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USER MANUAL

LX1100

PHOTO- RADIO METER

MODEL HD2302

TO MEASURE = TO KNOW

1. Input for probes, 8-pole DIN45326 connector.
2. Battery symbol: displays the battery charge level.
3. Function indicators.
4. Secondary display line.
5. **DATA** key: displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements.
6. **CLR** key: resets the maximum, average, and minimum value of the captured measurements.
7. **HOLD** key: freezes the measurement.
8. **UNIT** key: allows selection of the unit of measurement.
9. **REL** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed).
10. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the *AutoPowerOff* function.
11. MAX (maximum value), MIN (minimum value) and AVG (average value) symbols.
12. Main display line.
13. Line for symbols and comments.

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1. GENERAL CHARACTERISTICS

This Photo-Radiometer is a portable instrument, fitted with a large LCD display for visualization of the measured data. It measures:

- **illuminance**;
- **luminance;**
- **PAR**;
- **irradiance** (across VIS-NIR, UVA, UVB and UVC spectral regions or in the measured effective irradiance according to the UV action curve).

The probes are fitted with the SICRAM *automatic detection* module, with the factory calibration settings already being memorized inside. In addition to detection, the unit of measurement selection is also automatic.

The Photo-Radiometer measures the following instantaneous quantities:

Type of measurement	**Unit of measurement**
Illuminance (Phot)	lux – fcd
Irradiance (RAD – UVA – UVB – UVC)	W/m^2 - $\mu W/cm^2$
PAR	$\mu mol\ (m^2 \cdot s)$
Luminance (LUM 2)	cd/m^2

Using the Max, Min and Avg function of this instrument respectively obtains the maximum, minimum or average values.

Other available functions are:

- the relative measurement REL;
- the HOLD function;
- the automatic turning off which can also be disabled.

For further details, see chapter ‘Description of the functions’ at page 6

2. DESCRIPTION OF THE FUNCTIONS

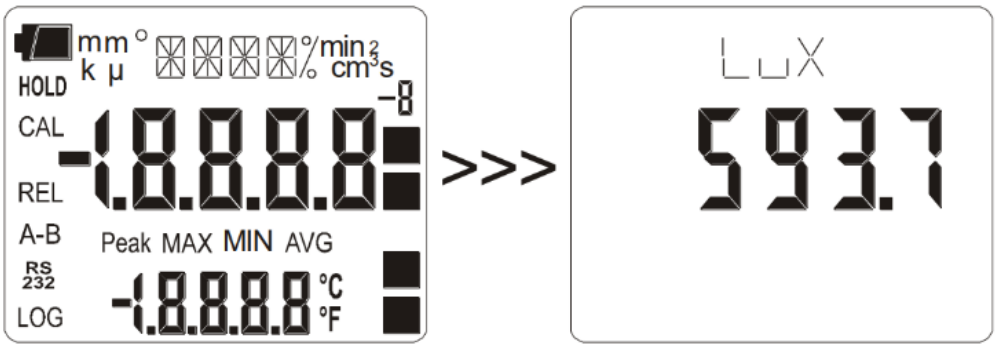
The Photo-Radiometer keyboard is composed of single-function keys, except the ON-OFF/Auto-OFF key that has two functions (see the description of the key below).
The pressing of a key is accompanied by a short confirmation "beep": a longer "beep" sounds if the wrong key is pressed. Each key specific function is described in detail below.

ON-OFF and AUTO-OFF key

This key has two functions:

- **ON/OFF:** to turn the instrument on press **ON**, to turn it off press **OFF**.

The turning on enables all display segments for a few seconds, starts an **Auto-test** including the detection of the probe connected to the input, and sets the instrument ready for normal measurement. The following is displayed:



- **AUTO/OFF:** the ***AutoPowerOff*** function can be disabled by simultaneously pressing this key and the "HOLD" key when turning the instrument on.

During turning on, should no probes be connected, the **"PROB"** message is displayed in the line for symbols for a few seconds, while the **"ERR"** message is shown in the central part of the display.
When the probe is inserted into a functioning instrument, it is not detected: as the data are captured upon turning the instrument on, it is necessary to turn it off and on again.

Caution! Replace the probes when the instrument is off.

+ HOLD Disabling of the automatic turning off

The instrument has an *AutoPowerOff* function that automatically turns the instrument off after about 8 minutes if no key is pressed during the intervening time.
Press simultaneously the **ON/OFF** key and the **HOLD** key to disable this function.
In this case, remember to turn the instrument off using the **ON/OFF** key: disabling of the automatic turning off is shown by the blinking battery symbol.

CLR/ESC key

It resets the maximum, average, and minimum value of the captured measurements.

DATA key

By pressing this key once the maximum (MAX) value of the measurements captured by the probe connected to the instrument is displayed, updating it with the acquisition of new samples;

- by pressing this key again the minimum (MIN) value is displayed;
- by pressing this key a third time the average (AVG) value is displayed.

The acquisition frequency is once a second.
The MAX, MIN and AVG values remain in the memory until the instrument is on, even after exiting the DATA calculation function. When the instrument is off, the previously memorized data are cleared. Upon turning on, the instrument automatically starts memorizing the MAX, MIN and AVG values.
To reset the previous values and start with a new measurement session, press the **CLR** key until the **FUNC_CLRD** message appears.

