

## Sun 3000 Solar Simulators

### Cost effective and versatile UV to IR sources



Abet Technologies Model 11000A Sun 3000 55 x 55 mm Solar Simulator.

### Innovative and complete

Abet Technologies' Sun 3000 family of Class AAA Solar Simulators covers wide range of illuminated field sizes, 55x55 mm through 400x400 mm.

The Abet Gen II optical design dramatically increases the percentage of photons reaching the work plane. This higher optical efficiency allows the use of lower power lamps to illuminate a given size field, e.g. more than one AM 1.5G sun achieved with a 1 kW lamp over a 210x210 mm field.

All electronics are packaged in the lamp house – no clutter of high power cables to deal with. A digital shutter timer allowing both manual and external control is included.

Most units come with a built-in beam imaging accessory to assist in system alignment. Locking indicator dials on all the system controls provide for a reproducible and stable setup.

Standard maintenance, lamp or filter replacement, does not require any tools.

- Gen II Optics for High Efficiency Illumination
- Class A Spectral Match
- Class A Stability
- Class A Uniformity
- DC Xe Arc Lamp, 150W to 3 kW
- Wide range of Working Distances
- Full Spectrum/UV Switchable models
- Multi-sun output models
- Long Life Shutter Included
- Digital Shutter Timer Included
- Long Life Lamps
- HEPA Filtered Cooling

### Adaptable

Up-pointing and horizontal output direction models complement the standard down pointing ones.

Long working distances allow easy interface to glove boxes.

The compact design of the systems, combined with the long working distance optics, leaves the space below these instruments wide open for any sample positioning or testing equipment.

Beyond the standard AM 1.5 and AM 0 filters many other filters are offered to fine tune the spectral characteristics of the source for your particular application.

### Clean Cooling

Any dust or dirt particles introduced into an optical system can degrade system performance and shorten the life of critical optical components. Sun 3000 sources utilize a HEPA filtered cooling air to extend the life of the delicate optical components.

## Sun 3000 Solar Simulator Specifications, 1 sun models

Model #	Field size (mm)	Stability (%)	Uniformity (%)	Lamp (W)	Ozone free	Lamp life (hours)	Working distance (mm typ.)	Irradiance AM 1.5G suns (max. typ.)	AM 1.5G spectral match
11000A	55x55	0.5	2	550	☑	1500	200±50	2.0	A
11016A	110x110	0.5	2	550	☑	1500	300±50	1.3	A
11018A	160x160	0.5	2	1000	☑	1500	300±50	1.3	A
11044A	210x210	0.5	2	1000	☑	1500	200±50	1.3	A
11046A	254x254	0.5	2	1400	☑	1500	200±50	1.3	A
11048A	300x300	0.5	2	2000	☑	2000	400±75	1.3 (2.1) <sup>1</sup>	A

<sup>1</sup>With the 3kW lamp

The Sun 3000 models listed above are most popular with our customers. They deliver one sun irradiances over the lamp lifetime and limit UV exposure by utilizing an N-BK7 condenser lens. However, if your test needs require a Class AAA multi-sun level of irradiance or UV content matching AM0 or terrestrial atmospheric UV edge see page 16 in this brochure. The above are the most popular field size models. Please let us know if your needs require a different one – many additional square and rectangular shaped field size systems have been manufactured.

### Certified

Each Sun 3000 Solar Simulator ships with a performance certificate according to the applicable ASTM, IEC and JIS standards.



**Certificate of Compliance** 15-Aug-2012  
 Product: Sun 3000 Solar Simulator Model 11018A SN 343  
 Applicable Standards: ASTM E 927-10; IEC 60904-9 ED. 2.0; JIS C 8912

**Spectral fit**

Band	Error	Class A limits	Status
400-500 nm	-3.3%	25%	Pass
500-600 nm	2.4%	25%	Pass
600-700 nm	1.0%	25%	Pass
700-800 nm	-2.7%	25%	Pass
800-900 nm	-1.9%	25%	Pass
900-1100 nm	3.6%	25%	Pass

**Nonuniformity**

Field	Nonuniformity	Class A limit	Status
160x160	1.9%	2%	Pass

**Instability**

Period	Instability	Class A limit	Status
0.5 sec	0.36%	0.5%	Pass
10 min	0.95%	2.0%	Pass

