

# Регистраторы данных многофункциональные DELTA OHM HD31

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# 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<sub>2</sub>) – 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.

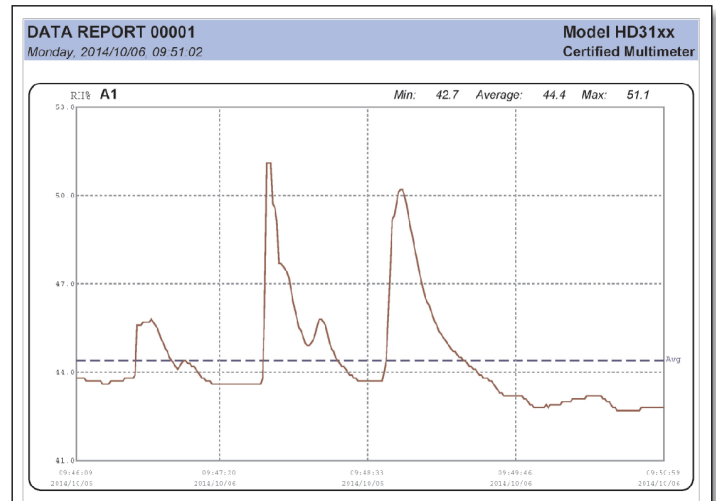
It is also possible to connect not SICRAM probes to the instrument's inputs by using special interface modules to be inserted between the instrument and the probe.

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.



DATA REPORT 00001										Model HD31xx		
Monday, 2014/10/06, 09:51:02										Certified Multimeter		
#	Date	Time	A1 Rel.Humidity RH%	A2 Temperature °C	A3 Diff.Pressure Pa	#	Date	Time	A1 Rel.Humidity RH%	A2 Temperature °C	A3 Diff.Pressure Pa	
00001	2014/10/06	09:46:09	43.6	25.20	32.08	00059	2014/10/05	09:47:17	43.6	25.33	32.50	
00002	2014/10/06	09:46:10	43.6	25.20	32.08	00070	2014/10/05	09:47:18	43.6	25.33	32.50	
00003	2014/10/06	09:46:11	43.6	25.20	32.08	00071	2014/10/05	09:47:19	43.6	25.33	32.50	
00004	2014/10/06	09:46:12	44.8	25.20	32.08	00072	2014/10/05	09:47:20	43.6	25.33	32.50	
00005	2014/10/06	09:46:13	43.6	25.29	32.06	00073	2014/10/05	09:47:21	43.6	25.33	32.50	
00006	2014/10/06	09:46:14	43.7	25.29	32.06	00074	2014/10/05	09:47:22	43.6	25.33	32.50	
00007	2014/10/06	09:46:15	43.7	25.29	32.06	00075	2014/10/05	09:47:23	43.6	25.33	32.50	
00008	2014/10/06	09:46:16	43.7	25.29	32.06	00076	2014/10/05	09:47:24	43.6	25.30	32.28	
00009	2014/10/06	09:46:17	43.7	25.20	32.08	00077	2014/10/05	09:47:25	43.6	25.30	32.28	
00010	2014/10/06	09:46:18	43.7	25.20	32.08	00078	2014/10/05	09:47:26	43.6	25.30	32.28	
00011	2014/10/06	09:46:19	43.7	25.29	32.06	00079	2014/10/05	09:47:27	43.6	25.30	32.28	
00012	2014/10/06	09:46:20	43.7	25.29	32.06	00080	2014/10/05	09:47:28	43.6	25.30	32.28	
00013	2014/10/06	09:46:21	43.7	25.29	32.06	00081	2014/10/05	09:47:29	43.6	25.33	32.50	
00014	2014/10/06	09:46:22	44.6	25.28	32.04	00082	2014/10/05	09:47:30	43.6	25.30	32.28	
00015	2014/10/06	09:46:23	43.6	25.29	32.06	00083	2014/10/05	09:47:31	43.6	25.33	32.50	
00016	2014/10/06	09:46:24	43.6	25.29	32.06	00084	2014/10/05	09:47:32	43.6	25.33	32.50	
00017	2014/10/06	09:46:25	43.6	25.29	32.06	00085	2014/10/05	09:47:33	43.6	25.30	32.28	
00018	2014/10/06	09:46:26	43.7	25.28	32.04	00086	2014/10/05	09:47:34	43.6	25.30	32.28	
00019	2014/10/06	09:46:27	43.7	25.28	32.04	00087	2014/10/05	09:47:35	43.6	25.33	32.50	
00020	2014/10/06	09:46:28	43.7	25.29	32.06	00088	2014/10/05	09:47:36	43.6	25.33	32.50	
00021	2014/10/06	09:46:29	43.7	25.29	32.06	00089	2014/10/05	09:47:37	43.6	25.32	32.50	
00022	2014/10/06	09:46:30	43.7	25.29	32.06	00090	2014/10/05	09:47:38	43.6	25.32	32.50	
00023	2014/10/06	09:46:31	43.7	25.20	32.08	00091	2014/10/05	09:47:39	43.6	25.32	32.50	
00024	2014/10/06	09:46:32	43.7	25.20	32.08	00092	2014/10/05	09:47:40	43.6	25.32	32.50	
00025	2014/10/06	09:46:33	43.6	25.29	32.06	00093	2014/10/05	09:47:41	43.8	25.33	32.53	
00026	2014/10/06	09:46:34	43.8	25.29	32.06	00094	2014/10/05	09:47:42	46.4	25.34	32.55	
00027	2014/10/06	09:46:35	43.6	25.29	32.06	00095	2014/10/05	09:47:43	51.1	25.36	32.59	
00028	2014/10/06	09:46:36	43.6	25.20	32.08	00096	2014/10/05	09:47:44	51.1	25.40	32.47	
00029	2014/10/06	09:46:37	43.6	25.20	32.08	00097	2014/10/05	09:47:45	51.1	25.47	32.61	
00030	2014/10/06	09:46:38	43.9	25.21	32.10	00098	2014/10/05	09:47:46	49.7	25.51	32.68	
00031	2014/10/06	09:46:39	45.6	25.22	32.12	00099	2014/10/05	09:47:47	49.6	25.53	32.72	
00032	2014/10/06	09:46:40	45.6	25.24	32.16	00100	2014/10/05	09:47:48	49.1	25.53	32.72	
00033	2014/10/06	09:46:41	45.6	25.28	32.24	00101	2014/10/05	09:47:49	47.7	25.43	32.72	
00034	2014/10/06	09:46:42	45.7	25.30	32.28	00102	2014/10/05	09:47:50	47.7	25.50	32.70	



