



## HD2102.1 AND HD2102.2 PHOTO-RADIOMETERS

The **HD2102.1** and **HD2102.2** are portable instruments with a large LCD display. They measure **illuminance, luminance, PAR** and **irradiance** (across VIS-NIR, UVA, UVB and UVC spectral regions or measurement of irradiance effective according to the UV action curve). The probes are fitted with the SICRAM automatic detection module: in addition to detection, the unit of measurement selection is also automatic. The factory calibration data are already stored inside the instruments.

In addition to instantaneous measurement the instruments calculate the acquired measurements time integral Q(t). Some thresholds can be associated with the integrated measurement and with the integration time, which can be set in the menu. When exceeded these thresholds cause the instrument to stop the integral calculation. The HD2102.2 instrument is a **datalogger**. It stores up to 38,000 samples which can be transferred from the instrument connected to a PC via the multi-standard RS232C serial port and USB 2.0. The storing interval, printing, and baud rate can be configured using the menu.

The HD2102.1 and HD2102.2 models are fitted with an RS232C serial port and can transfer the acquired measurements in real time to a PC or to a portable printer. *The Max, Min* and *Avg* function calculate the maximum, minimum or average values. Other functions include: the relative measurement REL, the HOLD function, and the automatic turning off that can also be excluded.

**The instruments have IP67 protection degree.**



HD40.1



SWD10

## INSTRUMENT TECHNICAL CHARACTERISTICS

### Instrument

|   |   |
|---|---|
| Dimensions<br>(Length x Width x Height) | 185x90x40mm   |
| Weight                                  | 470g (complete with batteries)                              |
| Materials                               | ABS, rubber   |
| Display                                 | 2x4½ digits plus symbols - 52x42mm<br>Visible area: 52x42mm |

### Operating conditions

|                           |                                |
|---------------------------|--------------------------------|
| Operating temperature     | -5...50°C                      |
| Storage temperature       | -25...65°C                     |
| Working relative humidity | 0...90%RH without condensation |
| <b>Protection degree</b>  | <b>IP67</b>                    |

### Power

|                                    |   |
|------------------------------------|---|
| Batteries                          | 4 1.5V type AA batteries                  |
| Autonomy                           | 200 hours with 1800mAh alkaline batteries |
| Power absorbed with instrument off | 20µA                                      |
| Mains                              | Output mains adapter 12Vdc / 1000mA       |

### Measuring unit

lux - fcd - lux/s - cd/s - W/m<sup>2</sup> - µW/cm<sup>2</sup>  
J/m<sup>2</sup> - µJ/cm<sup>2</sup> - µmol(m<sup>2</sup>·s) - µmol/m<sup>2</sup> - cd/m<sup>2</sup>

### Security of memorized data

Unlimited, independent of battery charge conditions

### Time

|               |                       |
|---------------|-----------------------|
| Date and time | Schedule in real time |
| Accuracy      | 1min/month max drift  |

### Measured values storage - model HD2102.2

|                  |                                       |
|------------------|---------------------------------------|
| Type             | 2000 pages containing 19 samples each |
| Quantity         | Total of 38000 samples                |
| Storage interval | 1s...3600s (1hour)                    |

### Serial interface RS232C

|                          |                                    |
|--------------------------|------------------------------------|
| Type                     | RS232C electrically isolated       |
| Baud rate                | Can be set from 1200 to 38400 baud |
| Data bit                 | 8                                  |
| Parity                   | None                               |
| Stop bit                 | 1                                  |
| Flow Control             | Xon/Xoff                           |
| Serial cable length      | Max 15m                            |
| Immediate print interval | 1s...3600s (1hour)                 |

### USB interface - model HD2102.2

|      |                                 |
|------|---------------------------------|
| Type | 1.1 - 2.0 electrically isolated |
|------|---------------------------------|

### Connections

|                             |                                       |
|-----------------------------|---------------------------------------|
| Input module for the probes | 8-pole male DIN45326 connector        |
| Serial interface and USB    | 8-pole MiniDin connector              |
| Mains adapter               | 2-pole connector (positive at centre) |

