



**SLOVENSKI STANDARD**  
**SIST EN 60904-1:2007**

**01-junij-2007**

**BUXca Yý U**  
**SIST EN 60904-1:2001**

---

**Fotonapetostne naprave – 1. del: Merjenje fotonapetostnih tokovno napetostnih karakteristik (IEC 60904-1:2006)**

Photovoltaic devices -- Part 1: Measurement of photovoltaic current-voltage characteristics

Photovoltaische Einrichtungen Teil 1: Messen der photovoltaischen Strom-/Spannungskennlinien (IEC 60904-1:2006)

Dispositifs photovoltaïques Partie 1: Mesure des caractéristiques courant-tension des dispositifs photovoltaïques (CEI 60904-1:2006)

**Ta slovenski standard je istoveten z: EN 60904-1:2006**

---

**ICS:**

27.160      Ú[ } } æ } ^ i \* æ      Solar energy engineering

**SIST EN 60904-1:2007**      en

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60904-1:2007

<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007>

English version

**Photovoltaic devices**  
**Part 1: Measurement of photovoltaic**  
**current-voltage characteristics**  
(IEC 60904-1:2006)

Dispositifs photovoltaïques  
Partie 1: Mesure des caractéristiques  
courant-tension des dispositifs  
photovoltaïques  
(CEI 60904-1:2006)

Photovoltaische Einrichtungen  
Teil 1: Messen der photovoltaischen  
Strom-/Spannungskennlinien  
(IEC 60904-1:2006)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

This European Standard was approved by CENELEC on 2006-10-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 82/433/FDIS, future edition 2 of IEC 60904-1, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60904-1 on 2006-10-01.

This European Standard supersedes EN 60904-1:1993.

The main changes with respect to EN 60904-1:1993 are as follows:

- Added object.
- Added normative references.
- Updated original Clause 2 (General Measurement Requirements), removing Figure 1 as it is obsolete.
- Provided more detail and guidance on how to measure in sunlight or simulated sunlight.
- Expanded original Clause 6 (Test Report) with requirements based on ISO 17025.

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) 2007-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-10-01

Annex ZA has been added by CENELEC.

[SIST EN 60904-1:2007](https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007)  
<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007>

### Endorsement notice

The text of the International Standard IEC 60904-1:2006 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	- <sup>1)</sup>	Procedures for temperature and irradiance corrections to measured I-V characteristics of crystalline silicon photovoltaic devices	EN 60891	1994 <sup>2)</sup>
IEC 60904-2	- <sup>1)</sup>	Photovoltaic devices Part 2: Requirements for reference solar cells	EN 60904-2	1993 <sup>2)</sup>
IEC 60904-3	- <sup>1)</sup>	Photovoltaic devices Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	1993 <sup>2)</sup>
IEC 60904-5	- <sup>1)</sup>	Photovoltaic devices Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method	EN 60904-5	1995 <sup>2)</sup>
IEC 60904-6	- <sup>1)</sup>	Photovoltaic devices Part 6: Requirements for reference solar modules	EN 60904-6	1994 <sup>2)</sup>
IEC 60904-7	- <sup>1)</sup>	Photovoltaic devices Part 7: Computation of spectral mismatch error introduced in the testing of a photovoltaic device	EN 60904-7	1998 <sup>2)</sup>
IEC 60904-9	- <sup>1)</sup>	Photovoltaic devices Part 9: Solar simulator performance requirements	-	-
IEC 60904-10	- <sup>1)</sup>	Photovoltaic devices Part 10: Methods of linearity measurement	EN 60904-10	1998 <sup>2)</sup>
ISO/IEC 17025	- <sup>1)</sup>	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005 <sup>2)</sup>

<sup>1)</sup> Undated reference.

<sup>2)</sup> Valid edition at date of issue.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60904-1:2007

<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007>

# INTERNATIONAL STANDARD

# IEC 60904-1

Second edition  
2006-09

---

---

## Photovoltaic devices –

### Part 1: Measurement of photovoltaic current-voltage characteristics

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60904-1:2007

<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007>

© IEC 2006 Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

L

*For price, see current catalogue*

## CONTENTS

FOREWORD.....	5
1 Scope and object.....	9
2 Normative references .....	9
3 General measurement requirements.....	11
4 Apparatus.....	13
4.1 For measurements in natural sunlight.....	13
4.2 For measurements in simulated sunlight.....	13
5 Measurements in natural sunlight .....	13
6 Measurement in steady-state simulated sunlight.....	15
7 Measurement in pulsed simulated sunlight .....	19
8 Test report.....	23

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60904-1:2007

<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-a286aa9d6e9d/sist-en-60904-1-2007>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## PHOTOVOLTAIC DEVICES –

**Part 1: Measurement of photovoltaic  
current-voltage characteristics**

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.  
<https://standards.iteh.ai/catalog/standards/sist/a7a23c3e-ebcd-45f0-ab1c-2a4c1e1e-2000>
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60904-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 1987. This edition constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

- Added object.
- Added normative references.
- Updated original Clause 2 (General Measurement Requirements), removing Figure 1 as it is obsolete.
- Provided more detail and guidance on how to measure in sunlight or simulated sunlight.
- Expanded original Clause 6 (Test Report) with requirements based on ISO 17025.