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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

Performance énergétique des bâtiments — Propriétés thermiques, solaires et lumineuses des composants et éléments du bâtiment —

Partie 1: Méthode de calcul simplifiée des caractéristiques solaires et lumineuses pour les dispositifs de protection solaire combinés à des vitrages

Reference number
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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 on 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 the following URL: www.iso.org/iso/foreword.html.

ISO 52022-1 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 89, *Thermal performance of buildings and building components*, in collaboration with ISO Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 52022 series can be found on the ISO website.

Introduction

This document is part of a series aimed at the international harmonization of the methodology for assessing the energy performance of buildings. Throughout, this series is referred to as a “set of EPB standards”.

All EPB standards follow specific rules to ensure overall consistency, unambiguity and transparency.

All EPB standards provide a certain flexibility with regard to the methods, the required input data and references to other EPB standards, by the introduction of a normative template in Annex A and Annex B with informative default choices.

For the correct use of this document, a normative template is given in Annex A to specify these choices. Informative default choices are provided in Annex B.

The main target groups for this document are architects, engineers and regulators.

Use by or for regulators: In case this document is used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications. These choices (either the informative default choices from Annex B or choices adapted to national/regional needs, but in any case following the template of this Annex A) can be made available as national annex or as separate (e.g. legal) document (national data sheet).

NOTE 1 So in this case:

— the regulators will **specify** the choices;

— the individual user will apply the document to assess the energy performance of a building, and thereby **use** the choices made by the regulators

Topics addressed in this document can be subject to public regulation. Public regulation on the same topics can override the default values in Annex B of this document. Public regulation on the same topics can even, for certain applications, override the use of this document. Legal requirements and choices are in general not published in standards but in legal documents. In order to avoid double publications and difficult updating of double documents, a national annex may refer to the legal texts where national choices have been made by public authorities. Different national annexes or national data sheets are possible, for different applications.

It is expected, if the default values, choices and references to other EPB standards in Annex B are not followed due to national regulations, policy or traditions, that:

— national or regional authorities prepare data sheets containing the choices and national or regional values, according to the model in Annex A. In this case a national annex (e.g. NA) is recommended, containing a reference to these data sheets;

— or, by default, the national standards body will consider the possibility to add or include a national annex in agreement with the template of Annex A, in accordance to the legal documents that give national or regional values and choices.

Further target groups are parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

More information is provided in the Technical Report (ISO/TR 52022-2) accompanying this document.

The framework for overall EPB includes:

a) common terms, definitions and symbols;

b) building and assessment boundaries;

c) building partitioning into space categories;

d) methodology for calculating the EPB (formulae on energy used, delivered, produced and/or exported at the building site and nearby);

e) a set of overall formulae and input-output relations, linking the various elements relevant for the assessment of the overall EPB;

f) general requirements for EPB dealing with partial calculations;

g) rules for the combination of different spaces into zones;

h) performance indicators;

i) methodology for measured energy performance assessment.

Table 1 shows the relative position of this document within the set of EPB standards in the context of the modular structure as set out in ISO 52000-1.

NOTE 2 In ISO/TR 52000-2, the same table can be found, with, for each module, the numbers of the relevant EPB standards and accompanying technical reports that are published or in preparation.

NOTE 3 The modules represent EPB standards, although one EPB standard could cover more than one module and one module could be covered by more than one EPB standard, for instance, a simplified and a detailed method respectively.

Table 1 — Position of this document (*in casu* M2–8) within the modular structure of the set of EPB standards

	Overarching		Building (as such)		Technical building systems									
Sub module	**Descriptions**		**Descriptions**		**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic hot water**	**Lighting**	**Building automation and control**	**PV, wind, ..**
sub1		**M1**		**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
1	General		General		General									
2	Common terms and definitions; symbols and subscripts		Building energy needs		Needs								[a]	
3	Applications		(Free) Indoor conditions without systems		Maximum load and power									
4	Ways to express energy performance		Ways to express energy performance		Ways to express energy performance									
5	Building categories and building boundaries		Heat transfer by transmission		Emission and control									
6	Building occupancy and operating conditions		Heat transfer by infiltration and ventilation		Distribution and control									

[a] The shaded modules are not applicable.