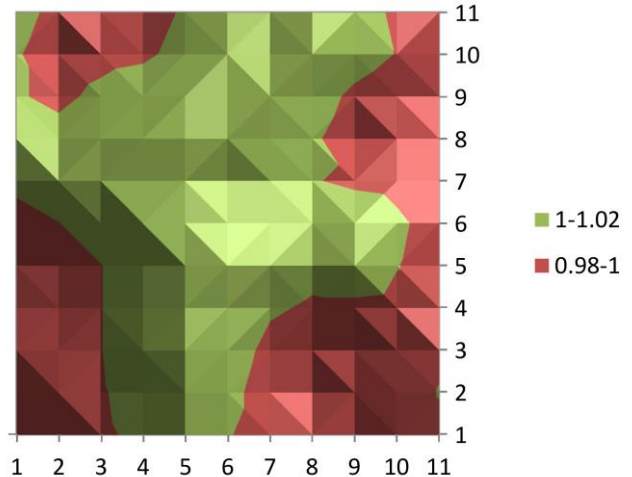
**Irradiance:** 1 Sun at 36.5 A  
 Reference cell used: ReRaRef 6

**System Class:** AAA  
  
 Signature

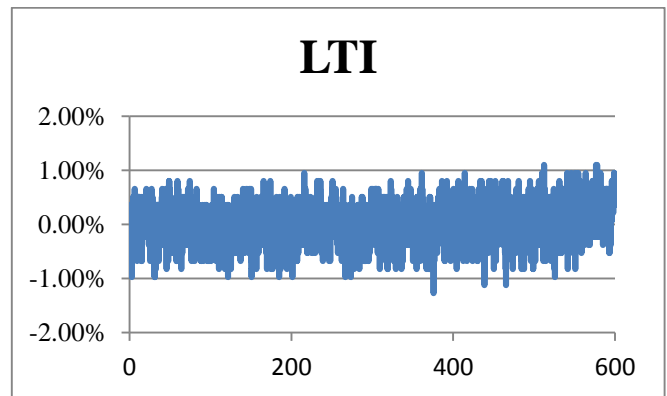
### Available Options

All models listed above include an AM 1.5G filter for ordering convenience. Other filter options can be substituted or added at the time of ordering.

Working distances listed above are typical. Systems can be optimized, at no extra cost, at other distances. In particular, the up-pointing and horizontal output models are often shipped with longer working distances to accommodate a glove box or more complex test bench requirements.



Non-uniformity map of an Abet Technologies model 11018A Solar Simulator, 160x160 mm, 1.6%.



Output stability, 10 min, of Abet Technologies model 11018A Solar Simulator, 1.1%

## Sun 3000 Solar Simulators, High Output and UV models

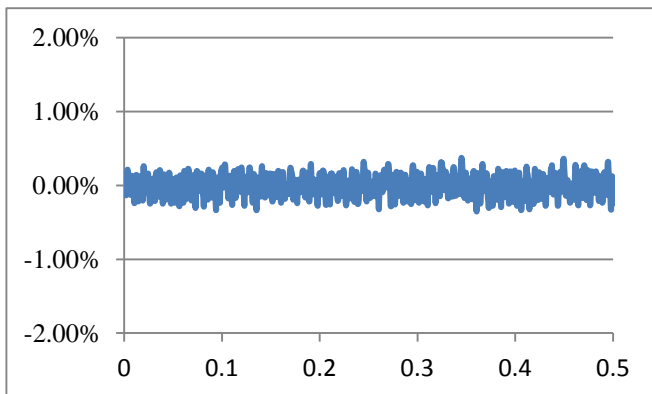
Model #	Field size (mm)	Stability (%)	Uniformity (%)	Lamp (W)	Ozone free	Lamp life (hours)	Working distance (mm typ.)	Irradiance AM 1.5G suns (max. typ.)	AM 1.5G spectral match
11038A	55x55	0.5	2	1000	<input checked="" type="checkbox"/>	1500	200	4	A
11040A	110x110	0.5	2	1000	<input checked="" type="checkbox"/>	1500	300	2	A
11060A	160x160	0.5	2	1400	<input checked="" type="checkbox"/>	1500	300	1.8	A

The above table shows a sampling of more than one sun Class AAA systems available from Abet Technologies. If they do not satisfy your requirements please let us know what your needs are. For those who require a full UV content in their solar simulators Abet offers systems with a Fused Silica condenser lens. Add "-1" to model number for 280-400 nm Dichroic Reflector equipped units to allow accelerated UV aging tests without excessive heating of the test devices. The "-2" Full Spectrum (280-2500 nm) units are most often used with an AM 0 filter for testing of extraterrestrial solar cells. The "-3" systems allow operation in either mode – full spectrum or 280-400 nm by a simple swap of frame mounted reflectors. This option can be customer added to either "-1" or "-2" models when the need arises.

