

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-11140-02-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 19.03.2020

Date of issue: 19.03.2020

Holder of certificate:

**Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
Hansastraße 27c, 80686 München**

with its calibration laboratory

**Fraunhofer-Institut für Solare Energiesysteme ISE – CalLab PV Modules
Heidenhofstraße 2, 79110 Freiburg**

Calibration in the fields:

Optical quantities
- **Photovoltaics**

Abbreviations used: see last page

*The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH.
<https://www.dakks.de/en/content/accredited-bodies-dakks>*

Annex to the accreditation certificate D-K-11140-02-00
Permanent Laboratory
Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Short-circuit current *) solar modules	16 mA to 20 A	DIN EN 60904-1:2007 IEC 60904-1:2006	0.9 %	
Open-circuit voltage *) solar modules	10 mV to 250 V	DIN EN 60904-1:2007 IEC 60904-1:2006	0.6 %	
Current at maximum power *) solar modules	16 mA to 20 A	DIN EN 60904-1:2007 IEC 60904-1:2006	1.3 %	
Voltage at maximum power *) solar modules	10 mV to 250 V	DIN EN 60904-1:2007 IEC 60904-1:2006	1.0 %	
Maximum power *) solar modules	0.2 W to 400 W	DIN EN 60904-1:2007 IEC 60904-1:2006	1.1 %	
Fill factor of IV-curve solar *) modules	0 % to 100 %	DIN EN 60904-1:2007 IEC 60904-1:2006	1.0 %	
Efficiency *) solar modules	0 % to 100 %	DIN EN 60904-1:2007 IEC 60904-1:2006	1.3 %	

Within the measurands/calibration items marked with with *), the calibration laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use calibration standards or equivalent calibration procedures listed here with different issue dates. The calibration laboratory maintains a current list of all calibration standards / equivalent calibration procedures within the flexible scope of accreditation.

Abbreviations used:

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DIN	Deutsches Institut für Normung e.V.
IEC	International Electrotechnical Commission

¹⁾ The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.