HOLD key

By pressing this key the current measurement update is frozen and the "HOLD" message will appear in the upper left-hand corner of the display. To return to the current measurement, press the key again. It is also used to disable the *AutoPowerOff* function (see the description of the ON/OFF key).

UNIT key

By pressing this key, the **unit of measurement of the main input quantity is selected**: the unit of measurement will appear in the upper part of the display; the measured value will be displayed in the central line. By repeatedly pressing the UNIT key, the desired unit of measurement can be selected. In the combined probes, **UNIT** key allows to select one of the available measures (in these probes, unit of measurement cannot be changed).
NOTE: The **units of measurement** available are determined according to the probe connected to the input, as reported in the following table:

Type of measurement	**Unit of measurement**
Illuminance (Phot)	lux – fcd
Irradiance (RAD – UVA – UVB – UVC)	W/m^2 - $\mu W/cm^2$
PAR	$\mu mol\ (m^2 \cdot s)$
Luminance (LUM 2)	cd/m^2

REL key

It displays the difference between the current value and that measured on pressing the key. The "REL" message is displayed on the left.
To return to the normal measurement, press the key again.

3. PROBES AND MEASUREMENTS

The instrument works with probes of the LP471... series: these are photometric and radiometric probes that measure:

- **illuminance** (LP471 PHOT),
- **irradiance** (LP471 RAD, LP471 UVA, LP471 UVB, LP471 UVC and LP471UVBC),
- **PAR** (LP471 PAR),
- **luminance** (LP471 LUM 2),
- **effective irradiance** in the spectral range of blue light (LP471BLUE),
- **illuminance, UVA irradiance** and **UVA irradiance-illuminance ratio** (Combined probe LP471P-A),
- **total effective irradiance UVA + UV-CB** according to the UV weighting curve (combined probe LP471A-UVeff for measuring total effective irradiance in the range 250...400 nm),
- **global solar irradiance** in the spectral range 400...1100 nm with silicon photodiode (LP471SILICON-PYRA),
- **global solar irradiance** in the spectral range 300...2800 nm. Probe consisting of a Spectrally Flat Class C pyranometer LPPYRA03 and a cable with SICRAM module (LP471PYRA03),
- **global solar irradiance** in the spectral range 283...2800 nm. Probe consisting of a Spectrally Flat Class B LPPYRA02 or Spectrally Flat Class A pyranometer LPPYRA10 and a cable with SICRAM module (LP471PYRA02 – LP471PYRA10).

All probes, except LUM2, are provided with a diffuser for cosine correction.
Upon turning on the instrument automatically detects the probe connected to the input: it is sufficient to **connect it before turning the instrument on**.
The **unit of measurement** is determined according to the probe connected to the input: use the UNIT key to change the unit of measurement.
In the combined probes, **UNIT** key allows to select one of the available measures (in these probes, unit of measurement cannot be changed).
All probes are calibrated in the factory; no calibration is required by the user.

The probe is detected during turn on: if a probe is connected and the instrument is on, it is necessary to turn it off and on.

COMBINED PROBE LP471P-A

LP471P-A is a two sensors combined probe with SICRAM module for measuring **illuminance** (lux) with standard photopic spectral response and **irradiance** (µW/cm2) in **UVA** spectral range (315...400 nm, with peak at 360 nm). Moreover probe provides the ratio of UVA irradiance and illuminance in µW/lumen (quantity of interest in the museums field). Both sensors are equipped with diffuser for the correction according to the cosine law. At switching on, the instrument displays alternatively the measures of the two sensors. Pressing any key (excluded ON/OFF key), automatic commutation is turned off. To reactivate it, press HOLD and REL keys together. To select the measure to display, press UNIT key.

COMBINED PROBE LP471A-UVEFF

LP471A-UVeff is a two-sensors combined probe with SICRAM module for measuring **total effective irradiance** according to the UV weighting curve. 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 ("Er" at display), the effective irradiance in the range UV-CB ("BC" at display) and the UVA irradiance ("A" at display). At switching on, the instrument displays alternatively the measures of the two sensors. Pressing any key (excluded ON/OFF key), automatic commutation is turned off. To reactivate it, press HOLD and REL keys together. To select the measure to display, press UNIT key.

PROBES LP471PYRA10 - LP471PYRA02 – LP471PYRA03

The **LP471PYRA...** probes measure the **global solar radiation** in the spectral range 283...2800 nm (**LP471PYRA10** and **LP471PYRA02**) or 300...2800 (**LP471PYRA03**). They are composed of a Spectrally Flat Class A (LPPYRA10), Spectrally Flat Class B (LPPYRA02) or Spectrally Flat Class C (LPPYRA03) pyranometer and a cable with SICRAM module. Since calibration data of pyranometer are saved in SICRAM module, the cable cannot be used together with other pyranometers. The **global solar radiation** is expressed in W/m2 or in µW/cm2. Measuring range is 0...2000 W/m2. The module is equipped with a 5 m long cable ending with a 4 poles male connector to be inserted in the female connector of the pyranometer. No user calibration is required. The SICRAM module is recognized at the instrument switching on, then it's absolutely necessary to **connect the module before turning the instrument on**.

