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Solceller – Del 5: Bestämning av ekvivalent celltemperatur med vilospänningsmetoden

Photovoltaic devices –

*Part 5: Determination of the equivalent cell temperature (ECT)
of photovoltaic (PV) devices by the open-circuit voltage method*

Som svensk standard gäller europastandarden EN 60904-5:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60904-5:2011.

Nationellt förord

Europastandarden EN 60904-5:2011

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60904-5, Second edition, 2011 - Photovoltaic devices - Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60904-5, utgåva 1, 1996, gäller ej fr o m 2014-03-24.

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Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

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Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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English version

**Photovoltaic devices -
Part 5: Determination of the equivalent cell temperature (ECT) of
photovoltaic (PV) devices by the open-circuit voltage method
(IEC 60904-5:2011)**

Dispositifs photovoltaïques -
Partie 5: Détermination de la température
de cellule équivalente (ECT) des
dispositifs photovoltaïques (PV) par la
méthode de la tension en circuit ouvert
(CEI 60904-5:2011)

Photovoltaische Einrichtungen -
Teil 5: Bestimmung der gleichwertigen
Zellentemperatur von photovoltaischen
(PV) Betriebsmitteln nach dem
Leerlaufspannungs-Verfahren
(IEC 60904-5:2011)

This European Standard was approved by CENELEC on 2011-03-24. 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

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Foreword

The text of document 82/595/CDV, future edition 2 of IEC 60904-5, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60904-5 on 2011-03-24.

This European Standard supersedes EN 60904-5:1995.

The main technical changes with regard to EN 60904-5:1995 are as follows:

- added and updated normative references;
- added reporting section;
- added method on how to extract the input parameters;
- rewritten method on how to calculate ECT;
- reworked formulae to be in line with EN 60891.

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) | 2011-12-24 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-03-24 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60904-5:2011 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	-	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 60904-2	-	Photovoltaic devices - Part 2: Requirements for reference solar devices	EN 60904-2	-
IEC 60904-7	-	Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices	EN 60904-7	-
IEC 60904-10	-	Photovoltaic devices - Part 10: Methods of linearity measurement	EN 60904-10	-
IEC 61215	-	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	-
IEC 61829	-	Crystalline silicon photovoltaic (PV) array - On-site measurement of I-V characteristics	EN 61829	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	-

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INTRODUCTION

When temperature sensors, such as thermocouples, are used to determine the cell temperature of PV devices under natural or simulated steady-state irradiance, two main problems arise. First, a considerable spread of temperature can be observed over the area of the module. Second, as the solar cells are usually not accessible, sensors are attached to the back of the module and the measured temperature thus is influenced by the thermal conductivity of the encapsulant and back materials. These problems are aggravated when determining the equivalent cell temperature for on-site measurements of array performance where all cells have slightly different temperatures and one cannot easily determine the average cell temperature.

The equivalent cell temperature (ECT) is the average temperature at the electronic junctions of the device (cells, modules, arrays of one type of module) which equates to the current operating temperature if the entire device were operating uniformly at this junction temperature.

PHOTOVOLTAIC DEVICES –

Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method

1 Scope and object

This part of IEC 60904 describes the preferred method for determining the equivalent cell temperature (ECT) of PV devices (cells, modules and arrays of one type of module), for the purposes of comparing their thermal characteristics, determining NOCT (nominal operating cell temperature) and translating measured I-V characteristics to other temperatures.

This standard applies to linear devices with logarithmic V_{OC} dependence on irradiance and in stable conditions. It may be used for all technologies but one has to verify that there is no preconditioning effect influencing the measurement.

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, *Photovoltaic devices – Procedures for temperature and irradiance corrections to measured I-V characteristics*

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 60904-7, *Photovoltaic devices – Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices*

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 61829, *Crystalline silicon photovoltaic (PV) array – On-site measurement of I-V characteristics*

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