DO 9721

DO9721
QUANTUM PHOTO-RADIOMETER AND THERMOMETER DATA-LOGGER

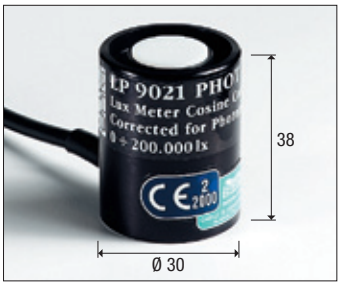
The **DO 9721** quantum photo-radiometer and thermometer data logger has been designed for measuring illuminance, irradiance, luminance and temperature. The instrument has two inputs, A and B, and automatically detects the sensors, whether illuminance, irradiance, luminance or temperature and can provide a view of 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** can take illuminance measurements in lux and in fcd (foot-candle), irradiance measurements in W/m^2, in µW/cm^2 and in µmol·m^{-2}s^{-1}, luminance measurements in cd/m^2 and temperature measurements in °C or °F.
With the data logger function the instrument stores up to 30,000 readings with selectable sampling interval from 1 second to 12 hours.
The data acquired can then be downloaded 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 field and in the laboratory.

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 should be chosen according to the specific application.

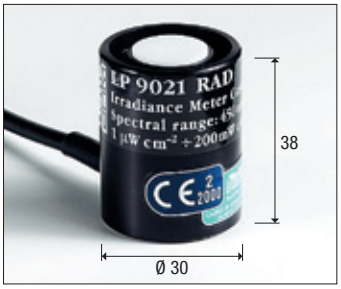
INSTRUMENT TECHNICAL DATA

Inputs / type of measurement	2: photometric / radiometric or temperature
Connector	DIN 45326 8-pole
Measuring range	
Photometric measurements	0.1...200.000 lux
	1...20.000 fcd
	1...2.000.000 cd/m^2
Radiometric measurements	1·10^{-3}...2000 W/m^2
	0.1...200.000 µW/cm^2
	0.1...200.000 µmol·m^{-2}s^{-1}
Q energy	depends on the active measurements unit
Integration time	19 hours, 59 minutes, 59 seconds
No. conversions per second	2
Working temperature	-5...+50°C
Working relative humidity	0...90% R.H. (no condensation)
Serial output	RS232C 300...19200 baud (galvanically insulated)
Display	Double LCD 12.5 mm
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
Autonomy	Approx. 30 hours (continuous duty)
Weight / dimensions	320 gr. / 215x73x38 mm

ORDERING CODES
DO 9721: Instrument, user's manual, carrying case, DeltaLog1 software, 9V battery. **Probes and cables must be ordered separately**.



LP 9021 PHOT: Photometric probe for measuring **ILLUMINANCE;** photopic filter in compliance with CIE n° 69 - UNI 11142, diffuser for correction according to the cosine law.

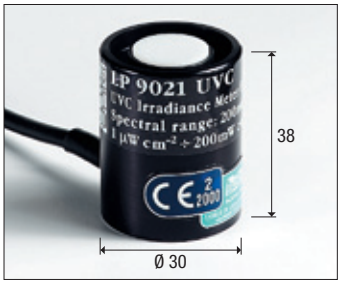


LP 9021 RAD: Radiometric probe for measuring the **IRRADIANCE** of artificial light sources, irradiance of the sun.

LP 9021 PAR: Quantum-radiometric probe for measuring the PHOTONS FLOW in the chlorophyll field PAR (photosynthetically Active Radiation 400nm…700nm), µmol·m^{-2}s^{-1} measure, cosine correction diffuser.

LP 9021 UVA: Radiometric probe for measuring **IRRADIANCE** in the ultraviolet field. Suitable for measuring radiation in the ultraviolet region **A**.

LP 9021 UVB: Radiometric probe for measuring **IRRADIANCE** in the ultraviolet field. 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 LUM2: Probe for measuring **LUMINANCE**, measuring range from 1 to 1999·10³ cd/m². Measuring angle 2°. CIE filter for correction of the response according to the human eye, CIE n°69-UNI11142.

LP BL: Stand for supporting and levelling probes, except for LP 9021 LUM2.

TP 870.0: Immersion temperature probe, Pt100 sensor, diam. 3x230 mm, measuring range -50...+250°C.

TP 870C.0: Contact temperature probe, Pt100 sensor, diam. 4x230 mm, measuring range -50...+250°C.

TP 870P.0: Penetration temperature probe, Pt100 sensor, diam. 4x150 mm, measuring range -50...+250°C.

TP 870A.0: Air temperature probe, Pt100 sensor, diam. 4x230 mm, measuring range -50...+250°C.

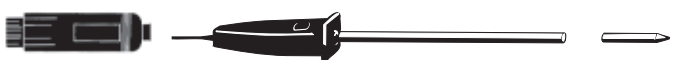
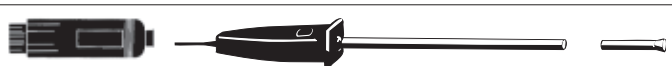
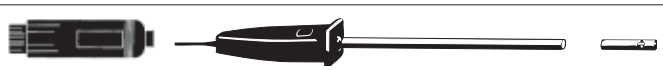
C.205: Serial connection cable with USB connector for PC and Sub-D 9-pole connector for the instrument. The cable has a built-in USB/RS232 converter and connects the instrument **DO 9721** directly to the USB port of the PC.

9CPRS232: Sub D 9-pole Female/Female RS232 null-modem cable for **DO 9721**.

