HD 2102.1
HD 2102.2

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 (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols - 52x42mm Visible area: 52x42mm
Operating conditions	
Operating temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP67**
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/m² - µW/cm² J/m² - µJ/cm² - µmol(m²·s) - µmol/m² - cd/m²*
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

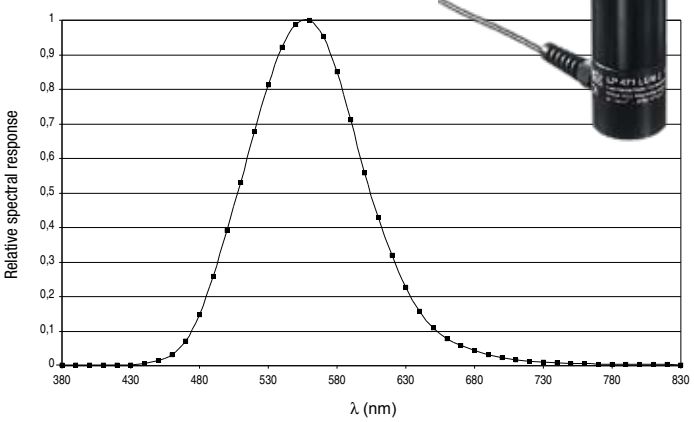
ILLUMINANCE measurement probe LP 471 PHOT				
Measurement range (lux):	0.01…199.99	…1999.9	…19999	…199.99·10³
Resolution (lux):	0.01	0.1	1	0.01·10³
Spectral range:	in agreement with standard photopic curve V(λ)			
Class	C (B on request)			
Calibration uncertainty:	<4%			
f'1 (in agreement with photopic response V(λ)):	<8%			
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%			
α (temp. coefficient) f_6 (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…200·10³ lux.
CIE69, UNI11142

LUMINANCE measurement probe LP 471 LUM 2				
Measurement range (cd/m²):	0.1…1999.9	…19999	…199.99·10³	…1999.9·10³
Resolution (cd/m²):	0.1	1	0.01·10³	0.1·10³
Optical angle:	2°			
Spectral range:	in agreement with standard photopic curve V(λ)			
Class	C			
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%			
α (temp. coefficient) f_6 (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/m²…2000·10³ cd/m².

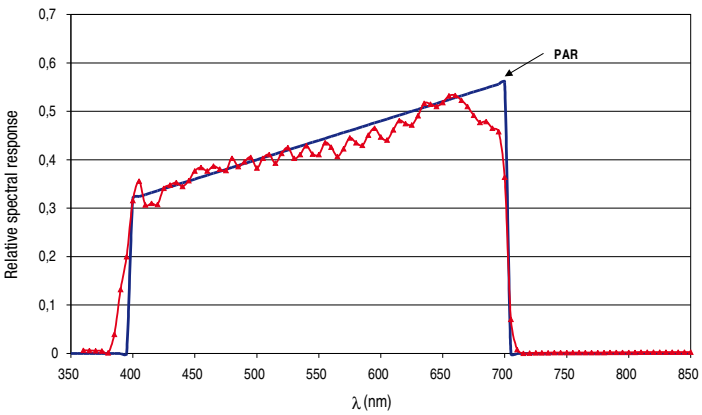
Typical response curve: LP 471 PHOT and LP 471 LUM2



Quantum radiometric probe for the measurement of the photon flow across the chlorophyll range PAR LP 471 PAR			
Measurement range (µmol/m⁻²s⁻¹):	0.01… 199.99	200.0…1999.9	2000…10000
Resolution (µmol/m⁻²s⁻¹):	0.01	0.1	1
Spectral range:	400nm…700nm		
Calibration uncertainty:	<5%		
f_3 (linearity):	<1%		
f_4 (instrument reading error):	±1digit		
f_5 (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/m²s. Measurement range: 0.01µmol/m⁻²s⁻¹…10·10³µmol/m⁻²s⁻¹.

