Schedule of Accreditation

issued by

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Accredited to ISO/IEC 17025:2017

CREST Photovoltaic Measurement and Calibration Laboratory (part of Loughborough University)

Issue No: 005 **Issue date:** 17 August 2021

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Calibration performed at the above address only

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
PERFORMANCE CHARACTERISTICS OF PV MODULES			
Short circuit current I_{SC}	50 mA to 30 A	2.0 %	Using digital multimeter.
Open circuit voltage V_{OC}	0.25 V to 300 V	0.59 %	Using digital multimeter.
Maximum power	250 mW to 800 W	2.1 %	Using solar simulator and monitor cell.
Fill factor	0.1 to 0.98	0.50 %	Ratio of maximum power to product of I_{SC} and V_{OC}.
PERFORMANCE CHARACTERISTICS OF SMALL AREA PV DEVICES			
Short circuit current I_{SC}	100 µA to 1 A	1.7 %	Using digital multimeter.
Open circuit voltage V_{OC}	0.1 V to 25 V	0.30 %	Using digital multimeter.
Maximum power	10 µW to 25 W	1.7 %	Using solar simulator and monitor cell.
Efficiency	0.01 to 0.75	1.8 %	Using solar simulator and monitor cell.
Device area	1 mm^2 to 64 cm^2	0.72 %	Comparison with stage micrometer.
Fill factor	0.1 to 0.98	0.50 %	Ratio of maximum power to product of I_{SC} and V_{OC}.
SPECTRAL RESPONSIVITY OF SMALL AREA PV DEVICES	0 A/W to 1 A/W *340 nm to 1150 nm*	(4.0 % to 9.8 %) + 0.0003 A/W	By comparison with reference cell. The quoted uncertainty is dependent on the dominant wavelength.
PYRANOMETER SENSITIVITY	1 µV/W·m^{-2} to 30 µV/W·m^{-2}	1.5 %	Using reference pyranometer.

NOTE: The CMCs for performance characteristics are stated for standard conditions (temperature 25 °C, irradiance 1000 W/m^2, perpendicular incidence and AM 1.5). Other conditions may be applied however the reported uncertainties may be increased.

END

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Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand.
Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$