

# PVIV Test Solution



- Complete I-V measurement solutions for photovoltaic cells
- Works with all Oriel solar simulators
- Easily integrated with Oriel solar simulators in the field
- Easy-to-use LabVIEW™ based I-V characterization software

The Oriel® Instruments I-V Test Station takes a modular approach to I-V measurements. Today's photovoltaic devices incorporate a wide range of efficiencies, where one application may require only a small area and generate a higher current, or another may require a large area of illumination but generate low current. To address this, Oriel has created basic IV systems that incorporate an appropriate sourcemeter, cabling, interface, and measurement software into separate models for 1 amp, 3 amps, 5 amps, or 10 amps. The choice of model is based on the current generated by the device.

Oriel's PVIV-2.1 software works with all configurations to perform I-V measurements and calculate critical parameters such as short circuit current ( $I_{sc}$ ), current density ( $J_{sc}$ ), open circuit voltage ( $V_{oc}$ ), fill factor ( $ff$ ), maximum output power ( $P_{max}$ ), cell efficiency, and other standard photovoltaic cell parameters.

In addition, Oriel offers a wide range of solar simulators, sampling chucks, probing devices, and test stations which allow the user to customize a complete I-V solution that meets every need. A typical configuration should include the appropriate IV system, a calibrated reference cell, some type of cell holder, and electrical probing capability, depending upon the test sample's requirements. A vacuum pump and a circulating water bath are available options and may be purchased separately as needed. Oriel IV Test solutions are all designed to work with any Oriel solar simulator.



The current generated by the cell under test determines which model (1 amp, 3 amp, 5 amp, or 10 amp) is appropriate. The user can mix and match the correct cell holder size, solar simulator size, and current (amp) requirements as well as the accessories needed to put together a complete test station.

Among the accessory choices:

- Basic sample positioning chuck
- Temperature controlled vacuum chuck
- Electrical probing (single point)
- Chiller
- Calibrated reference cell
- Vacuum pump
- Optical table or work station

## CELL HOLDER ASSEMBLY

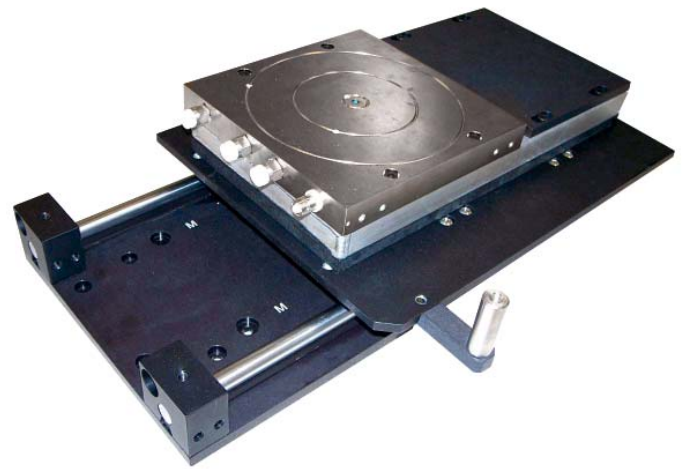
Various cell holders are available to allow for precise positioning of the device under test. These chuck assemblies are fixed in position with respect to the solar simulator beam. The cell position can be maintained with precision despite the simplicity of the design. Vacuum positioning capability and temperature control are available options on some models.

## REFERENCE CELL AND METER

A reference cell is a suggested option which consists of a calibrated reference solar test cell and a digital display where the measured solar simulator irradiance and the cell temperature are displayed. These values are entered in the software to accurately perform the I-V characterization. The calibrated reference cell can also be used independently of the I-V test station for tuning the solar simulator power level to other test conditions. The reference cell is also available as a separate item.



