

ISOS testing laboratory

infinityPV ApS offers a **complete testing laboratory for characterization of the solar cell lifetime behavior**. Intrinsic and operational stability for solar cell devices are described through reporting the performance of a series of devices subjected to several different test conditions. Until now this has been achieved through use of a number of laboratory equipment.



The ISOS test laboratory is an **all in one “turn-key” package** comprising: ISOSun solar simulator, test chamber, multiplexed SMU, a powerful software package, and all needed accessories. With the ISOS testing laboratory you do not need to spend a fortune to **fully characterize novel PV technologies such as organic, kesterite, perovskite, dye-sensitized and quantum dot solar cell technologies**. It can easily be complemented with our LBIC systems that powerfully highlight failure modes from ingress, delamination, bubble formation once failure is established with the ISOS testing laboratory. Our LBIC systems are both a good companion and powerful “eyes” on the device highlighting where it functions correctly and where it does not.

Key highlights:

- Full testing possibilities for ISOS-D-1/2/3, ISOS-L-1/2/3, ISOS-O-1/2/3
- Full ISOS testing of up to 40 solar cells simultaneously
- Data analysis and reporting
- Large illuminated areas
- Turn-key package comprising ISOSun, ISOS-L-3 chamber, ISOS-D-2, ISOS testing laboratory hardware, SMU, DAQ and MUX, cables & connectors, and software
- Optionally we can include weather station and thermal cycling hardware



At the heart of the ISOS testing laboratory is the ISOSun solar simulator that presents a very high degree of homogeneity over the large area (Class A over 10 cm x 10 cm, Class B over 32 x 32 cm), a very high degree of temporal stability (Class A), and good spectral match qualified for ISOS testing employing a stable metal halide light source. The ISOSun is designed for continuous operation for many years and is very safe in use with little emission of light, no interference with adjacent equipment or experiments, and has a flexible test compartment allowing easy access of any testing probe (wires, hoses, gas etc.) and of course the ISOS-L-3 humidity chamber. The optional outdoor platform is interfaced with the system allowing for simultaneous recording of data outdoor and indoor. Weather data (if available) and test conditions are stamped into the IV-data. It is a completely integrated system with no extra parts needed and has multiple integrated light, humidity and temperature monitoring sensors with easy control over light intensity and chamber temperature. Finally, it has an industry 4.0 ready test software package and present simple interfacing to robotics. We are proud to state that no competitors can match our current quality, adaptability, price, and flexibility in our range of solar simulators.



Photographs showing the typical setup of an ISOS-L-3 experiment. (1) First the device is mounted inside the ISOS-L-3 chamber and then the top plate is added. (2) The ISOS-L-3 chamber is carefully inserted into the test compartment of the ISOSun and water is added. You then switch on the solar simulator and run the preinstalled software.

Training, service and support:

Included in the ISOS test laboratory is a full day workshop where you learn how to operate the system and how to accurately report the data. Once in your laboratory we offer service using phone or skype on a 24/7 basis and we guarantee shipping of spare parts to Europe, US and RoW within 2 working days using DHL (islands and remote areas excluded).

ISOS tests and what you get

There are nine ISOS tests that the ISOS test laboratory grants access to fully in compliance with the ISOS consensus [Sol. Energy Mater Sol. Cells 95 (2011) 1253]. As supplied the 40-channel system has dedicated channels to certain functions while you can of course configure this as required. In the standard configuration there are channels used for recording conditions (temperature, light intensity and humidity) and weather data. This data is always available as the system is running.

	SOLAR SIMULATOR	SOURCEMETER	PC WITH IV SOFTWARE	MULTICHANNEL KIT	CHAMBER
ISOS-D-1		✓	✓	✓	✓
ISOS-D-2		✓	✓	✓	✓
ISOS-D-3		✓	✓	✓	✓
ISOS-L-1	✓	✓	✓	✓	
ISOS-L-2	✓	✓	✓	✓	
ISOS-L-3	✓	✓	✓	✓	✓
ISOS-O-1		✓	✓	✓	
ISOS-O-2		✓	✓	✓	
ISOS-O-3		✓	✓	✓	

ISOS codes in brief

The required environmental conditions and equipment for the different ISOS guidelines are outlined in the table below.

ISOS CODE	TEMPERATURE (°C)	RELATIVE HUMIDITY (%)	EXPOSURE TO LIGHT	CHARACTERIZATION LIGHT SOURCE
ISOS-D-1	Ambient	Ambient	-	Solar simulator
ISOS-D-2	85 °C	Low	-	Solar simulator
ISOS-D-3	85 °C	65 %	-	Solar simulator
ISOS-L-1	Uncontrolled	Low	Simulated light	Solar simulator
ISOS-L-2	65 °C	Low	Simulated light	Solar simulator
ISOS-L-3	85 °C	Near 50 %	Simulated light	Solar simulator
ISOS-O-1	Outdoor	Outdoor	Sun light	Sunlight
ISOS-O-2	Outdoor	Outdoor	Sun light	Solar simulator
ISOS-O-3	Outdoor	Outdoor	Sun light	Sunlight & solar simulator
ISOS-T-1*	Between 25 °C and 65/85 °C	Ambient	-	Solar simulator
ISOS-T-2*	Between 25 °C and 65/85 °C	Ambient	-	Solar simulator

* Note: The thermal cycling hardware for ISOS-T-1 and ISOS-T-2 are available as options