PROBE LP471SILICON-PYRA

The **LP471SILICON-PYRA** probe measures the **global solar radiation** using a silicon photodiode in the spectral range 400...1100 nm. The particular geometry and the diffuser allow the sensor to have a field of view of 180° according to the cosine law. The probe is suitable for the measurement of natural sunlight. Under overcast skies, or for reflected light measurements the use of a thermopile pyranometer is recommended (LP471PYRA10, LP471PYRA02 or LP471PYRA03). The measurement of global solar radiation is expressed in W/m2 or in µW/cm2. Measuring range is 0...2000 W/m2. No user calibration is required. The SICRAM module is recognized at the instrument switching on, then it's absolutely necessary to **connect the module before turning the instrument on**.

4. INSTRUMENT SIGNALS AND FAULTS

The following table lists all of the indications displayed by the instrument in different operating and error situations:

Display indications	Explanation
BATT TOO LOW **CHNG NOW**	Indication of insufficient battery charge: it appears when you turn the instrument on. The instrument issues a long beep and turns off. Replace the batteries.
CAL **LOST**	Program error: it appears after turning on for a few seconds. Contact the instrument's supplier.
PROB COMM LOST	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
FUNC CLRD	Maximum (MAX), minimum (MIN) and average (AVG) values cleared.
NEW_PROB_DET	New probe detected
NO_PRBE_ **SER_NUM**	The connected probe's serial number is absent
OVER **or** **- - - -**	Measurement overflow: indicates that the probe is measuring a value exceeding the measuring range.
PLS_EXIT >>> FUNC **RES_FOR_FACT** **ONLY**	Please exit using ESC >>> function reserved to factory calibration
PRBE_SER ##### #####	Serial number ##### ##### of the connected probe
PROB **ERR**	A probe with SICRAM module has been inserted when not admissible for that instrument.
SYS **ERR** **#**	Instrument management program error. Contact the instrument's supplier and communicate the numeric code # reported by the display.

5. LOW BATTERY WARNING AND BATTERY REPLACEMENT

The battery symbol 

on the display constantly shows the battery charge status. To the extent that batteries have discharged, the symbol "empties". When the charge decreases still further it starts blinking.

In this case, batteries should be replaced.

If you continue to use it, the instrument can no longer ensure correct measurement. However, the memory data are maintained.
If the battery charge level is insufficient, the following message appears when you turn the instrument on:

BATT TOO LOW
CHNG NOW

The instrument issues a long beep and turns off. In this case, replace the batteries in order to turn the instrument back on.

To replace the batteries, proceed as follows:
1. switch the instrument off;
2. unscrew the battery cover counter clockwise;
3. replace the batteries (3 1.5V alkaline batteries - type AA);
4. screw the cover on clockwise.

Malfunctioning upon turning on after battery replacement
After replacing the batteries, the instrument may not restart correctly; in this case, repeat the operation.
After disconnecting the batteries, wait a few minutes in order to allow circuit condensers to discharge completely; then reinsert the batteries.

6.1 WARNING ABOUT BATTERY USE

- Batteries should be removed when the instrument is not used for an extended time.
- Flat batteries must be replaced immediately.
- Avoid batteries leaking.
- Always use good quality leakproof alkaline batteries. Sometimes on the market, it is possible to find new batteries with an insufficient charge capacity.

6. WARNINGS

1. Do not bend the probe connectors or force them upward or downward.
2. Do not bend or force the contacts when inserting the probe connector into the instrument.
3. The sensors and filters should not exceed the temperature limits established with consequent irreparable degradation of their characteristics.
4. Do not drop the probes: as this could cause irreparable damage.
5. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
6. The instrument is water resistant and IP67, but should not be immersed in water. The probe connectors must be fitted with sealing gaskets. Should the instrument fall into the water, check for any water infiltration. Gently handle the instrument in such a way as to prevent any water infiltration from the connectors' side.

7. INSTRUMENT STORAGE

Instrument storage conditions:

- Temperature: -25...+65°C.
- Humidity: less than 90%RH without condensation.
- Do not store the instrument in places where:
  - humidity is high;
  - the instrument may be exposed to direct sunlight;
  - the instrument may be exposed to a source of high temperature;
  - the instrument may be exposed to strong vibrations;
  - the instrument may be exposed to steam, salt or any corrosive gas.

The instrument case is made of ABS plastic: do not use any incompatible solvent for cleaning.

8. NOTES ABOUT WORKING AND OPERATIVE SAFETY

Authorized use

The technical specifications as given in chapter TECHNICAL CHARACTERISTICS must be observed. Only the operation and running of the measuring instrument according to the instructions given in this operating manual is authorized. Any other use is considered unauthorized.

General safety instructions

This measuring system is constructed and tested in compliance with the EN 61010-1 safety regulations for electronic measuring instruments. It left the factory in a safe and secure technical condition.
The smooth functioning and operational safety of the measuring system can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.
The smooth functioning and operational safety of the instrument can only be guaranteed under the environmental and electrical operating conditions that are in specified in chapter TECHNICAL CHARACTERISTICS.

Do not use or store the product in places such as listed below:

- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the instrument.
- Excessive induction noise, static electricity, magnetic fields or noise.

If the measuring system was transported from a cold environment to a warm environment, the formation of condensate can impair the functioning of the measuring system. In this event, wait until the temperature of the measuring system reaches room temperature before putting the measuring system back into operation.

