Organismo accreditato *Accredited body*	**ESTI - European Solar Test Installation** **Energy and Efficiency Renewables Unit** **Dir. C - Energy, Mobility and Climate** **DG Joint Research Centre - European Commission** Via E. Fermi, 2749, TP450 21027 ISPRA (VA) – Italia https://ec.europa.eu/jrc/en/research-facility/european-solar-test-installation

Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

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Tabella allegata al Certificato di Accreditamento *Annex to the Accreditation Certificate*	**00465 Calibration** REV. **007** **UNI CEI EN ISO/IEC 17025:2018**

Attività oggetto di accreditamento *Accredited activities*			
Misure ottiche / Optical measurements - ***Irradiamento solare / Solar irradiance (SOT-12)***	Scopo fisso *Fixed scope*	Via E. Fermi, 2749 21027 ISPRA (VA) Italia	**A**
Misure ottiche / Optical measurements - ***Irradiamento solare / Solar irradiance (SOT-12)***	Scopo flessibile *Flexible scope*	Via E. Fermi, 2749 21027 ISPRA (VA) Italia	**A**
		In esterno, presso Clienti *Onsite customer premises*	**EXT**

L'incertezza di misura riportata nelle seguenti tabelle è da intendersi come incertezza estesa ottenuta moltiplicando l'incertezza tipo per il fattore di copertura k corrispondente ad un livello di fiducia di circa il 95%. Eventuali deviazioni sono puntualmente indicate.

Area metrologica *Metrological area*	**Misure ottiche** ***Optical measurements***

Settore / *Calibration field*	(SOT-12) **Irradiamento solare / *Solar irradiance***

Strumento *Instrument*	Misurando *Measurand*		Condizioni *Additional parameters*	Campo di misura *Measurement range*	Incertezza [1] *Uncertainty*		Metodo/Procedura *Method / Procedure*	Sede *Location*
Photovoltaic device (cell, module)	Linearity of Current vs Irradiance		n.a.	up to ±100%	0,16 %	*(abs)*	IEC 60904-10:2020	A
Bifacial photovoltaic device (cell, module)	Bifaciality coefficient	ϕ_{Isc}	n.a.	up to 100%	0,88 %	*(rel)*	IEC TS 60904-1-2:2019	
		ϕ_{Voc}		up to 100%	0,14 %	*(rel)*		
		ϕ_{Pmax}		up to 100%	1,36 %	*(rel)*		
		$BiFi_{rel}$		up to ±1 %/(W·m^{-2})	0,0060 %/(W·m^{-2})	*(abs)*		
		$P_{maxBiFi100}$		up to 1200 W	1,15 %			
		$P_{maxBiFi200}$		up to 1200 W	1,66 %			

[1] In case of a relative measurement range (i.e. expressed as %), the uncertainty has to be intended either as a relative value (marked as '*rel*') of the actual value of the measurand (itself expressed as %) or as an absolute value (marked as '*abs*') over the entire measurement range.

Campo di accreditamento flessibile [2]
Flexible accreditation scope

Strumento *Instrument*	Misurando *Measurand*	Condizioni *Additional parameters*	Campo di misura *Measurement range*	Incertezza [3] *Uncertainty*	Metodo/Procedura *Method / Procedure*	Sede *Location*
Primary photovoltaic reference cell	Current	Simulated sunlight	up to 1 A	2,4 %	IEC 60904-4	A
		Natural sunlight	up to 1 A	0,52 %		A, EXT
Photovoltaic device (cell)	Current	Simulated sunlight	up to 40 A	0,46 %	IEC 60904-1 IEC 60904-1-1 IEC TS 60904-1-2 IEC 60904-2 IEC 60904-3 IEC 61853-1 IEC 60891	A
	Voltage		up to 400 V	0,08 %		
	Power		up to 1200 W	0,84 %		
	Efficiency		up to 100%	0,84 % *(rel)*		
	Series resistance		up to 200 Ω	10 %		
	Current	Natural sunlight	up to 40 A	0,48 %		
	Voltage		up to 400 V	0,38 %		
	Power		up to 1200 W	0,95 %		
	Efficiency		up to 100%	0,95 % *(rel)*		
	Series resistance		up to 200 Ω	10 %		

(continua)

[2] The laboratory has flexibility to perform calibration including the methods listed in the table and to adopt new revisions and amendments of them or internal methods, without varying measurand, measurement range and uncertainty. The laboratory (under its own responsibility) maintains a list of methods adopted under this flexible scope for consultation on website: ESTI List of fixed and flexible scope calibration methods | Joint Research Centre.