## 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 measures 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 downloadable from Delta OHM website. 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

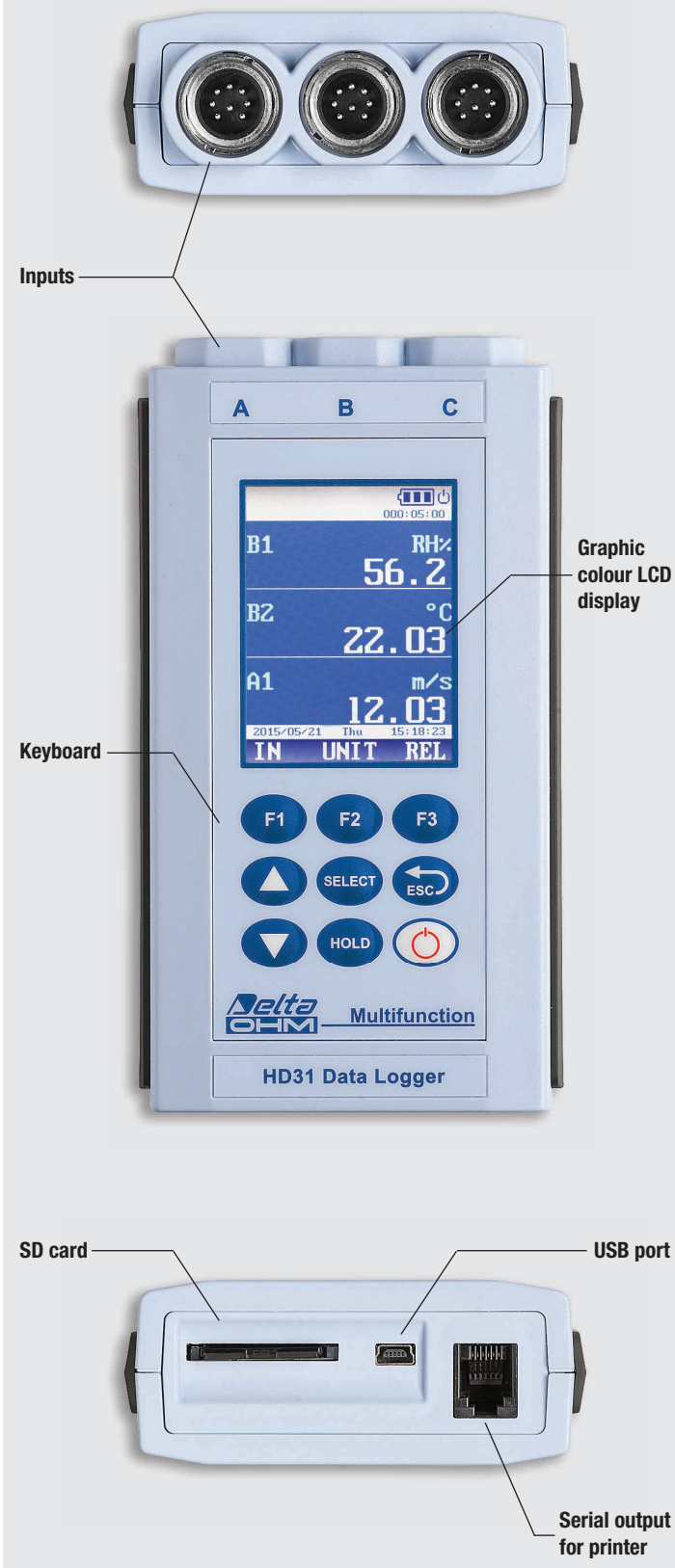


Rechargeable lithium-ion battery. Auto power off (excludable) after an idle time configurable by the user (2, 5, 10, 15, 20 or 30 minutes) to preserve the battery charge. External power supply through USB port (with mini-USB connector) by connecting a 5 Vdc adapter or the USB port (at least 500 mA) of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

<b>Power supply</b>	<b>Rechargeable</b> internal 3.7 V Lithium battery, capacity 2250 mA/h, JST 3-pole connector. <b>Optional</b> external 5 Vdc/1A power supply ( <b>SWD05</b> ) 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.
<b>Battery autonomy</b>	18 hours of continuous operation (typical autonomy with full charge battery and three connected Pt100 probes). <b>The effective autonomy depends on the number and type of connected sensors.</b>
<b>Logging interval</b>	1, 5, 10, 15, 30 seconds / 1, 2, 5, 10, 15, 20, 30 minutes / 1 hour
<b>Storage capacity</b>	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.
<b>Inputs</b>	3 8-pole DIN45326 connector inputs. Depending on the type of connected probes, the instrument manages up to 36 quantities.
<b>Accuracy @ 20°C</b>	± 0.02 % of the measure ( <b>the instrument only, excluded the accuracy of the probes connected</b> )
<b>Temperature drift @ 20°C</b>	20 ppm/°C ( <b>the instrument only, excluded the drift of the probes connected</b> )
<b>Long term stability</b>	0.05 %/year ( <b>the instrument only, excluded the stability of the probes connected</b> )
<b>Clock stability</b>	1 min/month maximum drift
<b>Display</b>	Color graphic LCD. Visible area 43 x 58 mm.
<b>USB Connection</b>	1 USB port with mini USB connector.
<b>RS232C Connection</b>	1 serial RS232C output with RJ12 (6P6C) connector for connecting to a serial printer. Baud Rate selectable from 1200 to 115200.
<b>Auto power off</b>	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.
<b>Operating conditions</b>	-10 ... 60 °C, 0 ... 85% RH without condensation.
<b>Storage temperature</b>	-25 ... 65 °C
<b>Materials</b>	ABS, protective 55 shore rubber bands on the sides. 55 shore rubber protective shell.
<b>Dimensions</b>	165x88x35 mm without rubber protection shell 180x102x46 mm with rubber protection shell
<b>Weight</b>	About 400 g. (including batteries and protection shell)
<b>Protection degree</b>	IP 64