Obligations of the purchaser

The purchaser of this measuring system must ensure that the following laws and guidelines are observed when using dangerous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations

9. TECHNICAL CHARACTERISTICS

9.1 TECHNICAL CHARACTERISTICS OF THE PHOTO-RADIOMETER

Instrument	
Dimensions (Length x Width x Height)	140 x 88 x 38 mm
Weight	160 g (complete with batteries)
Material	ABS
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Operating temperature	-5 ÷ 50°C
Warehouse temperature	-25 ÷ 65°C
Working relative humidity	0 ÷ 90%RH without condensation
Protection degree of the case	**IP67**
Power	
Batteries	3 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	< 20 µA
Connections	
Input for probes	8-pole male DIN45326 connector
Unit of Measurement	lux – fcd - W/m² - µW/cm² - µmol/(m²·s) - cd/m² - µW/lumen nella sonda **LP471P-A**

9.2 TECHNICAL CHARACTERISTICS PROBES IN LINE WITH THE INSTRUMENT

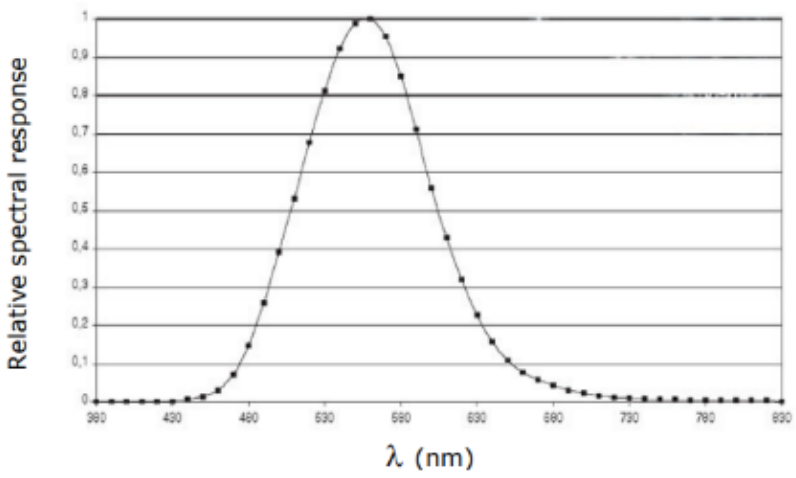
LP471PHOT – Illuminance probe with SICRAM module

Measurement 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 (ctemperature 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 the cosine law)	<3%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	B			
Drift after 1 year	<1%			
Functioning temperature	0...50 °C			
Reference Standard	CIE n°69 – UNI 11142			

LP471LUM2 – Luminance probe with SICRAM module

Measurement range (cd/m^2)	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%			
Functioning temperature	0...50 °C			
Reference Standard	CIE n°69 – UNI 11142			

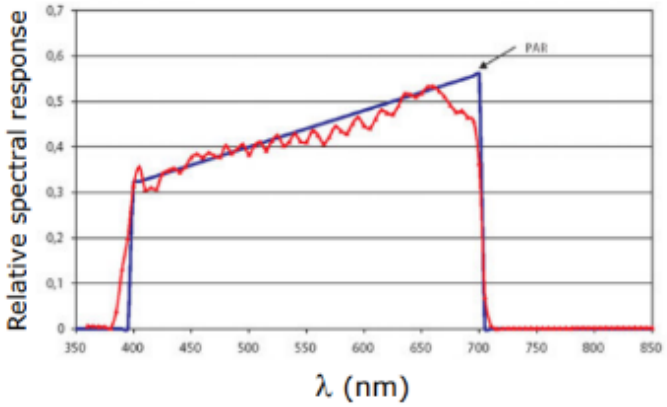
Typical response curve **LP471PHOT** and **LP471LUM2.**



IP471PAR – Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range PAR, complete with SICRAM module

Measurement range (µmol/m²s)	0.1...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 the cosine law)	<6%		
f_3 (linearity)	<1%		
f_4 (instrument reading error)	±1digit		
f_5 (fatigue)	<0.5%		
Drift after 1 year	<1%		
Functioning temperature	0...50 °C		

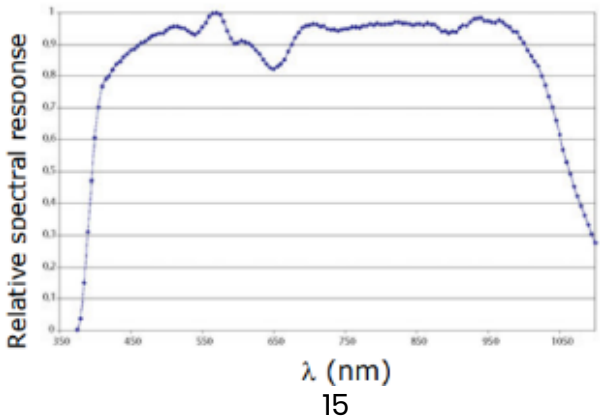
Typical response curve **LP471PAR**:



LP471RAD – Irradiance probe with SICRAM module.

