

List of methods managed within the ESTI fixed and the flexible scope of accreditation

List N°: 4.9	Replaces List N°: 4.8	Prepared: L. Mercado	Approved: E. Dunlop
Valid from: 03/07/2024	Valid since: 26/06/2024	Signature: e-signed	Signature: e-signed

CALIBRATION FIELD: SOT-12 Solar irradiance Methods managed within Flexible Scope¹								
CALIBRATION OBJECTS	MEASURAND	CONDITIONS	RANGE	CMC	INTERNAL METHOD	Version in Flex. Scope*	LOCATION	REFERENCE to STANDARDS
Primary PV reference cell	Current	Simulated Sunlight	Up to 1 A	2.4%	M44		Permanent Laboratory	IEC 60904-4
		Natural sunlight	Up to 1 A	0.52%	M45		Permanent Laboratory or external locations	
PV device (cell)	Current Voltage Power Efficiency Series Resistance	Simulated Sunlight	up to 40 A up to 400 V up to 1200W up to 100 % up to 200 Ω	0.46% 0.08% 0.84% 0.84% 10%	M07	m	Permanent Laboratory	IEC 60904-1 IEC 60904-1-1 IEC TS 60904-1-2 IEC 60904-2 IEC 60904-3 IEC 61853-1 IEC 60891
					M41	m		
					M51	f		
					M55	h		
					M56	h		
					M59	d		
					M60	a-rev4		
					M63	f		
	M64							
	M65							
	M66	c						
	Current Voltage Power Efficiency Series Resistance	Natural Sunlight	up to 40 A up to 400 V up to 1200W up to 100 % up to 200 Ω	0.48% 0.38% 0.95% 0.95% 10%	M46			
					M51	f		
					M59	d		
M60					a-rev4			

¹ Flexible scope: The laboratory has flexibility to perform calibration including methods which are equivalent to those which are already covered by the fixed accreditation scope and to adopt new revisions and amendments of them, without varying measurand, measurement range and uncertainty.

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CALIBRATION FIELD: SOT-12 Solar irradiance Methods managed within Flexible Scope ¹								
CALIBRATION OBJECTS	MEASURAND	CONDITIONS	RANGE	CMC	INTERNAL METHOD	Version in Flex. Scope*	LOCATION	REFERENCE to STANDARDS
PV device (module)	Current Voltage Power Efficiency Series Resistance	Simulated Sunlight	up to 40 A up to 400 V up to 1200W up to 100 % up to 200 Ω	0.58% 0.22% 0.95% 0.95% 10%	M07	m	Permanent Laboratory	IEC 60904-1 IEC 60904-1-1 IEC TS 60904-1-2 IEC 60904-2 IEC 60904-3 IEC 61853-1 IEC 60891
					M41	m		
					M51	f		
					M55	h		
					M56	h		
					M59	d		
					M60	a-rev4		
					M63	f		
					M64			
	M65							
	M66	c						
	Current Voltage Power Efficiency Series Resistance	Natural Sunlight	up to 40 A up to 400 V up to 1200W up to 100 % up to 200 Ω	0.48% 0.38% 0.95% 0.95% 10%	M46			
					M51	f		
					M59	d		
M60					a-rev4			
PV device (cell, module)	Spectral responsivity Spectral mismatch factor	Not Applicable	up to 2 A/W	2.50%	M04	n-rev1	Permanent Laboratory	IEC 60904-3 IEC 60904-7 IEC 60904-8 IEC 60904-8-1
					M42			
			M50					
			M60	a-rev4				
	Temperature coefficient of: - Current - Voltage - Power	Simulated Sunlight	up to ±5%/°C up to ±5%/°C up to ±5%/°C	0.0055%/°C 0.0057%/°C 0.0093%/°C	M61		Permanent Laboratory	IEC 60891
					M62			
					M65			
- Current - Voltage - Power	Natural Sunlight	up to ±5%/°C up to ±5%/°C up to ±5%/°C	0.0049%/°C 0.0075%/°C 0.0089%/°C	M52				