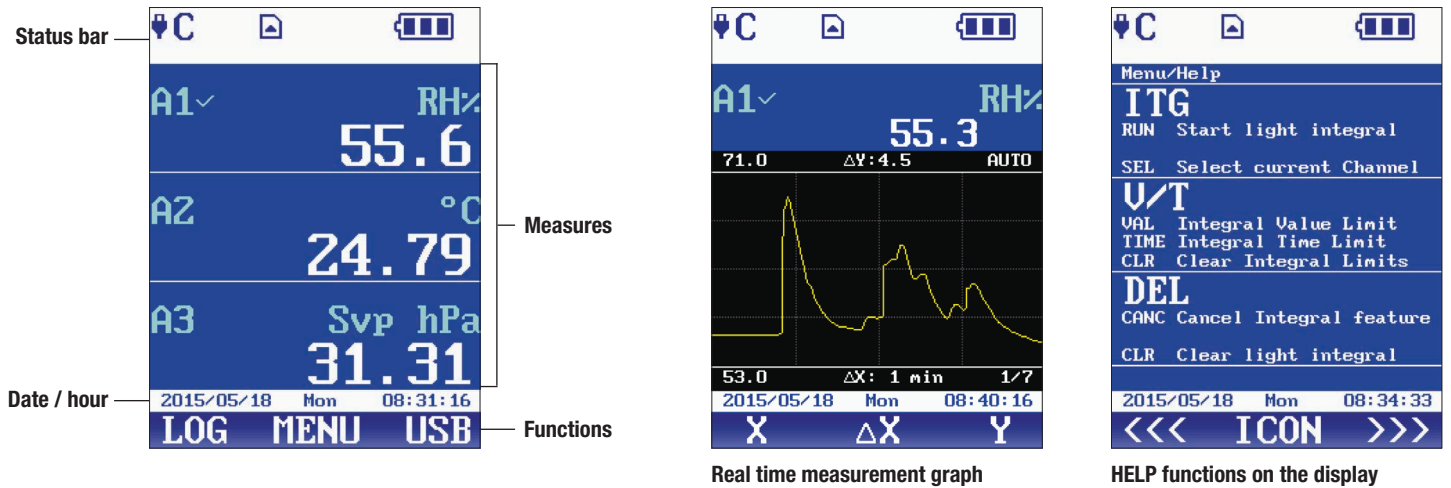
The accuracy and resolution characteristics of the instrument in line with the available SICRAM modules are detailed in the descriptive sections of the modules themselves.