Measurement 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	400 nm...1050 nm			
Calibration uncertainty	<5%			
f_2 (response according to the cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<1%			
Functioning temperature	0...50 °C			

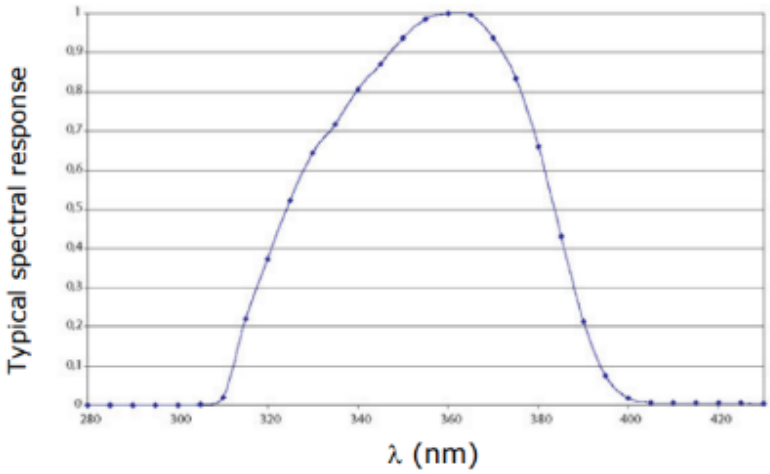
Typical response curve **LP471RAD**:



LP471UVA – UVA Irradiance probe with SICRAM module

Measurement 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_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

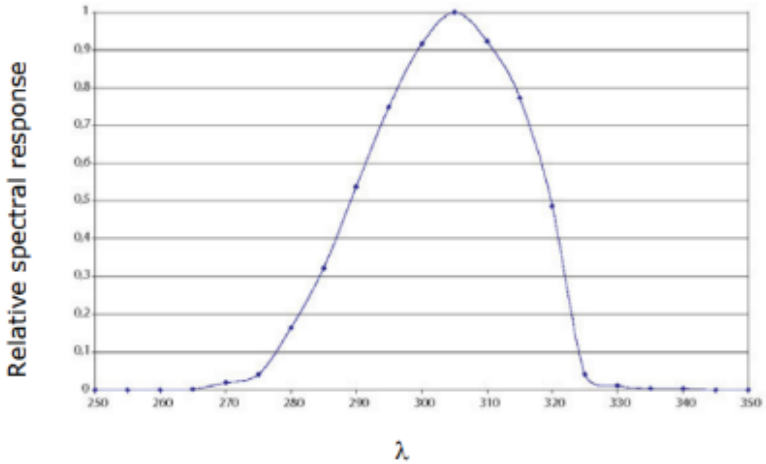
Typical response curve **LP471UVA**:



LP471UVB – UVB Irradiance probe with SICRAM module

Measurement 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)			
Calibration uncertainty	<5%			
f_3 (linearity)	<2%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

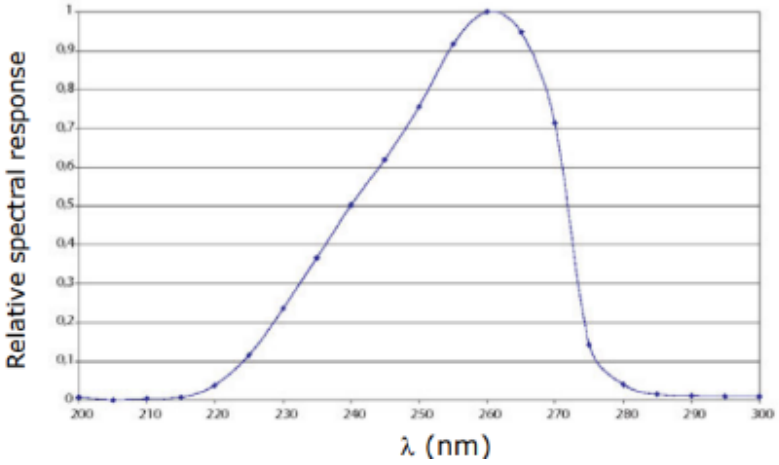
Typical response curve **LP471UVB**:



LP471UVC -UVC Irradiance probe with SICRAM module.

Measurement 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_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

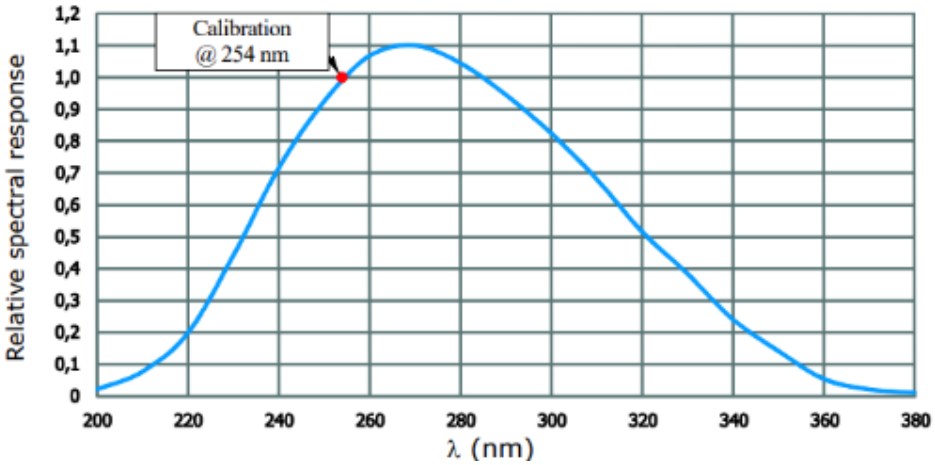
Typical response curve **LP471UVC**:



LP471UVBC – UVBC Irradiance probe with SICRAM module

Measurement 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	210 nm...355 nm (Peak 265 nm)			
Calibration uncertainty	<7% (Calibration @ 254 nm)			
f_3 (linearity)	<2%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0,5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

Typical response curve **LP471UVBC**:

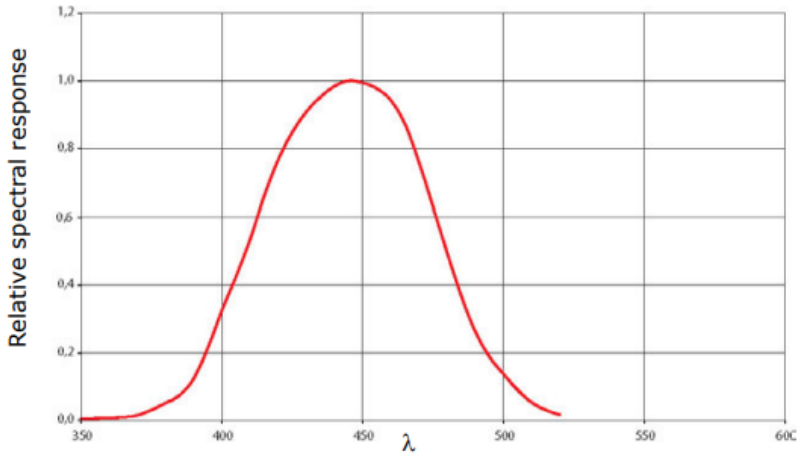


LP471BLUE – Probe with SICRAM module for the measurement of **effective irradiance in the spectral range of Blue light.**

Measurement 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	380 nm...550 nm. Blue hazard action curve B (λ)			
Calibration uncertainty	<10%			
f_2 (response according to the cosine law)	<6%			
f_3 (linearity)	<3%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

The radiometric probe LP471BLUE measures the irradiance (W/m^2) 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 to measure the effective irradiance for blue light hazard (curve B (λ) according to the standards ACGIH / ICNIRP) in the spectral range 380 nm...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.

Typical response curve **LP471BLUE**:



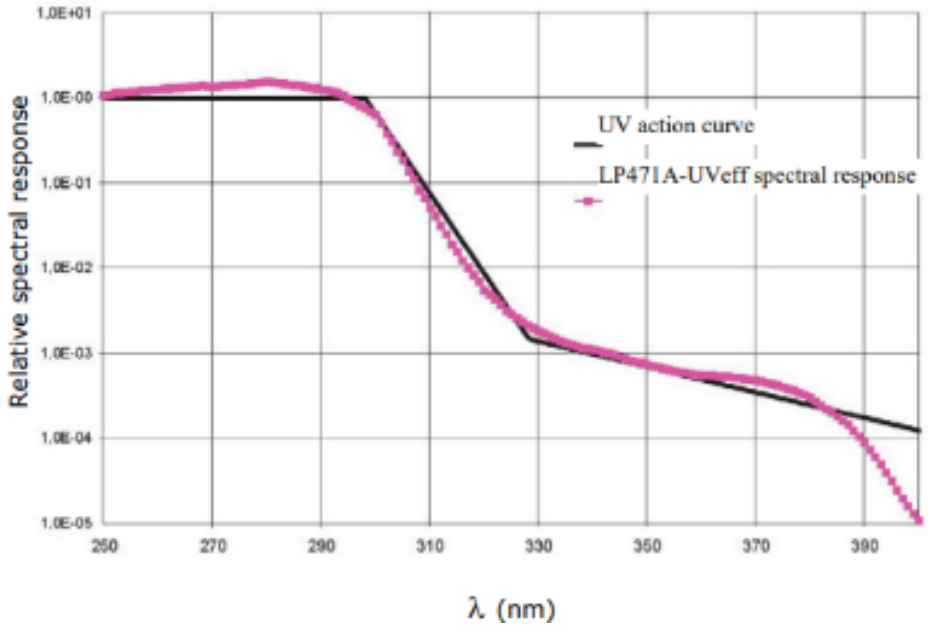
LP471P-A – Two sensor combined probe with SICRAM module **for UVA irradiance and illuminance measurement**

Illuminance				
Measurement range (lux)	0.3...199.99	...1999.9	...19999	...199.99x10³
Resolution (lux)	0.01	0.1	1	0.01x10³
Spectral range	according to photopic curve V(λ)			
α (temperature coefficient) $f_6(T)$	<0.05% K			
Calibration uncertainty	<4%			
f'_1 (according to the photopic curve V(λ))	<6%			
f_2 (response according to the cosine law)	<3%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	B			
Drift after 1 year	<1%			
Functioning temperature	0...50 °C			
Reference standard	CIE n°69 – UNI 11142			
Response curve	See LP471PHOT typical response curve			
UVA Irradiance				
Measurement 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 the cosine law)	<6%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			
Response curve	See LP471UVA typical response curve			

LP471A-UVeff – Combined probe with SICRAM module for the measurement of **total effective irradiance according to UV weighting curve.**

Total effective irradiance	
Measurement range (W/m²)	0.010...19.999
Resolution (W/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%
Functioning temperature	0...50 °C
Reference standard	CEI EN 60335-2-27
UVA Irradiance	
Measurement range (W/m²)	0.1... 1999.9
Resolution (W/m²)	0.1
Spectral range	315 nm...400 nm
UV-BC Irradiance	
Measurement range (W/m²)	0.010... 19.999
Resolution (W/m²)	0.001
Spectral range	250 nm...315 nm

