SOLARONIX

SOLARONIX
EQUIPMENT

Based on Solaronix' exclusive light engine, our solar simulation equipment delivers a perfect and continuous artificial sunlight 24/7, allowing for accurate stability and performance assessments of solar cells at laboratory and industrial scale.

INNOVATIVE SOLUTIONS FOR SOLAR PROFESSIONALS

EXCLUSIVE SOLAR TESTING EQUIPMENT

We know it for ourselves, developing and manufacturing photovoltaic solar cells implies no compromise on testing equipment. Developers need an accurate way of measuring the performance of their prototypes and compare their experiments, while manufacturers must be able to rely on robust equipment that presents minimum operation and maintenance costs.

Most light sources have severe drawbacks when it comes to solar simulation: unmatched spectrum, poor yield, small surface, non-continuous illumination, and above all, aging.

How can you know a solar cell is stable when the light source used for simulating sunlight is not stable either? Is the solar cell aging, or is the solar cell observing the aging of the lamp?

Fortunately, this problem is now solved. Solaronix has developed a specific kind of light source that perfectly mimics sunlight and presents an outstanding long term light stability. The unmatched features of the Lumixo light engine allow Solaronix to supply the photovoltaic industry with accurate and dependable testing equipment.

Our competences comprise optical calculations, mechanical design, machinery assembly, electronic circuits, and software development. These strengths enable Solaronix to provide turnkey equipment meeting customers' most demanding requirements, as well as consultation in photovoltaic testing.

LUMIXO, THE HEART OF OUR SOLAR TESTING EQUIPMENT

The need for a reliable and accurate light source for solar simulation and solar cell testing emerged during the early days of Solaronix. At the time, available light sources appeared to be unstable over time and led to biased photovoltaic measurements. With the same credo of autonomy and technological leadership, Solaronix developed a specific type of light source to overcome such limitations, the Lumixo light engine.

This genuine light source perfectly mimics sunlight, and presents an outstanding light stability over a long period of time. The unmatched features of the Lumixo light engine allow Solaronix to supply today's photovoltaic industry with accurate and dependable testing equipment.

In common discharge lamps, the light is emitted as an electrical arc between two electrodes. The extreme temperature of the discharge causes electrode breakdown after a few hundred hours of operation.

Alternatively, plasma lamps belong to a class of electrodeless light sources energized by radio frequency power. In the Lumixo light engine, a radio frequency system generates the power necessary to excite a plasma in a sealed electrode-less bulb. The bulb's lifetime itself is virtually infinite, allowing for the Lumixo's outstanding lifetime of 20,000 hours. The end-of-life time is actually dictated by the rotating parts (fans, motors) and the radio frequency system, parts that can be easily replaced. Existing Solaronix solar simulators have over 63,000 hours of operation!

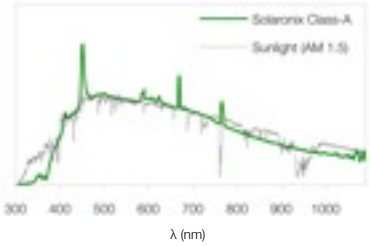
Proper documentation and remote assistance is provided to make Lumixo light engine service trouble free, directly on-site by the customer's team.

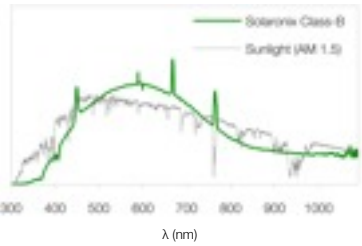
KEY FEATURES

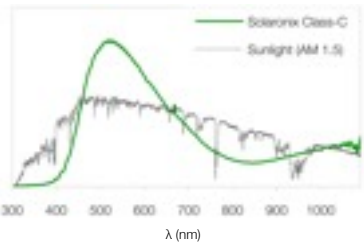
- outstanding lifetime of the light emitter (> 20,000 h), unprecedented for a 1 kW light source
- continuous illumination, especially well suited for monitoring thin film and other 3rd generation solar cells
- temporal light stability allowing an excellent measurement reproducibility over a long period of time
- smooth and continuous light spectrum with a sun-like wavelength distribution
- several spectra available, from energy-saving Class C (140 lm/W) to high-end Class A (70 lm/W)
- beautifully simple design, no filter needed
- adjustable illumination (30%-110%) to operate at partial sun equivalents
- safe: does not contain mercury, low pressure bulb
- reduced cost of ownership and streamlined maintenance

LIGHT CHARACTERISTICS

Class A, B or C spectrum
(as per IEC 60904-9)



