Solar Simulator (350-1100nm)  
HAL-320

High approximation of solar spectrum with AM1.5G, compact design and fiber illumination

Features

- JIS* Class AAA solar simulator (350-1100nm)
- Built-in AM1.5G filter
- Flexible illumination by light guide
- Adjustable light intensity
- Self-contained lamp and power supply
- No need of optical axis alignment
- External controller
- RS232C remote control

*SIS, Japanese industrial standards is equivalent to IEC.
Our unique fiber output method enables the use in various experimental configurations

The solar simulator HAL-320, includes an AM1.5G filter, is a compact design and easy-carrying. Fiber output system enables flexible design of experiment: combination with a glove box, a prober, manufacturing line and so on.

Compact and Easy-carrying

Compact and Easy-carrying

Flexible Configuration with Light Guide

Glove box
- Custom light guide
- Gauge port

Prober
- HAL-320
- Microscope
- Solar cell
- Source meter

Mobile solar simulator
- Solar cell
- Production line
- Source meter

Applications

Solar simulator for various inspection and research

Artificial photosynthesis

Solar cell research

Photocatalytic research

Current

Energy

Sythesis

Electron

H2O

O2

CO2

H

Splitting

Solar simulator

Solar simulator

Solar simulator
Compact solar simulator achieves Class AAA with fiber output system

### Spectral Match

Our own designed AM1.5G filter corrects xenon emission lines according to Class A. This simulator can evaluate not only a crystal type, also dye-sensitized solar cells, CIGS and so on.

JIS C 8912-2011

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>Energy Distribution (%)</th>
<th>Spectral Match</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 - 500</td>
<td>17.1</td>
<td>18.4</td>
<td>0.93</td>
</tr>
<tr>
<td>500 - 600</td>
<td>19.9</td>
<td>19.9</td>
<td>1.00</td>
</tr>
<tr>
<td>600 - 700</td>
<td>18.4</td>
<td>18.4</td>
<td>1.00</td>
</tr>
<tr>
<td>700 - 800</td>
<td>15.3</td>
<td>14.9</td>
<td>1.03</td>
</tr>
<tr>
<td>800 - 900</td>
<td>11.5</td>
<td>12.5</td>
<td>0.92</td>
</tr>
<tr>
<td>900 - 1100</td>
<td>17.8</td>
<td>15.9</td>
<td>1.12</td>
</tr>
</tbody>
</table>

*JIS, Japanese industrial standards is equivalent to IEC.

### Uniformity

The calculated value of 1SUN in the range of 400-1100nm is about 75mW/cm². Working distance: about 370mm

You can obtain Class A uniformity in the area 30x30mm with 1 SUN intensity when you set the ND control by about 70% of initial lamp as described in the right figure (factory default setting). Light intensity decline due to a lamp life can be adjusted by light intensity control. Above the size of Class A area is reference value. Please note that the output of lamp varies among the manufacturing lots.

The values shown in parenthesis are the values of illumination at the recommended size. In this case, it needs to check the light intensity separately.

### Temporal Stability of Irradiance

There is less flicker and stable output at long times.

*10 minutes measurement after turning on the lamp for 30 minutes.

*The values are for reference only.

*If you use the HAL-320 for a long time, we recommend that you use the constant-voltage power supply so that the HAL-320 is not influenced by the change of load.

### JIS Classification

<table>
<thead>
<tr>
<th>Item</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positional uniformity of irradiance (%)</td>
<td>≤±2</td>
<td>≤±3</td>
<td>≤±10</td>
</tr>
<tr>
<td>Temporal stability of irradiance (%)</td>
<td>≤±1</td>
<td>≤±3</td>
<td>≤±10</td>
</tr>
<tr>
<td>Spectral match</td>
<td>0.75 - 1.25</td>
<td>0.6 - 1.4</td>
<td>0.4 - 2.0</td>
</tr>
</tbody>
</table>

### Target Solar Cell

The HAL-320 is suited for the evaluation for development and prototype of next-generation solar cell.

### RS232C Remote Control

The HAL-320 can be controlled remotely via RS232C.

### User-friendly External Controller

The HAL-320 is controlled by our proprietary controller. Various functions can be easily controlled just by pressing the control buttons of the controller and it has a comprehensive display.

< Operation contents >
1. Shutter function Open/Close
2. Timer function
3. Light intensity adjustment etc.

< Connection image >
HAL-320 cable
PC

The HAL-320 is controlled by our proprietary controller. Various functions can be easily controlled just by pressing the control buttons of the controller and it has a comprehensive display.
**Options**

### Stand for Collimator Lens

**Dimensions**

### High Condensing Lens

<table>
<thead>
<tr>
<th>Type</th>
<th>2.5mm dia.</th>
<th>4.5mm dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>KLG-2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KLG-4.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Telecentric uniform illumination unit

### Light Guide (TPO)

This light guide is the option for bringing a light into a glove box. The gauge port is equipped.

### Package Contents

- HAL-320 main unit
- Lamp cartridge
- Quartz light guide (1m)
- Light guide adapter
- Collimator lens
- Controller
- Controller cable (2m)
- AC cable (3m)
- RS232C cable (1.8m)
- Instruction manual

### General Specifications

**Model:** HAL-320  
**Output wavelength:** 350 - 1100nm  
**Circuit method:** Switching power supply  
**Input voltage:** AC100 - 240V 50/60Hz (Input range: AC90 - 264V)  
**Apparent power:** Less than 510VA (AC100V/50Hz)  
**Lamp type:** Compact xenon lamp 300W  
**Lamp voltage, current:** 14V, 21A (DC) *Representative value  
**Lamp life:** 500h (Average)  
**Optical axis alignment:** Cartridge type (Alignment-free)  
**Cooling method:** Forced air cooling  
**Shutter:** Solenoidal drive  
**Exposure time control:** 100 - 30 (Steps)  
**Light intensity control:** Continuously variable  
**Air Mass filter:** Air Mass 1.5G filter  
**Emitting method:** Bundled light guide  
**Controller:** Remote controller (Cable length=2m)  
**Remote control:** RS232C *The cable must be less than 3m.  
**Safety mechanism:** Xenon lamp problem, Top door is open, Lamp usage exceeds 500 hours, Cooling fan problem, Temperature anomaly  
**Recommended environment:** Temperature 10 - 35 deg C  
**Humidity:** 20 - 80% *Avoid condensation  
**Dimensions:** Main unit 200(W) x 300(D) x 292(H)mm  
**Controller 160(W) x 37(D) x 99(H)mm  
**Weight:** Main unit 11.3kg  
**Controller 0.6kg (including cable)  

### 1 SUN Checker CS-20

1 SUN Checker is used for checking the light intensity (1 SUN) of HAL-320. It is battery operated and portable.

### Light Guide (TPO)

This light guide is the option for bringing a light into a glove box. The gauge port is equipped.

### Dimensions

**Main unit**

**Light guide**

**Controller**

**Collimator lens**

*Product specifications are subject to change without notice.*