

Deutsche Akkreditierungsstelle

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

Valid from: 09.12.2024

Date of issue: 09.12.2024

Holder of accreditation certificate:

**Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung
eingetragener Verein
Hansastraße 27c, 80686 München**

with the location

**Fraunhofer-Institut für Solare Energiesysteme ISE – CalLab PV Modules
Heidenhofstraße 5, 79110 Freiburg**

The calibration laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The calibration laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and they conform to the principles of DIN EN ISO 9001.

Calibration in the fields:

Optical quantities

- Photovoltaics

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.

This certificate annex is only valid together with the written accreditation certificate and reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at <https://www.dakks.de>.

Abbreviations used: see last page

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

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Photovoltaics				
Monofacial Photovoltaics modules				
Short-circuit current solar modules	16 mA to 50 A	DIN EN 60904-1:2023 IEC 60904-1:2020	0.9 %	
Open-circuit voltage solar modules	10 mV to 420 V	DIN EN 60904-1:2023 IEC 60904-1:2020	0.6 %	
Current at maximum power solar modules	16 mA to 50 A	DIN EN 60904-1:2023 IEC 60904-1:2020	1.3 %	
Voltage at maximum power solar modules	10 mV to 420 V	DIN EN 60904-1:2023 IEC 60904-1:2020	1.0 %	
Maximum power solar modules	0.2 W to 5 kW	DIN EN 60904-1:2023 IEC 60904-1:2020	1.1 %	
Fill factor of IV-curve solar modules	0 % to 100 %	DIN EN 60904-1:2023 IEC 60904-1:2020	1.0 %	
Efficiency solar modules	0 % to 100 %	DIN EN 60904-1:2023 IEC 60904-1:2020	1.3 %	

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Bifacial Photovoltaics modules Short circuit current solar modules	16 mA to 50 A	IEC TS 60904-1-2:2019	1,2 %	
Open circuit voltage solar modules	10 mV to 420 V	IEC TS 60904-1-2:2019	0,6 %	
Current at maximum power solar modules	16 mA to 50 A	IEC TS 60904-1-2:2019	1,6 %	
Voltage at maximum power solar modules	10 mV to 420 V	IEC TS 60904-1-2:2019	1,0 %	
Maximum power solar modules	0.2 W to 5 kW	IEC TS 60904-1-2:2019	1,4 %	
Fill factor of IV-curve solar modules	0 % to 100 %	IEC TS 60904-1-2:2019	1,1 %	
Efficiency solar modules	0 % to 100 %	IEC TS 60904-1-2:2019	1,6 %	
Bifacial coefficient current	0 % to 100 %	IEC TS 60904-1-2:2019	0,7 %	
Bifacial coefficient voltage	0 % to 100 %	IEC TS 60904-1-2:2019	0,9 %	
Bifacial coefficient power	0 % to 100 %	IEC TS 60904-1-2:2019	1,3 %	
Power gain through backside irradiation (BiFi)	0 W/(W/m ²) to 5 W/(W/m ²)	IEC TS 60904-1-2:2019	11,7 %	

Abbreviations used:

DIN Deutsches Institut für Normung e.V. – German institute for standardization

EN Europäische Norm – European Standard

IEC International Electrotechnical Commission

ISO International Organization for Standardisation

TS Technical Specification - technische Spezifikation

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