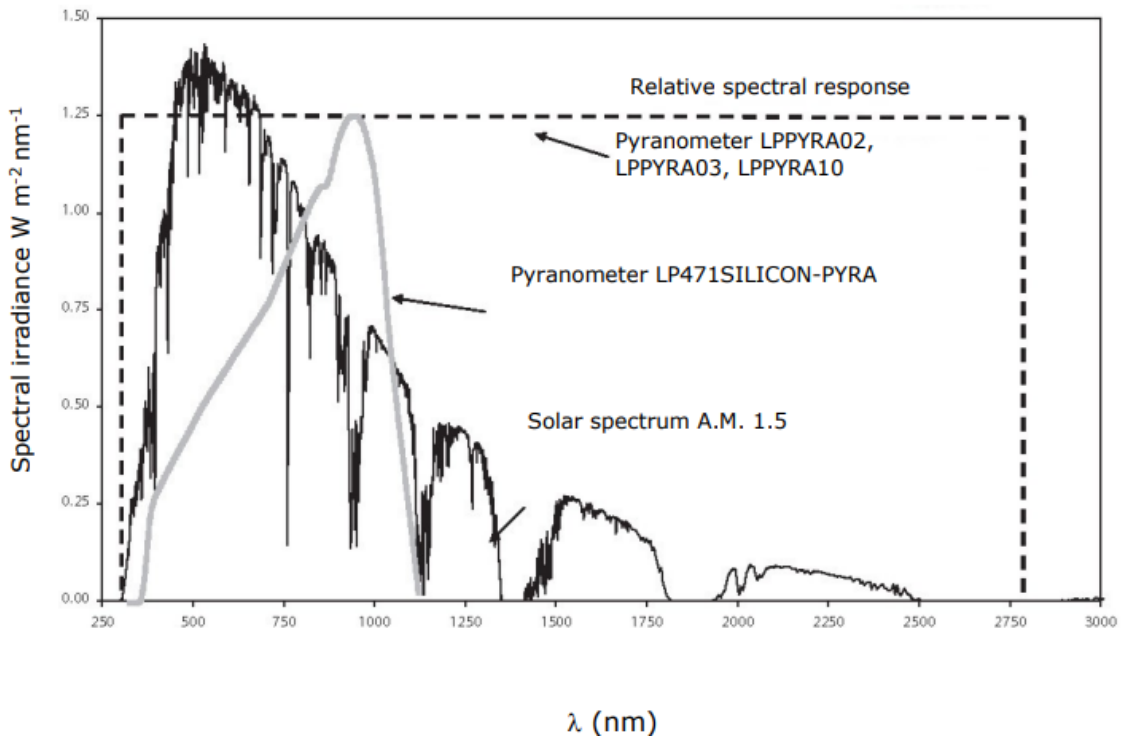
Typical response curve **LP471A-UVeff**:



LP47SILICON-PYRA – Global solar irradiance probe with SICRAM module.

Measurement range (W/m^2)	0...999.9x10^{-3}	1.000...19.999	20.00...199.99	200.0...1999.9
Risoluzione (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 the cosine law)	<3%			
f_3 (linearity)	<1%			
f_4 (instrument reading error)	±1digit			
f_5 (fatigue)	<0.5%			
Drift after 1 year	<2%			
Functioning temperature	0...50 °C			

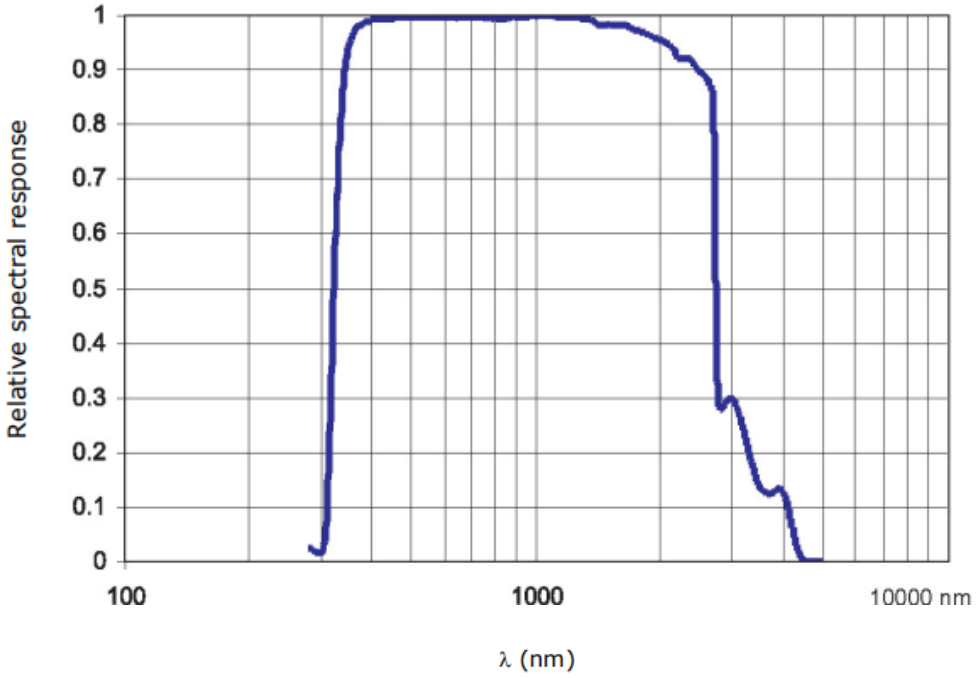
Typical response curve **LP471SILICON-PYRA**:



LP471PYRA02/03/10 – "Spectrally Flat"pyranometers, with SICRAM module.

