

# QuickSun<sup>®</sup> 800 - Series Module Solar Simulators



Flash generator add-on

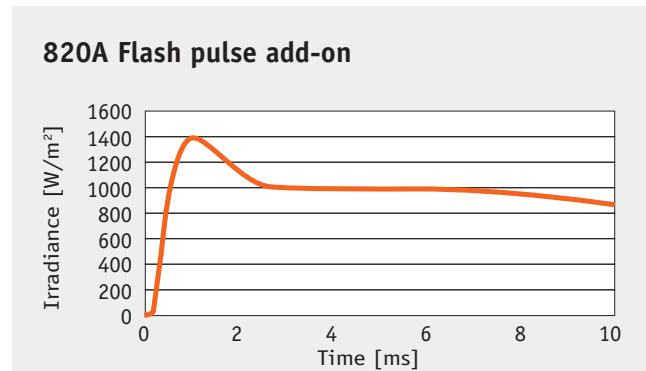
## Class A Performance

QuickSun 800-Series simulators use Xenon flash tubes for simulating solar irradiation. Complete IV-characteristics are recorded during one flash at desired intensity level when module is swept electronically from short circuit to open circuit.

In order to comply with the Class AAA tolerances of the standard IEC 60904-09, ed. 2, proprietary optics has been developed for filtering the spectrum and improving irradiance non-uniformity. Since voltage, current and irradiance signals are recorded simultaneously, Short Term Instability (STI) is inherently 0% and in A class.

800-Series simulators are routinely applied to measure standard mono/polycrystalline silicon, or a-Si, CdTe and CIS/CIGS PV modules. The measurement of thin film materials only requires filtering of the monitor cell in order to comply with the spectral response of the material to be measured.

All 800-Series simulators can be equipped, or later upgraded, with an Add-on flash generator and flash tube. This increases duration of IV recording and improves Long Term Instability (LTI) which is necessary when testing high capacitance PV materials.



	810A	820A	830A	850A
<b>Max module size</b> [cm x cm]	80 x 125	120 x 200	150 x 220	220 x 260
<b>Testing capacity</b> [meas/hr]	150	120	90	60
<b>Flash tunnel</b> [cm x cm x cm]	390x160x250	465x240x250	555x250x270	650x280x320
<b>Flash pulse duration</b> [ms]	20	15	12	10
<b>IV data recording duration</b> [ms]	2 / 7*	2 / 5*	2 / 4*	2 / 3*
<b>Irradiance range</b> [W/m²]	200 - 1200	200 - 1000	200 - 1000	200 - 1000
<b>Flash tube lifetime**</b> [flashes]	50 000	40 000	40 000	30 000
<b>Number of flash tubes</b>	1 / 2*	1 / 2*	1 / 2*	2

### IEC904-9 ed. 2 compliance

<b>Spectrum</b> < ± 25%	A	A	A	A
<b>Non-Uniformity</b> < ±2%	A	A	A	A
<b>Short term instability (STI)</b> < 0.5%	A	A	A	A

<b>Long term instability (LTI)</b> < ±2%	A	A	A	A
<b>Non-uniformity test positions</b>	4 x 6	5 x 8	5 x 7	6 x 7

\* With add-on flash generator

\*\* on average

## Load and sampling

QuickSun electronics records voltage, current and irradiance signals when voltage is linearly swept from short circuit to open circuit. Simultaneously module temperature is measured

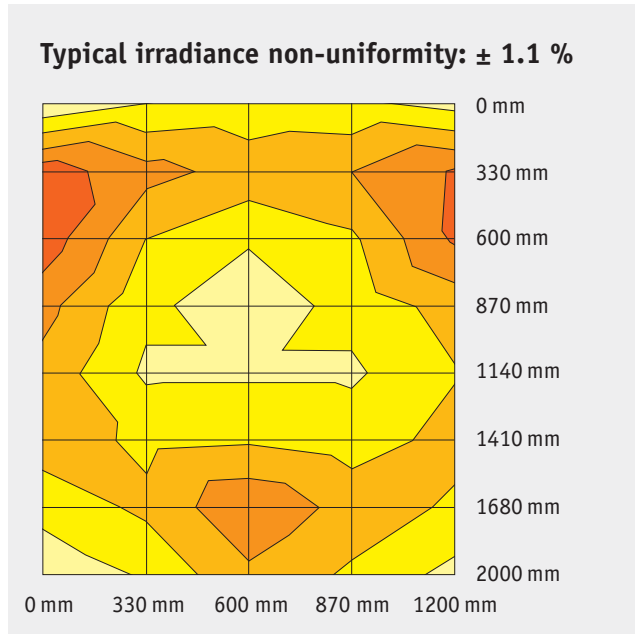
either indirectly by ambient temperature measurement or by an IR sensor. Dark reverse IV characteristics can be recorded with an optional power source.

