Solar Simulation
Environmental Chambers & Systems

SOLAR / WIND / HUMIDITY / TEMPERATURE
Environmental Light Irradiation Test Chambers
IWASAKI, the Lighting Experts

Multiple light technologies to meet diverse testing requirements

Iwasaki has over 60 years of experience and successful installations combining a wide array of light sources and optical filters to provide quality simulated solar lighting solutions.

400W Metal Halide technology Lamp
Complies with IEC and JIS Class C spectrum conformity.

150W Metal Halide technology Lamp
Complies with IEC and JIS Class B spectrum conformity.

Dual Technology Lighting System
(Combined Metal Halide and Halogen Technology)
Ideal for custom environmental testing such as vehicle performance evaluation and artificial climate chambers.

Infrared Lamps
Optimum when placing emphasis on the heat quantity of infrared rays.

Ultraviolet Lamps
Spectral distribution corresponding to PV qualification standards (IEC61215 / IEC61646).

Pulsed Xenon Lamps
This technology provides the basis for our IEC and JIS Class A spectrum irradiation systems.

Optical Filter for Spectrum Control
Fully controls the designed spectral range.

Planning and designing the optimum device

Our flexible systems can be designed according to your test requirements, to suit environmental conditions like interior volume, temperature, humidity, solar radiation intensity, and in combination with various measuring instruments.
Supporting solar cells from development to manufacture

Solar energy is free and basically unlimited. Using it produces no greenhouse gases or other adverse environmental impact. To directly convert this outstanding energy source, however, more efficient photovoltaic (PV) systems must be developed. Iwasaki’s lighting systems are playing an active role in each process of basic research, development and production.

<table>
<thead>
<tr>
<th>Basic research and development</th>
<th>Output measurement evaluation test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Durability performance test</td>
</tr>
<tr>
<td>Production process</td>
<td>Stabilization of product quality</td>
</tr>
<tr>
<td></td>
<td>Improvement of production efficiency</td>
</tr>
<tr>
<td>Verification / quality assurance tests</td>
<td>IEC61646, IEC61215, etc.</td>
</tr>
</tbody>
</table>

Complex Environment Simulator
Class A Bench-top Solar Simulator
EYE Super UV Tester
Light Irradiation Systems for PV Production Lines
Pulsed xenon solar simulator
Light-soaking Tester
UV Preconditioning Tester (1SUN)
UV Preconditioning Tester (1 to 5SUN)

Solar simulation

IWASAKI’s solar lighting systems are recognized for superior solar simulation environmental testing; evaluating outdoor-use product quality, reliability and safety.

Climate Chambers
Construction Material Testing
Vehicle VOC Testing
Other Environmental Tests

From general lighting fixtures (visible light) to industrial equipment applications

In addition to actively developing lighting that utilizes advanced optical technology, IWASAKI provides a wide selection of products and systems in various fields.

Comparison of various light source spectral distribution (displayed in relative value with a maximum value of 100)
Supporting the Development and the Manufacturing of PV Cells and Modules

In order to create a better global environment, great hopes are being placed on solar photovoltaic arrays (PV) as a future primary energy source. Iwasaki is proud that our solar simulation lighting systems are playing an active role in the basic research, product development, and manufacturing of new technology PV panels. Solar simulation lighting has become indispensable for the efficient development and production of high performance, high quality PV panels. The environmental conditions required differ depending on the tests, such as output measurement evaluation and durability assessment, and manufacturing processes. Iwasaki’s equipment perfectly controls the “Light”, “Temperature” and “Humidity” according to each process and provides the optimal test environment.

