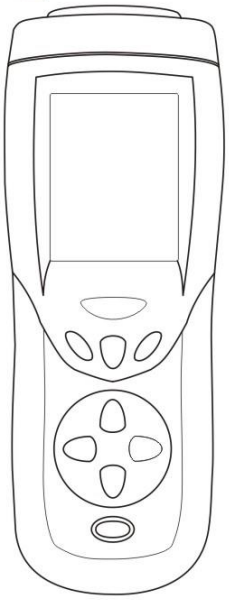
Sonel®



OPERATION MANUAL

DATA LOGGING LIGHT METERS

LXP-2, LXP-10B, LXP-10A

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CE

Version 1.00

Digital data-logging light meters are precision instruments used to measure illuminance (lux and foot-candles) in field conditions.

They meet the requirements of CIE spectral sensitivity curves for spectral response. Their photoelement is cosine-corrected.

The meters are compact and durable units thanks to their simple-to-use design.

The photosensitive element used in these meters consists of a very stable and durable silicon photodiode and spectral sensitivity filter.

The most important features of the devices include:

- maximum resolution of light metering: 0.1 lx (0.01 fc) - LXP-2, 0.01 lx (0.001 fc) - LXP-10B, 0.001 lx (0.0001 fc) - LXP-10A,
- high accuracy and fast response time,
- Data-hold function for holding the measured values displayed on the screen,
- automatic reset,
- no need to use correction factors for different light sources, thanks to a very good adjustment of spectral sensitivity ensuring correct measurements of light intensity regardless of the nature of radiation,
- short response times to changing light intensity,
- "Peak-hold" function that enables the user to measure the peak signal of light pulse longer than 0.1 s (0.4 s for LXP-2 with probe LP-1) and shorter than 1 s,
- automatic power off after 5, 10 or 15 minutes, or auto-off function
- measurements of maximum and minimum values,
- relative readings,
- large and readable display with backlit function;
- USB socket for connecting the meter to a PC,
- data transmission via wireless (radio) link with an optional adapter OR-1 (only LXP-10B, LXP-10A),
- four measuring ranges - LXP-2, five measuring ranges - LXP-10B, six measuring ranges - LXP-10A,
- memory space for 99 results (LXP-2) or 999 results (LXP-10B, LXP-10A), that may be read on the meter or on a PC,
- data logger with a logging capacity of 16000 values.

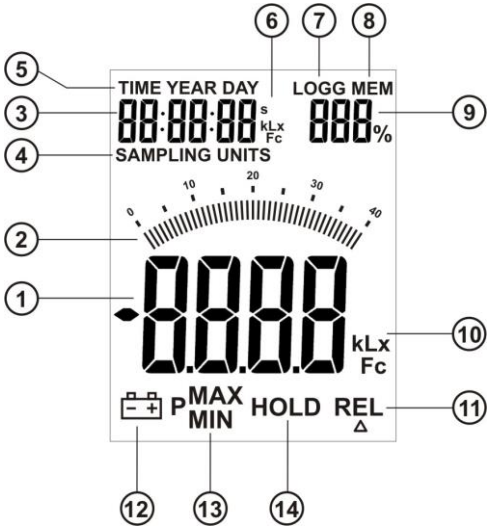
CONTENTS

1 Functional Description

1.1 Description of the device

(1) Power Button: Turns the light meter ON/OFF.
(2) Liquid crystal display 3 3/4": digital display with a maximum reading of 3999, showing the symbols of the measured values, symbols of functions, etc.
(3) **RANGE** button: Manual change of the range or switching it to automatic.
(4) **LOGG** button: turning data logger or backlight ON/OFF, erasing data logger memory.
(5) **ENTER/MEM** button: Entering values into the measurement memory, viewing and deleting the measurement memory.
(6) **SET** button: Entering the meter settings.
(7) **HOLD** button: Holding the displayed data or "up" cursor.
(8) **PEAK**: Holding the peak values or "right" cursor.
(9) **MAX/MIN** button: Reading the maximum or minimum value; or "left" cursor.
(10) **REL** button: Relative measurement or "down" cursor.
(11) Measuring head with a sensor.