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CALIBRATION FIELD: SOT-12 Solar irradiance Methods managed within Fixed Scope							
CALIBRATION OBJECTS	MEASURAND	CONDITIONS	RANGE	CMC	INTERNAL METHOD	LOCATION	REFERENCE to STANDARDS
PV device (cell, module)	Linearity of Current vs Irradiance	Simulated Sunlight	up to $\pm 100\%$	0.16%	M58	Permanent Laboratory	IEC 60904-10
Bifacial PV device (cell, module)	Bifaciality coefficient: <ul style="list-style-type: none"> – ϕ I_{sc} – ϕ V_{oc} – ϕ P_{max} – BiFi_{rel} – P_{maxBiFi100} – P_{maxBiFi200} 	Simulated Sunlight	up to 100% up to 100% up to 100% up to $\pm 1\%/(Wm^{-2})$ up to 1200 W up to 1200 W	0.88% 0.14% 1.36% 0.0060%/(Wm ⁻²) 1.15% 1.66%	M64	Permanent Laboratory	IEC TS 60904-1-2

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Table of changes:

VERSION	COMMENTS
V2.0 amd1	Internal Method (row 5): added M62
V2.1	Flexible scope (Row 4) added M42_e
V2.2	Flexible scope (Row 2 and 3) added M55_d
V2.3	Flexible scope (Row 2 and 3) added M56_b
V2.4	Flexible scope (Row 2 and 3) added M46_h
V2.5	Flexible scope removed M42_e, M46_h, M55_d, M56_b, UC04_i, UC42_h
V2.6	Flexible scope (Row1) added M44_d; (Row 2&3) added M14_d, M46_i, M55_e, M56_c; Fixed and Flexible scope (Row6) added Line for linearity vs Current and M58_a; Fixed and Flexible scope (Row 2&3) added M63_a and M64_a.
V.2.7	Flexible scope removed: M41_d, M46_i, M55_e, M58_a, M63_a, M64_a-rev1 (Methods approved by Accredia during the reaccreditation audit on 24-25/07/2019); Flexible scope (Row 2 and 3) added M56_d (Updated reference for IEC 60904-3 ed.4; added alternative measurement of I-V curve).
v.2.8	Flexible scope added for M45_g, M41_d-amd1, M56_d, M04_L, M42_f, M50_d, M52_d, M61_c, M62_b
v.2.9	Flexible scope added for M55_f, M62_c, M63_b
V3.0	Flexible scope removed: M04_L, M41_d-amd1, M42_f, M45_g, M50_d, M52_d, M56_d, M61_c (Methods, approved by Accredia during the surveillance audit on 16/10/2020)
v3.1	Flexible scope added M07_L-rev1 (Row 2 and 3, updated references).
V3.2	Flexible scope added: M41_f (Row 2 and 3, Added Section on measurements of devices with inherent slow response (e.g. Perovskite Solar Cells) M65_a (Rows 2, 3, and 5, new solar simulator standard measurements). M21 removed (Row 5, Substituted by M65). M60 added (Rows 2, 3, 4 and 5, approved by Accredia during the reaccreditation audit on 24-25/07/2019)
V3.3	Corrigendum in track of changes V2.7: citation of the version of M64 approved by ACCREDIA during the reaccreditation audit (M64_a-rev1)
V3.4	Flexible scope added: M52_e (Row 5, Updated reference to standard IEC 60904-10:2020 [Ed 3.0]) M61_d (Row 5, Updated reference to standard IEC 60904-10:2020 [Ed 3.0]) M62_d (Row 5, Updated reference to standard IEC 60904-10:2020 [Ed 3.0]) M63_c (Rows 2 and 3, Updated reference to standard IEC 60904-10:2020 [Ed 3.0])

