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INTERNATIONAL STANDARD

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Photovoltaics in buildings –
Part 1: Requirements for building-integrated photovoltaic modules

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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PHOTOVOLTAICS IN BUILDINGS –

Part 1: Requirements for building-integrated photovoltaic modules

FOREWORD

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International Standard IEC 63092-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems, in collaboration with ISO technical committee 160: Glass in building.

This standard is based on EN 50583-1.

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

FDIS	Report on voting
82/1769/FDIS	82/1792/RVD

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

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

A list of all parts in the IEC 63092 series, published under the general title *Photovoltaics in buildings*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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- withdrawn,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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PHOTOVOLTAICS IN BUILDINGS –

Part 1: Requirements for building-integrated photovoltaic modules

1 Scope

This part of IEC 63092 specifies BIPV (building-integrated photovoltaic) module requirements while IEC 63092-2 specifies BIPV system requirements. Both parts specify building requirements and the applicable electrotechnical requirements (both in general and specific with respect to module assembly and application category).

This document applies to photovoltaic modules used as building products. It focuses on the properties of these photovoltaic modules relevant to basic building requirements and the applicable electro-technical requirements. This document references international standards, technical reports and guidelines. For some applications, national standards (or regulations) for building products may also apply in individual countries, which are not explicitly referenced herein and for which harmonized International Standards are not yet available.

The document is addressed to manufacturers, planners, system designers, installers, testing institutes and building authorities.

This document does not apply to concentrating photovoltaic modules.

This document addresses requirements on the BIPV modules in the specific ways they are intended to be mounted but not the mounting structure itself, which is within the scope of IEC 63092-2.

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.

IEC 61082-1, *Preparation of documents used in electrotechnology – Part 1: Rules*

IEC 61215-1, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements*

IEC 61215-1-1, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules*

IEC 61215-1-2, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules*

IEC 61215-1-3, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules*

IEC 61215-1-4, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-4: Special requirements for testing of thin-film Cu(In,Ga)(S,Se)2 based photovoltaic (PV) modules*

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

IEC 61730-1, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction*

IEC 61730-2, *Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing*

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

IEC 62446-1, *Photovoltaic (PV) systems – Requirements for testing, documentation and maintenance – Part 1: Grid connected systems – Documentation, commissioning tests and inspection*

IEC TS 62915, *Photovoltaic (PV) modules – Type approval, design and safety qualification – Retesting*

IEC 63092-2, *Photovoltaics in buildings – Part 2: Requirements for building-integrated photovoltaic systems*

IEC TS 63126, *Guidelines for qualifying PV modules, components and materials for operation at high temperatures*

IEC/IEEE 82079-1: *Preparation of information for use (instructions for use) of products – Part 1: Principles and general requirements*

ISO 9050, *Glass in building – Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors*

ISO 10291, *Glass in building – Determination of steady-state U values (thermal transmittance) of multiple glazing – Guarded hot plate method*

ISO 10292, *Glass in building – Calculation of steady-state U values (thermal transmittance) of multiple glazing*

ISO 10293, *Glass in building – Determination of steady-state U values (thermal transmittance) of multiple glazing – Heat flow meter method*

ISO 12543-1, *Glass in building – Laminated glass and laminated safety glass – Part 1: Definitions and description of component parts*

ISO 12543-2, *Glass in building – Laminated glass and laminated safety glass – Part 2: Laminated safety glass*

ISO 12543-3, *Glass in building – Laminated glass and laminated safety glass – Part 3: Laminated glass*

ISO 12543-4, *Glass in building – Laminated glass and laminated safety glass – Part 4: Test methods for durability*

ISO 12543-5, *Glass in building – Laminated glass and laminated safety glass – Part 5: Dimensions and edge finishing*

ISO 12543-6, *Glass in building – Laminated glass and laminated safety glass – Part 6: Appearance*

ISO 15099, *Thermal performance of windows, doors and shading devices – Detailed calculations*

ISO 16940, *Glass in building – Glazing and airborne sound insulation – Measurement of the mechanical impedance of laminated glass*

ISO 19467 *Thermal performance of windows and doors – Determination of solar heat gain coefficient using solar simulator*

ISO 22897, *Glass in building – Glazing and airborne sound insulation – Product descriptions and determination of properties*

ISO 28278-1, *Glass in building – Glass products for structural sealant glazing – Part 1: Supported and unsupported monolithic and multiple glazing*

ISO 29584, *Glass in building – Pendulum impact testing and classification of safety glass*

ISO 52022-1, *Energy performance of buildings – Thermal, solar and daylight properties of building components and elements – Part 1: Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*

ISO 52022-3, *Energy performance of buildings – Thermal, solar and daylight properties of building components and elements – Part 3: Detailed calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*

3 Terms and definitions

For the purposes of this document, terms and definitions given in IEC 61215-1, IEC 61215-2, IEC TS 61836, IEC 63092-2 and ISO 12543-1 (in case the module contains one or more glass sheets), 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
building product
any product or kit which is produced and placed on the market for incorporation in a permanent manner in buildings or parts thereof and the performance of which has an effect on the performance of the buildings with respect to the following basic building requirements:

a) Mechanical resistance and durability

b) Safety in case of fire

c) Hygiene, health and the environment

d) Safety and accessibility in use

e) Protection against noise

f) Energy economy and heat retention

g) Sustainable use of natural resources

3.2
building-integrated photovoltaic module
BIPV module
photovoltaic module that provides one or more of the functions of the building envelope

Note 1 to entry: The building envelope functions shall be, depending on the application, one or more of the following:

a) Mechanical rigidity or structural integrity.

b) Primary weather impact protection: rain, snow, wind, hail.

c) Shading, daylighting, thermal insulation.

d) Fire protection.

