DAkkS
Deutsche
Akkreditierungsstelle

Accreditation

The Deutsche Akkreditierungsstelle attests with this **Accreditation Certificate** that

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

with its calibration laboratory

Fraunhofer-Institut für Solare Energiesysteme – CalLab PV-Cells
Heidenhofstraße 2, 79110 Freiburg

meets the requirements according to DIN EN ISO/IEC 17025:2018 for the conformity assessment activities listed in the annex to this certificate. This includes additional existing legal and normative requirements for the calibration laboratory, including those in relevant sectoral schemes, provided they are explicitly confirmed in the annex to this certificate

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 general with the principles of DIN EN ISO 9001.

This accreditation was issued in accordance with Art. 5 Para. 1 Sentence 2 of Regulation (EC) 765/2008, after an accreditation procedure was carried out in compliance with the minimum requirements of DIN EN ISO/IEC 17011 and on the basis of a review and decision of the appointed accreditation committees.

This accreditation certificate only applies in connection with the notices of 25.08.2023 with accreditation number D-K-11140-01.
It consists of this cover sheet, the reverse side of the cover sheet and the following annex with a total of 2 pages.

Registration number of the accreditation certificate: **D-K-11140-01-00**

Berlin, 25.08.2023

Dr. Florian Witt
Head of Technical Unit

Translation issued:
25.08.2023

Dr. Florian Witt
Head of Technical Unit

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 can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH (www.dakks.de).

See notes overleaf

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The Deutsche Akkreditierungsstelle GmbH (DAkkS) is the entrusted national accreditation body of the Federal Republic of Germany according to § 8 section 1 AkkStelleG in conjunction with § 1 section 1 AkkStelleGBV. DAkkS is designated as the national accreditation authority by Germany according to Art. 4 Para. 4 of Regulation (EC) 765/2008 and clause 4.7 of DIN EN ISO/IEC 17000.

Pursuant to Art. 11 section 2 of Regulation (EC) 765/2008, the accreditation certificate shall be recognised as equivalent by the national authorities within the scope of this Regulation as well as by the WTO member states that have committed themselves in bilateral or multilateral mutual agreements to recognise the certificates of accreditation bodies that are members of ILAC or IAF as equivalent.

DAkkS is a signatory to the multilateral agreements for mutual recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Co-operation (ILAC).

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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Annex to the Accreditation Certificate D-K-11140-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: **25.08.2023**

Date of issue: 25.08.2023

Holder of accreditation certificate:

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

with its calibration laboratory

Fraunhofer-Institut für Solare Energiesysteme – CalLab PV-Cells
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 they conform to the general with the principles of DIN EN ISO 9001.

Calibration in the fields:

High frequency and radiation quantities
optical quantities
- **photovoltaics**
- **radiometry**

***) 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.

DAkkS Deutsche Akkreditierungsstelle

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement [1]	Remarks
photovoltaics						
short circuit current solar cells *	0.1 mA	to	20 A	DIN EN 60904-1:2020	0.87 %	
				IEC/TS 60904-1-2:2019 (IV characteristics acc. to Ch.6.2)	0.94 %	
open circuit voltage solar cells *	0.1 V	to	20 V	DIN EN 60904-1:2020 IEC/TS 60904-1-2:2019 (IV characteristics acc. to Ch.6.2)	0.16 %	
fill factor solar cells *	20 %	to	95 %	DIN EN 60904-1:2020 IEC/TS 60904-1-2:2019 (IV characteristics acc. to Ch.6.2)	0.41 %	
maximum power solar cells *	0.01 mW	to	40 W	DIN EN 60904-1:2020	0.96 %	
				IEC/TS 60904-1-2:2019 (IV characteristics acc. to Ch.6.2)	0.98 %	
efficiency solar cells *	0.01 %	to	100 %	DIN EN 60904-1:2020 IEC/TS 60904-1-2:2019 (IV characteristics acc. to Ch.6.2)	1.0 %	
shunt voltage irradiance sensor	1 mV	to	10 V		0.88 %	
radiometry *						
spectral irradiance responsivity solar cells	$1.0\ 10^{-7}$ A m²/W	to	0.1 A m²/W	DIN EN 60904-8:2014 wavelength		
				280 nm to < 320 nm	7.6 %	
				320 nm to < 350 nm	2.3 %	
				350 nm to < 450 nm	0.86 %	
				450 nm to < 1000 nm	0.75 %	
				1000 nm to < 1070 nm	1.5 %	
				1070 nm to < 1120 nm	1.9 %	
				1120 nm to < 1150 nm	3.0 %	
				1150 nm to < 1180 nm	6.9 %	
				1180 nm to < 1200 nm	14 %	

Abbreviations used:

CMC	Calibration and measurement capabilities
DIN	German Institute for Standardization e.V.
EN	European Standard
IEC	International Electrotechnical Commission

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

Valid from: 25.08.2023

Date of issue: 25.08.2023