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

| ILLUMINANCE measurement probe LP 471 PHOT                  |  |           |          |                           |
|--|--|-----------|----------|---------------------------|
| Measurement range (lux):                                   | 0.01...199.99                                  | ...1999.9 | ...19999 | ...199.99·10 <sup>3</sup> |
| Resolution (lux):  | 0.01   | 0.1       | 1        | 0.01·10 <sup>3</sup>      |
| Spectral range:  | in agreement with standard photopic curve V(λ) |           |          |                           |
| Class  | C (B on request)                               |           |          |                           |
| Calibration uncertainty:                                   | <4%  |           |          |                           |
| f <sub>1</sub> (in agreement with photopic response V(λ)): | <8%  |           |          |                           |
| f <sub>2</sub> (response according to the 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%  |           |          |                           |
| α (temp. coefficient) f <sub>6</sub> (T)                   | <0.05%K  |           |          |                           |
| Drift after 1 year:  | <1%  |           |          |                           |
| Functioning temperature:                                   | 0...50°C                                       |           |          |                           |
| Reference Standards  | CIE n.69 - UNI 11142                           |           |          |                           |

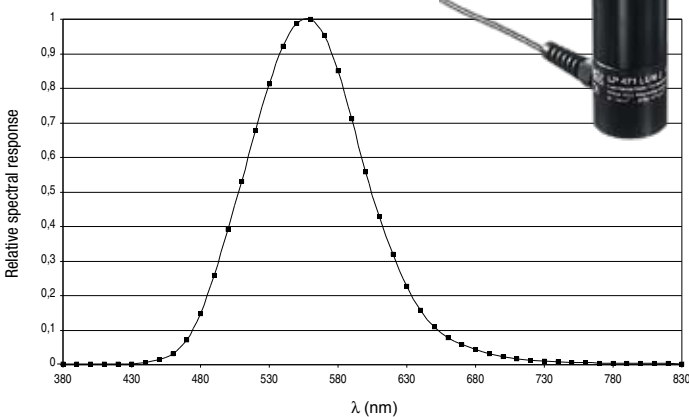
Photometric probe for **ILLUMINANCE** measurement, spectral response in agreement with standard photopic vision, diffuser for cosine correction.  
Measurement range: 0.01 lux...200·10<sup>3</sup> lux.  
CIE69, UNI11142



| LUMINANCE measurement probe LP 471 LUM 2                   |  |          |                           |                           |
|--|--|----------|---------------------------|---------------------------|
| Measurement range (cd/m <sup>2</sup> ):                    | 0.1...1999.9                                   | ...19999 | ...199.99·10 <sup>3</sup> | ...1999.9·10 <sup>3</sup> |
| Resolution (cd/m <sup>2</sup> ):                           | 0.1  | 1        | 0.01·10 <sup>3</sup>      | 0.1·10 <sup>3</sup>       |
| Optical angle:   | 2°   |          |                           |                           |
| Spectral range:  | in agreement with standard photopic curve V(λ) |          |                           |                           |
| Class  | C  |          |                           |                           |
| Calibration uncertainty:                                   | <5%  |          |                           |                           |
| f <sub>1</sub> (in agreement with photopic response V(λ)): | <8%  |          |                           |                           |
| f <sub>3</sub> (linearity):                                | <1%  |          |                           |                           |
| f <sub>4</sub> (instrument reading error):                 | <0.5%  |          |                           |                           |
| f <sub>5</sub> (fatigue):                                  | <0.5%  |          |                           |                           |
| α (temp. coefficient) f <sub>6</sub> (T)                   | <0.05%K  |          |                           |                           |
| Drift after 1 year:  | <1%  |          |                           |                           |
| Functioning temperature:                                   | 0...50°C                                       |          |                           |                           |
| Reference Standards  | CIE n.69 - UNI 11142                           |          |                           |                           |

Photometric probe for **LUMINANCE** measurement, spectral response in agreement with standard photopic vision, vision angle 2°. Measurement range: 0.1 cd/m<sup>2</sup>...2000·10<sup>3</sup> cd/m<sup>2</sup>.