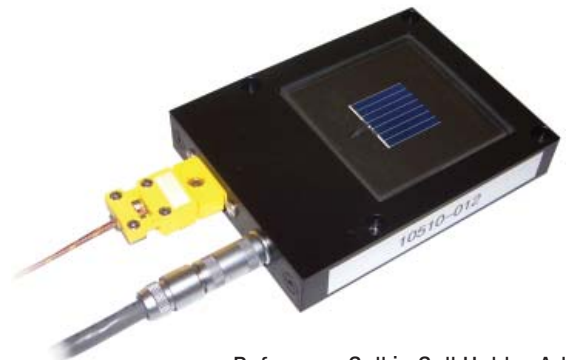
PVIV-VAC-CHUCK



PVIV-TC-VAC - Temperature Controlled / Vacuum Positioning Cell Holder for 2 x 2 through 6 x 6 Cells



Reference Meter



Reference Cell in Cell Holder Adapter

## SOFTWARE

The PVIV 2.1 is a LabVIEW® based I-V measurement software suite with an intuitive, easy to use interface. This updated version is compatible with Windows® 10 operating systems.

A number of critical cell performance parameters are calculated as well as displaying the raw I-V curve. Device ID and User Name can be easily entered from the main user interface, where the configuration set up and the raw data are easily saved into a tab delimited .txt file format report. The software menu also includes a Print Window function, so the measured plot can be printed.

Oriel I-V Test Station Version 2.1 functions include calculating critical parameters such as short circuit current ( $I_{sc}$ ), current density ( $J_{sc}$ ), open circuit voltage ( $V_{oc}$ ), fill factor ( $ff$ ), maximum output power ( $P_{max}$ ), maximum output voltage ( $V_{max}$ ), maximum output current ( $I_{max}$ ) cell efficiency ( $\eta$ ), shunt resistance 1 sun ( $R@I_{sc}$ ), series resistance 1 sun ( $R@V_{oc}$ ), shut resistance dark IV ( $R_{shunt}$ ), and other standard photovoltaic cell parameters.

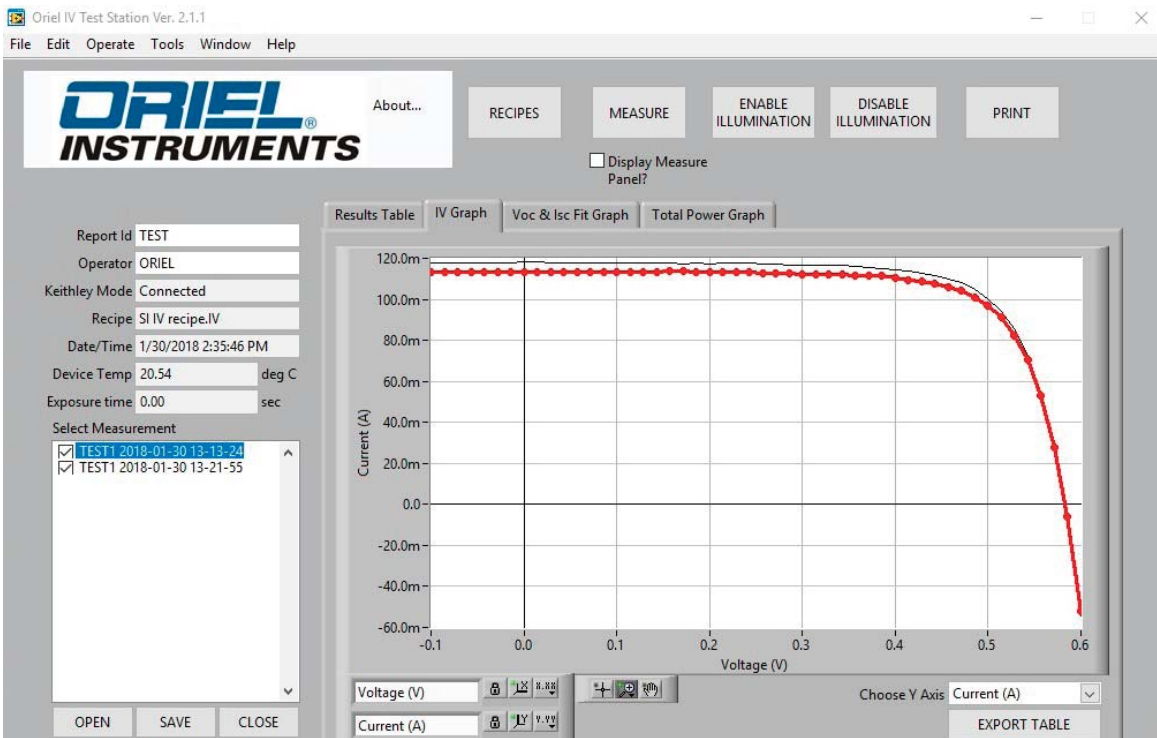
- Organization of measurement settings in “Recipes” which can be easily saved and recalled. This approach replaces that of using configuration settings and measurement settings, utilized in version 1.2 and earlier PVIV software