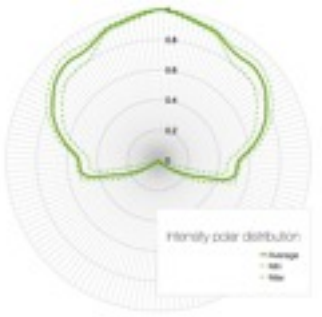


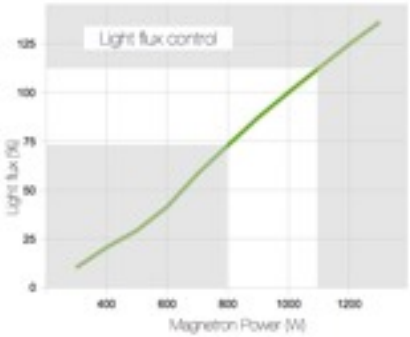


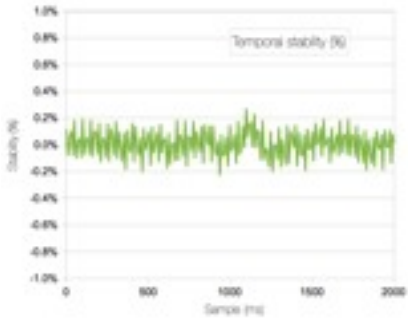
Quasi-uniform intensity distribution

Linear light flux control 300-1100 W

< 0.5% temporal stability in 'freeze' mode

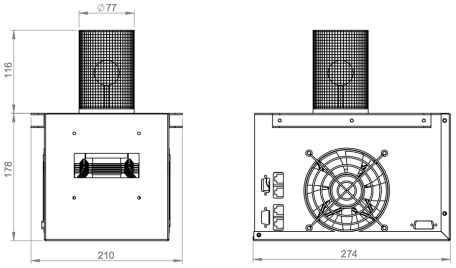






SPECIFICATIONS

Software control:	desktop application (RS-232) or web-based control (CAN server)
Radio frequency system power supply:	included
Lamp lifetime:	20,000 hours, serviceable
Warranty:	24 months
Electrical:	220-230 VAC, 50-60 Hz, max 1.5 kW
Weight:	10.5 kg (inc. power supply)
Dimensions:	*Power supply (not shown): H 125 x W 240 x L 165 mm*



SUNIRAD AND SOLIXON SOLAR SIMULATORS

Solaronix offers solar testing equipment based on a reliable design with over 12 years of development. The Sunirad product line is intended for light-soaking with thermal control of your sample at 50°C. The Solixon units benefit from the same steady-state reliability while offering room temperature testing (25°C) and high-end Class A spectrum for sample characterization. The two product lines profit from the same exceptional characteristics of the Lumixo light engine described in the previous pages.

Solixon, exclusive continuous solar simulators

The Solixon equipment from Solaronix generates a perfectly true sun-like illumination, up to Class A rating over large areas. This unmatched behavior enables accurate solar simulation independent of the type of photovoltaic material. It is perfectly suited for the characterization of today's solar cells absorbing over of a broad range of wavelengths, such as tandem and multi-junctions cells.

The unique features of the Lumixo light engine afford:

- high fidelity Class A spectrum,
- power adjustable to simulate partial sun illuminations from 30% to 110% sun equivalents,
- possibility to combine light soaking and solar simulation functionalities with the same equipment.

Sunirad, our light soakers product line

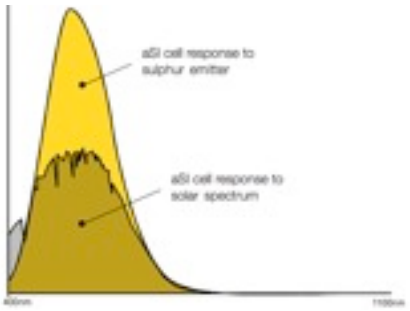
The Sunirad equipment features Lumixo light engines with an emitter that is spectrally matched to the type of solar cells under test.

The spectral emission of the Class-C unit is specifically suited for the light soaking of a-Si solar cells and Dye Solar Cells, while offering minimal power consumption. The Class A and Class B units are suited for light-soaking of crystalline silicon solar cells, and for the aging of compound semiconductor based thin film solar cells.

The light soaking machines are built to be run continuously, allowing for long term tests lasting several months.

- Active thermal management for temperature accuracy.
- Optimized power consumption and low residual heat.
- Light soakers available with superior spectrum quality.