**Basic research and development**

- Conversion rate improvements for solar cells
  - Cell/module output measurement evaluation
- Durability improvement quality assurance test
  - Durability performance test simulating an outdoor environment

**Complex Environment Simulator**

- Simulated Solar Lighting (diffusion light type)
- Programmable Temperature
- Programmable Humidity
- Multiple Samples

**Spectral image**

- Metal Halide Lamp

**Class A Bench-top Solar Simulator**

- Simulated Solar Lighting (parallel light type)
- Small Sample

**Spectral image**

- Xenon Lamp

**EYE Super UV Tester**

- UV Light
- Programmable Temperature
- Programmable Humidity
- For Deterioration Testing

**Spectral image**

- UV metal Halide Lamp

**Production process**

- Product quality stabilization
  - Light stabilization process

**Light Irradiation System for PV Production Lines**

- Simulated Solar Lighting (diffusion light type)
- Programmable Temperature

**Spectral image**

- Metal Halide Lamp
The quality of light is categorized into Classes by IEC and JIS standards. We will recommend the light technology and performance to meet the specific equipment requirements for use in basic research, development, production and verification testing.

### Solar simulator class

<table>
<thead>
<tr>
<th>Item</th>
<th>Class</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral concordance level</td>
<td></td>
<td>0.75</td>
<td>1.25</td>
<td>0.6</td>
</tr>
<tr>
<td>Irradiated area variation (%)</td>
<td></td>
<td>±2%</td>
<td>±5%</td>
<td>±10%</td>
</tr>
<tr>
<td>Irradiated time fluctuation (%)</td>
<td></td>
<td>±0.5%</td>
<td>±2%</td>
<td>±10%</td>
</tr>
</tbody>
</table>

### JIS C8912 - 8933

<table>
<thead>
<tr>
<th>Item</th>
<th>Class</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral concordance level</td>
<td></td>
<td>0.7</td>
<td>1.25</td>
<td>0.6</td>
</tr>
<tr>
<td>Irradiated area variation (%)</td>
<td></td>
<td>Under ±2</td>
<td>Under ±3</td>
<td>Under ±10</td>
</tr>
<tr>
<td>Irradiated time fluctuation (%)</td>
<td></td>
<td>Under ±1</td>
<td>Under ±3</td>
<td>Under ±10</td>
</tr>
</tbody>
</table>

The quality of light is categorized into Classes by IEC and JIS standards. We will recommend the light technology and performance to meet the specific equipment requirements for use in basic research, development, production and verification testing.

### Verification / quality assurance testing

#### Quality assurance testing

**Light-soaking System**

(Simulated solar lighting, diffusion light type)

**UV Preconditioning System (1SUN)**

**UV Preconditioning System (1 to 5SUN)**

### Xenon Long Pulse Solar Simulator

Simulated Solar Lighting (diffusion light type)

### Output performance assessment process

Communication with the transfer equipment and the up-stream/down-stream process

Comprehensive communication control system
Complex Environment Simulator

Complies with IEC60904-9 solar simulator/classes B and C. Includes integrated temperature and humidity controls, allowing the output measurement testing and the complex durability testing to be conducted by one unit. The work size and the temperature/humidity control range, etc. can be customized.

These chambers are available at Iwasaki for testing your samples; please contact your local agent for details.

<table>
<thead>
<tr>
<th>Item</th>
<th>Complex Environment Simulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irradiation range</td>
<td>300mm × 300mm</td>
</tr>
<tr>
<td>Light source</td>
<td>Metal Halide Lamp</td>
</tr>
<tr>
<td>Radiant intensity</td>
<td>Approximately 1000 W/m²</td>
</tr>
<tr>
<td>Spectral concordance level</td>
<td>Classes B (0.6 to 1.4), C (0.4 to 2.0)</td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Classes B (under ±5%), C (under ±10%)</td>
</tr>
<tr>
<td>Irradiated time fluctuation</td>
<td>Class A (under ±1%)</td>
</tr>
<tr>
<td>Temperature control</td>
<td>Work temperature : +25°C to +90°C</td>
</tr>
<tr>
<td>Humidity control</td>
<td>20%RH to 90%RH</td>
</tr>
</tbody>
</table>

* Specifications may vary depending upon application.
* Customization of the irradiation range, etc. is also available.