1.2 Display



(1) The main read-out field.
(2) Bar graph - analogue scale for showing rapid changes in light intensity.
(3) Additional reading field
(4) Symbols of sampling period and units.
(5) Symbols for setting date and time.
(6) Units.
(7) Symbol of data logging.
(8) Symbol of memory.
(9) Additional reading field
(10) Units.
(11) Symbol of relative measurement.
(12) Discharged battery symbol.
(13) Symbol of MIN / MAX values (also for PEAK HOLD function).
(14) Symbol of HOLD function.

2 Settings

Use **SET** button to enter the meter settings. The buttons ▲ and ▼ are used to set the parameter value, while ◀ and ▶ buttons are used to move to the next parameter. Settings are introduced in the following order:
unit (lx or fc) → sampling period (every 1 s...60 s) → day → month → year → hour → minute → second → sounds (On/Off) → AutoOFF (300 s, 600 s, 900 s, none (---)) → unit ...
Exit settings by pressing **SET** - selected/changed settings will be saved.

3 Taking measurements

- Press the power button in order to switch the meter ON.
- The device is in the automatic range selection mode. To enter the manual range selection mode, press **RANGE** button for 2 sec. Ranges are switched by short pressing of **RANGE** button. The range is displayed at the top of the display. Pressing the button again for 2 seconds will return the device to the automatic range selection mode.
- Remove the cover from the photodetector and point it perpendicularly to the light source.

- Read the nominal value of the lighting from the display.
- If the instrument displays only "OL" symbol, it means that the input signal is too strong and you need to set a higher measuring range.
- After completing the measurement cover the photodetector with its cover and turn the meter OFF.

4 Special Features

4.1 DATA HOLD mode for holding displayed data

- Press **HOLD** button to select the Data Hold mode. When **HOLD** mode is selected, the meter stops the currently displayed result and shows it as numbers, whereas the bar graph continues to show actual indications.
- Press again **HOLD** again to exit Data Hold mode, the meter returns to normal operation.

4.2 PEAK HOLD function for read-out of peak values

PEAK HOLD function enables the user to measure the peak signal of light pulse longer than 0.1 s (0.4 s for LXP-2 with probe LP-1) and shorter than 1 s. The bar graph shows current result continuously.

- Press **PEAK** to enter Pmax data logging mode and place the device in the light measuring area.
- Press **PEAK** button again to enter Pmin data logging mode.
- Press **PEAK** button again to exit Peak Hold mode and return to normal operation.

4.3 Maximum and minimum value mode

- Press **MAX/MIN** button to read the maximum value (MAX).
- Press **MAX/MIN** button again to read the minimum value (MIN).
- Press **MAX/MIN** button again exit this mode and return to normal operation mode.
- The bar graph shows current result continuously.

4.4 Relative mode measurement

- Press **REL** button to start the relative mode measurement. The displayed result is the difference between the currently measured value and the reference value saved in the moment of pressing **REL** button. If the new reading is identical to the reference value, then the display will show zero. The bar graph shows current result continuously.
- Press **REL** again to exit the relative measurement.

4.5 USB Mode

- Connect the device to your computer via the USB port.
- Start the program on your computer.
- The meter operates in data reading mode.
- To read the data stored in memory, use the appropriate commands in the software. The software enables the user to select the type of the read memory: measurement memory or data logger memory.

4.6 Wireless (radio) transmission mode (only LXP-10)

- Connect the OR-1 module to the PC USB socket.
- Start FOTON 12464 software.
- In order to activate radio transmission function, press **SET** button and hold it pressed for 2 seconds. Instead of showing the measurement range, the display will show message: PC-dAtA.
- On-line operation or data read-out using software commands.
- Displaying the measurement range is the same as in USB mode.
- To exit the function, again hold **SET** button pressed for 2 seconds.

Note:
Standard PIN code for wireless (radio) transmission is "123".

4.7 Display backlight

- Press the backlight button briefly to switch it ON.
- Press the backlight button briefly again to switch it OFF.

