



**NSAI**  
Standards

Irish Standard  
I.S. EN 60904-3:2016

# Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data

**I.S. EN 60904-3:2016**

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

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## National Foreword

I.S. EN 60904-3:2016 is the adopted Irish version of the European Document EN 60904-3:2016, Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

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EUROPEAN STANDARD

**EN 60904-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2016

ICS 27.160

Supersedes EN 60904-3:2008

English Version

**Photovoltaic devices - Part 3: Measurement principles for  
terrestrial photovoltaic (PV) solar devices with reference spectral  
irradiance data  
(IEC 60904-3:2016)**

Dispositifs photovoltaïques - Partie 3: Principes de mesure  
des dispositifs solaires photovoltaïques (PV) à usage  
terrestre incluant les données de l'éclairement spectral de  
référence  
(IEC 60904-3:2016)

Photovoltaische Einrichtungen - Teil 3: Messgrundsätze für  
terrestrische photovoltaische (PV) Einrichtungen mit  
Angaben über die spektrale Strahlungsverteilung  
(IEC 60904-3:2016)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## **EN 60904-3:2016**

### **European foreword**

The text of document 82/1071/FDIS, future edition 3 of IEC 60904-3, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60904-3:2016.

The following dates are fixed:

- latest date by which the document has to be (dop) 2017-02-20  
implemented at national level by  
publication of an identical national  
standard or by endorsement
- latest date by which the national (dow) 2019-05-20  
standards conflicting with the  
document have to be withdrawn

This document supersedes EN 60904-3:2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

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The text of the International Standard IEC 60904-3:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60904-9	NOTE	Harmonized as EN 60904-9.
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## Annex ZA (normative)

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

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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 60891	-	Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics	EN 60891	-
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 photovoltaic reference devices	EN 60904-2	-
IEC 60904-5	-	Photovoltaic devices - Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method	EN 60904-5	-
IEC 60904-7	-	Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices	EN 60904-7	-
IEC 60904-8	-	Photovoltaic devices - Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device	EN 60904-8	-

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**IEC 60904-3**

Edition 3.0 2016-04

# **INTERNATIONAL STANDARD**

## **NORME INTERNATIONALE**

**Photovoltaic devices –**

**Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices  
with reference spectral irradiance data**

**Dispositifs photovoltaïques –**

**Partie 3: Principes de mesure des dispositifs solaires photovoltaïques (PV) à  
usage terrestre incluant les données de l'éclairement spectral de référence**



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**IEC 60904-3**

Edition 3.0 2016-04

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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**Photovoltaic devices –**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### PHOTOVOLTAIC DEVICES –

#### **Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data**

#### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60904-3 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.

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

- a) the direct beam irradiance corresponding to the global irradiance in Table 1 was included;
- b) the term “Global photon irradiance” in Table 1 was changed to “Global photon flux”;
- c) the titles of some clauses have been changed (others have been added) in accordance with the usual structure of IEC standards.

This publication contains an attached file in the form of an Excel spreadsheet. This file is intended to be used as a complement and does not form an integral part of the publication.

The text of this standard is based on the following documents:

FDIS	Report on voting
82/1071/FDIS	82/1096/RVD

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

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## PHOTOVOLTAIC DEVICES –

### Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data

#### 1 Scope and object

This part of IEC 60904 applies to the following photovoltaic devices for terrestrial applications:

- solar cells with or without a protective cover;
- sub-assemblies of solar cells;
- modules; and
- systems.

NOTE The term “test specimen” is used to denote any of these devices.

The principles contained in this standard cover testing in both natural and simulated sunlight.

Photovoltaic conversion is spectrally selective due to the nature of the semiconductor materials used in PV solar cells and modules. To compare the relative performance of different PV devices and materials a reference standard solar spectral distribution is necessary. This standard includes such a reference solar spectral irradiance distribution.

This standard also describes basic measurement principles for determining the electrical output of PV devices. The principles given in this standard are designed to relate the performance rating of PV devices to a common reference terrestrial solar spectral irradiance distribution.

The reference terrestrial solar spectral irradiance distribution is given in this standard in order to classify solar simulators according to the spectral performance requirements contained in IEC 60904-9.

#### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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: Measurements of photovoltaic current-voltage characteristics*

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

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*

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