Delivery example

Nagaoka University of Technology

Complex Environment Simulator (large solar simulator)

<table>
<thead>
<tr>
<th>Item</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiant intensity</td>
<td>Approximately 1000 W/m²</td>
</tr>
<tr>
<td>Spectral concordance level</td>
<td>Class C (0.4 to 2.0)</td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Class C (under ±10%)</td>
</tr>
<tr>
<td>Irradiated time fluctuation</td>
<td>Class C (under ±10%)</td>
</tr>
<tr>
<td>Irradiation range</td>
<td>1200mm × 1200mm</td>
</tr>
<tr>
<td>Temperature control</td>
<td>+20°C to +60°C (during irradiation)</td>
</tr>
<tr>
<td>Humidity control</td>
<td>20%RH to 70%RH (during irradiation)</td>
</tr>
</tbody>
</table>
Class A Bench-top Solar Simulator

Complies with IEC60904-9 solar simulator/class A. Primary light irradiation testing (performance evaluation testing) for solar research and development.

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### Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Small solar simulator</th>
<th>EYE Super UV Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irradiation range</td>
<td>500mm x 500mm</td>
<td>190mm x 422mm</td>
</tr>
<tr>
<td>Light source</td>
<td>Xenon Lamp</td>
<td>Metal Halide Lamp (with filter)</td>
</tr>
<tr>
<td>Radiant intensity</td>
<td>10000W/m²</td>
<td>150±8mW/cm²</td>
</tr>
<tr>
<td>Spectral concordance level</td>
<td>Class A (0.75 to 1.25)</td>
<td></td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Class A (under ±2%)</td>
<td>Under ±10%</td>
</tr>
<tr>
<td>Irradiated time fluctuation</td>
<td>Class A (under ±1%)</td>
<td></td>
</tr>
<tr>
<td>Incoming radiation angle</td>
<td>Under 3°</td>
<td></td>
</tr>
</tbody>
</table>

* Specifications may vary depending upon application.
* Customization of the irradiation range, etc. is also available.

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### Features

- Testing is accelerated to more than 10 times that of typical weathering chambers. Accurate and speedy weather-durability assessment is enabled by the uniform irradiation from our proprietary high intensity UV irradiation source.
- The irradiation distribution is uniform. The output irradiation power is programmable and maintained by a feedback control circuit.
- The system cuts wavelengths under 295nm. Negative influence by wavelengths that are not found in sunlight has been eliminated.

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These chambers are available at Iwasaki for testing your samples; please contact your local agent for details.
Light Irradiation System for PV Production Lines

In a PV production line, solar-simulated light is often required for light stabilization of modules and the assessment of PV output performance. Iwasaki has developed a system incorporating its unique continuous light source technology to provide the simulated solar irradiation required in the PV production line process. We provide a complete process system including material handling, temperature control, equipment control, and process communication.
Xenon Long Pulse Solar Simulator
Three Target Sizes

Complies with IEC60904 Class A solar simulation standards. Up to 100ms of effective irradiated time is achieved. Through our proprietary filter technology, spectral concordance conforms to IEC / JIS Class A standards. Three systems provide a wide selection to meet your panel size, floor space, and performance requirements.

<table>
<thead>
<tr>
<th>Type</th>
<th>Xenon Long Pulse Solar Simulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Irradiation Area (mm)</td>
<td>XLP15</td>
</tr>
<tr>
<td>600 x 1200</td>
<td>1100 x 1300</td>
</tr>
<tr>
<td>Light Source</td>
<td>Filtered Pulsed Xenon Lamp</td>
</tr>
<tr>
<td>Radiant Intensity</td>
<td>1000W/m²</td>
</tr>
<tr>
<td>Total Cycle Time</td>
<td>10 sec / inst. production capacity up to 360 modules / hr</td>
</tr>
<tr>
<td>Effective Pulse Duration</td>
<td>Programmable 10 to 100ms</td>
</tr>
<tr>
<td>Spectral Concordance Level</td>
<td>Class A (0.75 to 1.25)</td>
</tr>
<tr>
<td>Irradiated Area Variation</td>
<td>Class A (under 8%)</td>
</tr>
<tr>
<td>Irradiated Time Fluctuation</td>
<td>Class A (under 8%)</td>
</tr>
</tbody>
</table>

* Specifications may vary depending upon application.
* Customization of the irradiation range, etc. is also available.