Sunirad C-65 (for a-Si)



Sunirad C-65 is the low-cost light soaker dedicated to amorphous silicon (a-Si) solar cells, or other solar cells having a similar spectral response. This machine features a yellow shifted Class C spectrum, specifically optimized for a-Si testing, using one Lumixo light engine and additional halogen bulbs.

Thanks to an excellent overlap of the Lumixo light emitter and the a-Si spectral response, an irradiance of 800 W/m^2 is enough to obtain nominal short-circuit current on a-Si cells.

The additional halogen bulbs don't contribute significantly to the current generation of the a-Si cells, and are simply needed to be compliant with IEC 60904-9 Class C spectrum.

Common Solixon & Sunirad characteristics

- Solaronix' exclusive Lumixo light engine.
- Standard or custom sizes, ranging from half a square meter up to several square meters.
- Continuous operation for long term testing.
- Uniform sample illumination through carefully designed reflectors.
- Drawer style sample holder for easy sample manipulation.
- Thermostated sample holder.
- Small footprint and optimized form factor.
- Remotely or locally operated.

Examples of Standard Units

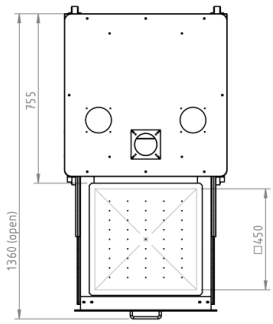
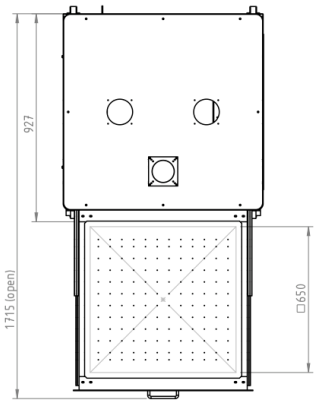
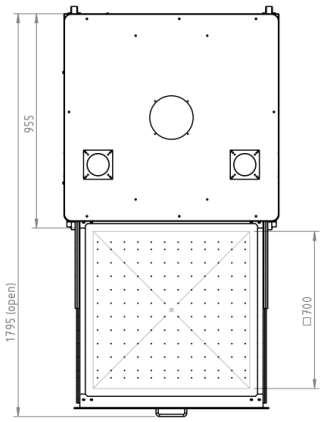
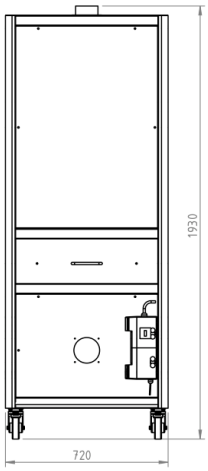
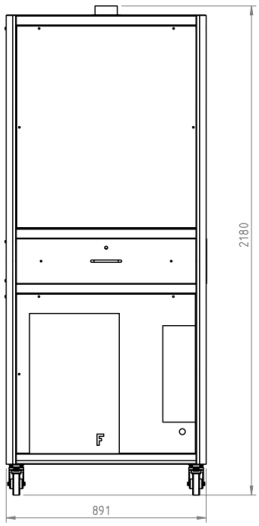
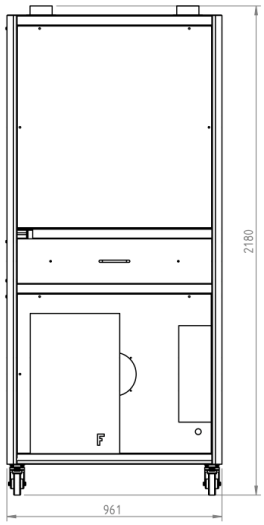
	Light Soakers			Solar Simulators	
	Sunirad C-65	**Sunirad A-45 or B-45**	**Sunirad A-70 or B-70**	**Solixon A-45**	**Solixon A-70**
PV Technologies:	a-Si or similar	all	all	all	all
Sample area (cm):	65 x 65	45 x 45	70 x 70	45 x 45	70 x 70
Light source:	Lumixo (x1) and halogen	Lumixo (x1)	Lumixo (x2)	Lumixo (x1)	Lumixo (x2)
Spectrum:	Class C+*	Class A or Class B		Class A	
Sample temperature:	50°C			25°C	
Irradiance uniformity:	Class A or Class B				
Irradiance stability:	Class A or Class B				

* Sunirad C equipment have an optimized spectrum for a-Si although overall rating gets classified as C.

