x10 ³
Resolution (cd/m ²)	0.1	1	0.01 x 10 ³	0.1 x 10 ³
Optical angle	2°			
Spectral range	In agreement with standard photopic curve V(λ)			
α (temperature coefficient) f ₆ (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:

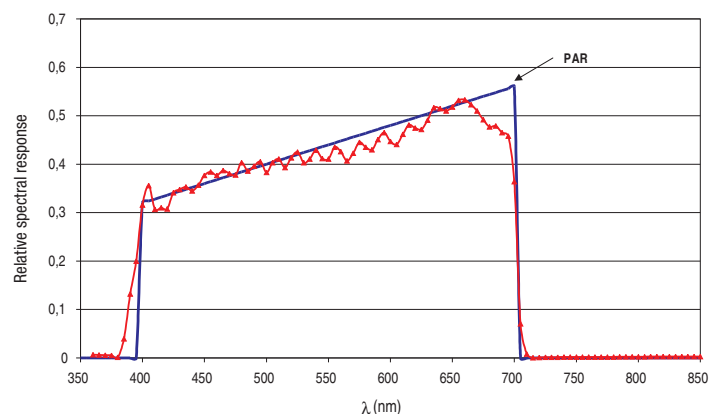


LP471LUM2
LP471PHOT
LP471RAD
LP471PAR
LP471UVA
LP471UVB
LP471UVC

LP471PAR Quantum radiometric probe for the measurement of the **photon flow across the chlorophyll range PAR**, equipped with SICRAM module.

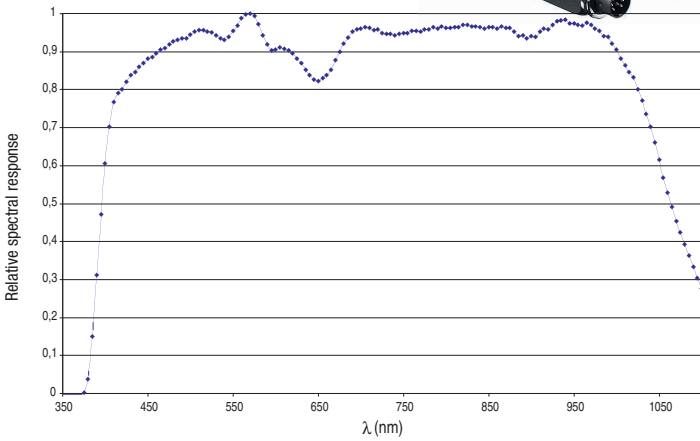
Measuring range ($\mu\text{mol}/\text{m}^2\text{s}$)	0.01... 199.99	200.0...1999.9	2000...10000
Resolution ($\mu\text{mol}/\text{m}^2\text{s}$)	0.01	0.1	1
Spectral range	400 nm...700 nm		
Calibration uncertainty	<5%		
f ₂ (response according to cosine law)	<6%		
f ₃ (linearity)	<1%		
f ₄ (instrument reading error)	± 1 digit		
f ₅ (fatigue)	<0.5%		
Drift after one year	<1%		
Working temperature	0...50 °C		

Typical response curve of the probe LP471PAR:



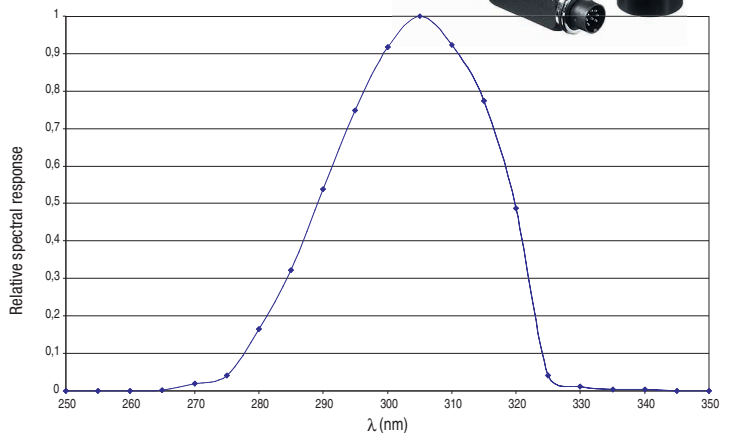
LP471RAD Probe for the measurement of irradiance, equipped with SICRAM module.				
Measuring range (W/m ²)	0.1x10 ⁻³ ...999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	0.1x10 ⁻³	0.001	0.01	0.1
Spectral range	400 nm...1050 nm			
Calibration uncertainty	<5%			
f ₂ (response according to cosine law)	<6%			
f ₃ (linearity)	<1%			
f ₄ (instrument reading error)	±1 digit			
f ₅ (fatigue)	<0.5%			
Drift after one year	<1%			
Working temperature	0...50 °C			

Typical response curve of the probe LP471RAD:



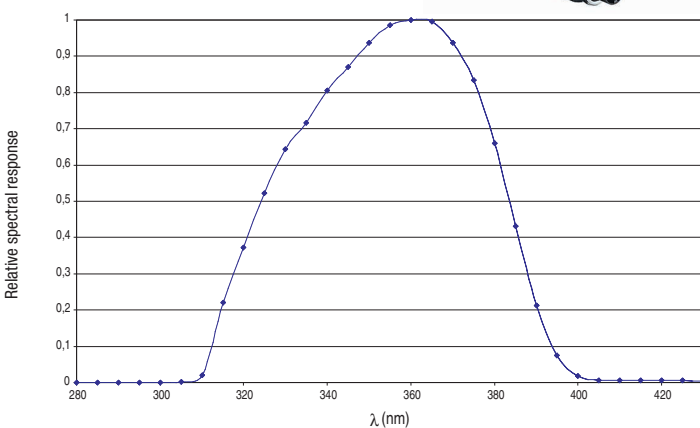
LP471UVB Probe for the measurement of the UVB irradiance, equipped with SICRAM module.				
Measuring range (W/m ²)	1x10 ⁻³ ...999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	0.1x10 ⁻³	0.001	0.01	0.1
Spectral range	280 nm...315 nm (Peak 305 nm)			
Calibration uncertainty	<5%			
f ₂ response according to cosine law	<6%			
f ₃ (linearity)	<2%			
f ₄ (instrument reading error)	±1 digit			
f ₅ (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0...50 °C			

Typical response curve of the probe LP471UVB:



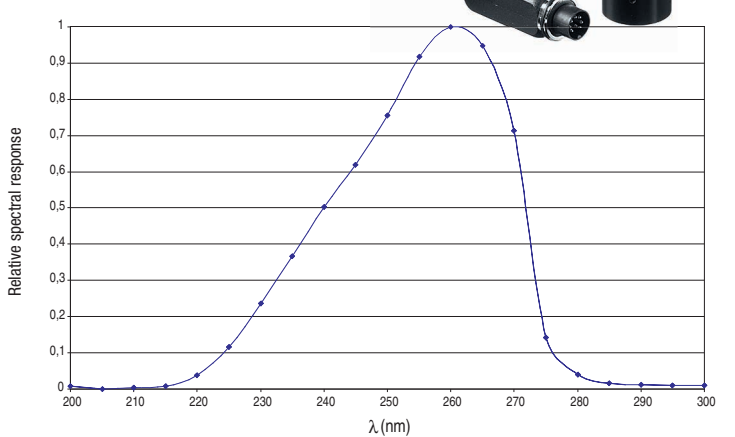
LP471UVA Probe for the measurement of UVA irradiance, equipped with SICRAM module.				
Measuring range (W/m ²)	1x10 ⁻³ ...999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	0.1x10 ⁻³	0.001	0.01	0.1
Spectral range	315 nm...400 nm (Peak 360 nm)			
Calibration uncertainty	<5%			
f ₂ (response according to cosine law)	<6%			
f ₃ (linearity)	<1%			
f ₄ (instrument measuring error)	±1 digit			
f ₅ (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0...50 °C			

Typical response curve of the probe LP471UVA:



LP471UVC Probe for the measurement of the UVC irradiance, equipped with SICRAM module.				
Measuring range (W/m ²)	1x10 ⁻³ ...999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	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)	±1 digit			
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.

