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Standards

Irish Standard  
I.S. EN IEC 60904-4:2019

# Photovoltaic devices - Part 4: Reference solar devices - Procedures for establishing calibration traceability

**I.S. EN IEC 60904-4:2019**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

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## National Foreword

I.S. EN IEC 60904-4:2019 is the adopted Irish version of the European Document EN IEC 60904-4:2019, Photovoltaic devices - Part 4: Reference solar devices - Procedures for establishing calibration traceability

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EUROPEAN STANDARD

**EN IEC 60904-4**

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2019

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Supersedes EN 60904-4:2009 and all of its amendments  
and corrigenda (if any)

English Version

**Photovoltaic devices - Part 4: Reference solar devices -  
Procedures for establishing calibration traceability  
(IEC 60904-4:2019)**

Dispositifs photovoltaïques - Partie 4: Dispositifs  
photovoltaïques de référence - Procédures pour établir la  
traçabilité de l'étalonnage  
(IEC 60904-4:2019)

Photovoltaische Einrichtungen - Teil 4: Referenz-  
Solarelemente - Verfahren zur Feststellung der  
Rückverfolgbarkeit der Kalibrierung  
(IEC 60904-4:2019)

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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## **EN IEC 60904-4:2019 (E)**

### **European foreword**

The text of document 82/1618/FDIS, future edition 2 of IEC 60904-4, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60904-4:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-09-17
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-12-17

This document supersedes EN 60904-4:2009 and all of its amendments and corrigenda (if any).

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60904-1	-	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics	EN 60904-1	-
IEC 60904-2	-	Photovoltaic devices -- Part 2: Requirements for reference solar cells	-	-
IEC 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN IEC 60904-3	-
IEC/TS 61836	-	Solar photovoltaic energy systems - Terms, definitions and symbols	-	-
ISO/IEC Guide 98-3 2008	-	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-

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**IEC 60904-4**

Edition 2.0 2019-11

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**



**Photovoltaic devices –  
Part 4: Photovoltaic reference devices – Procedures for establishing calibration  
traceability**

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



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**IEC 60904-4**

Edition 2.0 2019-11

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**



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**Photovoltaic devices –  
Part 4: Photovoltaic reference devices – Procedures for establishing calibration  
traceability**

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

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### PHOTOVOLTAIC DEVICES –

#### **Part 4: Photovoltaic reference devices – Procedures for establishing calibration traceability**

#### FOREWORD

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International Standard IEC 60904-4 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

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

- a) modification of standard title;
- b) inclusion of working reference in traceability chain;
- c) update of WRR with respect to SI;
- d) revision of all methods and their uncertainties in Annex A;
- e) harmonization of symbols and formulae with other IEC standards.

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

FDIS	Report on voting
82/1618/FDIS	82/1638/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60904 series, published under the general title *Photovoltaic devices*, can be found on the IEC website.

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## **PHOTOVOLTAIC DEVICES –**

### **Part 4: Photovoltaic reference devices – Procedures for establishing calibration traceability**

#### **1 Scope**

This part of IEC 60904 sets the requirements for calibration procedures intended to establish the traceability of photovoltaic (PV) reference devices to SI units as required by IEC 60904-2.

This document applies to PV reference devices that are used to measure the irradiance of natural or simulated sunlight for the purpose of quantifying the performance of PV devices. The use of a PV reference device is required in many standards concerning PV (e.g. IEC 60904-1 and IEC 60904-3).

This document has been written with single-junction PV reference devices in mind, in particular crystalline silicon, but it is sufficiently general to include other single-junction technologies.

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

IEC 60904-2, *Photovoltaic devices – Part 2: Requirements for photovoltaic reference devices*

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

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

ISO/IEC Guide 98-3: 2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM: 1995)*

#### **3 Terms and definitions**

For the purposes of this document, the terms and definitions given in IEC TS 61836 and the following apply.

**NOTE** The different reference instruments for the traceability chain of solar irradiance are defined in this clause. Typical examples for each category are listed in Table 1, which also refers to relevant standards (where available). Figure 1 then shows schematically the most common traceability chains linking these instruments and the relevant standards (where available). Methods for the implementation of this document are described in Annex A.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>



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