Light irradiation
We can provide you with a comprehensive customized proposal calculating the necessary dwell time and insolation distribution based on the desired specifications such as the required cumulative insolation (kW-h/㎡) and installation space of the line.

Process temperature control
Designed so that the temperature can be maintained at a specified level while the irradiation subject is insolated.

Communication with the transfer equipment and the up-stream/down-stream processes
The system can be designed to interface directly with the production process or the process control communication system for comprehensive communication control systems.
Compliant Light-Soaking System

This light-soaking system is designed for PV module light stabilization and is especially suited for thin-film PV applications (IEC 61646).

<table>
<thead>
<tr>
<th>Item</th>
<th>Light-soaking tester / I</th>
<th>Light-soaking tester / II</th>
<th>Light-soaking tester / IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irradiation range</td>
<td>1100×1400mm module x1 sheet</td>
<td>1100×1400mm module x2 sheets</td>
<td>1100×1400mm module x4 sheets</td>
</tr>
<tr>
<td>Radiant intensity</td>
<td>800 to 1000W/m² (equivalent to 1SUN)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectral concordance level</td>
<td>Class C (0.4 to 2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Class C (under ±10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irradiated time fluctuation</td>
<td>Class A (under ±1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module temperature</td>
<td>+40 to +60°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Specifications may vary depending upon application.
* Customization of the irradiation range, etc. is also available.
* Customization for specifications compliant with IEC 61730 is also available.

ULVAC, Inc.
Solar Energy Assessment Center
Light-soaking System

ULVAC, Inc.
Solar Energy Assessment Center
UV Preconditioning System (1SUN)

Japan Electrical Safety & Environment Technology Laboratories (JET)
UV Preconditioning System (1 to 5SUN)
UV Preconditioning System (1SUN)
Compliant with IEC61646, this UV preconditioning system is designed specifically for thin-film technology PV panels and ensures uniform irradiation.

<table>
<thead>
<tr>
<th>Item</th>
<th>UV Preconditioning Tester / I</th>
<th>UV Preconditioning Tester / II</th>
<th>UV Preconditioning Tester / IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irradiation range</td>
<td>1200×1700mm module ×1 sheet</td>
<td>1200×1700mm module ×2 sheets</td>
<td>1200×1700mm module ×4 sheets</td>
</tr>
<tr>
<td>UV intensity</td>
<td>Approximately 50W/m² (equivalent to 1SUN)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Under ±15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module temperature</td>
<td>+60°C±5°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Specifications may vary depending upon application.
* Customization of the irradiation range, etc. is also available.

UV Preconditioning System (1 to 5SUN)
Compliant with IEC61646 and IEC61215, this system is designed for both crystalline and thin-film modules and delivers accelerated UV irradiation to significantly reduce preconditioning process time.

<table>
<thead>
<tr>
<th>Item</th>
<th>UV Preconditioning Tester / S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irradiation range</td>
<td>1700×1850mm</td>
</tr>
<tr>
<td>Ultraviolet intensity</td>
<td>50 to 250W/m² (equivalent to 1 to 5SUN)</td>
</tr>
<tr>
<td>Irradiated area variation</td>
<td>Under ±15%</td>
</tr>
<tr>
<td>Module temperature</td>
<td>+60°C±5°C</td>
</tr>
</tbody>
</table>
Solar Light Simulation

For reliable and safe performance tests for products used outdoors, irradiation testing with a simulated solar lighting system is effective. We can provide solutions specific to your application needs, optimized from the selection of the light source to the design of the control system.

Clarification of the heat-island phenomenon

Light source: Simulated Solar Lighting Metal Halide Lamp

The angle can be automatically altered up to 45°, allowing adjustment of the radiation direction.

