

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

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60904-4:2010 sisaldab Euroopa standardi EN 60904-4:2009 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 28.02.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 30.11.2009.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 60904-4:2010 consists of the English text of the European standard EN 60904-4:2009.

This standard is ratified with the order of Estonian Centre for Standardisation dated 28.02.2010 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 30.11.2009.

The standard is available from Estonian standardisation organisation.

ICS 27.160

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**Photovoltaic devices -
Part 4: Reference solar devices -
Procedures for establishing calibration traceability
(IEC 60904-4:2009)**

Dispositifs photovoltaïques -
Partie 4: Dispositifs solaires de référence -
Procédures pour établir
la traçabilité de l'étalonnage
(CEI 60904-4:2009)

Photovoltaische Einrichtungen -
Teil 4: Referenz-Solarelemente -
Verfahren zur Feststellung
der Rückverfolgbarkeit der Kalibrierung
(IEC 60904-4:2009)

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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 82/533/CDV, future edition 1 of IEC 60904-4, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60904-4 on 2009-09-01.

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) 2010-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60904-4:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60891	NOTE Harmonized as EN 60891:1994 (not modified).
IEC 60904-1	NOTE Harmonized as EN 60904-1:2006 (not modified).
IEC 60904-3	NOTE Harmonized as EN 60904-3:2008 (not modified).
IEC 60904-7	NOTE Harmonized as EN 60904-7:2009 (not modified).
IEC 60904-8	NOTE Harmonized as EN 60904-8:1998 (not modified).
IEC 60904-9	NOTE Harmonized as EN 60904-9:2007 (not modified).
IEC 61836	NOTE Harmonized as CLC/TS 61836:2009 (not modified).

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 60904-2	- ¹⁾	Photovoltaic devices - Part 2: Requirements for reference solar devices	EN 60904-2	2007 ²⁾
ISO/IEC 17025	- ¹⁾	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005 ²⁾
ISO/IEC Guide 98-3	2008	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
ISO 9059	- ¹⁾	Solar energy - Calibration of field pyrheliometers by comparison to a reference pyrheliometer	-	-
ISO 9846	- ¹⁾	Solar energy - Calibration of a pyranometer using a pyrheliometer	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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PHOTOVOLTAIC DEVICES –

Part 4: Reference solar devices – Procedures for establishing calibration traceability

1 Scope and object

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

This standard applies to photovoltaic (PV) reference solar 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 solar device is required in the application of IEC 60904-1 and IEC 60904-3.

This standard has been written with single junction PV reference solar devices in mind, in particular crystalline Silicon. However, the main part of the standard is sufficiently general to include other technologies. The methods described in Annex A, however, are limited to single junction technologies.

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

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 9059, *Solar energy – Calibration of field pyrheliometers by comparison to a reference pyrheliometer*

ISO 9846, *Solar energy – Calibration of a pyranometer using a pyrheliometer*

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 following terms and definitions apply.

NOTE The different reference instruments for the traceability chain of solar irradiance are defined in this Clause. Table 1 lists and compares them with those in use for time. Figure 1 shows schematically the most common traceability chains, based on the methods described in Annex A.

3.1

primary standard

a device, which implements physically one of the SI units or directly related quantities. They are usually maintained by national metrology institutes (NMIs) or similar organisations entrusted with maintenance of standards for physical quantities. Often referred to also just as the «primary», the physical implementation is selected such that long-term stability, precision