SLOVENSKI STANDARD
SIST EN 60904-3:2001

01-september-2001

Fotonapetostne naprave ï 3. del: Postopki merjenja prizemnih fotonapetostnih (PV) sonį nih naprav s podatki referenį nega spektralnega sevanja

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

Photovoltaische Einrichtungen -- Teil 3: Meßgrundsätze für terrestrische photovoltaische (PV) Einrichtungen mit Angaben über die spektrale Strahlungsverteilung

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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ENGLISH VERSION

Photovoltaic devices
Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data
(IEC 904-3:1989)

Dispositifs photovoltaïques
Troisième partie: Principes de mesure des dispositifs solaires photovoltaïques (PV) à usage terrestre incluant les données de l'éclairement spectral de référence
(CEI 904-3:1989)

Photovoltaische Einrichtungen
Teil 3: Meßgrundsätze für terrestrische photovoltaische (PV) Einrichtungen mit Angaben über die spektrale Strahlungsverteilung
(IEC 904-3:1989)

This European Standard was approved by CENELEC on 1993-07-06. 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.

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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: rue de Stassart 35, B-1050 Brussels

FOREWORD

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 904-3:1989 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60904-3 on 6 July 1993.

The following dates were fixed:

- latest date of publication of an identical national standard	(dop)	1994-08-01
- latest date of withdrawal of conflicting national standards	(dow)	1994-08-01

ENDORSEMENT NOTICE

The text of the International Standard IEC 904-3:1989 was approved by CENELEC as a European Standard without any modification.

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Dispositifs photovoltaïques

Troisième partie:

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

Photovoltaic devices

Part 3:

Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data

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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 formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

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PREFACE

This standard has been prepared by IEC Technical Committee No. 82: Solar photovoltaic energy systems.

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

Six Months' Rule	Report on Voting	Two Months' Procedure	Report on Voting
82(CO)5	82(CO)9	82(CO)10	82(CO)13

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

PHOTOVOLTAIC DEVICES

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

1. Scope

This standard applies to the following crystalline silicon photovoltaic devices for terrestrial applications:

a) single solar cells with or without a protective cover

b) sub-assemblies of solar cells

c) flat modules

Note. – The term "test specimen" is used to denote any of these devices.

This standard is not applicable to solar cells designed for operation in concentrated sunlight, to modules embodying concentrators, nor to hybrid collectors which in addition to generating electricity, transfer heat to fluids for use in thermal systems.

This standard describes measurement principles and specifies the reference spectral irradiance distribution.

Current-voltage characteristics and the derived parameters are explained.

2. Object

This standard specifies measurement principles for determining the electrical performance of the terrestrial photovoltaic solar devices defined in the scope. These principles cover testing in both natural and simulated sunlight.

3. Measurement principles

In current practice the photovoltaic performance of a solar cell or module is determined by exposing it at a known temperature to stable sunlight, natural or simulated, and tracing its current-voltage characteristic while measuring the magnitude of the incident irradiance. The measured performance is then corrected to Standard Test Conditions (STC) or other desired conditions of irradiance and temperature. The corrected power output at the rated voltage and STC is commonly referred to as the rated power.

Since a solar cell has a wavelength-dependent response, its performance is significantly affected by the spectral distribution of the incident radiation, which in natural sunlight varies with location, weather, time of year and time of day, 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, the measured conversion efficiencies can vary by several per cent due to spectral distribution changes.

The principles given in this standard are designed to reduce such discrepancies by relating the performance rating to a reference terrestrial solar spectral irradiance distribution.

This is done by measuring the irradiance with a reference device that has essentially the same relative spectral response as the test specimen, and has been calibrated in terms of short-circuit current per unit of irradiance ($AW^{-1}m^2$) with the reference spectral distribution.

The reference device automatically takes into account variations in the spectral distribution. Because of this, location and weather conditions are not critical when the reference device method is used for outdoor performance measurements. The type of simulator is not critical for indoor measurements. Moreover, since the time constants of both the reference device and the test specimen are similar, fluctuations in solar intensity can be accepted provided they do not occur during a measurement.

If the performance of a cell or module is related to a known spectral irradiance distribution, it is possible for a user or array designer, using the spectral response of the cells, to compute within a reasonable tolerance its performance when exposed to light of any other known spectral irradiance distribution.

4. Reference solar spectral irradiance distribution

The reference solar spectral irradiance distribution for the purposes of this standard is given in Table I and Figure 1. This is a total distribution (direct + diffuse) sunlight, corresponding to an irradiance of 1000 W m^{-2} at AM 1.5, on a plane surface tilted at 37° to the horizontal, with 0.2 ground reflectance albedo, under the following meteorological conditions:

- atmospheric water content: 1.42 cm
- atmosphere ozone content: 0.34 cm
- turbidity: 0.27 at 0.5 μm