4.8 Memory function

- To save the current data in memory, press **ENTER/MEM** button and the display will show **MEM** for 3 seconds along with the cell number in which the measurement will be saved. Each new measurement is saved automatically to the next available cell. When the memory is full, then after pressing **ENTER/MEM**, instead of a cell number, the display will show '---' and the measurement will not be saved.
- To read measurement results from the memory - press and hold **ENTER/MEM** button pressed for 2 seconds. Use ▲ and ▼ buttons to scroll individual memory cells. The device will display: measured value, unit, date and time of measurement (use ◄ and ► buttons) and information on memory - main (general) memory or memory of individual functions e.g. **Pmax**, **Pmin**, **MAX**, **MIN**, **REL**. The same data may also be accessed from your PC.
- I order to return to the normal operation mode - press and hold **ENTER/MEM** button for 2 seconds.
- To clear the memory, turn the meter ON while holding down **ENTER/MEM** button. The process of erasing the memory lasts about 10 seconds. The main display will show CLr and the cell number display field will show numbers of cells decreasing to zero, indicting remaining cells to be erased. After erasing the memory, the meter returns to the measurement mode

4.9 Data Logging function

- Set the time and the sampling rate according to par. 2, the default sampling rate is 1 sec.
- To start the data logging function, press and hold **LOGG** button for 2 seconds, the display will show **LOGG** and free memory space will be displayed as a percentage value (from 100 to 0). The memory stores data on measured value, its unit, date and time.
- **LOGG** will blink at intervals equal to the set sampling period, indicating when the measurement is taken.
- When the memory is full, then the percentage value shown is 0 and a double beep is generated to indicate ending the data logging process. If data logging mode is activated when the meter memory is full, the meter after 2 seconds will exit this mode and **LOGG** symbol will disappear - after that a double beep is generated.
- To stop the data logging function, press and hold **LOGG** button for 2 seconds, the meter will return to the normal operation mode, data logging may be started from the beginning.
- As data is logged in a separate memory, different than a single measurement, the user may save single measurement results. This may be done by pressing **MEM**/**ENTER** button. In such case, the display apart from **LOGG** symbol will additionally show **MEM**, and instead of the percentage value of free memory space, the device will display the number of memory cell where the measurement is saved.
- To clear the memory of the meter, turn the meter ON while holding down **LOGG** button. The main display will show CLr and the percentage value field will show the amount of free space that will change from 0 to 100 % when erasing progresses. After erasing the memory, the meter returns to the measurement mode.
- Logged data may be read only with the PC software provided with the meter.

5 Characteristics of spectral sensitivity

Installed photodiodes with filters makes the spectral sensitivity characteristics well matched to the requirements of C.I.E. (INTERNATIONAL COMMISSION ON ILLUMINATION). Sensitivity parameters V (λ) are presented on the following charts.

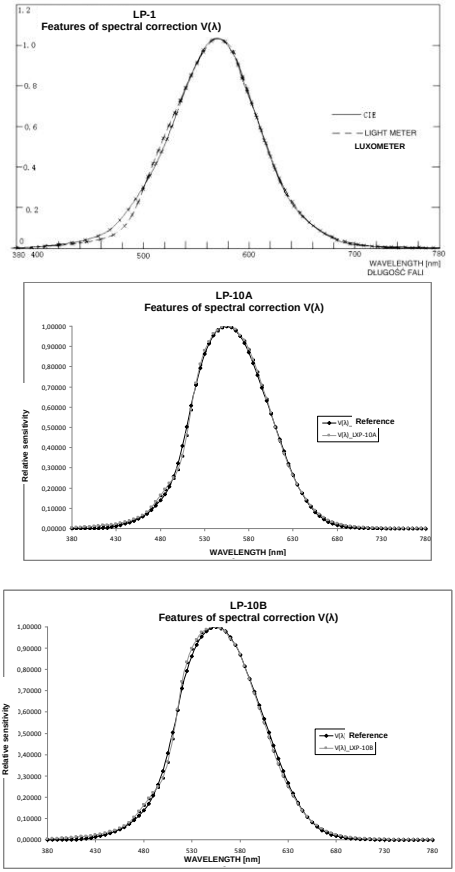


Fig. 1 Characteristics of spectral sensitivity

6 Recommended lighting

LOCATION		lx	fc
OFFICE	Conference room, reception	200~750	18~70
	Office work	700~1,500	65~140
	Typing, designing	1,000~2,000	93~186
FACTORY	Visual works on the production line	300~750	28~70
	Inspection works	750~1,500	70~140
	Electronic components, assembly line	1,500~3,000	140~279
	Packaging, corridors	150~300	14~28