	LP471PYRA02	LP471PYRA03	LP471PYRA10
Measuring range (W/m²)	0...2000		
Resolution (W/m²)	1		
Field of view	2π sr		
Spectral range (50%)	283 nm...2800 nm	300 nm...2800 nm	283 nm...2800 nm
Operating temperature	-40...80 °C		
Technical features according to ISO 9060			
Class	B	C	A
Rsponse time (95%)	<10 s	<20 s	<5 s
Zero Offset a) Response at 200 W/m² b) Response to 5 K/h ambient temperature variation c) Total zero offset including the effects a), b) and other sources	<|±10| W/m² <|±4| W/m² <|±15| W/m²	<|±15| W/m² <|±4| W/m² <|±20| W/m²	<|±7| W/m² <|±2| W/m² <|±10| W/m²
Long-term instability (1 year)	<|±1|%	<|±1|%	<|±0.5|%
Non linearity	<|±1|%	<|±1,5|%	<|±0.2|%
Response according to cosine law	<|±18| W/m²	<|±20| W/m²	<|±10| W/m²
Spectral error	<|±0.5|%	<|±2|%	<|±0.2|%
Temperature response	<1.5%	<3%	<1%
Tilt response	<|±2|%	<|±2|%	<|±0.2|%

Typical response curve of **LP471PYRA02** and **LP471PYRA03**:



10. ORDER CODES

HD2302.0 (LX1100) The kit is composed of the instrument HD2302.0, 3 1.5V alkaline batteries, operating manual, and case. **The probes must be ordered separately.**

10.1 PROBES COMPLETE WITH SICRAM MODULE

LP471PHOT Photometric probe for the measurement of **illuminance**, complete with SICRAM module, spectral response according to standard photopic vision, diffuser for cosine correction. Measuring range: 0.1...200x103 lux. Cable length 1.5 m.

LP471RAD Radiometric probe for the measurement of **irradiance** in the spectral range 400...1050 nm, complete with SICRAM module, diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471PAR Quantum-radiometric probe for the measurement of **photon flux in the PAR chlorophyll field** (photosynthetically Active Radiation 400...700 nm) complete with SICRAM module, µmol/m2s measurement, diffuser for cosine correction. Measuring range 0.1...10x103 µmol/m2s. Cable length 1.5 m.

LP471UVA Radiometric probe for the measurement of irradiance in the 315...400 nm **UVA** spectral range, peak at 360 nm, complete with SICRAM module, quartz diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471UVB Radiometric probe for the measurement of irradiance in the 280...315 nm **UVB** spectral range, peak at 305 nm, complete with SICRAM module, quartz diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471UVC Radiometric probe for the measurement of irradiance in the 220...280 nm **UVC** spectral range, peak at 260 nm, complete with SICRAM module, quartz diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471UVBC Radiometric probe for the measurement of irradiance in the 210...355 nm **UVBC** spectral range, peak at 265 nm, complete with SICRAM module, quartz diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471LUM2 Photometric probe for the measurement of **luminance**, complete with SICRAM module, spectral response according to standard photopic vision, angle of view 2°. Measuring range: 1...2000x103 cd/m2. Cable length 1.5 m.

LP471BLUE Radiometric probe for the measurement of **effective irradiance in the Blue light** spectral band, complete with SICRAM module. Spectral range 380...550 nm, diffuser for cosine correction. Measuring range: 1x10-3...2000 W/m2. Cable length 1.5 m.

LP471P-A Combined probe for the measurement of **illuminance** (lux), with standard photopic spectral response, and measurement of **irradiance** (µW/cm2) in the UVA spectral range (315...400 nm, with peak at 360 nm). Both sensors are provided with diffuser for cosine correction. Illuminance measuring range: 0.3...200x103 lux. Irradiance measuring range: 1x10-3...2000 W/cm2. The probe provides the ratio between UV irradiance and illuminance in µW/lumen (quantity of interest in museums). Complete with SICRAM module and 1.5 m cable.

LP471A-UVeff Combined probe for the measurement of **effective total irradiance** according to UV action curve. The two sensors are used for the correct measurement of the effective total irradiance in the range 250...400 nm. Both sensors are provided with diffuser for cosine correction. The probe provides the effective total irradiance (Eeff), the effective irradiance in the UV-CB band and UV irradiance. Effective total irradiance measuring range: 0.01...20 W/m2. Effective irradiance measuring range B_C: 0.01...20 W/m2. UV irradiance measuring range: 0.1...2000 W/m2. Complete with SICRAM module and 1.5 m cable.

LPBL Base with level for photometric and radiometric probes (LP471LUM2 and LP471PYRA...excluded). To assemble to probes when placing the order.

LPBL3 Adjustable wall mount support for photometric and radiometric probes (LP471LUM2 and LP471PYRA...excluded).

LP471Silicon-Pyra Pyranometer with Silicon photodiode for the measurement of the **global solar irradiance**, diffuser for cosine correction. Spectral range: 400...1100 nm. Measuring range: 0...2000 W/m2. Fixed cable length 5 m with SICRAM module.

LP471PYRA02.5 LPPYRA02 Spectrally Flat class B pyranometer with 5 m cable with SICRAM module.

LP471PYRA03.5 LPPYRA03 Spectrally Flat class C pyranometer with 5 m cable with SICRAM module.

LP471PYRA10.5 LPPYRA10 Spectrally Flat class A pyranometer with 5 m cable with SICRAM module.

TO MEASURE = TO KNOW

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