<b>Contacting</b>	4-wire / Kelvin	
<b>Load element</b>	feedback controlled MOSFET	
<b>Voltage sweep</b>	Linear Isc -> Voc / 2 - 7 ms	
<b>Bias power source</b>	0 - 4.5 V	
<b>Voltage measurement</b>	1 - 100 V (other scales on request)	accuracy 0.2 % / 512 samples
<b>Current measurement</b>	0.5 - 25 A (other scales on request)	accuracy 0.2 % / 512 samples
<b>Irradiance measurement</b>	200 - 1200 W/m²	resolution 1 W/m² / 512 samples
<b>Module temperature</b>	0 - 75 °C	accuracy 1 °C
<b>Monitor cell temperature</b>	0 - 75 °C	accuracy 1 °C

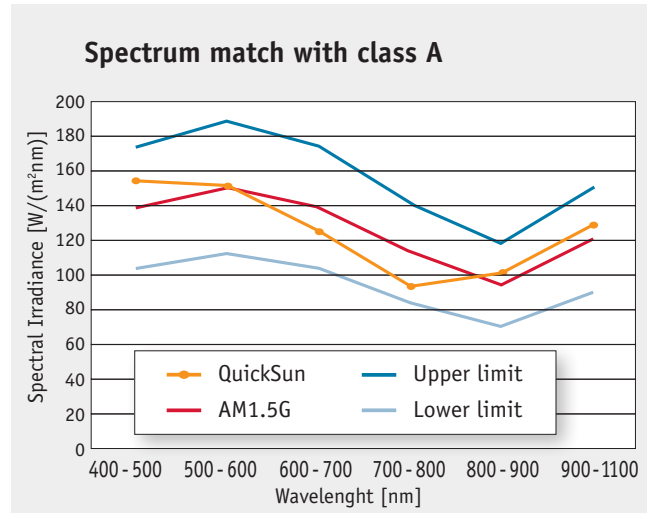
# Simulator Testing

Every QuickSun simulator is thoroughly factory acceptance tested (FAT) before dispatching the system to the client's site. The test results are included with the simulator docu-

mentation assisting the module manufacturers to convince their clients that modules are tested with a true Class AAA simulator.



Non-uniformity is measured by recording the short circuit current distribution of a laminated c-Si cell over specified test area. Same test can be easily reproduced at client's site by using the test sensor and Quicksun software tools provided with the simulator.



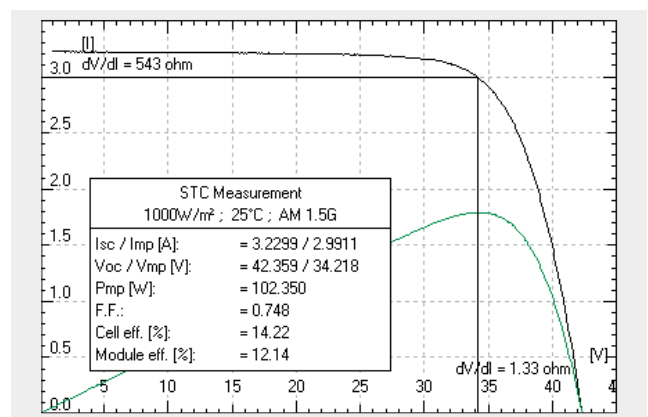
Spectrum of every simulator is recorded and compared to comply with the Class A tolerances as specified in IEC904-9 ed.2.

Voltage, current and temperature measurement accuracies are calibrated and verified to comply with IEC904-1 ed. 2 specifications. Irradiance measurement accuracy is factory calibrated but final calibration is performed on-site by applying client's certified reference modules.

## QuickSun software

QuickSun software is designed to provide flexibility for different end-users, from fully automated large scale production lines to smaller factories and research institutes. It combines a diverse range of options for control and data handling to ease in use and simplicity. Full remote control of the software is possible through a TCP interface, and measurement data is conveniently transferred to an external database using an ODBC interface.

Classification of measurements based on all key performance parameters is readily available. QuickSun also analyses curve derivatives for shunt and series resistance evaluation, measures series resistance according to IEC 60891,



and has easy-to-use features for irradiance non-uniformity measurement.

### Remote control and saving options

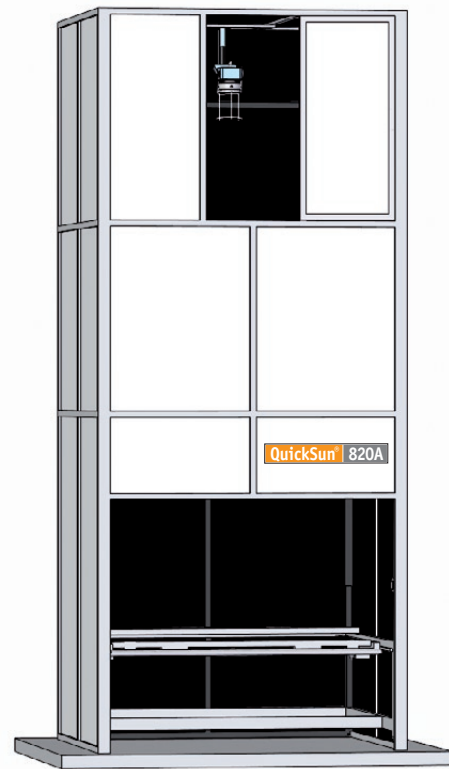
Interface	Function	Description
TCP	Data / Control	Total Control of QuickSun simulator with client/server TCP protocol. Measurement data in reply messages.
Digital Automation Interface, QS-DAI*	Control	Control of QuickSun simulator by digital signal. Generally used together with External Database.
Data export	Data	Exporting of measurement data in CSV -style.
External database, ODBC	Data	Sending of measurement data and characteristics to a SQL database with ODBC interface.
Label printing*	Data	Data exchange and printing control of Codesoft label design software.

\* Optional

## Installation Alternatives

800-Series simulators can be installed either horizontally or vertically and instructions for constructing a corresponding flash tunnel or tower are supplied with the simulators.

Flash tunnel gives easier access to the flash head e.g. for changing the flash tube but takes more factory space. A test surface with fixed test sensor positions covering the nominal test area of each simulator is an essential part in order to perform fluent and reproducible irradiance non-uniformity measurements.



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	<b>France</b>	<b>Equipements Scientifiques S.A.</b> www.es-france.com
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