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DO-060.17E

PORTABLE PHOTO-RADIOMETERS

HD2302.0 Photo-Radiometer

The **HD2302.0** is a portable instrument with a large LCD display.
It measures **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 fi tted with the SICRAM automatic detection module: in addition to detection, the unit of measurement selection is also automatic.
The factory calibration settings are already memorized inside the instruments.
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 disabled.
The instruments have IP67 protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument	
Dimensions (Length x Width x Height)	140x88x38mm
Weight	160g (complete with batteries)
Materials	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
Power	
Batteries	3 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Measuring unit	lux – fcd – µmol/ m^2.s – W/ m^2 – µW/ cm^2
Connections	
Input module for the probes	8-pole male DIN45326 connector

ORDER CODES

HD2302.0K: The kit is composed of the instrument HD2302.0, 3 1.5V alkaline batteries, operating manual, case.
The probes must be ordered separately.

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…200x10^3 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^2…2000x10^3 cd/m^2.
LP 471 PAR: Quantum radiometric probe for the measurement of the photon fl ow across the chlorophyll range PAR (Photosynthetically Active Radiation 400nm…700nm) complete with SICRAM, measurement in µmol/m^2s, diffuser for cosine correction. Measurement range: 0.01µmol/m^2s…10x10^3µmol/m^2s.
LP 471 RAD: Radiometric probe for IRRADIANCE measurement complete with SICRAM module; in the 400nm…1050nm spectral range, diffuser for cosine correction. Measurement range: 0.1x10-3W/m^2 …2000 W/m^2.
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: 0.1x10-3W/m^2…2000 W/m^2**.**
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: 0.1x10-3W/m^2…2000 W/m^2**.**
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: 0.1x10-3W/m^2…2000 W/m^2.
LP 471 ERY: Radiometric probe for TOTAL EFFECTIVE IRRADIANCE (W_{eff}/m^2) 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: 0.1x10-3W_{ef}f /m^2 … 2000 W_{ef}f /m^2.
LP BL: Base with levelling device for the probes.

The technical characteristics of the probes appear in the booklet DO-060.18

HD2102.1 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 fi tted with the SICRAM automatic detection module: in addition to detection, the unit of measurement selection is also automatic. The factory calibration settings are already memorized 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 confi gured using the menu.
The **HD2102.1** and **HD2102.2** models are fi tted 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 disabled.
The instruments have IP67 protection degree.

ORDER CODES

HD2102.1K: The kit is composed of the instrument **HD2102.1,** connection cable for serial output HD2110CSNM, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.
The probes must be ordered separately.

HD2102.2K: The kit is composed of the **HD2102.2** datalogger, connection cable HD2101/USB, 4 1.5V alkaline batteries, operating manual, case and Delta-Log9 software.
The probes 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 XP operating systems.
AF209.60: Stabilized power supply at 230Vac/9Vdc-300mA mains voltage.
S'print-BT: On request, portable, serial input, 24 column thermal printer, 58mm paper width.

Probes complete with SICRAM module

These instruments use the same probes that described above HD2302.0

The technical characteristics of the probes appear in the booklet DO-060.18

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument

Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
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

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 9Vdc / 250mA

Measuring unit	lux – fcd – µmol/ m^2.s – W/ m^2 – µW/ cm^2 – J/ m^2 µJ/ cm^2 – µmol(m^2.s) - – µmol/ m^2 – cd/ m^2
Security of memorized data	Unlimited, independent of battery charge conditions

Time

Date and time	Schedule in real time
Accuracy	1min/month max departure

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)

DO9721 Quantum-photo Radiometer and Thermometer - Datalogger

The **DO 9721** quantum photo-radiometer and thermometer data logger has been designed for measuring illuminance, irradiance, luminance and temperature. The instrument has two inputs, A and B, and automatically recognises the probes connected, whether they be illuminance, irradiance, luminance or temperature probes, and can display the difference between the two inputs.
As the probes are interchangeable, it is possible to choose the most suitable combination for all applications without having to recalibrate the instrument. The DO 9721 is able to take illuminance measurements in lux and in fcd (footcandle), irradiance measurements in W/m2, in µW/cm2 e in µmol/m2s, luminance measurements in cd/m2 and temperature measurements in °C or °F.
The instrument's **Data Logger function** enables it to store up to 30,000 readings. The sampling period is variable from 1 second to 12 hours. The data acquired may later be transferred to a Personal Computer or a printer by means of the opto-insulated serial line RS232C. For each value stored the date and time of acquisition are indicated; each acquisition block is ended with a report which provides the maximum, minimum and mean values.
With the Serial Output function it is possible to obtain the instantaneous values measured by the instrument at the output of the serial line RS232C, in order to send them to a printer or a computer.
Other functions such as Hold (which blocks the display), Rel (for taking relative measurements), Record (for storing the maximum, minimum and mean values) and Q (integration in time of the measurements with alarm threshold) further enrich the instrument's performance.
Thanks to its versatility and to its storage capacity, the instrument is suitable for a wide variety of applications, both in the fi eld and in the laboratory.