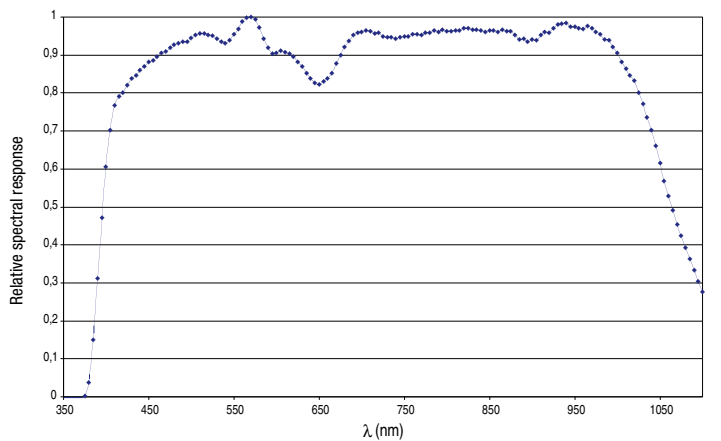
Typical response curve: LP 471 PHOT and LP 471 LUM2



| IRRADIANCE measurement probe LP 471 RAD    |  |                     |                     |                     |
|--|--|---------------------|---------------------|---------------------|
| Measurement range (W/m <sup>2</sup> ):     | 0.1·10 <sup>-3</sup><br>... 999.9·10 <sup>-3</sup> | 1.000<br>... 19.999 | 20.00<br>... 199.99 | 200.0<br>... 1999.9 |
| Resolution (W/m <sup>2</sup> ):            | 0.1·10 <sup>-3</sup>                               | 0.001               | 0.01                | 0.1                 |
| Spectral range:                            | 400nm...1050nm                                     |                     |                     |                     |
| Calibration uncertainty:                   | <5%  |                     |                     |                     |
| f <sub>3</sub> (linearity):                | <1%  |                     |                     |                     |
| f <sub>4</sub> (instrument reading error): | ±1digit  |                     |                     |                     |
| f <sub>5</sub> (fatigue):                  | <0.5%  |                     |                     |                     |
| Drift after 1 year:                        | <1%  |                     |                     |                     |
| Working temperature:                       | 0...50°C   |                     |                     |                     |

Radiometric probe for **IRRADIANCE** measurement in the spectral range 400nm...1050nm, diffuser for cosine correction. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

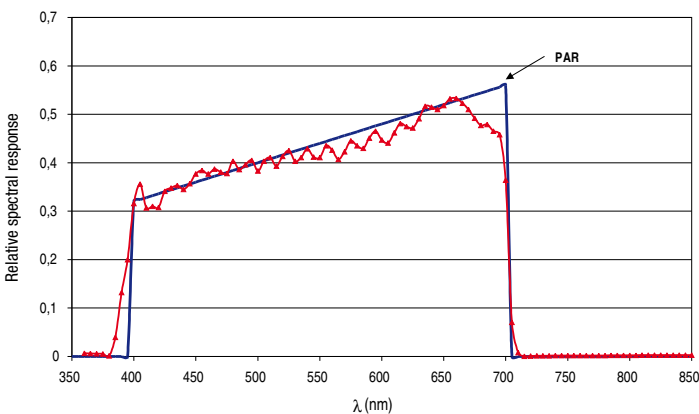
Typical response curve: LP 471 RAD



| Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range PAR LP 471 PAR |                |                |              |
|--|----------------|----------------|--------------|
| Measurement range (μmol/m <sup>2</sup> ·s <sup>-1</sup> ):   | 0.01... 199.99 | 200.0...1999.9 | 2000...10000 |
| Resolution (μmol/m <sup>2</sup> ·s <sup>-1</sup> ):  | 0.01           | 0.1            | 1            |
| Spectral range:  | 400nm...700nm  |                |              |
| Calibration uncertainty:   | <5%            |                |              |
| f <sub>3</sub> (linearity):  | <1%            |                |              |
| f <sub>4</sub> (instrument reading error):   | ±1digit        |                |              |
| f <sub>5</sub> (fatigue):  | <0.5%          |                |              |
| Drift after 1 year:  | <1%            |                |              |
| Working temperature:   | 0...50°C       |                |              |

Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range **PAR** (Photosynthetically Active Radiation 400nm...700nm), measurement in μmol/m<sup>2</sup>·s. Measurement range: 0.01 μmol/m<sup>2</sup>·s<sup>-1</sup>...10·10<sup>3</sup> μmol/m<sup>2</sup>·s<sup>-1</sup>.

