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Fotonapetostne naprave - Postopki za temperaturno in sevalno korekcijo izmerjenih karakteristik I-U

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

Verfahren zur Umrechnung von gemessenen Strom-Spannungs-Kennlinien von photovoltaischen Bauelementen auf andere Temperaturen und Bestrahlungsstärken

Dispositifs photovoltaïques - Procédures pour les corrections en fonction de la température et de l'éclairement à appliquer aux caractéristiques I-V mesurées

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Solar energy engineering

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN IEC 60891

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Supersedes EN 60891:2010 and all of its amendments
and corrigenda (if any)

English Version

**Photovoltaic devices - Procedures for temperature and
irradiance corrections to measured I-V characteristics
(IEC 60891:2021)**

Dispositifs photovoltaïques - Procédures pour les
corrections en fonction de la température et de l'éclairement
à appliquer aux caractéristiques I-V mesurées
(IEC 60891:2021)

Verfahren zur Umrechnung von gemessenen Strom-
Spannungs-Kennlinien von photovoltaischen Bauelementen
auf andere Temperaturen und Bestrahlungsstärken
(IEC 60891:2021)

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Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60891:2021 (E)**European foreword**

The text of document 82/1936/FDIS, future edition 3 of IEC 60891, prepared by IEC/TC 82 “Solar photovoltaic energy systems” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60891:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-09-01 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-12-01 document have to be withdrawn

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60904-1	-	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics	EN IEC 60904-1	-
IEC/TS 60904-1-2	-	Photovoltaic devices - Part 1-2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices	-	-
IEC 60904-2	-	Photovoltaic devices - Part 2: Requirements for photovoltaic reference devices	EN 60904-2	-
IEC 60904-7	-	Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices	EN IEC 60904-7	-
IEC 60904-8	-	Photovoltaic devices - Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device	EN 60904-8	-
IEC 60904-9	-	Photovoltaic devices - Part 9: Classification of solar simulator characteristics	EN IEC 60904-9	-
IEC 60904-10	2020	Photovoltaic devices - Part 10: Methods of linear dependence and linearity measurements	EN IEC 60904-10	2020
IEC 61215-2	-	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures	EN IEC 61215-2	-
IEC/TS 61836	-	Solar photovoltaic energy systems -- Terms, definitions and symbols	-	-

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

iTeh STANDARD

**Photovoltaic devices – Procedures for temperature and irradiance corrections
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PHOTOVOLTAIC DEVICES – PROCEDURES FOR TEMPERATURE AND IRRADIANCE CORRECTIONS TO MEASURED I-V CHARACTERISTICS**FOREWORD**

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International Standard IEC 60891 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- adds guidance on which correction procedure shall be used depending on application;
- introduces translation procedure 4 applicable to c-Si technologies with unknown temperature coefficients;
- introduces various clarifications in existing procedures to improve measurement accuracy and reduce measurement uncertainty;
- adds an informative annex for supplementary methods that can be used for series resistance determination.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
82/1936/FDIS	82/1957/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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PHOTOVOLTAIC DEVICES – PROCEDURES FOR TEMPERATURE AND IRRADIANCE CORRECTIONS TO MEASURED I-V CHARACTERISTICS

1 Scope

This document defines procedures to be followed for temperature and irradiance corrections to the measured I - V (current-voltage) characteristics (also known as I - V curves) of photovoltaic (PV) devices. It also defines the procedures used to determine factors relevant to these corrections. Requirements for I - V measurement of PV devices are laid down in IEC 60904-1 and its relevant subparts.

The PV devices include a single solar cell with or without a protective cover, a sub-assembly of solar cells, or a module. A different set of relevant parameters for I - V curve correction applies for each type of device. The determination of temperature coefficients for a module (or sub-assembly of cells) may be calculated from single cell measurements, but this is not the case for the internal series resistance and curve correction factor, which should be separately measured for a module or subassembly of cells. Refer to Annex A for alternative procedures for series resistance determination.

The use of I - V correction parameters is valid for the PV device for which they have been measured. Variations may occur within a production lot or the type of class.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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IEC 60904-1, *Photovoltaic devices – Part 1: Measurements of photovoltaic current-voltage characteristics*

IEC TS 60904-1-2, *Photovoltaic devices – Part 1-2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices*

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 60904-8, *Photovoltaic devices – Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device*

IEC 60904-9, *Photovoltaic devices – Part 9: Classification of solar simulator characteristics*

IEC 60904-10:2020, *Photovoltaic devices – Part 10: Methods of linear dependence and linearity measurements*

IEC 61215-2, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions, and symbols*

3 Terms and definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC TS 61836, together with the following, apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

B_1

irradiance correction factor for open-circuit voltage which is linked with the diode thermal voltage, V_t of the p-n junction and n_S

Note 1 to entry: It is used in correction procedure 2.

3.2

B_2

irradiance correction factor for open-circuit voltage which accounts for non-linearity of V_{OC} with irradiance scaling

Note 1 to entry: It is used in correction procedure 2.

3.3

DUT

device under test

3.4

R_S

internal series resistance of the DUT employed by correction procedures 1 and 4

3.5

R'_S

internal series resistance of the DUT employed by correction procedure 2

Note 1 to entry: Although determined by a different method than R_S , both quantities share the same physical meaning and therefore their values for the same DUT are similar.

3.6

n_S

number of cells serially connected in the DUT

3.7

a

interpolation constant employed in correction procedure 3, that has a relation with the irradiance and temperature

3.8

ε

product of ideality factor of the DUT with the bandgap of the photovoltaic material divided by electron's elementary charge

Note 1 to entry: It is used in correction procedure 4.