

Photovoltaic devices - Part 7: Computation of spectral mismatch error introduced in the testing of a photovoltaic device

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60904-7:2009 sisaldab Euroopa standardi EN 60904-7:2009 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 29.05.2009 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 27.03.2009.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 60904-7:2009 consists of the English text of the European standard EN 60904-7:2009.

This standard is ratified with the order of Estonian Centre for Standardisation dated 29.05.2009 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 27.03.2009.

The standard is available from Estonian standardisation organisation.

ICS 27.160

Võtmesõnad: photovoltaic devices, spectral mismatch error

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

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Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
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English version

**Photovoltaic devices -
Part 7: Computation of the spectral mismatch correction
for measurements of photovoltaic devices
(IEC 60904-7:2008)**

Dispositifs photovoltaïques -
Partie 7: Calcul de la correction
de désadaptation des réponses spectrales
dans les mesures de dispositifs
photovoltaïques
(CEI 60904-7:2008)

Photovoltaische Einrichtungen -
Teil 7: Berechnung der spektralen
Fehlanpassungskorrektur für Messungen
an photovoltaischen Einrichtungen
(IEC 60904-7:2008)

This European Standard was approved by CENELEC on 2009-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat 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 Central Secretariat has the same status as the official versions.

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CENELEC

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

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 82/540/FDIS, future edition 3 of IEC 60904-7, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60904-7 on 2009-03-01.

This European Standard supersedes EN 60904-7:1998.

The main changes with respect to EN 60904-7:1998 are listed below:

- the title has been modified in order to better reflect the purpose of the standard (changed from “mismatch error” to “mismatch correction”);
- formulae are now accompanied by explanatory text;
- Clause 3 “Description of method” now describes when it is necessary to use the method and when it may not be needed. It describes what data must be collected before the mismatch correction can be calculated;
- Clauses 4, 5 and 6 have been added;
- the formula for the mismatch correction has been corrected.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2012-03-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60904-7:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60891	¹⁾	Procedures for temperature and irradiance corrections to measured I-V characteristics of crystalline silicon photovoltaic devices	EN 60891	1994 ²⁾
IEC 60904-1	- ¹⁾	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics	EN 60904-1	2006 ²⁾
IEC 60904-2	- ¹⁾	Photovoltaic devices - Part 2: Requirements for reference solar devices	EN 60904-2	2007 ²⁾
IEC 60904-3	- ¹⁾	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	2008 ²⁾
IEC 60904-8	- ¹⁾	Photovoltaic devices - Part 8: Measurement of spectral response of a photovoltaic (PV) device	EN 60904-8	1998 ²⁾
IEC 60904-9	- ¹⁾	Photovoltaic devices - Part 9: Solar simulator performance requirements	EN 60904-9	2007 ²⁾
IEC 60904-10	- ¹⁾	Photovoltaic devices - Part 10: Methods of linearity measurement	EN 60904-10	1998 ²⁾
IEC 61215	- ¹⁾	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	2005 ²⁾
IEC 61646	- ¹⁾	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	2008 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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PHOTOVOLTAIC DEVICES –

Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices

1 Scope and object

This part of IEC 60904 describes the procedure for correcting the bias error introduced in the testing of a photovoltaic device, caused by the mismatch between the test spectrum and the reference spectrum and by the mismatch between the spectral responses (SR) of the reference cell and of the test specimen. The procedure applies only to photovoltaic devices linear in SR as defined in IEC 60904-10. This procedure is valid for single junction devices but the principle may be extended to cover multijunction devices.

The purpose of this standard is to give guidelines for the correction of measurement bias, should there be a mismatch between both the test spectrum and the reference spectrum and between the reference device SR and the test specimen SR.

Since a PV device has a wavelength-dependent response, its performance is significantly affected by the spectral distribution of the incident radiation, which in natural sunlight varies with several factors such as location, weather, time of year, time of day, orientation of the receiving surface, etc., and with a simulator varies with its type and conditions. If the irradiance is measured with a thermopile-type radiometer (that is not spectrally selective) or with a reference solar cell, the spectral irradiance distribution of the incoming light must be known to make the necessary corrections to obtain the performance of the PV device under the reference solar spectral distribution defined in IEC 60904-3.

If a reference PV device or a thermopile type detector is used to measure the irradiance then, following the procedure given in this standard, it is possible to calculate the spectral mismatch correction necessary to obtain the short-circuit current of the test PV device under the reference solar spectral irradiance distribution included in Table 1 of IEC 60904-3 or any other reference spectrum. If the reference PV device has the same relative spectral response as the test PV device then the reference device automatically takes into account deviations of the real light spectral distribution from the standard spectral distribution, and no further correction of spectral bias errors is necessary. In this case, location and weather conditions are not critical when the reference device method is used for outdoor performance measurements provided both reference cell and test PV device have the same relative spectral response. Also, for identical relative SR's, the spectral classification of the simulator is not critical for indoor measurements.

If the performance of a PV device is measured using a known spectral irradiance distribution, its short-circuit current at any other spectral irradiance distribution can be computed using the spectral response of the PV test device.

2 Normative references

The following referenced documents are indispensable for the application 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, *Procedures for temperature and irradiance corrections to measured I-V characteristics of crystalline silicon photovoltaic devices*

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

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

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

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

IEC 60904-9, *Photovoltaic devices – Part 9: Solar simulator performance requirements*

IEC 60904-10, *Photovoltaic devices – Part 10 Methods of linearity measurement*

IEC 61215, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61646, *Thin film terrestrial photovoltaic (PV) modules – Design qualification and type approval*

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