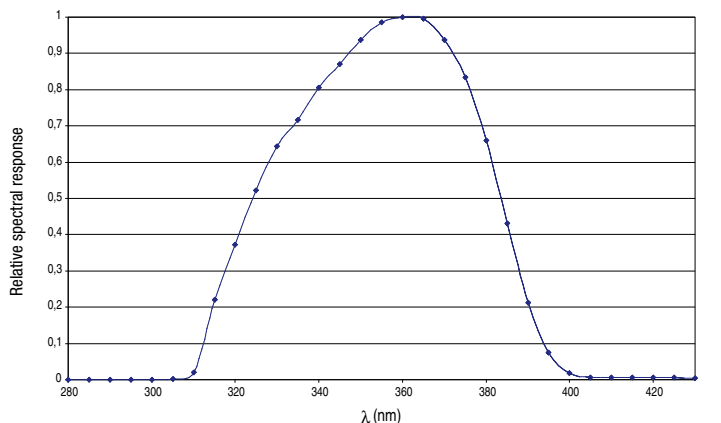
Typical response curve: LP 471 PAR



| IRRADIANCE measurement probe LP 471 UVA    |  |                     |                     |                     |
|--|--|---------------------|---------------------|---------------------|
| Measurement range (W/m <sup>2</sup> ):     | 0.1·10 <sup>-3</sup><br>... 999.9·10 <sup>-3</sup> | 1.000<br>... 19.999 | 20.00<br>... 199.99 | 200.0<br>... 1999.9 |
| Resolution (W/m <sup>2</sup> ):            | 0.1·10 <sup>-3</sup>                               | 0.001               | 0.01                | 0.1                 |
| Spectral range:                            | 315nm...400nm (Peak 360nm)                         |                     |                     |                     |
| Calibration uncertainty:                   | <5%  |                     |                     |                     |
| f <sub>3</sub> (linearity):                | <1%  |                     |                     |                     |
| f <sub>4</sub> (instrument reading error): | ±1digit  |                     |                     |                     |
| f <sub>5</sub> (fatigue):                  | <0.5%  |                     |                     |                     |
| Drift after 1 year:                        | <2%  |                     |                     |                     |
| Working temperature:                       | 0...50°C   |                     |                     |                     |

Radiometric probe for **IRRADIANCE** measurement, in the 315nm...400nm, peak 360nm, **UVA** spectral range. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

Typical response curve: LP 471 UVA

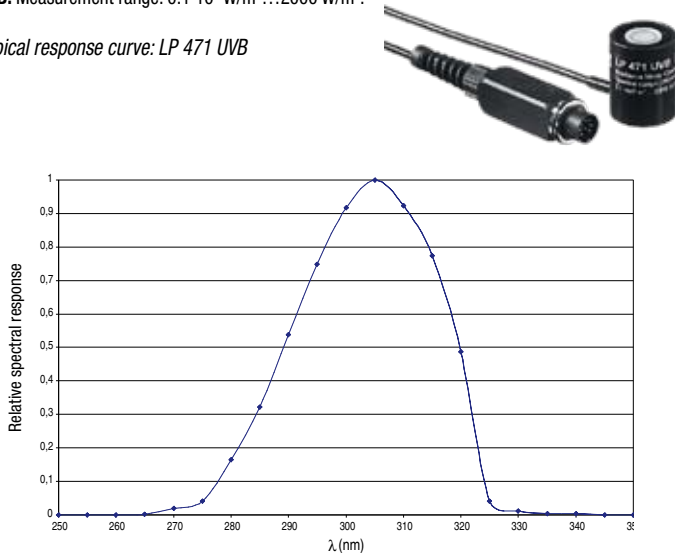


Light

| IRRADIANCE measurement probe LP 471 UVB    |  |                    |                    |                    |
|--|--|--------------------|--------------------|--------------------|
| Measurement range (W/m <sup>2</sup> ):     | 0.1·10 <sup>-3</sup><br>... 999.9·10 <sup>-3</sup> | 1.000<br>...19.999 | 20.00<br>...199.99 | 200.0<br>...1999.9 |
| Resolution (W/m <sup>2</sup> ):            | 0.1·10 <sup>-3</sup>                               | 0.001              | 0.01               | 0.1                |
| Spectral range:                            | 280nm...315nm (Peak 305nm)                         |                    |                    |                    |
| Calibration uncertainty:                   | <5%  |                    |                    |                    |
| f <sub>3</sub> (linearity):                | <2%  |                    |                    |                    |
| 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   |                    |                    |                    |