[3] In case of a relative measurement range (i.e. expressed as %), the uncertainty has to be intended either as a relative value (marked as '*rel*') of the actual value of the measurand (itself expressed as %) or as an absolute value (marked as '*abs*') over the entire measurement range.

Campo di accreditamento flessibile [4]
Flexible accreditation scope

Strumento *Instrument*	Misurando *Measurand*	Condizioni *Additional parameters*	Campo di misura *Measurement range*	Incertezza [5] *Uncertainty*	Metodo/Procedura *Method / Procedure*	Sede *Location*
(continua)						
Photovoltaic device (module)	Current	Simulated sunlight	up to 40 A	0,58 %	IEC 60904-1 IEC 60904-1-1 IEC TS 60904-1-2 IEC 60904-2 IEC 60904-3 IEC 61853-1 IEC 60891	A
	Voltage		up to 400 V	0,22 %		
	Power		up to 1200 W	0,95 %		
	Efficiency		up to 100%	0,95 % *(rel)*		
	Series resistance		up to 200 Ω	10 %		
	Current	Natural sunlight	up to 40 A	0,50 %		
	Voltage		up to 400 V	0,86 %		
	Power		up to 1200 W	1,2 %		
	Efficiency		up to 100%	1,2 % *(rel)*		
	Series resistance		up to 200 Ω	10 %		

(continua)

[4] The laboratory has flexibility to perform calibration including the methods listed in the table and to adopt new revisions and amendments of them or internal methods, without varying measurand, measurement range and uncertainty. The laboratory (under its own responsibility) maintains a list of methods adopted under this flexible scope for consultation on website: ESTI List of fixed and flexible scope calibration methods | Joint Research Centre.

[5] In case of a relative measurement range (i.e. expressed as %), the uncertainty has to be intended either as a relative value (marked as '*rel*') of the actual value of the measurand (itself expressed as %) or as an absolute value (marked as '*abs*') over the entire measurement range.

Campo di accreditamento flessibile [6]
Flexible accreditation scope

Strumento *Instrument*	Misurando *Measurand*		Condizioni *Additional parameters*	Campo di misura *Measurement range*	Incertezza [7] *Uncertainty*	Metodo/Procedura *Method / Procedure*	Sede *Location*
(continua)							
Photovoltaic device (cell, module)	Spectral responsivity		n.a.	up to 2 A/W	2,5 %	IEC 60904-8 IEC 60904-8-1 IEC 60904-7 IEC 60904-3	A
	Spectral mismatch factor			up to 1,5	0,36 %		
	Temperature coefficient of:	Current	Simulated sunlight	up to ±5 %/°C	0,0055 %/°C *(abs)*	IEC 60891	
		Voltage		up to ±5 %/°C	0,0057 %/°C *(abs)*		
		Power		up to ±5 %/°C	0,0093 %/°C *(abs)*		
		Current	Natural sunlight	up to ±5 %/°C	0,0049 %/°C *(abs)*		
		Voltage		up to ±5 %/°C	0,0075 %/°C *(abs)*		
		Power		up to ±5 %/°C	0,0089 %/°C *(abs)*		

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[6] The laboratory has flexibility to perform calibration including the methods listed in the table and to adopt new revisions and amendments of them or internal methods, without varying measurand, measurement range and uncertainty. The laboratory (under its own responsibility) maintains a list of methods adopted under this flexible scope for consultation on website: ESTI List of fixed and flexible scope calibration methods | Joint Research Centre.

[7] In case of a relative measurement range (i.e. expressed as %), the uncertainty has to be intended either as a relative value (marked as '*rel*') of the actual value of the measurand (itself expressed as %) or as an absolute value (marked as '*abs*') over the entire measurement range.