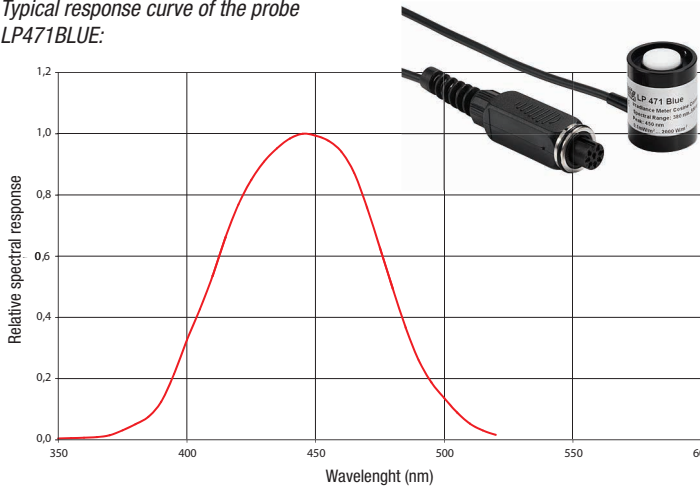
Measuring range (W/m ²)	0.1x10 ⁻³ ...999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	0.1x10 ⁻³	0.001	0.01	0.1
Spectral range	380 nm...550 nm. Effective irradiance for blue light hazard B(λ)			
Calibration uncertainty	<10%			
f ₂ (response according to cosine law)	<6%			
f ₃ (linearity)	<3%			
f ₄ (instrument reading error)	±1 digit			
f ₅ (fatigue)	<0.5%			
Drift after one year	<2%			
Working temperature	0...50 °C			

UVA irradiance				
Measuring range (μW/cm ²)	0.10...199.99	...1999.9	...19999	...199.99x10 ³
Resolution (μW/cm ²)	0.01	0.1	1	0.01x10 ³
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)	±1 digit			
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} /m ²)	0.010...19.999
Resolution (W _{eff} /m ²)	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)	±1 digit
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} /m ²)	0.1...1999.9
Resolution (W _{eff} /m ²)	0.1
Spectral range	315 nm...400 nm
UV-BC irradiance	
Measuring range (W _{eff} /m ²)	0.010...19.999
Resolution (W _{eff} /m ²)	0.001
Spectral range	250 nm...315 nm

Typical response curve of the probe LP471BLUE:

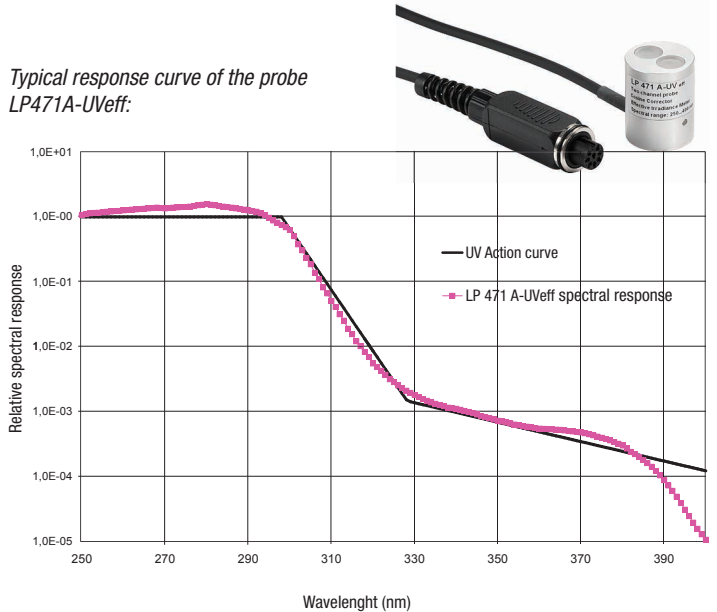


The radiometric probe LP 471 BLUE measures the irradiance (W/m²) in the spectral range of Blue light. The probe consists of a photodiode with an appropriate filter and is provided with a diffuser for correct measurement according to the cosine law. The spectral response curve of the probe allows measuring 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	...199.99x10 ³
Resolution (lux)	0.01	0.1	1	0.01x10 ³
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 LP471PH0T			

Typical response curve of the probe LP471A-Uveff:



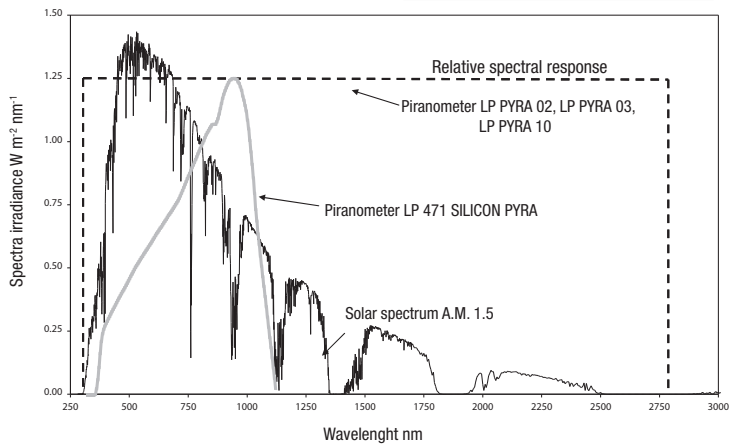
LP 471 PYRA 02.5
LP 471 PYRA 10.5

LP471 SILICON-PYRA Probe for the measurement of **global solar irradiance**, equipped with SICRAM module.

Measuring range (W/m ²)	0.1x10 ⁻³ ... 999.9x10 ⁻³	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m ²)	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)	±1 digit			
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/m ² , 1 μV
Accuracy	±1 W/m ² , ±3 μV
Sensitivity	selectable from 5 to 30 μV/Wm ⁻²

Архангельск (8182)63-90-72
 Астана (7172)727-132
 Астрахань (8512)99-46-04
 Барнаул (3852)73-04-60
 Белгород (4722)40-23-64
 Брянск (4832)59-03-52
 Владивосток (423)249-28-31
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 Вологда (8172)26-41-59
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Ижевск (3412)26-03-58
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 Липецк (4742)52-20-81
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 Орел (4862)44-53-42
 Оренбург (3532)37-68-04
 Пенза (8412)22-31-16
 Казахстан (772)734-952-31

Пермь (342)205-81-47
 Ростов-на-Дону (863)308-18-15
 Рязань (4912)46-61-64
 Самара (846)206-03-16
 Санкт-Петербург (812)309-46-40
 Саратов (845)249-38-78
 Севастополь (8692)22-31-93
 Симферополь (3652)67-13-56
 Смоленск (4812)29-41-54
 Сочи (862)225-72-31
 Ставрополь (8652)20-65-13
 Таджикистан (992)427-82-92-69

Сургут (3462)77-98-35
 Тверь (4822)63-31-35
 Томск (3822)98-41-53
 Тула (4872)74-02-29
 Тюмень (3452)66-21-18
 Ульяновск (8422)24-23-59
 Уфа (347)229-48-12
 Хабаровск (4212)92-98-04
 Челябинск (351)202-03-61
 Череповец (8202)49-02-64
 Ярославль (4852)69-52-93