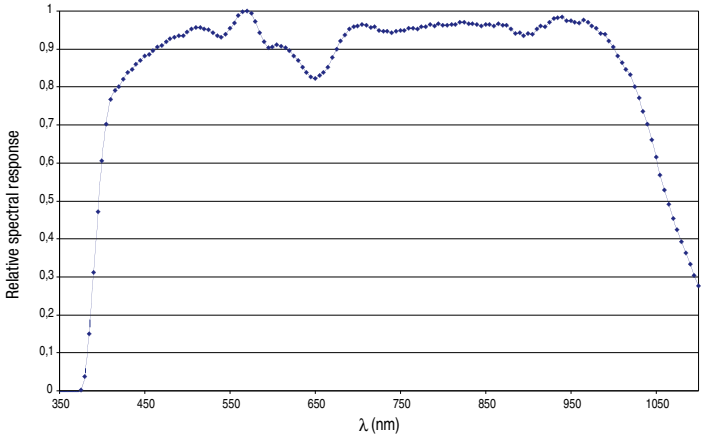
Typical response curve: LP 471 PAR



IRRADIANCE measurement probe LP 471 RAD				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	400nm…1050nm			
Calibration uncertainty:	<5%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (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: 0.1·10⁻³W/m² …2000 W/m².

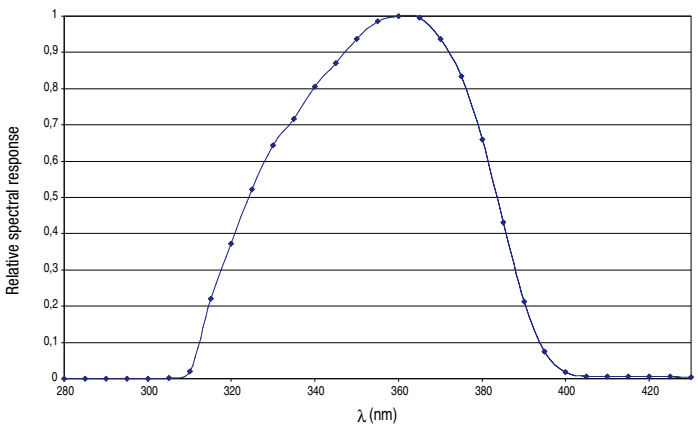
Typical response curve: LP 471 RAD



IRRADIANCE measurement probe LP 471 UVA				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	315nm…400nm (Peak 360nm)			
Calibration uncertainty:	<5%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<2%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement, in the 315nm…400nm, peak 360nm, **UVA** spectral range. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

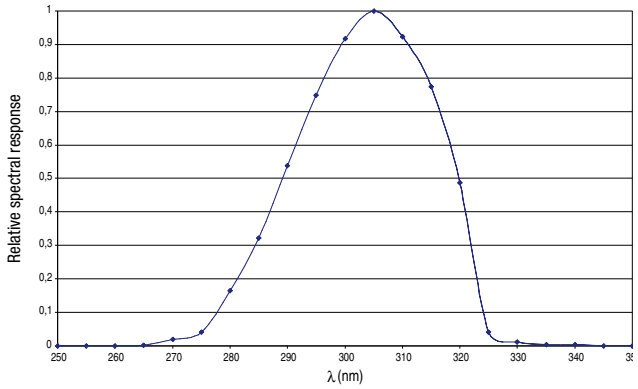
Typical response curve: LP 471 UVA



IRRADIANCE measurement probe LP 471 UVB				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	280nm…315nm (Peak 305nm)			
Calibration uncertainty:	<5%			
f_3 (linearity):	<2%			
f_4 (instrument reading error):	±1digit			
f_5 (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: 0.1·10⁻³W/m²…2000 W/m².

