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Sonļ ni fotonapetostni sistemi - Izrazi, definicije in simboli (IEC/TS 61836:2007)

Solar photovoltaic energy systems - Terms, definitions and symbols

Photovoltaische Solarenergiesysteme - Begriffe, Definitionen und Symbole

Systèmes de conversion photovoltaïque de l'énergie solaire - Termes, définitions et symboles

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Solar photovoltaic energy systems - Terms, definitions and symbols (IEC/TS 61836:2007)

Systèmes de conversion photovoltaïque de l'énergie solaire - Termes, définitions et symboles (CEI/TS 61836:2007)

Photovoltaische Solarenergiesysteme - Begriffe, Definitionen und Symbole (IEC/TS 61836:2007)

This Technical Specification was approved by CENELEC on 2009-01-23.

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CENELEC

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

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of the Technical Specification IEC/TS 61836:2007, prepared by IEC TC 82, Solar photovoltaic energy systems was submitted to the vote in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.3 and was approved by CENELEC as CLC/TS 61836 on 2009-01-23.

The following date was fixed:

– latest date by which the existence of the CLC/TS has to be announced at national level (doa) 2009-07-23

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the Technical Specification IEC/TS 61836:2007 was approved by CENELEC as a Technical Specification without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60891 + A1	NOTE	Harmonized as EN 60891:1994 (not modified).
IEC 60904-1	NOTE	Harmonized as EN 60904-1:2006 (not modified).
IEC 60904-2	NOTE	Harmonized as EN 60904-2:2007 (not modified).
IEC 60904-5	NOTE	Harmonized as EN 60904-5:1995 (not modified).
IEC 60904-7	NOTE	Harmonized as EN 60904-7:1998, which is superseded by EN 60904-7:2009 based on IEC 60904-7:2008 (not modified).
IEC 60904-8	NOTE	Harmonized as EN 60904-8:1998 (not modified).
IEC 60904-9	NOTE	IEC 60904-9:1995 is superseded by IEC 60904-9:2007, which is harmonized as EN 60904-9:2007 (not modified).
IEC 60904-10	NOTE	Harmonized as EN 60904-10:1998 (not modified).
IEC 61215	NOTE	Harmonized as EN 61215:2005 (not modified).
IEC 61646	NOTE	Harmonized as EN 61646:1997, which is superseded by EN 61646:2008 based on IEC 61646:2008 (not modified).
IEC 61730-1	NOTE	Harmonized as EN 61730-1:2007 (modified).
IEC 61730-2	NOTE	Harmonized as EN 61730-2:2007 (modified).
IEC 61683	NOTE	Harmonized as EN 61683:2000 (not modified).
IEC 61702	NOTE	Harmonized as EN 61702:1999 (not modified).
IEC 61725	NOTE	Harmonized as EN 61725:1997 (not modified).
IEC 62093	NOTE	Harmonized as EN 62093:2005 (not modified).
IEC 61173	NOTE	Harmonized as EN 61173:1994 (not modified).
IEC 61194	NOTE	Harmonized as EN 61194:1995 (modified).
IEC 61277	NOTE	Harmonized as EN 61277:1998 (not modified).
IEC 61724	NOTE	Harmonized as EN 61724:1998 (not modified).
IEC 62124	NOTE	Harmonized as EN 62124:2005 (not modified).
IEC 61345	NOTE	Harmonized as EN 61345:1998 (not modified).
IEC 61701	NOTE	Harmonized as EN 61701:1999 (not modified).
IEC 61721	NOTE	Harmonized as EN 61721:1999 (not modified).
IEC 62108	NOTE	Harmonized as EN 62108:2008 (not modified).

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.

Publication	Year	Title	EN/HD	Year
IEC 60904-3	1989	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3[1)]	1993

[1)] EN 60904-3 is superseded by EN 60904-3:2008, which is based on IEC 60904-3:2008.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOLAR PHOTOVOLTAIC ENERGY SYSTEMS – TERMS, DEFINITIONS AND SYMBOLS

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 61836, which is a technical specification, has been prepared IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

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

1) The number of terms has increased. Abbreviations have been included.

2) The terms in Edition 2 are organised into categories and families. Terms contained in families are cross referenced with an alphabetical listing. A bibliography and an index were added. The purpose of aggregating terms into families is to allow readers to easily see the relationships between terms that speak of similar quantities and subjects but that have slight variations.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
82/442/DTS	82/487/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual edition of this document may be issued at a later date.

INTRODUCTION

Following the development of solar photovoltaic (PV) technology, specific Standards have been prepared by IEC Technical Committee 82 since 1987. The terms and symbols used in the PV industry necessitate a systematisation in order to have a consolidated glossary for experts' common understanding.