ORDER CODES

DO 9721K: Basic instrument kit, diplomatic carrying case, instrument, CPRS232C serial connecting cable, 9V battery.
LP 9021 PHOT: Photometric probe for measuring light, **ILLUMINANCE**, photopic fi lter complying with CIE, diffuser for correction according to the cosine law.
LP 9021 RAD: Radiometric probe for measuring the **IRRADIANCE** of artifi cial light sources, irradiance of the sun.
LP 9021 PAR: Radiometric probe for measuring IRRADIANCE in the region of **PAR radiations (Photosynthetically Active Radiation)**; it works in the fi eld of the chlorophyll process following a special response curve.
LP 9021 UVA: Radiometric probe for measuring **IRRADIANCE** in the ultraviolet fi eld. Suitable for measuring radiation in the ultraviolet region A.
LP 9021 UVB: Radiometric probe for measuring **IRRADIANCE** in the ultraviolet fi eld. Suitable for measuring radiation in the ultraviolet region B.
LP 9021 UVC: Radiometric probe for measuring **IRRADIANCE** in the ultraviolet field. Suitable for measuring radiation in the ultraviolet region C.
LP 9021 LUM6: Probe for measuring **LUMINANCE**, measuring range from 1 to 1999 x 103 candles/ m^2. Measuring angle 6°. CIE fi lter for correction of the response according to the human eye.
LP 9021 ERY: Radiometric probe for **TOTAL EFFECTIVE IRRADIANCE** (W_{eff}/m^2) 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: 0.1x10-3W_{eff} /m^2 … 2000 W_{eff} /m^2.
LP BL: Stand for supporting and levelling probes, eccept for LP 9021 LUM6**.**

Temperature probes
TP 870: Immersion temperature probe, Pt100 sensor, diam. 3x230 mm,measuring range -50...+400°C.
TP 870/C: Contact temperature probe, Pt100 sensor, diam. 4x230 mm, measuring range -50...+400°C.
TP 870/P: Penetration temperature probe, Pt100 sensor, diam. 4x150 mm, measuring range -50...+400°C.
TP 870/A: Air temperature probe, Pt100 sensor, diam. 4x230 mm, measuring range -50...+250°C.

INSTRUMENT TECHNICAL DATA

Display	Double LCD 12.5 mm
Inputs / type of measurement	2: photometric / radiometric or temperature
Measuring range	
Photometric measurements:	0 . 200.000 lux, 0.20.000 fcc
Radiometric measurements:	0. 2.000 W/m², 0.200.000 µW/ m², 0...200.000 µmol/m²s. 0...2.000.000 cd/m²
Q energy depends on the active measurements unit	
Integration time	19 hours, 59 minutes, 59 seconds.
No. conversions per second	2.
Serial output RS232C	300...19200 baud (galvanically insulated
Functions	Auto power off / Autorange / Hold / Record /Maximum / Minimum / Mean / Relative / A-B /Energy
Memory	512kB (FLASH) corr. to 30,000 measurements
Power supply	9Vdc alkaline battery
Weight / dimensions	320 gr. / 215x73x38 mm

PROBE CONNECTION

The instrument DO 9721 has two circular DIN 45326 8-pole connectors (A and B) which allow the connection of Delta Ohm probes for measuring temperature, type TP 870, and probes for measuring the photometric and radiometric intensity ,type LP 9021.
The probe model must be chosen to suit the specifi c application; see the section on accessories

Probe Types	Measuring range	Spectral range	Calibration uncertainty	Uncertainty f_2
LP 9021 PHOT	0,1 to 200000 LUX	CIE Nº 69 Class C	< 4%	< 3%
LP 9021 RAD	1 mW/ m^2 to 200 W/ m^2	450 to 950 nm	< 5%	< 6%
LP 9021 PAR	0,1 µmol/ m^2 to 20000 µmol/ m^2	400 to 700 nm	< 5%	< 6%
LP 9021 UVA	1 mW/ m^2 to 2000 W/ m^2	315 to 400 nm	< 5%	< 6%
LP 9021 UVB	1 mW/ m^2 to 2000 W/ m^2	280 to 315 nm	< 5%	< 6%
LP 9021 UVC	1 mW/ m^2 to 2000 W/ m^2	200 to 280 nm	< 5%	< 6%
LP 9021 LUM6	1 to 2x 10^6 cd/ m^2	CIE Nº 69 Clase C	< 5%	-
LP 9021 ERY	0,1 x 10^3 W_{efc} / m^2 to 2000 W_{efc} / m^2	250 to 400 nm	<15%	-

Accuracy Instrument			
	at 25 ºC	**from –5 up to 50 ºC**	**Measuring range**
Basic accuracy instrument	0,1 % + 1 dígit	0,2 % + 1 dígit	
Temperature measurement instrument + probe	0,6 ºC 0,4 ºC 2 ºC	0,6 ºC + 0,01 ºC/ ºC 0,4 ºC + 0,01 ºC/ ºC 2 ºC + 0,01 ºC/ ºC	-200 a 50 ºC 50 a 200 ºC 200 a 650 ºC

The technical characteristics of the probes appear in the booklet DO-060.18