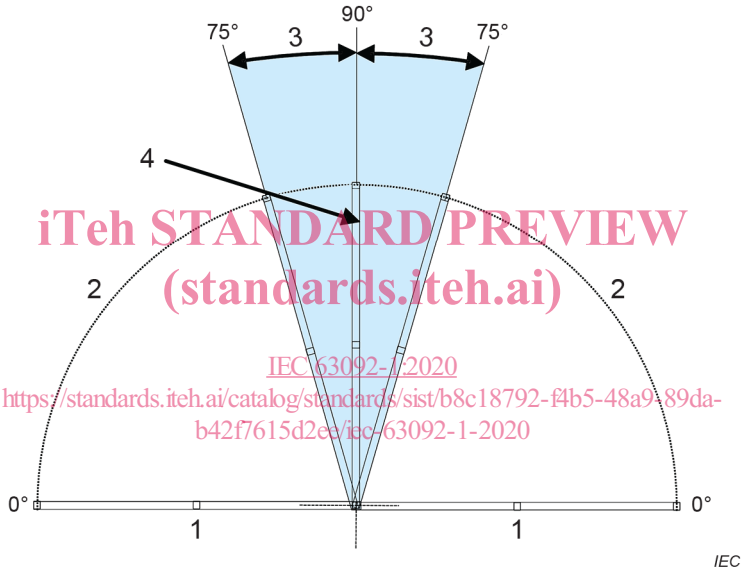
e) Noise protection.

f) Separation between indoor and outdoor environments.

g) Security, shelter or safety.

Note 2 to entry: If a BIPV module is uninstalled, it would have to be replaced by an appropriate building product in order to meet the building requirements.

3.3
non-sloping module
module installed at a tilt angle of 75° to 90° inclusive from the horizontal plane (see Figure 1), i.e. a module installed at an inclination of ±15° inclusive from the vertical plane



Key

1 horizontal module

2 angle of module considered to be sloping (including horizontal)

3 angle of module considered to be non-sloping (75° to 90° inclusive, from the horizontal plane)

4 vertical module

Figure 1 – Tilt angles of modules considered sloping and non-sloping

3.4
optically representative area of the module
selected surface area of the module that includes all the components of the module which have a significant effect on its optical properties and g value. The ratio of electrically active area (i.e. area covered by PV cells and interconnectors) to electrically inactive area within the optically representative area should not differ by more than 5 % from the ratio of the total electrically active area to the total electrically inactive area for the complete module (see Figure 2).

Note 1 to entry: The figure of 5 % was determined to result in an error of 3 % or less in the g value for BIPV modules consisting of crystalline silicon PV cells spaced over a light-transmitting medium (e.g. glass).

Note 2 to entry: The g value refers to the solar heat gain coefficient (SHGC) as defined in ISO 19467.

Note 3 to entry: If the solar cells themselves consist of opaque and transparent areas, or there are inhomogeneous layers such as ceramic frits or coloured interlayers in front of the solar cell layer, special care shall be taken in the selection of the "optically representative area" to ensure that it represents the proportions of all optically different areas of the BIPV module to within the specified tolerance.

Ratio of electrically active area to electrically inactive area for the complete module:

$$r_{\text{total,mod}} = \frac{A_{\text{cell,total}} + A_{\text{intercon,total}} + A_{\text{jb,total}}}{A_{\text{inact,total}}} \quad (1)$$

Ratio of electrically active area to electrically inactive area for the representative area of the module:

$$r_{\text{rep,mod}} = \frac{A_{\text{cell,rep}} + A_{\text{intercon,rep}}}{A_{\text{inact,rep}}} \quad (2)$$

Relation between the ratios associated to the complete module ($r_{\text{total,mod}}$) and the representative area of the module ($r_{\text{rep,mod}}$):

$$\frac{r_{\text{total,mod}} - r_{\text{rep,mod}}}{r_{\text{total,mod}}} = \pm 5\ \% \quad (3)$$

where

$r_{\text{total,mod}}$ is the ratio of electrically active area to electrically inactive area for the complete module;

$A_{\text{cell,total}}$ is the surface area covered by cells within total module area;

$A_{\text{intercon,total}}$ is the surface area covered by interconnectors within total module area;

$A_{\text{jb,total}}$ is the surface area covered by junction box, if within area of light-transmitting medium (otherwise $A_{\text{jb,total}} = 0$);

$A_{\text{inact,total}}$ is the electrically inactive surface area within total module area;

$r_{\text{rep,mod}}$ is the ratio of electrically active area to electrically inactive area for the representative area of the module;

$A_{\text{cell,rep}}$ is the surface area covered by cells within representative area;

$A_{\text{intercon,rep}}$ is the surface area covered by interconnectors within representative area;

$A_{\text{inact,rep}}$ is the electrically inactive surface area within representative area.