- Viewing of multiple IV measurement results simultaneously
- Multiple data presentation formats for enhanced visualization
- More complete results files stored in tab-delimited ASCII format
- Ability to load previously stored data from disk
- Option to perform “Dark IV” measurements
- Support for PVIV-10A-I-AMP current amplifier hardware

## COMPUTER

A computer is not supplied with the Oriel I-V test station. Minimum system requirements to run the software are listed below.

Operating System	Windows XP SP3 (32bit) Windows 7 (32bit or 64bit) Windows 10 (32bit or 64bit)
Processor	Minimum 2 GHz
Disk Space	600 MB
Memory (RAM)	2.0 Gb
Screen Resolution	1024 x 768
Communication Ports	USB
Peripherals	CD Drive



I-V Curve Obtained by the Oriel I-V Test Station

## SPECIFICATIONS

Model	PVIV-1A	PVIV-3A	PVIV-5A	PVIV-10A*
Electrical Interface	4-Wire	4-Wire	4-Wire	4-Wire
Voltage Range	200 mV - 200 V	200 mV - 60 V	200 mV - 40 V	±2.5 V
Current Range	1 µA - 1 A	10 µA - 3 A	10 µA - 5 A	-4 A - 10 A
Maximum Output Power	20 W	60W	50W	25W
Voltage Source Accuracy	0.02% across all voltage ranges			
Voltage Measurement Resolution	1 µV - 1 mV			
Current Measurement Accuracy	<0.23% across all ranges	<0.053% across all ranges	<0.11% across all ranges	<0.23% across all ranges
Current Measurement Resolution	10 pA - 10 µA	100 pA - 10 µA	100 pA - 10 µA	10 pA - 10 µA
No. of Measurement Points	2 - 1000			
Duration of IV Measurement	0.6 - 58 seconds			
Thermistor Temperature Accuracy	±0.25C at 25°C			
Software	LabVIEW® based application			
Measurements Performed	Voc, Isc, Jsc, Vmax, Imax, Pmax, efficiency, fill factor, Rsc, Roc, Rshunt, cell temp (start), cell temp (end), exposure duration, date and time			

\* Does not perform dark current measurement.

## ORDERING INFORMATION

PVIV-1A	I-V Test Station, 1 Amp Basic, No Cell Holding Chuck
PVIV-3A	I-V Test Station, 3 Amp Basic, No Cell Holding Chuck
PVIV-5A	I-V Test Station, 5 Amp Basic, No Cell Holding Chuck
PVIV-10A	I-V Test Station, 10 Amp Basic, No Cell Holding Chuck
91150V	Reference Solar Cell and Meter, 2 x 2 cm Calibrated with Fused Silica Window
91150-KG3	Reference Solar Cell and Meter, 2 x 2 cm Calibrated with KG3 Window
91150-KG5	Reference Solar Cell and Meter, 2 x 2 cm Calibrated with KG5 Window
PVIV-VAC-CHUCK	Height Adjustable Basic Cell Holder with Vacuum Plate (2 x 2 through 6 x 6)
PVIV-TC-VAC	Cell Holder with Temperature Control and Vacuum Positioning (2 x 2 through 6 x 6)
PVIV-VAC-PUMP	Vacuum Pump 110V
PVIV-VAC-PUMP-220	Vacuum Pump 220V
PVIV-CHILLER	Circulating Water Bath Chiller
PVIV-PROBE-KIT	Magnetic Electrical Probe Kit with X-Y Micro Control
PROBE-TIP-REPL	Replacement Tungsten Probe Tips (Package of 5)



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