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V3.5	Flexible scope added: M44_e-rev1 (Row 1, Updated reference to standards IEC 60904-3:2019 [Ed 4.0] and IEC 60904-4:2019 [Ed 2.0]) M46_i-rev1 (Rows 1 and 2, Updated reference to standards IEC 60904-3:2019 [Ed 4.0] and IEC 60904-7:2019 [Ed 4.0]) M55_f-rev1 (Rows 2 and 3, Updated reference to standard IEC 60904-3:2019 [Ed 4.0]) M56_e (Rows 2 and 3, Corrected UCs based on original input parameter for spatial non-uniformity) M60_a-rev2 (Rows 2, 3, 4 and 5, Updated reference to standards IEC 60904-3:2019 [Ed 4.0] and IEC 60904-7:2019 [Ed 4.0]) M65_a-rev1 (Rows 2, 3 and 5, Modification of scope for clarification on the traceability of operating instruction; general editing) M59_b (Rows 2, 3 and 4, Reviewed with minor changes, updated reference to standard IEC 60904-3:2019 [Ed 4.0]) M63_d (Rows 2 and 3, Updated UCs)
V3.6	Flexible scope added: M41_g (Row 2 and 3, general update, changed title)
V3.7	Flexible scope added: M59_b-rev1 (Rows 2, 3 and 4, Editorial changes)
V3.8	Flexible scope added: M51_d (Rows 2 and 3. Equations 1 and 2 modified; better description of the process. Annex moved to NTF, revised UC calculation.)
V3.9	Flexible scope methods approved by ACCREDIA during surveillance audit 2022: M07_L-rev1, M44_e-rev1, M46_i-rev1, M51_d, M52_e, M55_f-rev1, M56_e, M59_b-rev1, M60_a-rev2, M61_d, M62_d, M63_d and M65_a-rev1 Methods under Fixed Scope approved by ACCREDIA: Row 6, M58 - Updated standard IEC 60904-10:2020 Row 7, M64 – Updated CMC of $B_{iF_{rel}}$, $P_{maxB_{iF_{100}}}$ and $P_{maxB_{iF_{200}}}$ Editorial revision of reference to standards. Removal of ASTM standards; removed (cell, module) description where appropriate.
V4.0	Flexible scope added: M41_i (Row 2. Reference to IEC TR 63228:2019[Ed. 1.0] and steady-state and settling definitions added. Details about the settling criteria added).
V4.1	Flexible scope added: M41_J (Row 2. Update assessment window minimum duration, define Pmax as the average of the last assessment window. Update the minimum pre-conditioning duration. Make the repeat manual and fast I-V sweeps optional.) M45_h (Row 1. Merge documents M45 and UC45. Spectroradiometer OL750 removed. Lower irradiance rejection limit for DSM back to 750 W/m ² . Integration limits extended to infinity, with explanation on the real limits used for calculations. Formatting and re-organisation of the document. M04_m (Row3. Merged UC04 into document).
V4.2	Flexible scope added: M60_a-rev3 (Rows 2, 3 and 4. Rephrasing of scope and Section 4 for better understanding; editorial changes.)
V4.3	Flexible scope added: M65_a-rev1 (Rows 2, Operating instruction validated for I-V characterisation at non-STC irradiance and for Power Matrix Measurement)
V4.4	Methods under Fixed Scope approved by ACCREDIA: M41 (Row 2), M60 (Row 2, Row 3 and Row 4), M65(Row 2 and Row 4)

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VERSION	COMMENTS
V4.5	Flexible scope methods assessed by ACCREDIA and CMCs updated during reaccreditation process. Flexible Scope added: M66_a added under Flexible Scope after the reaccreditation process
V4.6	Flexible Scope added: M51_f added under flexible scope (Update of measurement procedure)
V4.7	Flexible Scope added: M04_n-rev1 added under flexible scope (editorial changes) M60_a-rev4 added under flexible scope (editorial changes)
V4.8	Flexible Scope added: M07_m added under flexible scope (Update to be compliant with IEC 60904-1 ed. 3 and IEC 60891 ed. 3; editorial changes). M41_L added under flexible scope (Update to be compliant with IEC 60904-1 ed. 3 and IEC 60891 ed. 3; editorial changes; additional details on measurement protocol for meta-stable devices). M55_h added under flexible scope (Update to be compliant with IEC 60904-1 ed. 3 and IEC 60891 ed. 3; editorial changes). M56_g added under flexible scope (Update to be compliant with IEC 60904-1 ed.3 and IEC 60891 ed.3). M59_d added under flexible scope (Update to be compliant with IEC 60904-1 ed.3 and IEC 60891 ed.3). M66_b added under flexible scope (Update to be compliant with IEC 60904-1 ed. 3 and IEC 60891 ed. 3; editorial changes; additional details on measurement protocol for meta-stable devices).
V4.9	Flexible Scope added: M63_f added under flexible scope (Update to be compliant with IEC 60904-1 ed. 3 and IEC 60891 ed. 3). M41_m added under flexible scope (Added additional detail about the measurement protocol for meta-stable devices) M66_c added under flexible scope (Added additional detail about the measurement protocol for meta-stable devices) M56_h added under flexible scope (Added additional detail about the measurement protocol for meta-stable devices)

