

Deutsche Akkreditierungsstelle

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

Valid from: 22.06.2023

Date of issue: 22.06.2023

Holder of accreditation certificate:

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.

with its calibration laboratory

**Fraunhofer-Institut für Solare Energiesysteme ISE - CalLab PV Modules
Heidenhofstraße 2, 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 confirm generally with the principles of DIN EN ISO 9001.

Calibration in the fields:

Optical quantities

- **Photovoltaics**

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 calibrationstandards / 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

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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-11140-02-00

Permanentes Laboratorium

Kalibrier- und Messmöglichkeiten (CMC)

Messgröße / Kalibriergegenstand	Messbereich / Messspanne	Messbedingungen / Verfahren	Erweiterte Messunsicherheit ¹	Bemerkungen
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 %	

¹ Unless otherwise specified, the unit of a variable corresponds to the unit of the measuring range.

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Bifacial Photovoltaics modules Short circuit current * solar modules	16 mA to 50 A	IEC TS 60904-1-2:2019	1.4 %	
Open circuit voltage * solar modules	10 mV to 420 V	IEC TS 60904-1-2:2019	0.7 %	
Current at maximum power * solar modules	16 mA to 50 A	IEC TS 60904-1-2:2019	1.7 %	
Voltage at maximum power * solar modules	10 mV to 420 V	IEC TS 60904-1-2:2019	1.2 %	
Maximum power * solar modules	0.2 W to 5 kW	IEC TS 60904-1-2:2019	1.8 %	
Fill factor of IV-curve * solar modules	0 % to 100 %	IEC TS 60904-1-2:2019	1.4 %	
Efficiency * solar modules	0 % to 100 %	IEC TS 60904-1-2:2019	1.9 %	
Bifacial coefficient current *	0 % to 100 %	IEC TS 60904-1-2:2019	0.8 %	
Bifacial coefficient voltage *	0 % to 100 %	IEC TS 60904-1-2:2019	1.0 %	
Bifacial coefficient power *	0 % to 100 %	IEC TS 60904-1-2:2019	1,6 %	
Power gain through backside irradiation (BiFi) *	0 W/(W/m ²) to 5 W/(W/m ²)	IEC TS 60904-1-2:2019	14.0 %	

Abbreviations used:

- DIN German institute for standardization
- EN Europäische Norm – European Standard
- IEC International Electrotechnical Commission

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