This Glossary lists the terms and symbols that the PV industry commonly uses. It is a living document that will change as new terms and symbols are added. These have been harmonized with IEC 60050 and other IEC documents as far as possible. All definitions not included in this Technical Specification may be found elsewhere in other IEC documents.

NOTE 1 The terms "PV", "photovoltaic" and "solar photovoltaic" can be read and used interchangeably and without the need for stating each term to show that each are applicable and commonly used by the solar photovoltaic industry.

NOTE 2 All terms beginning with "solar photovoltaic" and "PV" are listed under their respective "photovoltaic" names.

NOTE 3 The terms are listed alphabetically in ten categories. Under these categories, some of the terms have been grouped into families of related meaning in order for the reader to readily see the differences between the terms.

NOTE 4 This Glossary lists the precise usage of terms. Cross-references are provided to efficiently point the reader to the location of definitions. For example, a "solar photovoltaic array" may also be referred to as "photovoltaic array" or "array" when the reference to it is particularly clear. The definition for this term, for example, occurs under the family heading of "photovoltaic" in the "Solar photovoltaic systems" section.

NOTE 5 The colloquial use of "solar" as the sole adjective of a noun is discouraged. For example, though "solar array" may be commonly used in non-technical conversations, the precise terms are "solar photovoltaic array", "photovoltaic array", and "array".

NOTE 6 Unless specifically noted otherwise, the terms "device", "cell", "module", "array", "sub-array", "field", "component", "system", and "product" refer to items incorporating a photovoltaic device. As a result, each of these terms can be understood to read as "PV device", "PV cell", "PV module", *etc.*, without having to re-state the term "PV" each time, though now and then it is useful to re-state "PV".

NOTE 7 The numeric quantities described by many of the terms can be expressed over any convenient unit of time that the user may wish, such as day, month or year.

NOTE 8 "W_p" is not a recommended unit for rated power. For example for a 50 W module, the correct terminology is "the rated power is 50 W", and not "the power is 50 W_p".

NOTE 9 The documents from which these terms originated are shown in square brackets [ ]. Some adaptations may have occurred.

NOTE 10 This Glossary document recognises the related IEC co-ordinating Technical Committees:

1	Terminology	77	Electromagnetic compatibility
21	Secondary cells and batteries	82	Solar photovoltaic energy systems
22	Power electronic systems and equipment	88	Wind turbines
47	Semiconductor devices	105	Fuel cell technologies
64	Electrical installations and protection against electric shock	106	Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure

SOLAR PHOTOVOLTAIC ENERGY SYSTEMS – TERMS, DEFINITIONS AND SYMBOLS

1 Scope and object

This Technical Specification deals with the terms and symbols from national and international solar photovoltaic standards and relevant documents used within the field of solar photovoltaic (PV) energy systems. It includes the terms and symbols compiled from the published IEC technical committee 82 standards, previously published as technical report IEC 61836:1997.

The focus of this Technical Specification is "what do the words mean" and not "under what conditions do the terms apply".

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 60904-3:1989, *Photovoltaic devices – Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data*

3 Glossary of terms, definitions and symbols for solar photovoltaic energy systems

3.1 Solar photovoltaic cells and modules

This subclause addresses vocabulary pertaining to photovoltaic materials, photovoltaic cells and photovoltaic modules. Other photovoltaic components are described in subclause 3.2. Photovoltaic systems are described in subclause 3.3.

3.1.1 **amorphous photovoltaic material**

solid-state material in a semi-stable condition with no long-range order in the structural arrangement of the atoms

3.1.2 **amorphous silicon**

see "silicon/amorphous", 3.1.58a).

3.1.3 **anti-reflective coating**

layer formed on the surface of a PV cell to reduce reflective loss

3.1.4 **back surface field effect**

see "effect/back surface field effect", 3.1.25a)

3.1.5 **band gap energy**

(Unit: eV)

amount of energy required to bring an electron from the state of valence electron to the state of free electron

3.1.6 **barrier energy**

(Unit: eV)

energy given up by an electron in penetrating the PV cell barrier

NOTE The barrier energy is a measure of the electrostatic potential of the barrier.

3.1.7 **bus lines**

see "metallisation line/bus bar", 3.1.37a)

3.1.8 **bypass diode (on a module level)**

diode connected across one or more PV cells in the forward electric current direction to allow the PV module electric current to bypass cells to prevent hot spot or hot cell damage resulting from the reverse voltage biasing from the other cells in that module

3.1.9 **cell**

see "photovoltaic/photovoltaic cell", 3.1.43a).