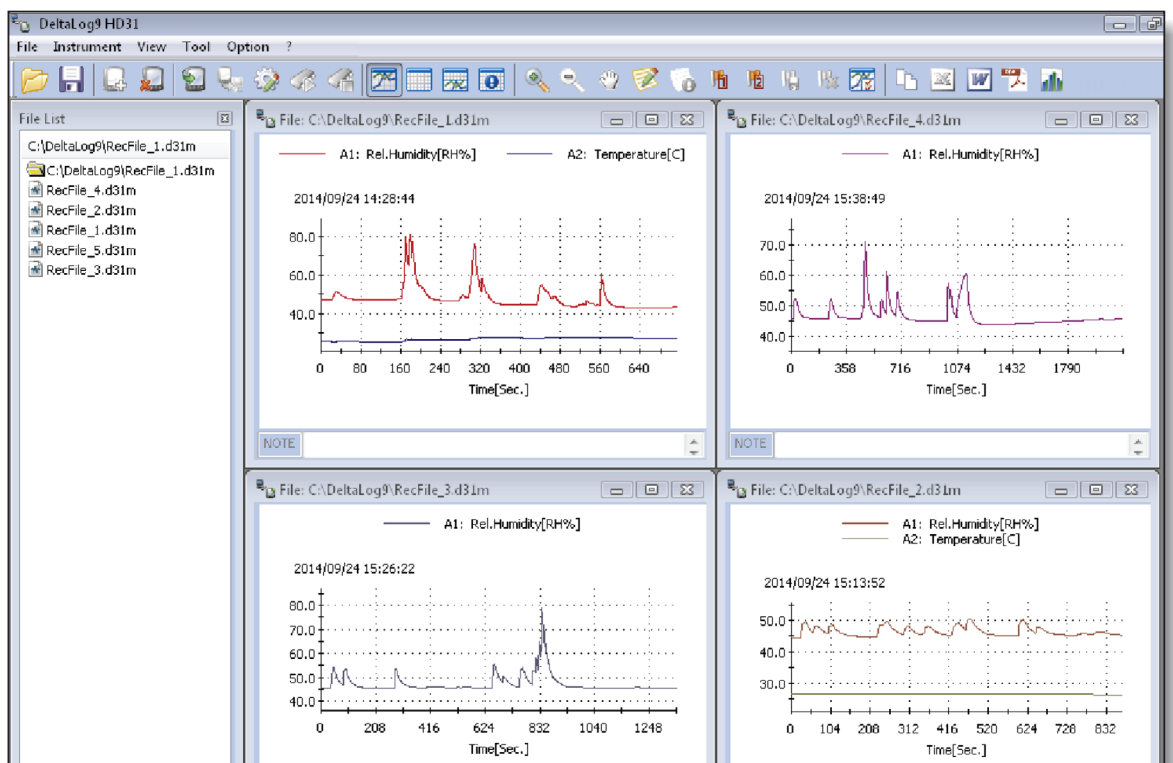
## Protection shell with support



## LCD description



## Software DeltaLog 9



## 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:  $\pm 20$  Vdc. Input impedance: 1 M $\Omega$ .

**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  $\Omega$ .

### Temperature with Platinum sensors (PRT)

#### 4-wire Pt100 sensor temperature probes equipped with SICRAM module

Model	Type	Application range	Accuracy
<b>TP472I</b>	Immersion	-196 °C...+500 °C	$\pm 0.25$ °C (-196 °C...+300 °C) $\pm 0.5$ °C (+300 °C...+500 °C)
<b>TP472I.0</b> 1/3 DIN - Thin Film	Immersion	-50 °C...+300 °C	$\pm 0.25$ °C
<b>TP473P.I</b>	Penetration	-50 °C...+400 °C	$\pm 0.25$ °C (-50 °C...+300 °C) $\pm 0.5$ °C (+300 °C...+400 °C)
<b>TP473P.0</b> 1/3 DIN - Thin Film	Penetration	-50 °C...+300 °C	$\pm 0.25$ °C
<b>TP474C.0</b> 1/3 DIN - Thin Film	Contact	-50 °C...+300 °C	$\pm 0.3$ °C
<b>TP475A.0</b> 1/3 DIN - Thin Film	Air	-50 °C...+250 °C	$\pm 0.3$ °C
<b>TP472I.5</b>	Immersion	-50 °C...+400 °C	$\pm 0.3$ °C (-50 °C...+300 °C) $\pm 0.6$ °C (+300 °C...+400 °C)
<b>TP472I.10</b>	Immersion	-50 °C...+400 °C	$\pm 0.3$ °C (-50 °C...+300 °C) $\pm 0.6$ °C (+300 °C...+400 °C)
<b>TP49A.I</b>	Immersion	-70 °C...+250 °C	$\pm 0.25$ °C
<b>TP49AC.I</b>	Contact	-70 °C...+250 °C	$\pm 0.25$ °C
<b>TP49AP.I</b>	Penetration	-70 °C...+250 °C	$\pm 0.25$ °C
<b>TP875.I</b>	Globe-thermometer $\varnothing$ 150 mm	-30 °C...+120 °C	$\pm 0.25$ °C
<b>TP876.I</b>	Globe-thermometer $\varnothing$ 50 mm	-30 °C...+120 °C	$\pm 0.25$ °C
<b>TP87.0</b> 1/3 DIN - Thin Film	Immersion	-50 °C...+200 °C	$\pm 0.25$ °C
<b>TP878.0</b> 1/3 DIN - Thin Film	Photovoltaic	-40 °C...+85 °C	$\pm 0.25$ °C
<b>TP878.1.0</b> 1/3 DIN - Thin Film	Photovoltaic	-40 °C...+85 °C	$\pm 0.25$ °C
<b>TP879.0</b> 1/3 DIN - Thin Film	Compost	-20 °C...+120 °C	$\pm 0.25$ °C

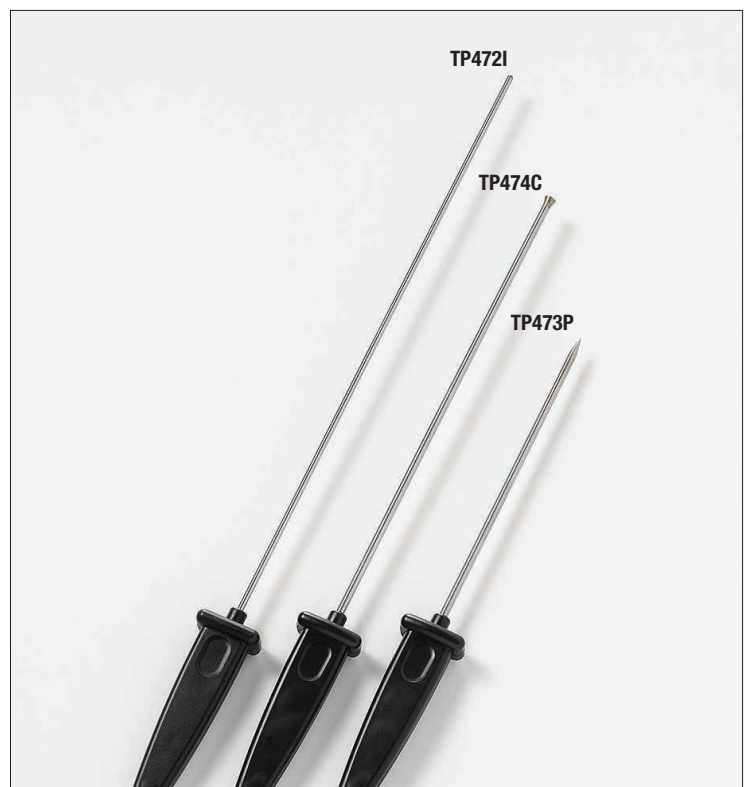
#### Common characteristics

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
<b>TP47.100.0</b> 1/3 DIN – Thin Film	4-wire Pt100	-50...+250 °C	1/3 DIN
<b>TP47.1000.0</b> 1/3 DIN – Thin Film	2-wire Pt1000	-50...+250 °C	1/3 DIN
<b>TP87.100.0</b> 1/3 DIN – Thin Film	4-wire Pt100	-50...+200 °C	1/3 DIN
<b>TP87.1000.0</b> 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

<b>TP471</b>	Module for <b>NO</b> 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

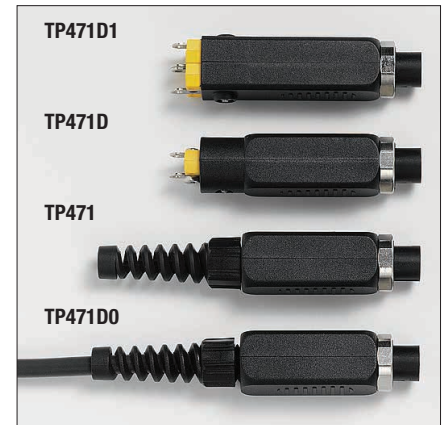
Instrument accuracy:	
Thermocouple K	±0.1 °C up to 600 °C ±0.2 °C above 600 °C
Thermocouple J	±0.05 °C up to 400 °C ±0.1 °C above 400 °C
Thermocouple T	±0.1 °C
Thermocouple N	±0.1 °C up to 600 °C ±0.2 °C above 600 °C
Thermocouple R	±0.25 °C
Thermocouple S	±0.3 °C
Thermocouple B	±0.35 °C
Thermocouple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

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	$\pm 0.0025 \times t$	+600...+800	$\pm 4$
	---	---	---	---	+800...+1700	$\pm 0.005 \times t$
E	-40...+375	$\pm 1.5$	-40...+333	$\pm 2.5$	-167...+40	$\pm 2.5$
	+375...+800	$\pm 0.004 \times t$	+333...+900	$\pm 0.0075 \times t$	-200...-167	$\pm 0.015 \times t$
J	-40...+375	$\pm 1.5$	-40...+333	$\pm 2.5$	---	---
	+375...+750	$\pm 0.004 \times t$	+333...+750	$\pm 0.0075 \times t$	---	---
K, N	-40...+375	$\pm 1.5$	-40...+333	$\pm 2.5$	-167...+40	$\pm 2.5$
	+375...+1000	$\pm 0.004 \times t$	+333...+1200	$\pm 0.0075 \times t$	-200...-167	$\pm 0.015 \times t$
R, S	0...+1100	$\pm 1$	0...+600	$\pm 1.5$	---	---
	+1100...+1600	$\pm [1+0.003 \times (t-1100)]$	+600...+1600	$\pm 0.0025 \times t$	---	---
T	-40...+125	$\pm 0.5$	-40...+133	$\pm 1$	-67...+40	$\pm 1$
	+125...+350	$\pm 0.004 \times t$	+133...+350	$\pm 0.0075 \times t$	-200...-67	$\pm 0.015 \times t$