Note: Solar simulator classification is defined as per IEC 60904-9 by three letters describing spectrum, irradiance uniformity and temporal stability performances.

	Class A	Class B	Class C
Spectral match:	0.75 - 1.25	0.6 - 1.4	0.4 - 2.0
Irradiance uniformity:	2%	5%	10%
Temporal instability:	0.5% / 2%	2% / 5%	10% / 10%

Standard Units Specifications

Sunirad B-45 or A-45, Solixon A-45	Sunirad C-65	Sunirad A-70 or B-70, Solixon A-70
		
		
Weight:		
~140 kg	~160 kg	~180 kg
Recirculating chiller:		
W 360 x D 540 x H 490 mm (does not fit inside the unit)	W 360 x D 540 x H 490 mm	W 460 x D 610 x H490 mm
Power requirement:		
3P+N 380-400 VAC 50-60 Hz	3P+N 380-400 VAC 50-60 Hz	3P+N 380-400 VAC 50-60 Hz
max. 4.1 kW, nominal 2.6 kW	max. 4.1 kW, nominal 2.6 kW	max. 5.6 kW, nominal 3.1 kW
	1P+N available upon request	

CUSTOM UNITS

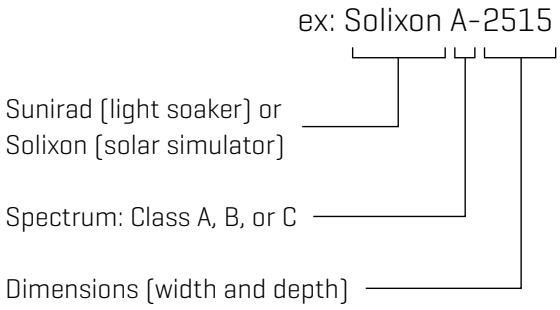
Many of our realizations are built upon customers' requirements. The mechanical design of our systems allows us to build units of any size, either custom Sunirad light soakers, or Solixon solar simulators.

Our large area Sunirad and Solixon equipment consist of arrays of Lumixo light engines. The complete machine is then built for the targeted illuminated area specified by the customer.

Thanks to our Lumixo light engine, our light soakers and solar simulators provide continuous and stable illumination. Sunirad and Solixon equipment can be ordered with a Class A, Class B, or Class C spectrum to fit every need and budget.

Our basic systems typically meet the Class BBB required for most testing standards, while our high end systems meet Class AAA specifications.

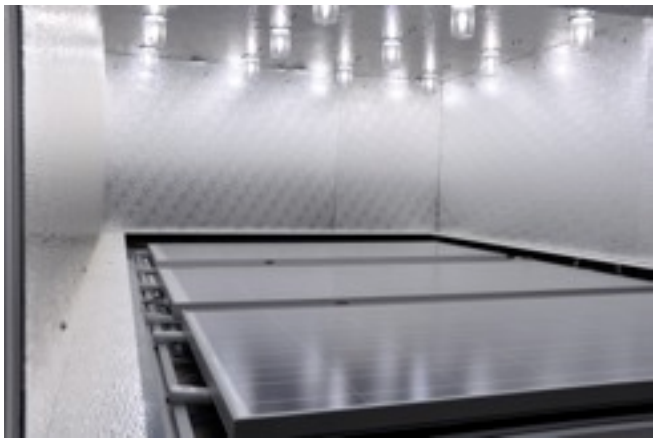
All our machines are constructed to give easy access to the illuminating chamber. Furthermore, they come with a network interface to allow remote control of the installation.



Thermal Control

Continuous solar simulation implies that a considerable amount of energy is fed to the sample under test. Solaronix' range of simulators are fully engineering for full thermal control of your samples.

Our sample holder can be fitted with thin-tube heat exchangers which circulates cooled air on the back side of the samples to accommodate virtually any shape of solar panel.

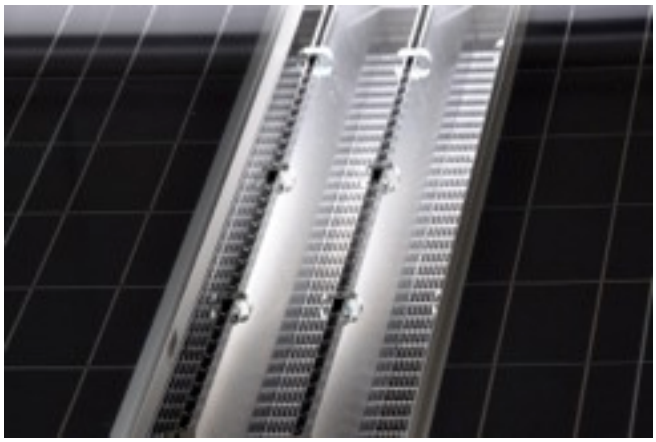


Sunirad units

The Sunirad units are designed for light-soaking and feature a thermostated sample holder for complete thermal control, be it room temperature or elevated temperatures up to 55±2°C. This exceeds the 50±10°C required by IEC 61646 to meet standard light soaking conditions.

