

Product datasheet (en)

Version: 1103_08.08.2016

Photo:



Name:

leXsolar-PV Large

Item number:

1103

Youtube link:

Area of application:

Physics

Dimensions (cm x cm x cm)

42x35x15

Weight (kg):

2,9

User group:

Highschool / Secondary School

Key facts:

Basics of photovoltaics learnable
Many qualitative and quantitative experiments
Worddidac Award winner

List of components:

3 x 1100-01 Solar module 0.5 V, 420 mA
1 x 1100-02 Solar module 0.5 V, 840 mA

1 x 1100-07 Solar module 1.5 V, 280 mA
1 x 1100-19 leXsolar-Base unit Large
1 x 1100-20 Lighting module
1 x 1100-21 Diode module
1 x 1100-22 Resistor module
1 x 1100-23 Potentiometer module
1 x 1100-24 Gear motor module
1 x 1100-25 Buzzer module
1 x 1100-27 Motor module without gear
1 x 1100-28 Color discs - Set 1
1 x 1100-29 Solar cell cover set (4 pieces)
1 x 1100-30 Color filters
1 x 1103-01 Box 1103
1 x 1400-07 Capacitor module 220 mF, 2.5V
1 x L3-01-004 Vacuum-padding leXsolar-experiment top, black
2 x L3-01-005 Vacuum-padding leXsolar-experiment below, black
1 x L3-01-013 Lid for tray
1 x L3-03-129 Layout diagram PV Large 1103
1 x L3-03-258 Info sheet initial startup

Extras needed:

1 x 9100-03 AV-Module
1 x 9100-05 PowerModule
2 x L2-06-012 Test lead black 25 cm
2 x L2-06-013 Test lead red 25 cm
1 x L2-06-016 Laboratory thermometer

Extras available:

L3-03-158 Lehrerheft leXsolar-PV Large
L3-03-032 Schülerheft leXsolar-PV Large
L3-03-033 Student's manual leXsolar-PV Large
L3-03-262 Teacher's manual leXsolar-PV Large
9102 leXsolar-SmartControl Large

Description:

Correlating school physics with practical usage of the photovoltaic cells is a specialty of this system. These unique didactic innovations are the premier choice when it comes to experiments related to solar energy since it has won the Worlddidac Award.

The system has been conceived in such a way that most experiments can be conducted in normal room lighting. An external power supply is not necessary for these experiments. The leXsolar lighting module (included) is required only for a few experiments - which can be operated with a student's power supply.

Experiments:

1. Understanding the leXsolar base unit
2. Optical illusions
 - 2.1 The basic setup for experiments with the color disks
 - 2.2 Color qualities
 - 2.3 Additive color mixing
 - 2.4 Optical illusions with the Benham-disk
 - 2.5 Optical illusions with the relief-disk
3. Experiments about different kinds of radiation
 - 3.1 The influence of diffuse radiation on solar cell power (qualitative)
 - 3.2 The influence of direct radiation on solar cell power (qualitative)
 - 3.3 The intensity of albedo-radiation of different substances (qualitative)
4. Dependence of solar cell power on its area
5. Dependence of solar cell power on angle of incidence of light
 - 5.1 Dependence of solar cell power on angle of incidence of light (qualitative)
 - 5.2 Dependence of solar cell power on angle of incidence of light (quantitative)
6. Dependence of solar cell power on illuminance
 - 6.1 Dependence of solar cell power on illuminance 1 (qualitative)
 - 6.2 Dependence of solar cell power on illuminance 2 (qualitative)
 - 6.3 Dependence of solar cell power on illuminance 1 (quantitative)
7. Dependence of solar cell power on temperature
8. Dependence of solar cell power on frequency of incident light
9. The diode character of a solar cell
 - 9.1 The dark characteristics of a solar cell
 - 9.2 The internal resistance of a solar cell depending on reverse or forward biasing or in the dark or under illumination
10. The I-V-characteristics of a solar cell
 - 10.1 Dependence of solar cell power on load
 - 10.2 The I-V-characteristics and filling factor of a solar cell
 - 10.3 Dependence of I-V-characteristics of a solar cell on illuminance
11. Behavior of voltage and current in series and parallel connections of solar cells
 - 11.1 Behavior of voltage and current in series and parallel connections of solar cells (qualitative)
 - 11.2 Behavior of voltage and current in series and parallel connections of solar cells (quantitative)
12. Behavior of voltage and current of series and parallel connection of solar cells depending on shading
 - 12.1 Behavior of voltage and current of a series connection of solar cells depending on shading (qualitative)
 - 12.2 Behavior of voltage and current of a series connection of solar cells depending on shading (quantitative)
 - 12.3 Behavior of voltage and current of a parallel connection of solar cells depending on shading (quantitative)
13. Simulation of a stand-alone grid with photovoltaic station
14. Characteristic graphs of a capacitor
 - 14.1 Characteristic graphs of a capacitor charged by a solar cell
 - 14.2 Discharging process of a capacitor
15. Practical experiments
 - 15.1 Determination of efficiency of some energy conversions
 - 15.2 Rotational direction and speed of a motor
 - 15.3 Starting and running current of a motor