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





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

CODE	°C max	$\tau$ 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			
	500	2s			
TP754/9	500	2s			
TP754					
TP755	800	2s			
TP755/9	800	2s			

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION					
CODE	°C max	$\tau$ s	DIMENSIONS (mm)		USE
TP756	200	2s			
TP757	180	30s	MAGNETIC PROBE FOR CONTACT MEASUREMENTS ON MAGNETIC METALLIC SURFACES 		
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	ACCREDIA calibration up to max. 300°C. 		
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			

THERMOCOUPLE PROBES TYPE "K" (CHROMEL - ALUMEL) WITH GROUNDED HOT JUNCTION						
CODE	°C max	$\tau$ s	DIMENSIONS (mm)			USE
TP656	200	1s	L=70	$\varnothing=1$		
TP656/1	1000	1s	L=500	$\varnothing=2$		
TP656/2	1000	1s	L=1000	$\varnothing=2$		
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  $\tau$ 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)	±0.3 °C
HP473ACR	Pt100	0...100%RH	-20 °C...+80 °C		±0.3 °C
HP474ACR	Pt100	0...100%RH	-40 °C...+150 °C	±2.5% (85...100%RH) @ T=15...35 °C	±0.3 °C
HP475ACR	Pt100	0...100%RH	-40 °C...+150 °C	(2 + 1.5% measure)% @ T= remaining field	±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	0.01 °C for HD31 0.003 %/°C


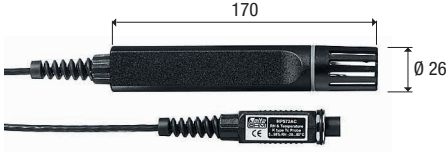
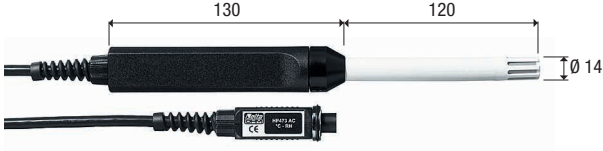
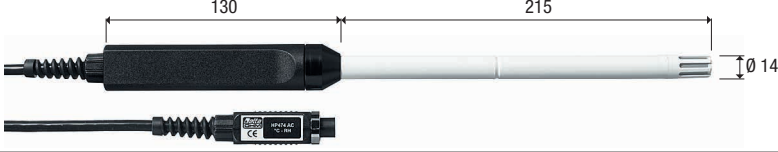
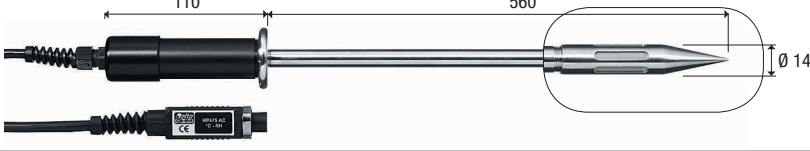
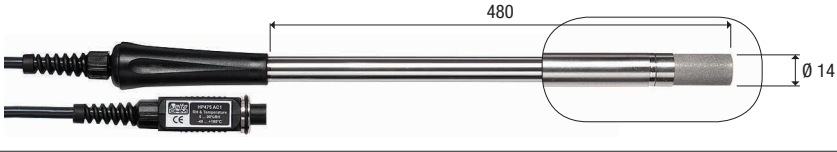
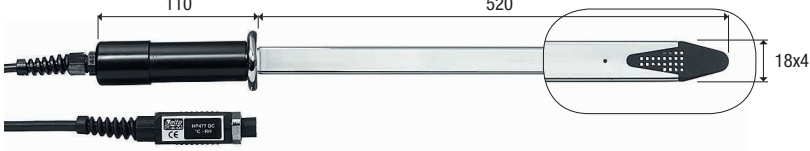
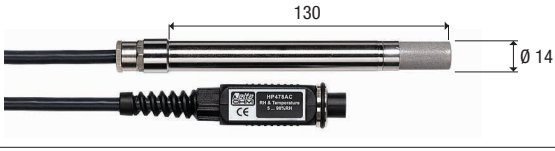

#### Protections and solutions for relative humidity and temperature probes

- 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	<b>S1</b> =f.s. 10 mbar	<b>S2</b> =f.s. 20 mbar	<b>S3</b> =f.s. 50 mbar
	<b>S4</b> =f.s. 100 mbar	<b>S5</b> =f.s. 200 mbar	<b>S6</b> =f.s. 500 mbar
	<b>S7</b> =f.s. 1 bar	<b>S8</b> =f.s. 2 bar	
Maximum overpressure	<b>S1,S2,S3</b> =200 mbar	<b>S4</b> =300 mbar	<b>S5,S6</b> =1 bar
	<b>S7</b> =3 bar	<b>S8</b> =6 bar	
Accuracy @ 25 °C	<b>S1,S2,S3</b> =0.5% f.s. <b>S4</b> =0.25% f.s. <b>S5,S6,S7,S8</b> =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>	m/s – km/h – ft/min – mph – knot		
<i>Flow rate</i>	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.)	
<i>Temperature</i>	±0.8 °C	---
Minimum speed	0.6 m/s	0.5 m/s
Units of measurement		
<i>Speed</i>	m/s – km/h – ft/min – mph – knot	
<i>Flow Rate</i>	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>	m/s – km/h – ft/min – mph - knots			
<i>Flow rate</i>	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).

