

# Why RC22 is the Best Performing PV Reference Cell

## KEY TAKEAWAYS

- Highest accuracy PV reference cell
- Optimized for bifacial irradiance monitoring
- All-in-one solution for commercial & industrial PV

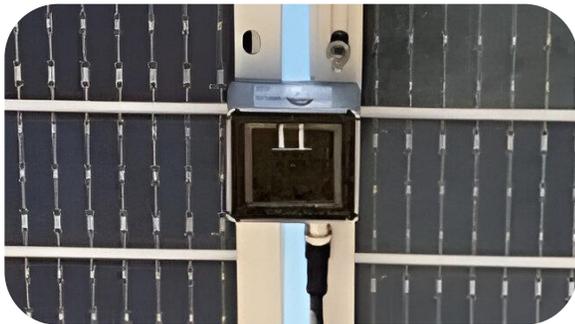
## WHAT ARE REFERENCE CELLS?

Solar reference cells are precise devices used to measure irradiance in photovoltaic (PV) systems. Reference cells mimic the performance of solar modules, including their spectral and angular response, making them highly suitable for monitoring plane-of-array (POA) irradiance in PV systems.

## APPLICATIONS

### *Bifacial Irradiance Applications*

With the rise of bifacial PV modules, reference cells have gained increased importance. Compact and spectrally matched sensors are ideal for measuring rear-side POA irradiance, accurately capturing the non-standard light spectrum reflected from varying ground cover.



### *Commercial & Industrial (C&I) Applications*

Reference cells are often used in commercial and industrial (C&I) solar installations as the primary irradiance sensor. Their low cost is a driving factor behind their selection in C&I power plants for the measurement of POA irradiance.

RC22 can be coupled with our maintenance-free Mars Optical Soiling Sensor to measure irradiance without any cleaning or local calibration.



Our product model RC22M is an all-in-one meteorological station for C&I power plants. This model has optional inputs for a wind speed sensor and back-of-module (BOM) and ambient RTD temperature sensors.



## Soiling Applications

Soiling measurement is another important application of PV reference cells. An RC22 can be paired with a second RC22 unit or a full-sized module to calculate the soiling ratio between a pair of clean and dirty devices.



RC22 is the best performing commercial reference cell in the world. It is specifically designed and calibrated for bifacial irradiance, commercial & industrial and utility-scale applications, and soiling measurement. For more product details, see [www.atonometrics.com/products/rc22-pv-reference-cell](http://www.atonometrics.com/products/rc22-pv-reference-cell).

## ABOUT ATONOMETRICS

Atonometrics is a world leader in measurement technology for PV performance. The company was founded in 2007 in Austin, Texas, USA, and has provided thousands of measurement products to customers in over 50 countries.



## PERFORMANCE

### Accuracy

Irradiance is the most important metric for solar performance monitoring. The RC22 series adheres to the requirements of IEC 60904-2 as a PV working reference device and meets the Class A requirements of IEC 61724-1. Its measurement uncertainty is less than 2% at 1000 W/m<sup>2</sup>, and it's stable to less than 0.5% per year.

### Zero Offset

An ultra-low zero offset is crucial for PV reference cells to make accurate irradiance measurements. This is especially important for rear-side irradiance measurements in bifacial systems. RC22 automatically resets its zero offset to less than 0.2 W/m<sup>2</sup> before every measurement.

### Light Soaking (Metastability)

A PV cell's response can change significantly when first exposed to sunlight due to metastability. All RC22 series reference cells are exposed to simulated sunlight (light soaked) for over 24 hours to ensure proper calibration during production.



## FEATURES

### Dual Calibration for Front and Rear POA Irradiance

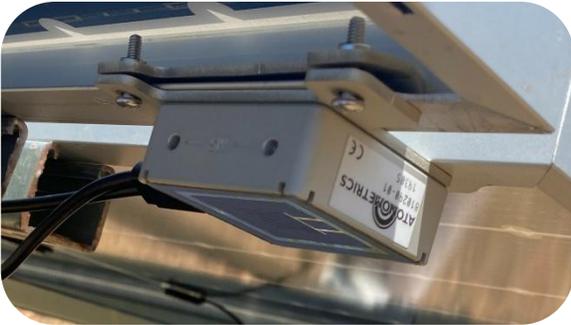
Reference cell calibration for both front-side and rear-side POA irradiance is vital for accurate performance monitoring of bifacial module systems, particularly for rear-side irradiance. The RC22 PV reference cells are calibrated at 1000 W/m<sup>2</sup> (STC) and 135 W/m<sup>2</sup> (BSTC) using a solar simulator and an NREL-calibrated reference cell standard.

### Compact Size

For bifacial solar systems, rear-side mounting location is critical. To accurately measure the average rear-side irradiance, two cells must be mounted in specific positions on the rear side. RC22 was designed to not create any shading on the module by fitting between the gaps of two PV modules along the frames. Its dimensions are only 65 x 65 x 25 mm.