Specifications of components

1100-01 Solar module 0.5 V, 420 mA:

Solar module with high efficiency polycrystalline solar cell

0.5 V open circuit voltage

420 mA short circuit current

0.2 Wp peak power

Optimized low light behaviour

Solar cell size 26 mm x 52 mm

Layout: plug-in module with 4 mm jacks

Grid-dimension of the jacks: 70 mm

Module size: 85 mm x 85 mm

1100-02 Solar module 0.5 V, 840 mA:

solar module with high efficiency polycrystalline solar cell

0.5 V open circuit voltage

840 mA short circuit current

0.4 Wp peak power

Optimized low light behaviour

Solar cell size 52 mm x 52 mm

Layout: plug-in module with 4 mm jacks

Grid-dimension of the jacks: 70 mm

Module size: 85 mm x 85 mm

1100-07 Solar module 1.5 V, 280 mA:

Solar module with 3 high efficiency polycrystalline solar cells

1.5 V open circuit voltage

280 mA short circuit current

0.13 Wp peak power

Optimized low light behaviour

Solar cell size 3 pcs. 17 mm x 52 mm

Layout: plug-in module with 4 mm jacks

Grid-dimension of the jacks: 70 mm

Module size: 85 mm x 85 mm

1100-19 leXsolar-Base unit Large:

Main board for the leXsolar plug-in system with 3 slots

Grid-dimension of the plugs: 70 mm

Enables series and parallel connection of the modules

Changing between series and parallel connection by turning the modules

Equipped with 4 additional 4 mm jacks for connecting measuring lines

1100-20 Lighting module:

Light source for illuminating leXsolar solar modules with defined intensity

Operating voltage: 0 - 12 V

Maximum power 4 W

Maximum illumination intensity on the solar cell: 200 W/m²

Aperture of the light source: 60 mm x 60 mm

Can be used to heat the solar cell to measure its temperature dependence

Connection: 4 mm-jacks

Includes 4 pcs. E5.5 bulbs

1100-21 Diode module:

Plug-in Module with Schottky-diode
Flux voltage ca. 0.3 V
Forward continuous current: 200 mA
Qualified as bypass-diode for single solar cells
Layout: plug-in module with 4 mm jacks
Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1100-22 Resistor module:
Plug-in module with 33 Ohm resistor
Tolerance: 5 %
Maximum power: 2 W
Layout: plug-in module with 4 mm jacks
Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1100-23 Potentiometer module:
Plug-in module with adjustable resistance
Resistance continuously adjustable: 0 - 1.1 kOhm
Maximum current: 1A
Module contains two potentiometers connected in series (1 x 100 Ohm and 1 x 1 kOhm)
Allows an exact adjustment of the resistance while having a large resistance range
Layout: plug-in module with 4mm jacks
Grid-dimension of the jacks: 70mm
Module size: 85mmx85mm

1100-24 Gear motor module:
Plug-in module with geared motor
Initial current: ca. 20 mA
Initial voltage: ca. 0.35 V
Minimum operating current: 10 mA
Maximum voltage: 4 V
Equipped with hook for attaching balance weights
Suitable for balance weights up to ca. 20 g
Gear reduction: 1:27
Layout: plug-in module with 4 mm jacks
Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1100-25 Buzzer module:
Plug-in Module with piezo buzzer
Pulse tone buzzer
Initial voltage: 0.7 V
Initial current: 0.2 mA
Layout: plug-in module with 4 mm jacks
Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1100-27 Motor module without gear:
Plug-in module with DC-motor
Initial current: 20 mA
Initial voltage: 0.35 V
Equipped with automatic fuse protecting from overvoltage
Layout: plug-in module with 4 mm jacks

Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1100-28 Color discs - Set 1:

Color discs for demonstration of color mixture and optical illusions

Contains a mount with 2 clips for attaching the discs

Mount fits axles of 2mm diameter

Included color discs:

Red-green-blue

Red-blue

Red-green

blue-green

Hue disc

Optical illusion: relief

Optical illusion: color formation

Stroboscope disc

1100-29 Solar cell cover set (4 pieces):

4 black plastic plates

Opaque

30 mm x 30 mm

For shadowing solar cells

1100-30 Color filters:

3 color filters (blue, red, yellow)

Red: edge filter with transmission from 600nm

Yellow: edge filter with transmission from 530nm

Blue: Transmission 380 nm - 530 nm; Maximum Transmission at 450nm

1400-07 Capacitor module 220 mF, 2.5V:

Capacitor plug-in module

Capacity: 220 mF

Voltage: 2.5 V

Equipped with automatic fuse protecting from overvoltage

Layout: plug-in module with 4 mm jacks

Grid-dimension of the jacks: 70 mm

Module size: 85 mm x 85 mm

L3-01-004 Vacuum-padding leXsolar-experiment top, black:

L3-01-005 Vacuum-padding leXsolar-experiment below, black:

L3-01-013 Lid for tray:

L3-03-129 Layout diagram PV Large 1103:

L3-03-258 Info sheet initial startup:

Specifications extras needed:**9100-03 AV-Module:**

The IV-Module is able to measure current and voltage and therefore replaces conventional multimeters completely. With touch buttons three measurement modes can be selected: current, voltage and combined current-/voltage-measurement.

leXsolar AV-Module is intuitive and easy to use but yet allows precise and professional measurements. A high resolution graphics display shows the measurement values as well as visualizes the measurement modes.

Technical specifications:**Voltage measurement:**

- Range: 0...12 V
- Accuracy: 1mV
- Overvoltage protection >12V

Current measurement

- Range: 0...2 A
- Accuracy: 0.1mA (0...199mA) and 1mA (200mA...1A)
- Automatic fuse protection >2A (reactivation with touch button)
- Internal resistance <0.5 Ohm (0...200mA); <0.2 Ohm (200mA...2A)

Electrical connection:

- compatible to leXsolar-basic unit
- 4mm-banana plugs

Display: Graphics display resolution 192x192

Power supply: 2 x AA battery or rechargeable

Interfaces:

- Display to read the measurement values
- leXsolar USB-Connect* for direct PC-connection
- leXsolar Wireless-Connect* for wireless data acquisition

*Please ask for availability

9100-05 PowerModule:

The PowerModule is a compact, robust and easy-to-use power supply for experiments. The voltage can be varied incrementally in 0.5V steps from 0 to 12V. It supplies up to 24W output power!

With the acoustic feedback during operation and the voltage indicator by LEDs it is simple and intuitive for the user. With only 70g it is the most lightweight power supply of its power class. Due to the design as leXsolar plug-in module it is fully compatible with all leXsolar experiments. However, it can also be used in other setups with standard 4mm-connectors.

With software control* continuous variable voltages - even time-dependent - can be realized.

Technical data:

Output voltage 0-12V DC
Maximum current 2A
Maximum output power 24W
Automatic overcurrent detection
Voltage variation in 0.5V steps (manually) or continuous (with software* via USB-Connect* or Wireless-Connect*)
Accuracy: +-0.15V
Contacts: 4mm standard connectors and compatible to leXsolar main board
Input voltage 110-230V AC 50-60Hz
Adaptors for all common sockets included
Weight: 70g (+180g included wall power supply)
RiSU conform

***Please ask for availability**

Specifications extras available:

L3-03-158 Lehrerheft leXsolar-PV Large:

L3-03-032 Schülerheft leXsolar-PV Large:

L3-03-033 Student´s manual leXsolar-PV Large:

The instruction manuals are available as PDF and Word versions in the online portal. A description of how to download the booklets is attached to every experiment set.

L3-03-262 Teacher´s manual leXsolar-PV Large:

The experiment handbooks are available as PDF and Word versions in the online portal. A description of how to download the booklets is attached to every experiment set.

9102 leXsolar-SmartControl Large:

SmartControl Large provides a convenient collection of SmartControl modules for every product of the leXsolar-Large series. There is no need for additional measuring instruments, power supplies or cables.

Additionally, a SmartGrid can be built through the combination of the included SmartMeter modules and multiple leXsolar products.

The package also contains three leXsolar-WirelessConnect which allow wireless control over the experiments using a Windows-PC.

If mobile devices or other platforms are used, an extra SmartControl Server is needed.