### Available Options

Many combinations of lamp power levels and field sizes can be easily assembled without any additional engineering charges. For field sizes up to 254x254 mm any of the standard lamps, 150W, 300W, 550W, 1000W, or 1400W can be used, when matched to the appropriate power supply selection, to obtain a wide variety of irradiance levels. High UV output "-1" 280-400 nm models are often used for accelerated UV damage testing.

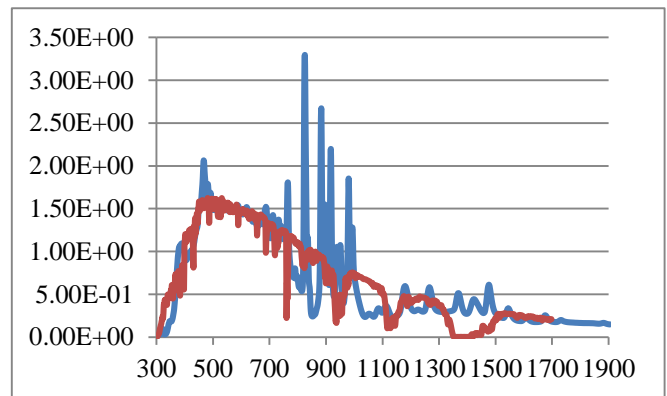
See the ordering information on page 17 for a list of standard options. Please contact Abet if you need something different.



Output stability, 0.5 min (STI), of Abet Technologies model 11018A Solar Simulator, 0.36%

### Spectrally corrected

A number of filter options are available for these systems to match their performance to the test requirements: AM 0 filter for extraterrestrial cells, Atmospheric Edge (AE) filter for terrestrial cells with response below 360 nm and for life sciences, UVC, UVB/C, and UVA/B/C blocking filters for material and life sciences.



AM 1.5G filtered output of model 11016A system (blue) overlaid with the AM 1.5G spectrum (red).

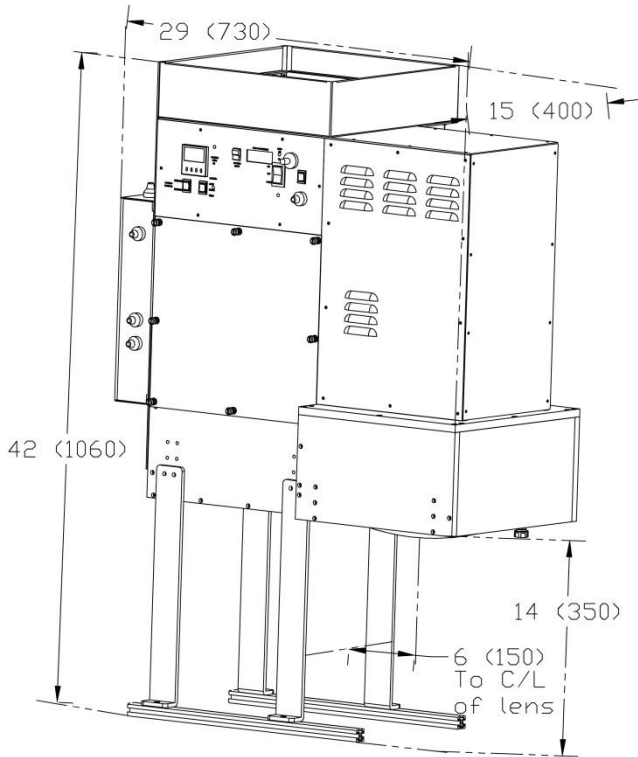
Band	Error	Class A limits	Status
400-500 nm	0.2%	25%	Pass
500-600 nm	-0.2%	25%	Pass
600-700 nm	-1.2%	25%	Pass
700-800 nm	-1.5%	25%	Pass
800-900 nm	-1.3%	25%	Pass
900-1100 nm	3.8%	25%	Pass

### 2015 Product update

Most of Abet Technologies' Solar Simulators achieve Class A stability without the need for Photofeedback function. For the few Sun 3000 models that do not the 11088 Photofeedback option is included with the system to assure Class AAA performance.