Radiometric probe for **IRRADIANCE** measurement, in the spectral range 280nm...315nm, peak 305nm, **UVB**. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

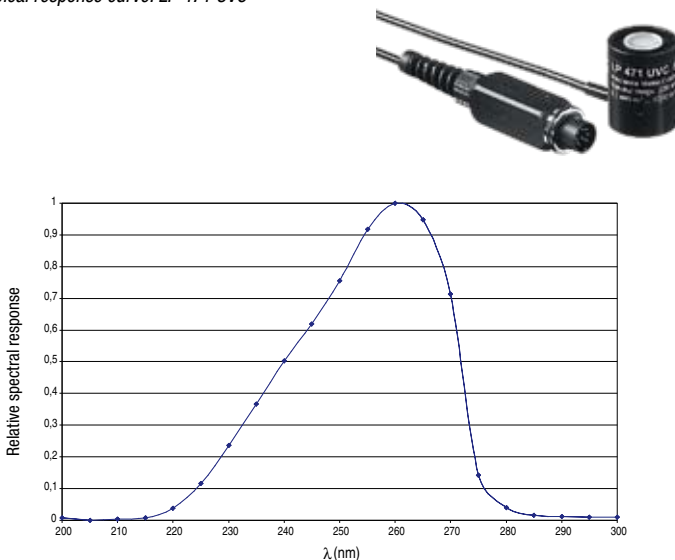
Typical response curve: LP 471 UVB



| IRRADIANCE measurement probe LP 471 UVC    |  |                    |                    |                    |
|--|--|--------------------|--------------------|--------------------|
| Measurement range (W/m <sup>2</sup> ):     | 0.1·10 <sup>-3</sup><br>... 999.9·10 <sup>-3</sup> | 1.000<br>...19.999 | 20.00<br>...199.99 | 200.0<br>...1999.9 |
| Resolution (W/m <sup>2</sup> ):            | 0.1·10 <sup>-3</sup>                               | 0.001              | 0.01               | 0.1                |
| Spectral range:                            | 220nm...280nm (Peak 260nm)                         |                    |                    |                    |
| Calibration uncertainty:                   | <5%  |                    |                    |                    |
| 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   |                    |                    |                    |

Radiometric probe for **IRRADIANCE** measurement, in the spectral range 220nm...280nm, peak 260nm, **UVC**. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