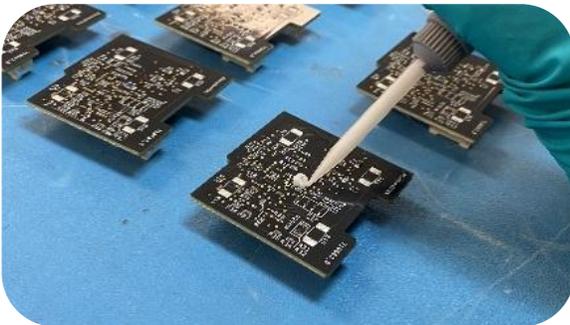
### Flexible Mounting Options

Module frames do not typically have perfectly located mounting holes for sensors, and drilling in frames is strictly prohibited. Atonometrics has developed a unique rear-side module frame clamp to effectively mount RC22 anywhere along the module frame without additional hardware.



### Built-In Temperature Compensation

PV cell temperature directly affects a reference cell's irradiance measurement. RC22 has a Class A PT1000 RTD component directly adhered to its cell backsheet with a thermally conductive adhesive for automatic accurate thermal compensation.



### Glass Water Roll Off

Reference cells with lifted edges can often collect dust and other soiling around their edges, leading to inaccurate irradiance measurements. RC22 is uniquely designed to allow water to easily roll off the glass edge to mitigate excess soiling accumulation.



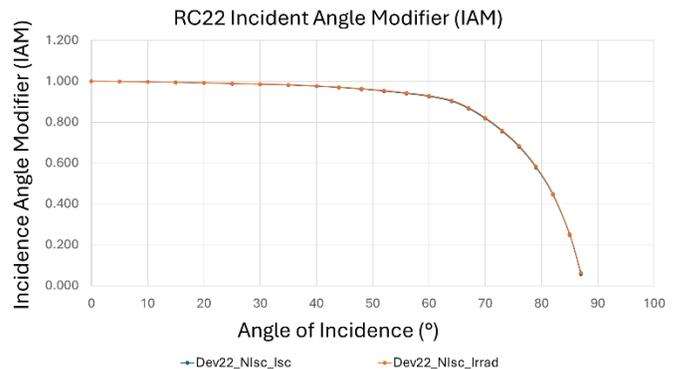
### Modbus RTU Communication

Modbus RTU is the standard digital communication protocol for meteorological sensors in the PV industry. RC22 communicates via Modbus RTU over RS485 to enable the user to easily read its three measurement outputs: irradiance, cell temperature, and cell short-circuit current (Isc).

## CHARACTERIZATION

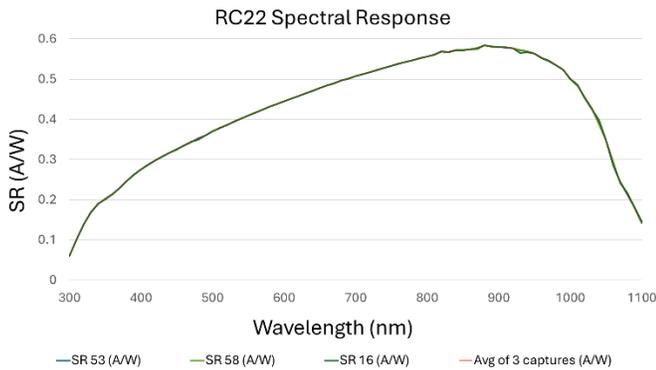
### Incidence Angle Modifier (IAM)

The IAM curve defines how your reference cell irradiance measurement responds with sunlight angle of incidence. RC22 is designed to mimic the response of full-sized solar modules by using the same construction materials and silicon technology and it features an IAM curve closely matching that of typical PV modules.



## Spectral Response

The spectral response of PV reference cells should closely match the spectral response of PV modules. Quantum efficiency (QE) testing is performed to quantify the cell's response at different wavelengths. RC22's silicon cells are sampled during the assembly process to ensure consistent calibration.



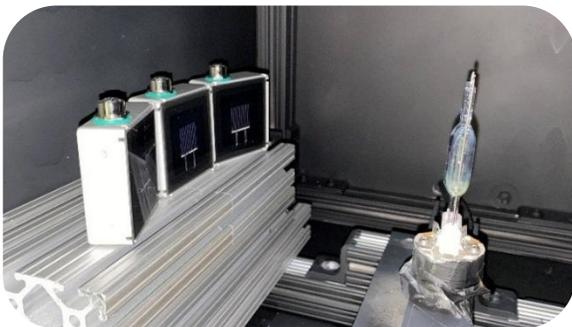
## Damp Heat / Freeze Testing

Reference cells are exposed to seasonal high humidity and freezing conditions. This poses the greatest risk of water ingress due to long-term water vapor permeation and condensation cycles. RC22 was tested according to a combination MIL-STD 610 Methods 524.1 freeze-thaw cycling and 507.6 temperature-humidity cycling from -15 to 60 degrees C at 95% to 100% relative humidity for over 60 days.

## RELIABILITY

### Accelerated UV / Heat Testing

Reference cells are exposed daily to direct UV radiation. It is essential that reference cells can withstand UVA and UVB exposure at elevated temperatures. RC22 was tested to > 8 years of equivalent accelerated UV exposure at a constant temperature of 50 degrees C.



## FOR MORE INFORMATION

Contact us at [info@atonometrics.com](mailto:info@atonometrics.com). We are happy to provide you with more information or publications relevant to our products.

### Submersion Testing

Reference cells are often exposed to heavy rainfall. The device seals must protect the sensitive electronics inside the enclosure. RC22 was tested beyond the strictest waterproofing test standard, IP67, which is submersion under 1 meter of water for 24 hours.