

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-18657-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 18.08.2022

Date of issue 18.08.2022

Holder of certificate:

**Institut für Solarenergieforschung GmbH
ISFH Calibration and Test Center (CalTeC)
Am Ohrberg 1, 31860 Emmerthal**

Calibration in the fields:

High Frequency – and radiation quantities

optical quantities

- photovoltaics
- radiometry

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.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories. Laboratories that conform to the requirements of this standard. operate generally in accordance with the principles of DIN EN ISO 9001.

The certificate together with the annex reflects the status as indicated by the date of issue.

The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH <https://www.dakks.de/en/content/accredited-bodies-search>.

Abbreviations used: see last page

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This document is a translation. The definitive version is the original German annex to the accreditation certificate.

Annex to the accreditation certificate D-K-18657-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Photovoltaics				
short circuit current solar cells*	0.5 mA to 20 A	DIN EN 60904-1:2020	0.93 %	
open circuit voltage solar cells*	0.1 V to 20 V		0.24 %	
fill factor solar cells*	25 % to 95 %		0.66 %	
maximum power solar cells*	0.01 mW to 40 W		1.1 %	
efficiency solar cells*	0.1 % to 95 %		1.2 %	
spectral responsivity*	0 mA/(W/m ²) to 50 mA/(W/m ²)	DIN EN 60904-8: 2014 Wavelength		
		280 nm to < 300 nm	14 %	
		300 nm to < 350 nm	1.4 %	
		350 nm to < 400 nm	1.1 %	
		400 nm to < 600 nm	0.90 %	
		600 nm to < 800 nm	0.90 %	
		800 nm to < 1000 nm	0.90 %	
		1000 nm to < 1100 nm	0.90 %	
	1100 nm to < 1150 nm	2.4 %		
	1150 nm to 1200 nm	5.2 %		
temperature coefficient of short circuit current of solar cells*	0 / K to 2.0 · 10 ⁻³ / K	IEC 60891:2021 IEC 60904-1:2020	1.0 · 10 ⁻⁴ / K	
temperatur coefficient of open circuit voltage of solar cells*	-1.0 · 10 ⁻¹ / K to 0 / K		8.0 · 10 ⁻⁵ / K	
temperature coefficient of maximum power of solar cells*	-1.0 · 10 ⁻¹ / K to 0 / K		2.1 · 10 ⁻⁴ / K	

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responsivity irradiance detectors	0.001 mV/(W/m ²) to 100 mV/(W/m ²)	AA_IV_Messprozedur-Strahlungssensor_QM22a (2022)	1.2 %	Measurement of output voltage and temperature signal of sensor unit.
	0.001 mA/(W/m ²) to 10 mA/(W/m ²)	100 W/m ² to 1500 W/m ² 20 °C to 100 °C		Measurement of output current and temperature signal of sensor unit.
area	0.25 cm ² to 490 cm ²	Contactless with linear scanner in reflection or transmission AA_AREA_Messprozedur_QM20a (2020)	0.40 %	
Radiometry spectral irradiance (lamps)	1.0 · 10 ⁻⁵ W/(m ² ·nm) to 0.50 W/(m ² ·nm)	AA_SRA_Messprozedur-Spektrum-Lampen_QM22a (2022) Wavelength		Lamp power: 200 W ≤ 1100 W
		250 nm to < 270 nm	19 %	
		270 nm to < 300 nm	5.0 %	
		300 nm to < 350 nm	1.9 %	
		350 nm to < 400 nm	1.4 %	
		400 nm to < 840 nm	1.2 %	
		840 nm to < 970 nm	1.3 %	
		970 nm to < 1200 nm	1.5 %	
		1200 nm to < 1500 nm	1.6 %	
		1500 nm to < 1650 nm	2.0 %	
1650 nm to 1700 nm	2.3 %			

Abbreviations used:

AA_XY inhouse-method of the laboratory
 CMC Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
 DIN Deutsches Institut für Normung e.V.