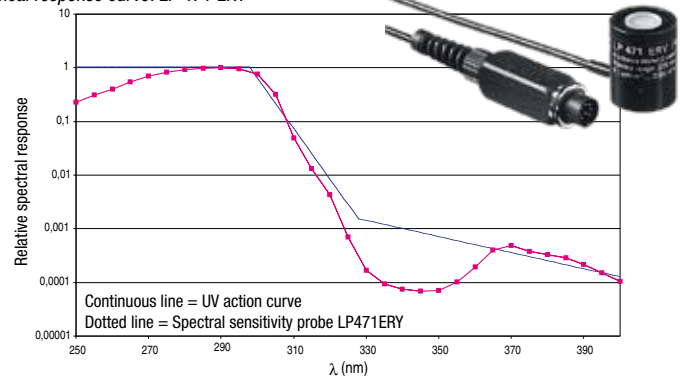
Typical response curve: LP 471 UVC



| Measurement probe LP 471 ERY of TOTAL EFFECTIVE IRRADIANCE (W/m <sup>2</sup> ) according to the UV action curve UV (CEI EN 60335-2-27) |  |                    |                    |                    |
|--|--|--------------------|--------------------|--------------------|
| Measurement range (W <sub>eff</sub> /m <sup>2</sup> ):   | 0.1·10 <sup>-3</sup><br>... 999.9·10 <sup>-3</sup>       | 1.000<br>...19.999 | 20.00<br>...199.99 | 200.0<br>...1999.9 |
| Resolution (W <sub>eff</sub> /m <sup>2</sup> ):  | 0.1·10 <sup>-3</sup>                                     | 0.001              | 0.01               | 0.1                |
| Spectral range:  | UV action curve for erythema measurement (250nm...400nm) |                    |                    |                    |
| 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 1 year:  | <2%  |                    |                    |                    |
| Working temperature:   | 0...50°C   |                    |                    |                    |
| Reference standard:  | CEI EN 60335-2-27  |                    |                    |                    |

Radiometric probe for **EFFECTIVE TOTAL IRRADIANCE** (W<sub>eff</sub>/m<sup>2</sup>) according to the UV action curve (CIE EN 60335-2-27). Spectral range: 250 nm...400 nm, Measurement range: 0.1·10<sup>-3</sup>W<sub>eff</sub>/m<sup>2</sup> ... 2000 W<sub>eff</sub>/m<sup>2</sup>

Typical response curve: LP 471 ERY



The probe LP 471 ERY measures the effective total irradiance (W<sub>eff</sub>/m<sup>2</sup>) according to the UV action curve (CEI EN 60335-2-27). A particular type of photodiode and a combination of special filters bring the spectral response closer to the UV action curve. CEI EN 60335-2-27 standards establish a maximum allowable dose of 100J/m<sup>2</sup> for first-time exposure and an annual dose of 15000J/m<sup>2</sup>. The typical spectral response curve of LP 471 ERY is shown in the Figure together with the UV action curve. The good accordance between the two curves enables the instrument to take reliable measurements of different types of lamps (and filters) used at present for tanning machines.

#### PURCHASING CODES

**HD2102.1:** The kit consists of the instrument HD2102.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **Probes and cable must be ordered separately.**

**HD2102.2:** The kit consists of the HD2102.2 datalogger, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **Probes and cable must be ordered separately.**

**HD2110CSNM:** 8-pole connection cable MiniDin - Sub D 9-pole female for RS232C.

**HD2101USB:** Connection cable USB 2.0 connector type A - 8-pole MiniDin.

**DeltaLog9:** Software for download and management of the data on PC using Windows 98 to Vista operating systems.

**SWD10:** Stabilized power supply at 230Vac/12Vdc-1000mA mains voltage.

**HD40.1:** On request, portable, serial input, 24 column thermal printer, 58mm paper width.

#### Probes complete with SICRAM module

**LP 471 PHOT:** Photometric probe for **ILLUMINANCE** measurement complete with SICRAM module, spectral response in agreement with standard photopic vision, diffuser for cosine correction. Measurement range: 0.01 lux...200·10<sup>3</sup> lux.

**LP 471 LUM 2:** Photometric probe for **LUMINANCE** measurement complete with SICRAM module, spectral response in agreement with standard photopic vision, vision angle 2°. Measurement range: 0.1 cd/m<sup>2</sup>...2000·10<sup>3</sup> cd/m<sup>2</sup>.

**LP 471 PAR:** Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range **PAR** (Photosynthetically Active Radiation 400nm...700nm) complete with SICRAM, measurement in μmol/m<sup>2</sup>s<sup>-1</sup>, diffuser for cosine correction. Measurement range: 0.01 μmol/m<sup>2</sup>s<sup>-1</sup>...10·10<sup>3</sup> μmol/m<sup>2</sup>s<sup>-1</sup>.

**LP 471 RAD:** Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module; in the 400nm...1050nm spectral range, diffuser for cosine correction. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

**LP 471 UVA:** Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module; in the 315nm...400nm, peak 360nm, **UVA** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

**LP 471 UVB:** Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module, in the 280nm...315nm, peak 305nm, **UVB** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

**LP 471 UVC:** Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module, in the 220nm...280nm, peak 260nm, **UVC** spectral range, quartz diffuser for cosine correction. Measurement range: 0.1·10<sup>-3</sup>W/m<sup>2</sup>...2000 W/m<sup>2</sup>.

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

**LP BL:** Base with levelling device (except LP 471 LUM 2).