The following terms are used to describe the structure of PV cells and materials.

a) **CIS photovoltaic cell**

PV cell fabricated of copper indium diselenide ($CuInSe_2$, abbreviation CIS) material as a main constituent (thin film type)

b) **compound semiconductor photovoltaic cell**

PV cell made of compound semiconductor, which consists of different chemical elements, such as GaAs (III-V compounds), CdS/CdTe (II-VI compounds), $CdS/CuInSe_2$, etc.

c) **concentrator photovoltaic cell**

see "concentrator photovoltaic cell", 3.8.5a)

d) **dye-sensitized photovoltaic cell**

photoelectrochemical device using dye molecules with two electrodes and an electrolyte

e) **integrated type photovoltaic cell**

multiple PV cells connected in series produced on a single substrate that appears like a single cell

NOTE 1 Integrated type PV cells may include stacked or side-by-side configurations.

f) **multijunction photovoltaic cell**

see "cell/stacked photovoltaic cell", 3.1.9k)

g) **organic photovoltaic cell**

PV cell fabricated of organic materials being polymers and/or small molecules (thin film type)

h) **PN junction photovoltaic cell**

PV cell using a PN junction

NOTE 2 See also "PN junction", 3.1.34f).

i) **Schottky barrier photovoltaic cell**

PV cell using a Schottky junction formed at the metal-semiconductor interface

j) silicon photovoltaic cell

PV cell fabricated of silicon material as a main constituent

k) stacked photovoltaic cell

PV cell consisting of layers of different PV cells having different optical properties in which incident light is absorbed by each cell layer

l) tandem photovoltaic cell

common name for a stack of two or more PV cells behind each other

m) thin film photovoltaic cell

PV cell made of thin layers of semiconductor material

NOTE 3 See also "silicon/polycrystalline silicon", 3.1.58e).

3.1.10 **cell barrier**

very thin electric-potential barrier along the interface between the P-type layer and the N-type layer of a PV cell

NOTE 1 A cell barrier is also known as the "depletion zone".

NOTE 2 An enlectric-potential barrier is a region of high electric field strength opposing the passage of an electrically charged particle in a direction depending on the sign of the electric charge.

3.1.11 **cell junction**

see "junction/cell junction", 3.1.34a)

3.1.12 **CIS photovoltaic cell**

see "cell/CIS photovoltaic cell", 3.1.9a)

3.1.13 **compound semiconductor photovoltaic cell**

see "cell/compound semiconductor photovoltaic cell", 3.1.9b)

3.1.14 **conversion efficiency**

(Unit: dimensionless, usually expressed as a percentage, %)

ratio of electric power generated by a PV device per unit area to its incident irradiance as measured under standard test conditions, STC

NOTE See also "conditions/standard test conditions", 3.4.16e).

3.1.15 **crystalline silicon**

see "silicon/crystalline silicon", 3.1.58b).

3.1.16 **current**

For PV devices and related entries, see "photovoltaic/photovoltaic current", 3.1.43b)

NOTE There are many uses for the electrical term "current".

3.1.17 **Czochralski process**

see "ingot manufacturing process/Czochralski process", 3.1.32a)

3.1.18 **dark current**

(Unit: A)

electric current remaining in a PV device when its incident irradiance is zero

3.1.19 **device**

see "photovoltaic/photovoltaic device", 3.1.43c)

3.1.20 **diffusion layer**

portion of P-layer or N-layer prepared by a diffusion of dopants to form a PN junction

3.1.21 **directional solidification**

see "ingot manufacturing process/directional solidification", 3.1.32b)

3.1.22 **donor** (in photovoltaic cells)

dopant (such as phosphorus in the case of silicon material) that supplies an additional electron to an otherwise balanced material structure

3.1.23 **dopant** (in photovoltaic cells)

chemical added in small amounts to a semiconductor material to modify its electrical properties

NOTE 1 An N-dopant introduces more electrons than are required for the structure of the material (e.g., phosphorus for silicon material).

NOTE 2 A P-dopant creates electron vacancies in the material structure (e.g., boron for silicon material).

3.1.24 **dye-sensitized photovoltaic cell**

see "cell/dye-sensitized photovoltaic cell", 3.1.9d)

3.1.25 **effect**

see "photovoltaic/photovoltaic effect", 3.1.43d).

a) **back-surface field effect**

effect where the charge carriers generated near the back side of a PV cell are collected effectively by the inner electric field that is formed by a heavily doped zone near the rear electrode

b) **light-confinement effect**

effect where the short-circuit electric current is increased by trapping incident light inside a PV cell using textured surfaces and structures, etc.

3.1.26 **electromagnetic casting**

see "ingot manufacturing process/electromagnetic casting", 3.1.32c).

3.1.27 **energy gap**

(Unit: eV)