



# SLOVENSKI STANDARD SIST EN 60904-10:2011

01-marec-2011

Nadomešča:

SIST EN 60904-10:2001

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## Fotonapetostne naprave - 10. del: Metode merjenja linearnosti

Photovoltaic devices -- Part 10: Methods of linearity measurement

Photovoltaische Einrichtungen -- Teil 10: Meßverfahren für die Linearität

Dispositifs photovoltaïques -- Partie 10: Méthodes de mesure de la linéarité

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Ta slovenski standard je istoveten z: **EN 60904-10:2010**

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### **ICS:**

27.160

Sončna energija

Solar energy engineering

**SIST EN 60904-10:2011**

**en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60904-10**

March 2010

ICS 27.160

Supersedes EN 60904-10:1998

English version

**Photovoltaic devices -  
Part 10: Methods of linearity measurement  
(IEC 60904-10:2009)**

Dispositifs photovoltaïques -  
Partie 10: Méthodes de mesure  
de la linéarité  
(CEI 60904-10:2009)

Photovoltaische Einrichtungen -  
Teil 10: Messverfahren für die Linearität  
(IEC 60904-10:2009)

This European Standard was approved by CENELEC on 2010-03-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, 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: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 82/582/FDIS, future edition 2 of IEC 60904-10, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60904-10 on 2010-03-01.

This European Standard supersedes EN 60904-10:1998.

The main technical changes with regard to the EN 60904-10:1998 are as follows:

- Added clause for two-lamp method for  $I_{sc}$  linearity.
- Changed standard deviation as a metric for linearity to percent deviation from linearity. This was done because a non-linear device can have a low standard deviation and percent deviation is the quantitative number that matters for the parameter of interest.
- Removed clause on spectral responsivity nonlinearity because it is not used by any PV testing / calibration group. For testing real PV devices it is difficult to make this error significant in the spectral mismatch correction factor while still passing  $I_{sc}$  linearity. Measuring the responsivity over the entire response range means that the device will probably fail the temperature linearity near the band edge.
- Added a clause to allow short circuit linearity with temperature or total irradiance to be determined from absolute spectral responsivity measurements. This data is routinely reported in PTB primary reference cell calibration certificates.
- Added report clause in compliance with ISO/IEC 17025 requirements.
- Often the temperature coefficient of short circuit current is very small so measurement errors can result in percent deviations outside the accepted range. Therefore, the following text was added to 7.3c): "If the temperature coefficient of short circuit current is less than 0,1 %/K, then the device can be considered linear with respect to this parameter."

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

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) 2010-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-03-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60904-10:2009 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 60904-7	NOTE	Harmonized as EN 60904-7.
IEC 61829	NOTE	Harmonized as EN 61829.

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## 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	-	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 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	-
IEC 60904-8	-	Photovoltaic devices - Part 8: Measurement of spectral response of a photovoltaic (PV) device	EN 60904-8	-
IEC 60904-9	-	Photovoltaic devices - Part 9: Solar simulator performance requirements	EN 60904-9	-
IEC 61215	-	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	-
IEC 61646	-	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	-

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IEC 60904-10

Edition 2.0 2009-12

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

Photovoltaic devices – **STANDARD PREVIEW**  
Part 10: Methods of linearity measurement  
(standards.iteh.ai)

Dispositifs photovoltaïques – **SIST EN 60904-10:2011**  
Partie 10: Méthodes de mesure de la linéarité  
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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

**M**

ICS 27.160

ISBN 978-2-88910-325-6

## CONTENTS

FOREWORD.....	3
1 Scope and object.....	5
2 Normative references.....	5
3 Apparatus.....	6
4 Sample selection.....	6
5 Procedure for current and voltage linearity test.....	6
5.1 Procedure in natural sunlight.....	6
5.2 Procedure with a solar simulator.....	8
5.3 Procedure for short-circuit linearity from absolute spectral responsivity.....	9
6 Procedure for short-circuit current linearity from two-lamp method.....	9
6.1 Background.....	9
6.2 Apparatus - Light sources A and B.....	9
6.3 General procedure.....	9
7 Linearity calculation.....	10
7.1 Slope linearity determination.....	10
7.2 Determination of the short circuit current linearity using the two lamp method.....	11
7.3 Linearity requirements.....	11
8 Report.....	11
Bibliography.....	13

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<https://standards.iteh.ai/catalog/standards/sist/7ddca51a-6e50-49ba-804a-c25211409e45/sist-en-60904-10-2011>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## PHOTOVOLTAIC DEVICES –

## Part 10: Methods of linearity measurement

## FOREWORD

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International Standard IEC 60904-10 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 1998 and constitutes a technical revision.

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

- a) Added clause for two-lamp method for  $I_{sc}$  linearity.
- b) Changed standard deviation as a metric for linearity to percent deviation from linearity. This was done because a non-linear device can have a low standard deviation and percent deviation is the quantitative number that matters for the parameter of interest.
- c) Removed clause on spectral responsivity nonlinearity because it is not used by any PV testing / calibration group. For testing real PV devices it is difficult to make this error significant in the spectral mismatch correction factor while still passing  $I_{sc}$  linearity. Measuring the responsivity over the entire response range means that the device will probably fail the temperature linearity near the band edge.