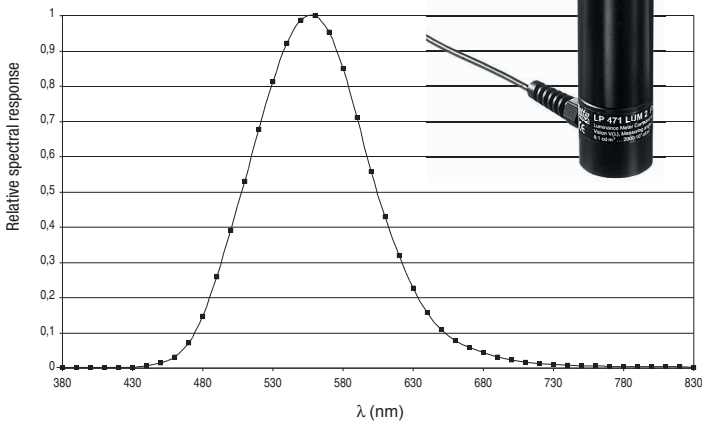
## Photometry and Radiometry

LP471PHOT Probe for the measurement of <b>illuminance</b> , equipped with SICRAM module.				
Measuring range (lux)	0.10...199.99	...1999.9	...19999	...199.99x10 <sup>3</sup>
Resolution (lux)	0.01	0.1	1	0.01 x 10 <sup>3</sup>
Spectral range	In agreement with standard photopic curve V( $\lambda$ )			
$\alpha$ (temperature coefficient) $f_6(T)$	<0.05% K			
Calibration uncertainty	<4%			
$f_1$ (in agreement with photopic response V( $\lambda$ ))	<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 <b>luminance</b> , equipped with SICRAM module.				
Measuring range (cd/m <sup>2</sup> )	0.1...1999.9	...19999	...199.99x10 <sup>3</sup>	...1999.9x10 <sup>3</sup>
Resolution (cd/m <sup>2</sup> )	0.1	1	0.01 x 10 <sup>3</sup>	0.1 x 10 <sup>3</sup>
Optical angle	2°			
Spectral range	In agreement with standard photopic curve V( $\lambda$ )			
$\alpha$ (temperature coefficient) $f_6(T)$	<0.05% K			
Calibration uncertainty	<5%			
$f_1$ (in agreement with photopic response V( $\lambda$ ))	<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:

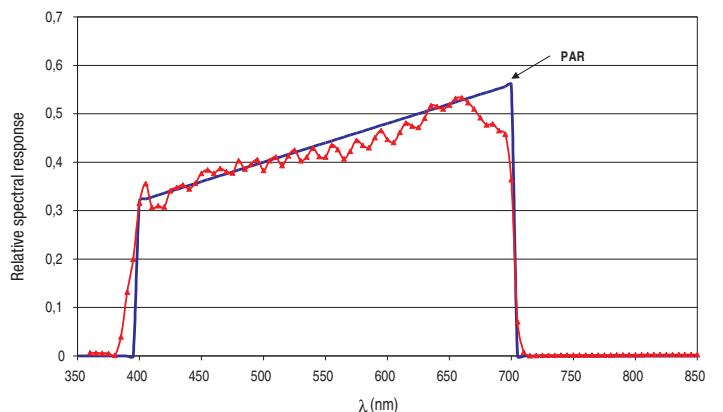


LP471LUM2  
LP471PHOT  
LP471RAD  
LP471PAR  
LP471UVA  
LP471UVB  
LP471UVC

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

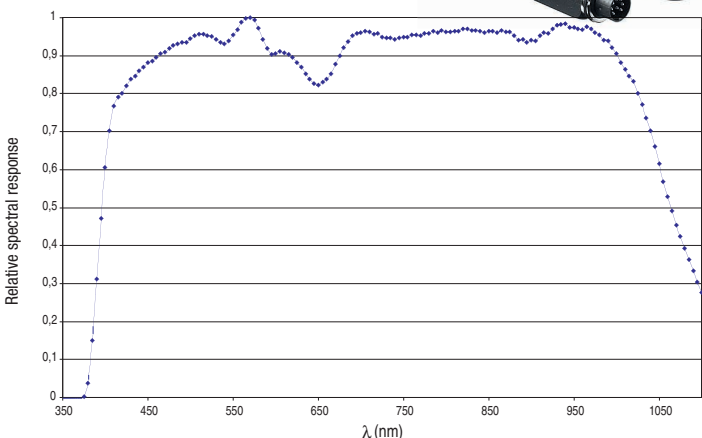
Measuring range ( $\mu\text{mol}/\text{m}^2\text{s}$ )	0.01... 199.99	200.0...1999.9	2000...10000
Resolution ( $\mu\text{mol}/\text{m}^2\text{s}$ )	0.01	0.1	1
Spectral range	400 nm...700 nm		
Calibration uncertainty	<5%		
$f_2$ (response according to cosine law)	<6%		
$f_3$ (linearity)	<1%		
$f_4$ (instrument reading error)	$\pm 1$ digit		
$f_5$ (fatigue)	<0.5%		
Drift after one year	<1%		
Working temperature	0...50 °C		

Typical response curve of the probe LP471PAR:



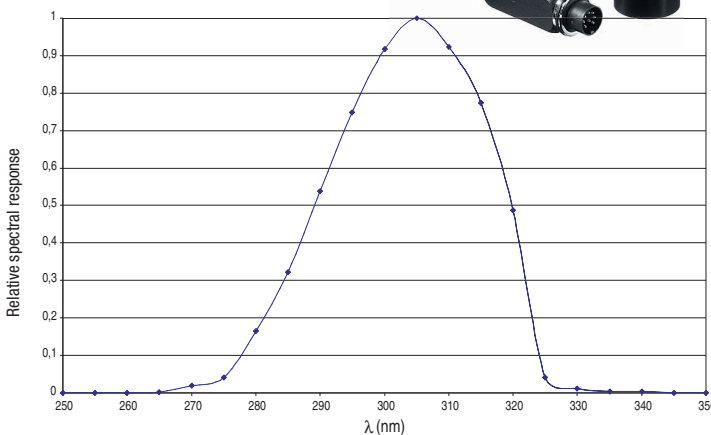
LP471RAD Probe for the measurement of irradiance, equipped with SICRAM module.				
Measuring range (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup> ...999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	400 nm...1050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

Typical response curve of the probe LP471RAD:



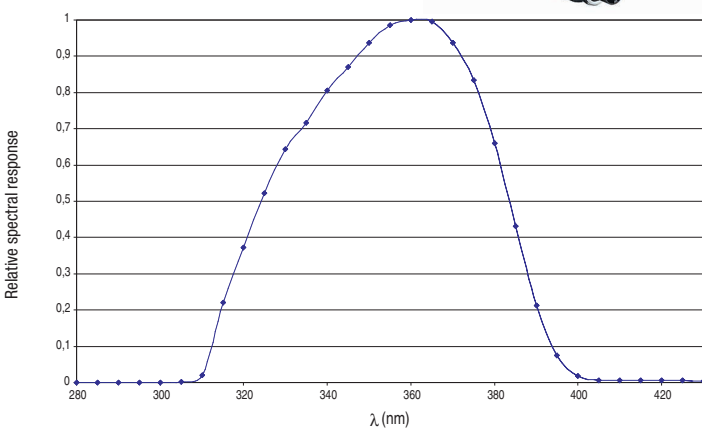
LP471UVB Probe for the measurement of the UVB irradiance, equipped with SICRAM module.				
Measuring range (W/m <sup>2</sup> )	1x10 <sup>-3</sup> ...999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	280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