Construction material test

Light source: Simulated Solar Lighting Metal Halide Lamp

Environmental testing and durability testing for heat insulation material, etc.

Climate chamber

Light source: Simulated Solar Lighting Metal Halide Lamp

Simulates sunlight radiating from a window
Vehicle surface heat testing and vehicle interior VOC testing

**Light source:** Infrared Lamp, Simulated Solar Lighting Metal Halide Lamp

The subject temperature is regulated through temperature feedback control. JAMA’s testing method, “In-car VOC Testing Method (for passenger cars)” can be set as the testing process.

VOC: Volatile Organic Compounds

Vehicle environmental testing

**Light source:** Simulated Solar Lighting Metal Halide Lamp, Halogen Lamp (with IR cut filter)

This system supports various environmental tests (positioning system, rotation mechanism) and can be rotated horizontally and raised or lowered to reproduce sunlight radiation from all angles.

Our various light sources are used for vehicle performance testing.

From individual parts to vehicles (large automobiles), we can design a system specific to the desired target size and required test process.
Optical Application Technology

**UV/EB Sterilization Systems**

The UV/EB Sterilization Systems, which utilize the sterilizing action of UV rays, are effective on all types of germs and provide a safe and effective sterilization method. A range of various sterilization methods is available including "surface sterilization," "running water sterilization," and "air sterilization."

**Lights for plant cultivation**

Artificial light can be utilized in nurseries and controlled horticulture.

**UV Cleaning System**

Utilizing wavelength range of 200nm or less and 254nm wavelengths, this UV cleaning system is used in the removal of organic substances on glass surfaces, the pre-cleansing of base materials (glass), and the improvement of coating film adhesion.

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**Ultraviolet range**

<table>
<thead>
<tr>
<th>UV-C</th>
<th>UV-B</th>
<th>UV-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>254</td>
<td>280</td>
<td>315</td>
</tr>
</tbody>
</table>

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**EB Irradiation System**

It is used in various industrial fields and is highly praised for enabling metallization, production of magnetic media and modification of plastic films by using the effect of EB irradiation such as hardening, bridging and flowing of substances. Its compact design has achieved an easy in-line application.

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For details, please see our catalog.
**Specialized Heating Halogen Heater**

With quick halogen bulb start-up and effective energy radiating properties, this halogen heater is used in various heat processing measures. We also provide water-cooled heating halogen that allows for production line speed-up and space saving with the achievement of a high watt density (100W/cm) lamp.

**High Speed Photographic Lighting System**

This lighting system is ideal for automobile crash safety facilities. It features high-lumen simulated solar light radiation without flicker.

**Reflective LED**

We have developed high-intensity LED lamps for infrared/visible light using our proprietary LED lamp manufacturing technology. The EYE High Luminance Reflector LED lamps utilize a revolutionary structure with a reflective function based on precision optics design. Compared to conventional resin lens LED lamps, in general use, the forward light extraction efficiency is 2 to 5 times greater and succeeds at bringing out the maximum performance level in light-emitting devices.

For details, please see our catalog.
http://www.iwasaki.co.jp/

IWASAKI ELECTRIC CO., LTD.

Headquarters
3-12-4, Shiba, Minato-ku, Tokyo, 105-0014, Japan
Ph: +81-3-3452-5351 (main switchboard), FAX: +81-3-3769-8446

Contact: Applied Optics Sales Department
Seio Building 2nd Floor, 2-1-28, Shiba, Minato-ku, Tokyo 105-0014, Japan
Ph: +81-3-3769-8448 FAX: +81-3-3769-8445 E-mail: iwasaki-ite@eye.co.jp

US Applied Optics
EYE Lighting International of North America
9150 Hendricks Rd., Mentor, Ohio 44060
Ph: (440) 350-7000 Fax: (800) 811-7395
E-mail: sales@eyeappliedoptics.com http://www.eyesolarlux.com