INTERNATIONAL STANDARD

ISO 19467-2

First edition
2021-11

Thermal Performance of windows and doors — Determination of solar heat gain coefficient using solar simulator —

Part 2: Centre of glazing

Performance thermique des fenêtres et portes — Détermination du coefficient de gain thermique solaire au moyen d'un simulateur solaire —

Partie 2: Centre du vitrage

Reference number
ISO 19467-2:2021(E)

© ISO 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2021 – All rights reserved

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **2**

4 Symbols ... **3**

5 Principle ... **4**
5.1 General ... 4
5.2 Measurement of the irradiance ... 4
5.2.1 General ... 4
5.2.2 Determination of the net radiant flux (power) of incident radiation ... 4
5.2.3 Calculation of I_{net} with correction of reflected by the absorber ... 7
5.3 Measurement of heat flow rates with irradiance ... 7
5.3.1 Hot box method ... 7
5.3.2 Cooled plate method ... 9
5.4 Determination of the net density of heat flow rate due to thermal transmission ... 10
5.5 Measurement of heat flow rates without irradiance ... 11
5.5.1 Thermal transmittance ... 11
5.5.2 Hot box method ... 11
5.5.3 Cooled plate method ... 13

6 Test apparatus and specimens ... **14**
6.1 Construction and summary of the test apparatus ... 14
6.1.1 Construction of the test apparatus ... 14
6.1.2 Summary of the test apparatus ... 15
6.2 Solar simulator ... 15
6.3 Climatic chamber ... 16
6.4 Metering box ... 16
6.5 Surround panel ... 16
6.6 Calibration panels ... 16
6.7 Metering location of temperatures ... 16
6.8 Test specimens ... 16
6.9 Insulation of glazing edge ... 16

7 Measurement procedure ... **17**
7.1 Determination of surface coefficient of heat transfer ... 17
7.2 Measurement ... 17

8 Test report ... **18**
8.1 Report contents ... 18
8.2 Estimation of uncertainty ... 19

Annex A (informative) **Cooled plate method for SHGC measuring for the centre of glazing** ... **20**

Annex B (informative) **Example of irradiation measurement** ... **22**

Annex C (informative) **Consideration of effects caused by the divergence of the incident light** ... **24**

Annex D (informative) **Specimen installation in surround panel** ... **29**

Bibliography ... **32**

© ISO 2021 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

A list of all parts in the ISO 19467 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2021 – All rights reserved

Introduction

This document is designed to provide solar heat gain coefficient values of the centre of glazing in fenestration systems by standardized measurement method. The terms solar heat gain coefficient (SHGC), total solar energy transmittance (TSET), solar factor and *g*-value are all used to describe the same quantity. Small differences might be caused by different reference conditions (e.g. differences in the reference solar spectrum). In this document, solar heat gain coefficient is used.

The solar heat gain coefficient of a complex fenestration system can depend on the direction of the incident radiation. It also might be influenced by other factors, e.g. window frame. In order to avoid the complexity and to enable the measurement of off-normal irradiation, this document focuses on the centre of glazing in fenestration systems.

This document specifies standardized apparatus and criteria. The solar heat gain coefficient measuring apparatus applied in this document includes solar simulator, climatic chamber, and metering box. In some cases, solar heat gain coefficient of the centre of glazing can be determined most accurately by a combination of calculations and measurements.

© ISO 2021 – All rights reserved

Thermal Performance of windows and doors — Determination of solar heat gain coefficient using solar simulator —

Part 2: Centre of glazing

1 Scope

This document specifies a method to measure the solar heat gain coefficient for the centre of glazing in fenestration systems (e.g. complete windows, doors or curtain walls with or without shading devices) for normal and off-normal irradiation on the surface.

This document applies to the centre of glazing in fenestration systems which might consist of:

a) various types of glazing (e.g. glass or plastic; single or multiple glazing; with or without low emissivity coatings, and with spaces filled with air or other gases; opaque or transparent glazing);

b) various types of shading devices (e.g. blind, screen, film or any attachment with shading effects);

c) various types of active solar fenestration systems [e.g. building-integrated PV systems (BIPV) or building-integrated solar thermal collectors (BIST)].

This document does not include:

a) shading effects of building elements (e.g. eaves, sleeve wall, etc.);

b) shading effects of fenestration attachments with overhang structures (e.g., awning, etc.) or similar;

c) shading effects of non-glazing elements in fenestration systems (e.g. window frame, etc.);

d) heat transfer caused by air leakage between indoors and outdoors;

e) ventilation of air spaces in double and coupled windows;

f) thermal bridge effects at the joint between the glazing and the rest of the fenestration parts (e.g. window frame, etc.).

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.

ISO 7345, *Thermal performance of buildings and building components — Physical quantities and definitions*

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

ISO 9288, *Thermal insulation — Heat transfer by radiation — Physical quantities and definitions*

ISO 12567-1, *Thermal performance of windows and doors — Determination of thermal transmittance by the hot-box method — Part 1: Complete windows and doors*

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

© ISO 2021 – All rights reserved

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

ISO 52016-1, *Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures*

IEC 60904-9, *Photovoltaic devices — Part 9: Solar simulator performance requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345, ISO 9050, ISO 9288, ISO 12567-1, ISO 15099, ISO 19467, ISO 52016-1 and IEC 60904-9 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
centre of glazing
central area of the glazing, undisturbed by edge and frame effects

3.2
off-normal irradiance
irradiation with altitude and/or azimuth angle not equal to 0°

3.3
projected area
area of the projection of the surface of the element on to a plane parallel to the transparent or translucent part of the element

Note 1 to entry: In the case of non-parallel condition, refer to Annex D.

3.4
simple fenestration system
fenestration products having non-ventilated glazing units made from glass and/or polymers and homogeneous specular and transparent properties in optical and thermal.

Note 1 to entry: In the case of non-parallel condition, refer to Annex D.

3.5
complex fenestration system
optically and/or thermally complex fenestration products that are not described as *simple fenestration systems* (3.4)

EXAMPLE optically scattering glazing and/or shading devices and/or ventilated cavities and/or PV cells and/or solar collectors.

3.6
solar wavelength range
range of wavelengths for the incident radiation used for solar properties

Note 1 to entry: The range of wavelengths for the incident shall be as specified in ISO 9050.

© ISO 2021 – All rights reserved