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Photovoltaics in buildings -
Part 3: Determination methodology for the solar heat gain coefficient of building-integrated photovoltaic modules

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IEC 63092-3 has been prepared by subcommittee IEC technical committee 82: Solar photovoltaic energy systems, in collaboration with ISO technical committee 160: Glass in building. It is a Technical Specification.

It is published as a double logo Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
82/2564/DTS	82/2672/RVDTS

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 Technical Specification 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/publications.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

IEC 63092-1 and IEC 63092-2 describe general requirements for building-integrated photovoltaic (BIPV) modules and systems, respectively. This part of IEC 63092 describes specific requirements for the calorimetric determination of the solar heat gain coefficient (SHGC or g value) for various designs of BIPV modules and provides complementary information to IEC 63092-1.

BIPV modules are often custom made and the design qualification is complicated. In particular, g-value measurements for construction components are made on test samples with dimensions which are different to those specified for PV modules in IEC test standards. It is important for manufacturers and users to use a simplified test method requiring a small number of test specimens that provides applicable results to a variety of BIPV modules consisting of identical components but varying in the effective cell area ratio.

The test method consists of two successive steps: g-value evaluation for transparent test samples with the same glazing and encapsulant components as the BIPV modules, but without solar cells or interconnects, and g-value evaluation for BIPV modules with a standard size in the open circuit and maximum power point states. By using data for these samples, the g values for any effective PV cell area ratio can be obtained by interpolation, corresponding to the g values for BIPV modules with the same cell type and glazing configuration, but with different heights, widths and cell configurations.

In the same way as the ISO 19467 series and ISO 9050 exist in parallel for determining the g value of architectural glazing and serve different purposes, there is value in having both approaches standardized for BIPV glazing. The component-based ISO 9050 (and its proposed future BIPV annex) is useful if the solar heat gain coefficient (SHGC or g value) is used for multi-pane glazing units which can be well characterized by optical measurements at normal incidence. It is not applicable if the components are strongly light-scattering or if the g value is used for other angles of incidence or if any components have a non-planar, non-parallel geometry. These are cases where a calorimetric method of the whole unit is valuable, particularly for building energy calculations. The same consideration applies to standards addressing the g value of BIPV modules.

NOTE A component-based method to determine the g value of BIPV modules is already documented in EN 410-1[1]. It is based on spectral measurements of the optically different components of a BIPV module and the photovoltaic conversion efficiency of the BIPV module. It is anticipated that this method will also be included in the future edition of ISO 9050.This method can be applied if it is feasible to carry out separate spectral measurements of the optically different areas of a BIPV module, e.g. the area covered by PV cells and the transparent areas between the PV cells. According to the papers by [1] and [2][2], results obtained by applying both methods agree within experimental error.

1 Under preparation. Stage at the time of publication: FprEN 410-1:2026.

2 Numbers in square brackets refer to the Bibliography.

1 Scope

This part of IEC 63092 is intended to provide a versatile method to determine the solar heat gain coefficient (SHGC or g value) of BIPV modules with a variety of designs.

It addresses the calorimetric determination of the g value for BIPV modules by using the hot box method or the cooled plate method in accordance with ISO 19467 and ISO 19467-2. The method takes into account the effect on the g value of extracting photovoltaically generated electricity from the BIPV module in the maximum power point state.

This document applies to BIPV modules as defined in IEC 63092-1 and specifically to BIPV modules with different effective cell area ratios but consisting of identical components such as cells, interconnects, encapsulation and front/back sheets. This evaluation method is applicable to all PV cell technologies and includes coloured BIPV modules.

NOTE The solar heat gain coefficient is known by various names (SHGC, g value, solar factor, total solar energy transmittance, etc.) depending on the country and region. These terms are all used to describe the same property; small differences can be caused by different reference conditions (e.g. differences in the reference solar spectrum). In this document, the quantity is referred to as the g value.

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

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

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

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

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

ISO 9845-1, *Solar energy - Reference solar spectral irradiance at the ground at different receiving conditions - Part 1: Direct normal and hemispherical solar irradiance for air mass 1,5*

ISO 19467:2017, *Thermal performance of windows and doors - Determination of solar heat gain coefficient using solar simulator*

ISO 19467-2:2021, *Thermal performance of windows and doors - Determination of solar heat gain coefficient using solar simulator - Part 2: Centre of glazing*

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[2] Konstantinos Kapsis, Andreas Athienitis, Stephen Harrison, Determination of solar heat gain coefficients for semi-transparent photovoltaic windows: An experimental study, ASHRAE Conf. 123 (2017) 82–94

[3] Hisashi Ishii, Helen Rose Wilson, Shinji Hagihara, Ulrich Amann, Veronika Shabunko, Simon Boddaert "International inter-laboratory comparison of solar heat gain coefficient of building-integrated photovoltaic modules - results of tests with or without power generation and tests with PV cell coverage ratios", Energy and Buildings Volume 329, 2025, 114843 [viewed 2025-12-05]. Available at https://doi.org/10.1016/j.enbuild.2024.114843

[4] ISO 19467 (all parts), *Thermal performance of windows and doors - Determination of solar heat gain coefficient using solar simulator*

[5] EN 410-1, *Glass in building - Determination of luminous and solar characteristics of glazing*[3]

[6] 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] Under preparation. Stage at the time of publication: FprEN 410-1:2026.