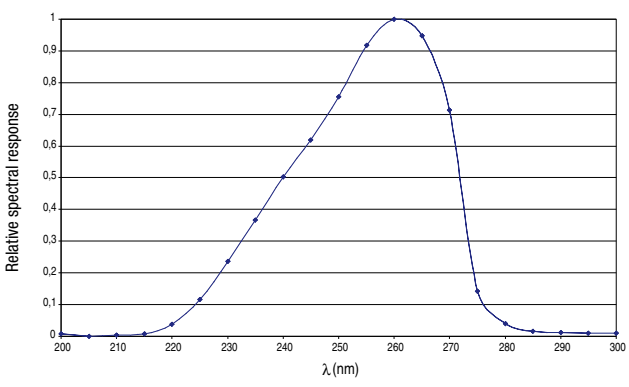
Typical response curve: LP 471 UVB



IRRADIANCE measurement probe LP 471 UVC				
Measurement range (W/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	220nm…280nm (Peak 260nm)			
Calibration uncertainty:	<5%			
f_3 (linearity):	<1%			
f_4 (instrument reading error):	±1digit			
f_5 (fatigue):	<0.5%			
Drift after 1 year:	<2%			
Working temperature:	0…50°C			

Radiometric probe for **IRRADIANCE** measurement, in the spectral range 220nm…280nm, peak 260nm, **UVC**. Measurement range: 0.1·10⁻³W/m²…2000 W/m².

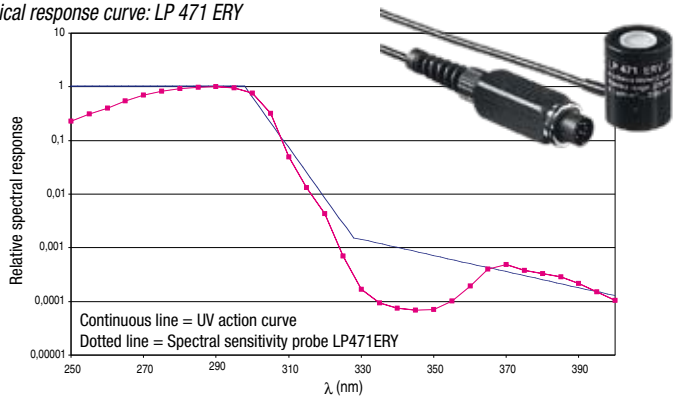
Typical response curve: LP 471 UVC



Measurement probe LP 471ERY of TOTAL EFFECTIVE IRRADIANCE (W/m²) according to the UV action curve UV (CEI EN 60335-2-27)				
Measurement range (W_{eff}/m²):	0.1·10⁻³ … 999.9·10⁻³	1.000 …19.999	20.00 …199.99	200.0 …1999.9
Resolution (W_{eff}/m²):	0.1·10⁻³	0.001	0.01	0.1
Spectral range:	UV action curve for erythema measurement (250nm…400nm)			
Calibration uncertainty:	<15%			
f_3 (linearity):	<3%			
f_4 (instrument reading error	±1digit			
f_5 (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_{eff}/m²) according to the UV action curve (CIE EN 60335-2-27). Spectral range: 250 nm…400 nm, Measurement range: 0.1·10⁻³W_{eff} /m² … 2000 W_{eff} /m²

Typical response curve: LP 471 ERY



The probe LP 471 ERY measures the effective total irradiance (W_{eff}/m²) 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 estabilish a maximum allowable dose of 100J/m² for first-time exposure and an annual dose of 15000J/m². 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 tonning 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.

HD2101/USB: 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…200·10³ 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/m²…2000·10³ cd/m².

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⁻²s⁻¹, diffuser for cosine correction. Measurement range: 0.01µmol/m⁻²s⁻¹…10·10³µmol/m⁻²s⁻¹.

LP 471 RAD: Radiometric probe for **IRRADIANCE** measurement complete with SICRAM module; in the 400nm…1050nm spectral range, diffuser for cosine correction. Measurement range: 0.1·10⁻³W/m² …2000 W/m².

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: 0.1·10⁻³W/m²…2000 W/m².

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: 0.1·10⁻³W/m²…2000 W/m².

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: 0.1·10⁻³W/m²…2000 W/m².

LP 471 ERY: Radiometric probe for **EFFECTIVE TOTAL IRRADIANCE** (W_{eff}/m²) 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: 0.1·10⁻³W_{eff} /m² … 2000 W_{eff} /m².

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