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Photovoltaic devices –
Part 2: Requirements for photovoltaic reference devices

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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PHOTOVOLTAIC DEVICES –

Part 2: Requirements for photovoltaic reference devices

FOREWORD

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This commented version (CMV) of the official standard IEC 60904-2:2023 edition 4.0 allows the user to identify the changes made to the previous IEC 60904-2:2015 edition 3.0. Furthermore, comments from IEC TC 82 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60904-2 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) added calibration procedures for calibrating PV devices at maximum power by extending the respective Clauses 12 and 13;
b) revised requirements for mandatory measurement of spectral responsivity, temperature coefficients and linearity, depending on usage and allowing some measurements on equivalent devices;
c) revised requirements for built-in shunt resistor;
d) added requirements for traceability of calibration explicitly.

The text of this International Standard is based on the following documents:

Draft	Report on voting
82/2127/FDIS	82/2151/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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PHOTOVOLTAIC DEVICES –

Part 2: Requirements for photovoltaic reference devices

1 Scope

This part of IEC 60904 gives requirements for the classification, selection, packaging, marking, calibration and care of photovoltaic reference devices.

This document ~~covers~~ applies to photovoltaic (PV) reference devices that are used to ~~determine~~ measure the irradiance of natural or simulated sunlight for the purpose of quantifying the electrical performance of photovoltaic devices (cells, modules and arrays ~~under natural and simulated sunlight~~). It does not cover photovoltaic reference devices for use under concentrated sunlight.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60891, *Photovoltaic devices – Procedures for temperature and irradiance corrections to measured I-V characteristics*

IEC 60904-1, *Photovoltaic devices – Part 1: Measurement of photovoltaic current-voltage characteristics*

IEC 60904-3, *Photovoltaic devices – Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data*

IEC 60904-4, *Photovoltaic devices – Part 4: ~~Reference solar~~ Photovoltaic reference devices – Procedures for establishing calibration traceability*

IEC 60904-5, *Photovoltaic devices – Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method*

IEC 60904-7, *Photovoltaic devices – Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices*

IEC 60904-8, *Photovoltaic devices – Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device*

IEC 60904-9, *Photovoltaic devices – Part 9: Classification of solar simulator ~~performance requirements~~ characteristics*

IEC 60904-10, *Photovoltaic devices – Part 10: Methods of linear dependence and linearity measurements*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols*

IEC 60904-2

Edition 4.0 2023-06

INTERNATIONAL STANDARD

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Photovoltaic devices –
Part 2: Requirements for photovoltaic reference devices

Dispositifs photovoltaïques –
Partie 2: Exigences applicables aux dispositifs photovoltaïques de référence



IEC 60904-2:2023-06(en-fr)

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Part 2: Requirements for photovoltaic reference devices

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PHOTOVOLTAIC DEVICES –

Part 2: Requirements for photovoltaic reference devices

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IEC 60904-4, *Photovoltaic devices – Part 4: Photovoltaic reference devices – Procedures for establishing calibration traceability*

IEC 60904-5, *Photovoltaic devices – Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method*

IEC 60904-7, *Photovoltaic devices – Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices*

IEC 60904-8, *Photovoltaic devices – Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device*

IEC 60904-9, *Photovoltaic devices – Part 9: Classification of solar simulator characteristics*

IEC 60904-10, *Photovoltaic devices – Part 10: Methods of linear dependence and linearity measurements*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols*

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DISPOSITIFS PHOTOVOLTAÏQUES –

Partie 2: Exigences applicables aux dispositifs photovoltaïques de référence

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Cette quatrième édition annule et remplace la troisième édition parue en 2015. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout de procédures d'étalonnage des dispositifs PV à la puissance maximale en développant les Articles 12 et 13) correspondants;

b) révision des exigences applicables au mesurage obligatoire de la sensibilité spectrale, des coefficients de température et de la linéarité, en fonction de l'usage et en permettant certains mesurages sur des dispositifs équivalents;

c) révision des exigences applicables aux résistances de shunt intégrées;

d) ajout d'exigences pour la traçabilité de l'étalonnage de manière explicite.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
82/2127/FDIS	82/2151/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les directives ISO/IEC, Partie 2, il a été développé selon les directives ISO/IEC, Partie 1 et les directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC 60904, publiées sous le titre général *Dispositifs photovoltaïques*, peut être consultée sur le site web de l'IEC.

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DISPOSITIFS PHOTOVOLTAÏQUES –

Partie 2: Exigences applicables aux dispositifs photovoltaïques de référence

1 Domaine d'application

La présente partie de l'IEC 60904 donne les exigences relatives à la classification, à la sélection, au conditionnement, au marquage, à l'étalonnage et aux précautions d'utilisation des dispositifs photovoltaïques de référence.

Le présent document s'applique aux dispositifs photovoltaïques (PV) de référence utilisés pour mesurer l'irradiance de la lumière solaire naturelle ou simulée afin de quantifier les performances électriques des dispositifs PV (cellules, modules et panneaux). Il ne couvre pas les dispositifs photovoltaïques de référence pour une utilisation sous éclairement solaire concentré.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60891, *Dispositifs photovoltaïques – Procédures pour les corrections en fonction de la température et de l'éclairement à appliquer aux caractéristiques I-V mesurées*

IEC 60904-1, *Dispositifs photovoltaïques – Partie 1: Mesurage des caractéristiques courant-tension des dispositifs photovoltaïques*

IEC 60904-3, *Dispositifs photovoltaïques – Partie 3: Principes de mesure des dispositifs solaires photovoltaïques (PV) à usage terrestre incluant les données de l'éclairement énergétique spectral de référence*

IEC 60904-4, *Dispositifs photovoltaïques – Partie 4: Dispositifs photovoltaïques de référence – Procédures pour établir la traçabilité de l'étalonnage*

IEC 60904-5, *Dispositifs photovoltaïques – Partie 5: Détermination de la température de cellule équivalente (ECT) des dispositifs photovoltaïques (PV) par la méthode de la tension en circuit ouvert*

IEC 60904-7, *Dispositifs photovoltaïques – Partie 7: Calcul de la correction de désadaptation des réponses spectrales dans les mesures de dispositifs photovoltaïques*

IEC 60904-8, *Dispositifs photovoltaïques – Partie 8: Mesure de la sensibilité spectrale d'un dispositif photovoltaïque (PV)*

IEC 60904-9, *Dispositifs photovoltaïques – Partie 9: Classification des caractéristiques des simulateurs solaires*

IEC 60904-10, *Dispositifs photovoltaïques – Partie 10: Méthodes de mesure de la dépendance linéaire et de la linéarité*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols* (disponible en anglais seulement)