Solixon units

The Solixon units are designed for solar simulation. They rely on thorough thermal engineering to maintain your samples at 25°C to meet the Standard Testing Conditions (STC) required by IEC 60904-9. Your samples can also be held at elevated temperatures up to 55±2°C for customized testing conditions.



CASE STUDY: SOLIXON A-1525

This Solixon A-1525 unit is designed to realize solar simulation on a 250 x 150 cm area. The system relies on 20 Lumixo light engines to obtain Class A spectrum, uniformity, and stability.

Solixon A-1525 Specifications

Customer's sample type:	mono and polycrystalline silicon solar cells
Sample area:	250 x 150 cm illuminated area
Light intensity:	800 to 1100 W/m^2 intensity
Light source:	20 Lumixo light engines, Class A
Lamps lifetime:	20,000 h, serviceable
Spectrum:	Class A
Illumination non-uniformity:	±2% over 250 x 150 cm (Class A)
Irradiance stability:	< 2% (Class A as per IEC 60904-9)
Light engine cooling:	forced air ventilation
Software:	lamp control and monitoring, sample holder temperature, light intensity
Dimensions:	330 x 270 x 210 cm (sample holder closed)
Mass:	~1500 kg without refrigerated circulator
Structure:	Anodized aluminum
Electromagnetic compatibility:	2.45 GHz ISM Group 2, Class B Device (CISPR 11)
RoHS conformity:	yes
CE conformity:	yes, the components and the entire system conform with the CE regulations, the system is intended for industrial or laboratory use

About Solaronix

Solaronix has developed a specific kind of lamp that perfectly mimics sunlight and presents an outstanding long term light stability, the Lumixo light engine.

Based on this exclusive light source, we manufacture complete solar simulation equipment that delivers continuous artificial sunlight, 24 hours a day and 7 days a week, allowing for accurate stability and performance assessments of any type of solar cell. Solaronix can provide standard and customized machines to a variety of clients ranging from university labs to industrial manufacturers to certification centers.

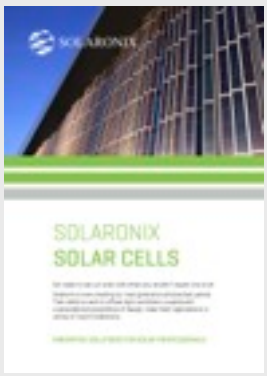
Our competence comprises optical calculations, mechanical design, machinery assembly, electronic circuits, and software development. These strengths enable Solaronix to provide turnkey equipment meeting customers' most demanding requirements, as well as consultation in photovoltaic testing.

Visit our website www.solaronix.com to learn more about our technology, products, and solutions.

Solaronix also has 2 more complementary divisions:

MATERIALS

Supplier of specialty chemicals and materials, Licensee of EPFL for Dye Solar Cell technology since 1994, we deliver the components used for Hybrid and Dye Solar Cell fabrication to researchers and industries worldwide.



SOLAR CELLS

Solaronix is developing next generation photovoltaic panels based on Hybrid and Dye Solar Cell technologies. Our models offer unprecedented possibilities in terms of customization and integration.

ASK FOR A QUOTATION

Our engineering team is looking forward to receiving your inquiry, and is ready to assist you in determining the best equipment for your application.

Send us a quotation request at equipment@solaronix.com

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Sign up at solaronix.com/hearfromus/

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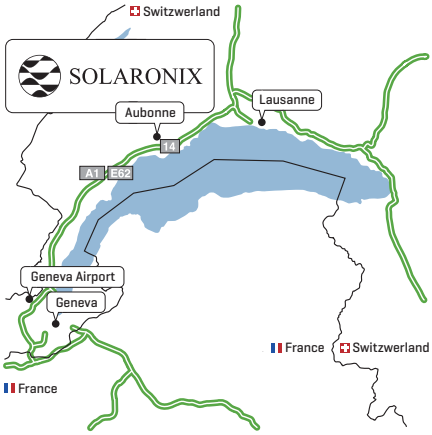

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