Typical response curve of the probe LP471UVB:



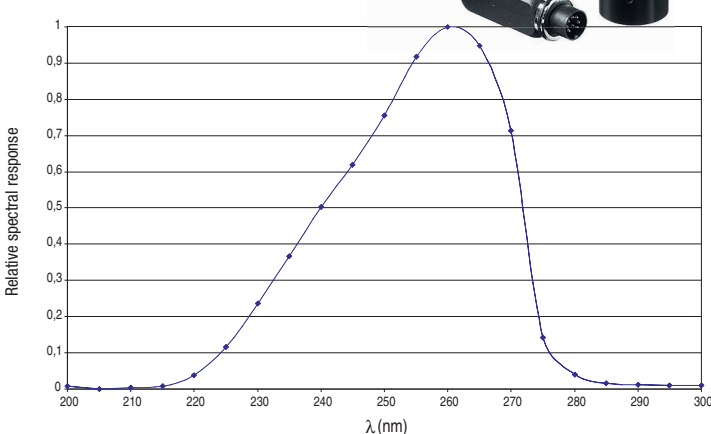
LP471UVA Probe for the measurement of UVA irradiance, equipped with SICRAM module.				
Measuring range (W/m <sup>2</sup> )	1x10 <sup>-3</sup> ...999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	315 nm...400 nm (Peak 360 nm)			
Calibration uncertainty	<5%			
f <sub>2</sub> (response according to cosine law)	<6%			
f <sub>3</sub> (linearity)	<1%			
f <sub>4</sub> (instrument measuring error)	±1 digit			
f <sub>5</sub> (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 <sup>2</sup> )	1x10 <sup>-3</sup> ...999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	220 nm...280 nm (Peak 260 nm)			
Calibration uncertainty	<5%			
f <sub>2</sub> (response according to cosine law)	<6%			
f <sub>3</sub> (linearity)	<1%			
f <sub>4</sub> (instrument reading error)	±1 digit			
f <sub>5</sub> (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.

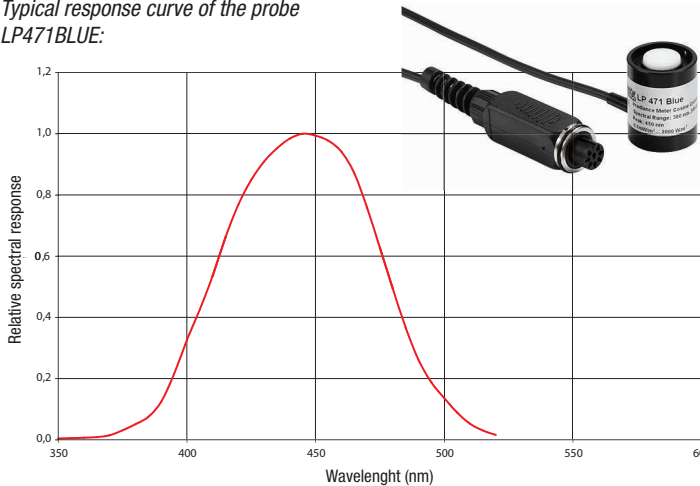
Measuring range (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup> ...999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	380 nm...550 nm. Effective irradiance for blue light hazard B(λ)			
Calibration uncertainty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

<b>UVA irradiance</b>				
Measuring range (μW/cm <sup>2</sup> )	0.10...199.99	...1999.9	...19999	...199.99x10 <sup>3</sup>
Resolution (μW/cm <sup>2</sup> )	0.01	0.1	1	0.01x10 <sup>3</sup>
Spectral range	315 nm...400 nm (Peak 360 nm)			
Calibration uncertainty	<5%			
f <sub>2</sub> (response according to cosine law)	<6%			
f <sub>3</sub> (linearity)	<1%			
f <sub>4</sub> (instrument reading error)	±1 digit			
f <sub>5</sub> (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.

<b>Total effective irradiance</b>	
Measuring range (W <sub>eff</sub> /m <sup>2</sup> )	0.010...19.999
Resolution (W <sub>eff</sub> /m <sup>2</sup> )	0.001
Spectral range	UV action curve for erythema measurement (250 nm...400 nm)
Calibration uncertainty	<15%
f <sub>3</sub> (linearity)	<3%
f <sub>4</sub> (instrument reading error)	±1 digit
f <sub>5</sub> (fatigue)	<0.5%
Drift after one year	<2%
Working temperature	0...50 °C
Reference standard	CEI EN 60335-2-27
<b>UVA irradiance</b>	
Measuring range (W <sub>eff</sub> /m <sup>2</sup> )	0.1...1999.9
Resolution (W <sub>eff</sub> /m <sup>2</sup> )	0.1
Spectral range	315 nm...400 nm
<b>UV-BC irradiance</b>	
Measuring range (W <sub>eff</sub> /m <sup>2</sup> )	0.010...19.999
Resolution (W <sub>eff</sub> /m <sup>2</sup> )	0.001
Spectral range	250 nm...315 nm

Typical response curve of the probe LP471BLUE:

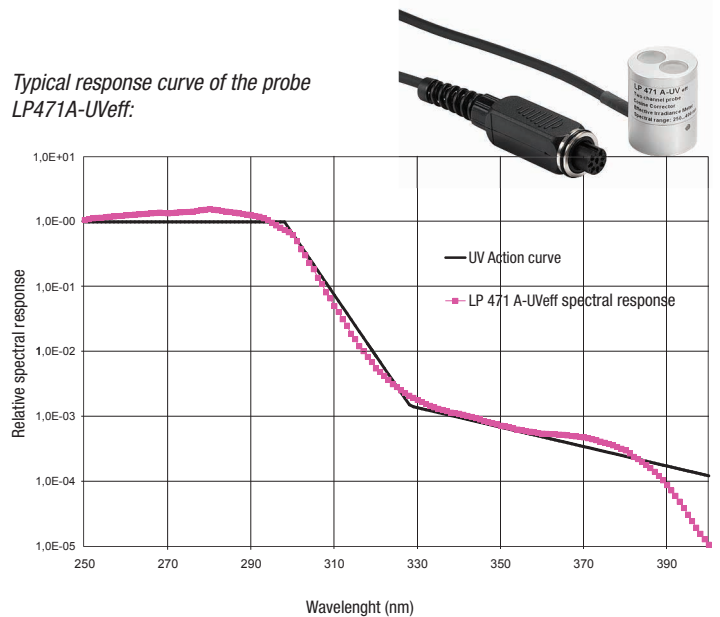


The radiometric probe LP 471 BLUE measures the irradiance (W/m<sup>2</sup>) in the spectral range of Blue light. The probe consists of a photodiode with an appropriate filter and is provided with a diffuser for correct measurement according to the cosine law. The spectral response curve of the probe 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.