HOTEL	Public rooms, cloakroom	100~200	9~18
	Reception	200~500	18~47
	Cash register	750~1,000	70~93
SHOP	Interiors, stairs, corridors	150~200	14~18
	Display window, packing table	750~1,500	70~140
	The front side of a display window	1,500~3,000	140~279
HOSPITAL	Patient room, store	100~200	9~18
	Room for medical examination	300~750	28~70
	Operating theatre, emergency cases	750~1,500	70~140
SCHOOL	Assembly hall, interiors, gym	100~300	9~28
	Classrooms	200~750	18~70
	Laboratory, library, labs	500~1,500	47~140

1fc=10,76lx

7 Connection

- Turn on the meter,
- activate USB mod (see section 4.5) or radio transmission mode (see section 4.6),
- start "FOTON" software to operate the meter.

Note: switch OFF the light meter before connecting USB cable to the meter socket.

8 Replacing the battery

Note:
While performing the measurements with the battery symbol displayed, the user must be aware of additional measurement uncertainties or unstable operation of the device.

- If the battery power is not sufficient to perform the measurements, the display will show the discharged battery symbol, indicating the need to replace the battery with a new one.
- After the meter is turned OFF, open the battery compartment cover.
- Remove the old battery from the device and replace it with a standard 9V battery, then re-attach the cover.

9 Cleaning and maintenance

1. White plastic disc on top of the detector should be cleaned with a damp cloth (if necessary).
2. Do not store the device in conditions of excessive heat or humidity.

Calibration interval for the photodetector will vary depending on the operating conditions, but in general, its sensitivity is reduced in direct proportion to the product of light intensity and operating time. In order to maintain the basic accuracy of the meter, we recommend periodic calibration (see section 16).

10 Storage

During the storage of the device, the following recommendations must be observed:

- disconnect the probe from the meter
- make sure that the meter and accessories are dry,
- when the device is to be stored for longer time, remove the batteries

11 Dismantling and Disposal

Worn-out electric and electronic equipment should be gathered selectively, i.e. it must not be placed with waste of another kind.

Worn-out electronic equipment should be sent to a collection point in accordance with the law of waste electrical and electronic equipment.

Before the equipment is sent to a collection point, do not dismantle any elements.

Observe local regulations concerning disposal of packages, waste batteries and accumulators.

12 Technical specifications

LP-1

Range of display [lx]	Resolution [lx]	Spectral uncertainty	Basic uncertainty
0 ... 399.9	0.1	f1 ≤ 6 %	±(5 %+5 digits)
400…3999	1		
4.00 k…39.99 k	0.01 k		
40.0 k…399.9 k	0.1 k		

Range of display [fc]	Resolution [fc]	Spectral uncertainty	Basic uncertainty
0 ... 39.99	0.01	f1 ≤ 6 %	±(5 %+5 digits)
40.0 ... 399.9	0.1		
400…3999	1		
4.00 k…39.99 k	0.01 k		

- displaying the result in lx or fc
- Class B of the meter

LP-10B

Range of display [lx]	Resolution [lx]	Spectral uncertainty	Basic uncertainty
0 ... 39.99	0.01	f1 ≤ 6 %	±(5 %+5 digits)
40.0 ... 399.9	0.1		
400…3999	1		
4.00 k…39.99 k	0.01 k		
40.0 k…399.9 k	0.1 k		

Range of display [fc]	Resolution [fc]	Spectral uncertainty	Basic uncertainty
0…3.999	0.001	f1 ≤ 6 %	±(5 %+5 digits)
4.00 ... 39.99	0.01		
40.0 ... 399.9	0.1		
400…3999	1		
4 k…39.99 k	0.01 k		

- displaying the result in lx or fc
- Class B of the meter

LP-10A

Range of display [lx]	Resolution [lx]	Spectral uncertainty	Basic uncertainty
0…3.999	0.001	f1 ≤ 2 %	±(2 %+5 digits)
4.00 ... 39.99	0.01		
40.0 ... 399.9	0.1		
400…3999	1		
4.00 k…39.99 k	0.01 k		
40.0 k…399.9 k	0.1 k		