## Sun 3000 Specifications

Illumination field.....	55x55 to 400x400 mm
Irradiance.....	1 to 5 suns
Spectral Match with AM 1.5G, AM 0, AM 1.5D Filters	
ASTM.....	Class A
IEC.....	Class A
JIS.....	Class A
Temporal Stability	
ASTM.....	Class A
IEC.....	Class A
JIS.....	Class A
Irradiance uniformity	
ASTM.....	Class A
IEC.....	Class A
JIS.....	Class A
Ozone-free Xe Arc Lamp (included) .....	150 to 3000 W
Typical life .....	1500 hours
HEPA filtered cooling fan included	
Elapsed Time Meter (included)	
Universal Input 90-250V, 50-60Hz, power supply included	
Standard Output Direction.....	Down pointing



Dimensional diagram of the Abet Technologies model 11018A Sun 3000 Solar Simulator, 160x160 mm

## Ordering Information

All standard Sun 3000 Solar Simulators include a Lamp, a Universal Input 90-250V Power Supply, an AM 1.5G Filter and a N-BK7 condenser lens. Add "-2" for a Fused Silica condenser lens, "-1" for a 280-400 nm dichroic option, "-3" for a Full Spectrum/280-400 nm convertible unit; add "U" for up-pointing option, "H" for horizontal output.

- 11000A** 55x55 mm, 550 W, filter and lamp included
- 11038A** 55x55 mm, 1000 W, filter and lamp included
- 11016A** 110x110 mm, 550 W, filter and lamp included
- 11040A** 110x110 mm, 1000 W, filter and lamp included
- 11018A** 160x160 mm, 1000 W, filter and lamp included
- 12060A** 160x160 mm, 1400 W, filter and lamp included
- 11044A** 210x210 mm, 1000 W, filter and lamp included
- 11046A** 254x254 mm, 1400 W, filter and lamp included
- 11048A** 300x300 mm, 2000 W, filter and lamp included

### Accessories and options

- 11080** AM 0 filter, Ø 3 in.
- 11079** AM 1.5G filter, 70x70 mm
- 11084** AM 1.5D filter, 70x70 mm
- 11057** AM 1D filter, Ø 3 in.
- 11059** AM 2D filter, Ø 3 in.
- 11060** UVA/B/C Blocking Filter, Ø 3 in.
- 11063** AE filter (Atmospheric Edge), Ø 3 in.
- 12163** AE filter for 300x300 mm systems
- 11064** UVC Blocking Filter, Ø 3 in.
- 11065** UVB/C Blocking Filter, Ø 3 in.
- 11068** Beam Attenuator <sup>1</sup> - 21%
- 11069** Beam Attenuator <sup>1</sup> - 33%
- 11070** Beam Attenuator <sup>1</sup> - 50%
- 11071** Beam Attenuator <sup>1</sup> - 60%
- 11072** Beam Attenuator <sup>1</sup> - 67%
- 11073** Beam Attenuator <sup>1</sup> - 77%
- 11075** Attenuator Set - All Six Attenuators <sup>1</sup>
- 12185** System Elevator, Adjustable Height Mount
- 13014** 150 W Xenon Arc Lamp
- 13020** 300 Watt Xenon Arc Lamp, OF
- 13021** 550 Watt Xenon Arc Lamp, OF
- 13024** 1kW Xenon Arc Lamp, OF
- 13025** 1.4kW Xenon Arc Lamp, OF
- 13026** 2.0kW Xenon Arc Lamp, OF
- 13027** 3.0kW Xenon Arc Lamp, OF
- 11051** Replacement HEPA filter

<sup>1</sup> For 150 W and 550 W lamps only

Abet Technologies regularly continues to upgrade our products, therefore all specifications are subject to change without notice.

Abet Technologies offers an expanding line of ASTM, IEC and JIS standards compliant products for solar cell PV-IV testing, steady state solar simulators, test stations, software, calibrated reference cells and a selection of electronic loads for low and high current cells. Visit [www.abet-technologies.com](http://www.abet-technologies.com) or contact us at [sales@abet-technologies.com](mailto:sales@abet-technologies.com).