

## Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV

Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

# Accreditation



The Deutsche Akkreditierungsstelle GmbH attests that the

**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**

is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out calibrations in the following fields:

**High frequency and radiation quantities**

**optical quantities**

- photovoltaics
- radiometry

The accreditation certificate shall only apply in connection with the notice of accreditation of 06.01.2021 with the accreditation number D-K-11140-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 2 pages.

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

Berlin,  
06.01.2021

Dr Heike Manke  
Head of Division

Translation issued:  
06.01.2021

Head of Division



*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>

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

See notes overleaf.

## Deutsche Akkreditierungsstelle GmbH

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

**Valid from:** 06.01.2021

**Date of issue:** 06.01.2021

Holder of 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**

Calibration in the fields:

**High frequency and radiation quantities**

**optical quantities**

- photovoltaics
- radiometry

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

*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>*

Abbreviations used: see last page

**Page 1 of 2**

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

**Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range		Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
<b>photovoltaics</b>					
short circuit current solar cells	0,1 mA	to 20 A	DIN EN 60904-1:2007	0,87 %	
open circuit voltage solar cells	0,1 V	to 20 V	DIN EN 60904-1:2007	0,16 %	
fill factor solar cells	20 %	to 95 %	DIN EN 60904-1:2007	0,41 %	
maximum power solar cells	0,01 mW	to 40 W	DIN EN 60904-1:2007	0,96 %	
efficiency solar cells	0,01 %	to 100 %	DIN EN 60904-1:2007	1,0 %	
shunt voltage irradiance sensor	1 mV	to 10 V		0,88 %	
<b>radiometry</b>					
spectral irradiance			DIN EN 60904-8:2015 wavelength		
responsivity solar cells	1,0 10 <sup>-7</sup> A m <sup>2</sup> /W	to 0,1 A m <sup>2</sup> /W	300 nm to < 320 nm	8,0 %	
			320 nm to < 340 nm	1,9 %	
			340 nm to < 430 nm	0,92 %	
			430 nm to < 450 nm	0,68 %	
			450 nm to < 530 nm	0,65 %	
			530 nm to < 930 nm	0,55 %	
			930 nm to < 1010 nm	0,62 %	
			1010 nm to < 1090 nm	1,5 %	
			1090 nm to < 1130 nm	2,0 %	
			1130 nm to < 1170 nm	3,2 %	
	1170 nm to < 1200 nm	11,0 %			

**Abbreviations used:**

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

<sup>1)</sup> 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.