Range of display [fc]	Resolution [fc]	Spectral uncertainty	Basic uncertainty
0…3.999	0.001	f1 ≤ 2 %	±(2 %+5 digits)
4.00 ... 39.99	0.01		
40.0 ... 399.9	0.1		
400…3999	1		
4.00 k…39.99 k	0.01 k		

- displaying the result in lx or fc (displaying fc result with reduced resolution due to the display limitations)
- Class A of the meter

Note: 1 fc=10.76 lx; 1 klx=1000 lx; 1 kfc=1000 fc

Other technical data

a) display ..... 3-3/4" digital LCD with 40-segment bar-graph
b) exceeding the range ..... "OL" symbol
c) Spectral sensitivity ..... CIE spectral sensitivity (CIE human eye sensitivity)
d) cosine correction (f2') ..... ±3 %
e) sampling rate ..... 1.3 times / sec
f) photodetector ..... one silicon photodiode and spectral sensitivity filter
g) memory ..... 99 results (LXP-2), 999 results (LXP-10B and LXP-10A)
h) recorder memory ..... 16000 results
i) working temperature ..... 0 °C...50 °C
j) operational relative humidity ..... 0 %...80 %
k) storage temperature ..... -20 °C...70 °C
l) relative humidity ..... 0 %...70 %
m) power source ..... 9V battery or 8.4 V rechargeable battery
n) length of the measuring probe ..... approx. 150 cm
o) dimensions of the measuring probe ..... 115 mm × 60 mm × 20 mm
p) dimensions of the control panel ..... 170 mm × 80 mm × 40 mm
q) weight ..... 390 g
r) interface ..... USB and wireless link (only LXP-10B and LXP-10A)

13 Standard equipment

The standard set of equipment supplied by the manufacturer includes:

- control panel for LXP-2 or LXP-10,
- 9V battery,
- measuring probe LP-1, LP-10B or LP-10A,
  Note: LP-1 probe is not compatible with LXP-10A(B) panel
- USB cable,
- CD with software for reading the results,
- operating manual,
- guarantee card,
- hard case.

14 Optional accessories

Additionally, the following items that are not included in the scope of standard equipment can be purchased from the manufacturer or the distributors:

- software for generating measurement reports - Foton 12464,
- receiver for wireless (radio) transmission OR-1 (only LXP-10A/B).

15 Service

The provider of guarantee and post-guarantee services is:

SONEL S.A.
ul. Wokulskiego 11
58-100 Świdnica
Poland
tel. +48 74 858 38 60
fax +48 74 858 38 09
E-mail: export@sonel.pl
Web page: www.sonel.pl

Note:
Service repairs must be performed solely by SONEL S.A.

Made in UE.

16 Laboratory services

Measurement Laboratory of SONEL SA offers tests and certification of the following instruments in the scope of their electrical/non-electrical features:

- infra-red cameras,
- pyrometers,
- meters for conducting the following electrical protective measurements: insulation resistance, earth resistance and impedance, short-circuit loops, RCD parameters and multi-functional meters that perform the above functions,
- electrical safety meters,
- power quality analysers,
- meters for measuring low resistance values,
- voltage meters, current meters (including clamp meters), resistance meters and multimeters,
- light meters.

A calibration certificate is a document confirming compliance of parameters declared by the manufacturer of tested device with national standards, specifying the measurement uncertainty

In accordance with **ISO 10012-1, Annex A** – "Requirements for assuring quality of measurement equipment. The system for approving metrological measuring equipment" –SONEL S.A. recommends for its instruments to be periodically tested, observing -- 13-month intervals.

For new devices with calibration certificates, the next metrological inspection (calibration) is recommended within **13 months** from the date of purchase, but not later than **19 months** from the date of manufacture.

SONEL S.A.
Wokulskiego 11, St
58-100 Swidnica
Poland

+48 74 85 83 860
+48 74 85 83 800
fax +48 74 85 83 808

http://www.sonel.pl
e-mail: export@sonel.pl