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Photovoltaics in buildings –
Part 2: Requirements for building-integrated photovoltaic systems

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PHOTOVOLTAICS IN BUILDINGS –

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FOREWORD

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International Standard IEC 63092-2 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 50583-2.

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

FDIS	Report on voting
82/1768A/FDIS	82/1793/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- withdrawn,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 2: Requirements for building-integrated photovoltaic systems

1 Scope

IEC 63092-1 specifies BIPV (building-integrated photovoltaic) module requirements while this document 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 systems that are integrated into buildings with the photovoltaic modules used as building products. It focuses on the properties of these photovoltaic systems relevant to basic building requirements and the applicable electrotechnical 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 here and for which harmonized International Standards are not yet available.

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

This document does not apply to concentrating photovoltaic systems or photovoltaic systems using concentrating photovoltaic modules.

This document addresses requirements on the BIPV systems in the specific ways they are intended to be mounted and the mounting structure, but not the BIPV module itself, which is within the scope of IEC 63092-1.

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 60364-1, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-42, *Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects*

IEC 60364-4-43, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-4-44, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-5-51, *Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules*

IEC 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60364-5-53, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring*

IEC 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 60364-5-55, *Electrical installations of buildings – Part 5-55: Selection and erection of electrical equipment – Other equipment*

IEC 60364-5-56, *Low-voltage electrical installations – Part 5-56: Selection and erection of electrical equipment – Safety services*

IEC 60364-6, *Low-voltage electrical installations – Part 6: Verification*

IEC 60364-7-712, *Low-voltage electrical installations – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems*

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

IEC 61724-1, *Photovoltaic system performance – Part 1: Monitoring*

IEC TS 61724-2, *Photovoltaic system performance – Part 2: Capacity evaluation method*

IEC TS 61724-3, *Photovoltaic system performance – Part 3: Energy evaluation method*

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 62548, *Photovoltaic (PV) arrays – Design requirements*

IEC 63092-1, *Photovoltaics in buildings – Part 1: Requirements for building-integrated photovoltaic modules*

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

ISO 2394, *General principles on reliability for structures*

ISO 3010, *Bases for design of structures – Seismic actions on structures*

ISO 4354, *Wind actions on structures*

ISO 4355, *Bases for design of structures – Determination of snow loads on roofs*

ISO 4356, *Bases for the design of structures – Deformations of buildings at the serviceability limit states*

ISO 6946, *Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods*

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

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

ISO 12494, *Atmospheric icing of structures*

ISO 12631, *Thermal performance of curtain walling – Calculation of thermal transmittance*

ISO 13033, *Bases for design of structures – Loads, forces and other actions – Seismic actions on nonstructural components for building applications*

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

ISO 15821, *Doorsets and windows – Water-tightness test under dynamic pressure – Cyclonic aspects*

ISO 16813, *Building environment design – Indoor environment – General principles*

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

ISO 22111, *Bases for design of structures – General requirements*

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

ISO 28278-2, *Glass in building – Glass products for structural sealant glazing – Part 2: Assembly rules*

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, the terms and definitions given in IEC 61215-1, IEC 61215-2, IEC 61724-1, IEC TS 61724-2, IEC TS 61724-3, IEC TS 61836, IEC 63092-1 and ISO 12543-1 (in case the module contains one or more glass panes), together with the following, apply.

NOTE Annex A-specific definitions are included in the Annex itself.

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-integrated photovoltaic system
BIPV system
photovoltaic system in which the PV modules satisfy the definition of IEC 63092-1 for BIPV modules. It includes the “PV array” as defined by IEC 62548 and the mechanical mounting systems needed to integrate the BIPV modules into the building

Note 1 to entry: Inverters are not addressed here, as they are adequately covered by International Standards applying to inverters in PV systems. Building integration of a PV system does not change the requirements on the inverters.

3.2
optically representative area of the system
selected surface area of the system that includes all the components of the system 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 system (see Figure 1)

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 in a light-transmitting medium.

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 system to within the specified tolerance.

Ratio of electrically active area to electrically inactive area for the complete system, including frame:

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

Ratio of electrically active area to electrically inactive area for the optically representative area of the system, including frame:

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

Relation between the ratios associated to the complete system ($r_{\text{tota,sys}}$) and the optically representative area of the system ($r_{\text{rep,sys}}$):

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

where

$r_{total,sys}$ is the ratio of electrically active area to electrically inactive area for the complete system, including frame;

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

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

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

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

$A_{frame,\ total}$ is the surface area of the frame within total system area;

$r_{rep,sys}$ is the ratio of electrically active area to electrically inactive area for the optically representative area of the system;

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

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

$A_{inact,rep}$ is the electrically inactive surface area within optically representative area;

$A_{frame,\ rep}$ is the surface area of the frame within optically representative area.