<b>Illuminance</b>				
Measuring range (lux)	0.3...199.99	...1999.9	...19999	...199.99x10 <sup>3</sup>
Resolution (lux)	0.01	0.1	1	0.01x10 <sup>3</sup>
Spectral range	In agreement with photopic standard curve V(λ)			
α (temperature coefficient) f <sub>6</sub> (T)	<0.05% K			
Calibration uncertainty	<4%			
f <sub>1</sub> (in agreement with photopic response V(λ))	<6%			
f <sub>2</sub> (response according to cosine law)	<3%			
f <sub>3</sub> (linearity)	<1%			
f <sub>4</sub> (instrument reading error)	<0.5%			
f <sub>5</sub> (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:

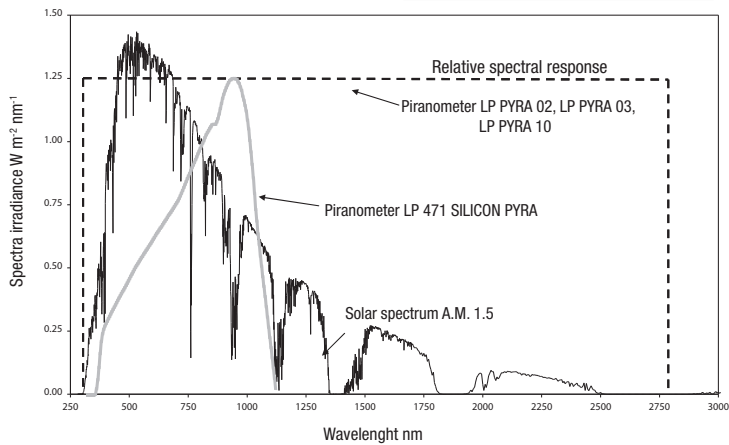


LP 471 PYRA 02.5  
LP 471 PYRA 10.5

<b>LP471 SILICON-PYRA</b> Probe for the measurement of <b>global solar irradiance</b> , equipped with SICRAM module.				
Measuring range (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup> ... 999.9x10 <sup>-3</sup>	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m <sup>2</sup> )	0.1x10 <sup>-3</sup>	0.001	0.01	0.1
Spectral range	400 nm...1100 nm			
Calibration uncertainty	<3%			
f <sub>2</sub> (response according to cosine law)	<3%			
f <sub>3</sub> (linearity)	<1%			
f <sub>4</sub> (instrument reading error)	±1 digit			
f <sub>5</sub> (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 <sup>2</sup> , 1 μV
Accuracy	±1 W/m <sup>2</sup> , ±3 μV
Sensitivity	selectable from 5 to 30 μV/Wm <sup>-2</sup>

## CO<sub>2</sub> (carbon dioxide)

**HD31.B3...** Probe for CO<sub>2</sub> measurement, equipped with SICRAM module.

Sensor	Dual wavelength NDIR
Measuring range	0...5,000 ppm ( <b>HD31.B3</b> ) 0...10,000 ppm ( <b>HD31.B3-10</b> )
Operating conditions	-20...60 °C / 0...95%RH non condensing
Accuracy @ 25 °C / 1013 mbar	±(50 ppm + 3% of measure) for HD31.B3 ±(100 ppm + 5% of measure) for HD31.B3-10
Resolution	1 ppm
Temperature dependence	1 ppm/°C
Response time (T <sub>90</sub> )	< 120 s (wind speed = 2 m/s)
Long-term stability	5% of measure / 5 years

<b>Архангельск</b> (8182)63-90-72	<b>Ижевск</b> (3412)26-03-58	<b>Магнитогорск</b> (3519)55-03-13	<b>Пермь</b> (342)205-81-47	<b>Сургут</b> (3462)77-98-35
<b>Астана</b> (7172)727-132	<b>Иркутск</b> (395)279-98-46	<b>Москва</b> (495)268-04-70	<b>Ростов-на-Дону</b> (863)308-18-15	<b>Тверь</b> (4822)63-31-35
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<b>Владивосток</b> (423)249-28-31	<b>Киров</b> (8332)68-02-04	<b>Новосибирск</b> (383)227-86-73	<b>Севастополь</b> (8692)22-31-93	<b>Уфа</b> (347)229-48-12
<b>Волгоград</b> (844)278-03-48	<b>Краснодар</b> (861)203-40-90	<b>Омск</b> (3812)21-46-40	<b>Симферополь</b> (3652)67-13-56	<b>Хабаровск</b> (4212)92-98-04
<b>Вологда</b> (8172)26-41-59	<b>Красноярск</b> (391)204-63-61	<b>Орел</b> (4862)44-53-42	<b>Смоленск</b> (4812)29-41-54	<b>Челябинск</b> (351)202-03-61
<b>Воронеж</b> (473)204-51-73	<b>Курск</b> (4712)77-13-04	<b>Оренбург</b> (3532)37-68-04	<b>Сочи</b> (862)225-72-31	<b>Череповец</b> (8202)49-02-64
<b>Екатеринбург</b> (343)384-55-89	<b>Липецк</b> (4742)52-20-81	<b>Пенза</b> (8412)22-31-16	<b>Ставрополь</b> (8652)20-65-13	<b>Ярославль</b> (4852)69-52-93
<b>Иваново</b> (4932)77-34-06	<b>Киргизия</b> (996)312-96-26-47	<b>Казахстан</b> (772)734-952-31	<b>Таджикистан</b> (992)427-82-92-69	

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