LP BL

Probe Model	Measuring range	Spectral measuring range	Calibration uncertainty
LP 9021 PHOT	0.1 ... 200000 lux	CIE N°69 Class C	<4%
LP 9021 RAD	1mW/m² ... 2000 W/m²	450 ... 950nm	<5%
LP 9021 PAR	0.1 µmol $m^{-2}s^{-1}$ ... 20000 µmol $m^{-2}s^{-1}$	400 ... 700nm	<5%
LP 9021 UVA	1 mW/m² ... 2000 W/m²	315 ... 400nm	<5%
LP 9021 UVB	1 mW/m² ... 2000 W/m²	280 ... 315nm	<5%
LP 9021 UVC	1 mW/m² ... 2000 W/m²	200 ... 280nm	<5%
LP 9021 LUM2	1 ... 2 · 10⁶ cd/m²	CIE N°69 Class C	<5%

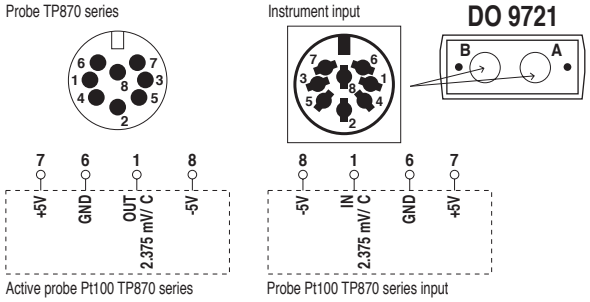
INSTRUMENT UNCERTAINTY			
	at 25°C +/-	**from -5°C to 50°C +/-**	**Measuring range +/-**
Instrument base uncertainty	0.1% ... 1 digit	0.2% ... 1 digit	
Temperature measure of instrument with probe	0.6°C 0.4°C 2°C	0.6°C + 0.01°C/°C 0.4°C + 0.01°C/°C 2°C + 0.01°C/°C	-50 … + 50°C +50 … +200°C +200 … + 400°C

TEMPERATURE PROBES OF THE SERIES TP870				
Code	Description	Drawing	τ Sec.	Temp/°C
TP 870.0	Immersion probe ø 3 x 230 mm		3"A	-50/+250
TP 870P.0	Penetration probe ø 4 x 150 mm		3"A	-50/+250
TP 870C.0	Contact probe ø 4 x 230 mm		12"C	-50/+250
TP 870A.0	Air probe ø 4 x 230 mm		3"B	-50/+250

A) Time constant in water at 100 ° C / **B)** Time constant detected in contact with metal surface at 200 ° C / **C)** Time constant in air at 100 ° C.
Notes: Time constant to respond to the 63% of the temperature variation.

1 Input A, DIN 45326 8-pole connector.
2 HOLD symbol, the measurement refers to the moment in which the HOLD key was pressed.
3 Battery symbol: flashes during RECORD function, permanently lit if the battery is running low.
4 REL symbol, indicates that the instrument is making a relative measurement.
5 Serial Out/Memory. Fixed symbol: the instrument is storing. Flashing symbol: serial output is enabled.
6 MED symbol: the display shows the mean values found during RCD function.
7 Q: instrument in Q-energy function, flashes when it has reached the limit.
8 Time: the display indicates the integration time, if flashing it has reached the time programmed for integration.
9 Lux: the led indicates that the measurement is in lux.
10 $\mu W/cm^2$: the led indicates that the measurement is in $\mu W/cm^2$.
11 $\mu mol \cdot m^{-2} s^{-1}$: the led indicates that the measurement is in $\mu mol \cdot m^{-2} s^{-1}$.
12 REL key: shows the difference between the current value and the value stored when the REL key is pressed.
13 HOLD key for blocking the reading.
14 Unit A key: for selecting the measurement unit for input A, depending on the probe fitted. When turned to P0 mode, it sets the Q-energy and Time limits for input A.
15 Serial Output: activates data transmission at the RS232C serial output.
16 ▲ (Memory clear): increases the parameters in programming mode; when held down it erases the "RCD" memory; when pressed with P1, it erases the permanent memory.
17 PROG key: activates the programs P0... P1... P... of the different instrument functions.
18 Connector for RS232C (SUB D male 9 pole).
19 Input B, DIN 45326 8-pole connector.
20 Symbol 10^3: indicates multiplication factor 10^3 for the respective channel.
21 Symbols A and B: for magnitudes Q and T indicate the channel selected.
22 A-B: the bottom display shows the difference between A and B. The top display shows A.
23 MIN symbol: the display shows the minimum values found during RCD function.
24 MAX symbol: the display shows the maximum values found during RCD function.
25 °C: the led indicates that the temperature measurement is in degrees centigrade.
26 °F: the led indicates that the temperature measurement is in degrees Fahrenheit.
27 fcd: the led indicates that the measurement is in fcd (foot-candle).
28 W/m^2: the led indicates that the measurement is in W/m^2.
29 cd/m^2: the led indicates that the measurement is in cd/m^2.
30 On/Off key: for switching the instrument on or off.
31 Unit B key: for selecting the measurement unit for input B, depending on the probe fitted. When turned to P0 mode, it sets the Q-energy and Time limits for input B.
32 A-B key: shows the difference between the inputs.
33 Data Call key (Max-Min-Med-Q-Time): recalls on the display the maximum, mean, minimum, Q and Time values of each input.
34 ▼ (RCD): starts and stops the RECORD function, in programming mode it decreases the parameter shown.
35 ENTER key: starts and stops storage, confirms the parameters set during programming.

A) Amplified temperature probe with Pt100 platinum-sensitive element



B) Probes for photometric and radiometric measurements