Table 1 *(continued)*

	Overarching		Building (as such)		Technical building systems									
Sub module	**Descriptions**		**Descriptions**		**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic hot water**	**Lighting**	**Building automation and control**	**PV, wind, ..**
sub1		**M1**		**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
7	Aggregation of energy services and energy carriers		Internal heat gains		Storage and control									
8	Building zoning		Solar heat gains	ISO 52022-1	Generation and control									
9	Calculated energy performance		Building dynamics (thermal mass)		Load dispatching and operating conditions									
10	Measured energy performance		Measured energy performance		Measured energy performance									
11	Inspection		Inspection		Inspection									
12	Ways to express indoor comfort				BMS									
13	External environment conditions													
14	Economic calculation													

[a] The shaded modules are not applicable.

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

1 Scope

This document specifies a simplified method based on thermal, solar and light characteristics of the glazing and solar and light characteristics of the solar protection device, to estimate the total solar energy transmittance, direct energy transmittance and the light transmittance of a solar protection device combined to a glazing.

This document is applicable to all types of solar protection devices parallel to the glazing, such as louvre, venetian or roller blinds. The position of the solar protection device can be interior, exterior or between single panes in a dual glazing system. It is applicable when the total solar energy transmittance of the glazing is between 0,15 and 0,85. Venetian or louvre blinds are assumed to be adjusted so that there is no direct solar penetration. It is assumed that for external solar protection devices and for integrated solar protection devices, the space between the solar protection devices and the glazing is unventilated and for internal solar protection devices this space is ventilated.

The resulting *g*-values of the simplified method given here are approximate and their deviation from the exact values lie within the range between +0,10 and -0,02. The results generally tend to lie on the safe side for cooling load estimations. The results are not intended to be used for calculating beneficial solar gains or thermal comfort criteria.

The simplified method is based on the normal incidence of radiation and does not take into account either the angular dependence of transmittance and the reflectance or the differences of spectral distribution. This should be considered when applying the method.

The simplified method can also be used for inclined elements.

This document can be applied when the solar transmittance and solar reflectance of the solar protection devices are within the following ranges:

$0 \leq \tau_{e,B} \leq 0,5$ and $0,1 \leq \rho_{e,B} \leq 0,8$

For reflectance and transmittance values outside these ranges ISO 52022-3 applies.

For cases not covered by the method given in this document more exact calculations based on the optical properties (in general the spectral data) of glass and solar protection device can be carried out in accordance with ISO 52022-3.

NOTE Table 1 in the Introduction shows the relative position of this document within the set of EPB standards in the context of the modular structure as set out in ISO 52000-1.

2 Normative references

The following documents are referred to in 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 insulation — 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 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 52000-1:2017, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures*

ISO 52022-3:2017, *Energy performance of buildings — Building and Building Elements — 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*

EN 410, *Glass in building — Determination of luminous and solar characteristics of glazing*

EN 673, *Glass in building — Determination of thermal transmittance (U value) — Calculation method*

EN 674, *Glass in building — Determination of thermal transmittance (U value) — Guarded hot plate method*

EN 675, *Glass in building — Determination of thermal transmittance (U value) — Heat flow meter method*

EN 14500, *Blinds and shutters — Thermal and visual comfort — Test and calculation methods*

NOTE Default references to EPB standards other than ISO 52000-1 are identified by the EPB module code number and given in Annex A (normative template in Table A.1) and Annex B (informative default choice in Table B.1).

EXAMPLE EPB module code number: M5–5, or M5–5.1 (if module M5–5 is subdivided), or M5–5/1 (if reference to a specific clause of the standard covering M5–5).

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 410, EN 14500, ISO 7345, ISO 52000-1 and 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
EPB standard
standard that complies with the requirements given in ISO 52000-1, CEN/TS 16628[3] and CEN/TS 16629[4]

Note 1 to entry: These three basic EPB documents were developed under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480), and support essential requirements of EU Directive 2010/31/EU on the energy performance of buildings (EPBD). Several EPB standards and related documents are developed or revised under the same mandate.

[SOURCE: ISO 52000-1:2017, definition 3.5.14]

4 Symbols and subscripts

4.1 Symbols

For the purposes of this document, the symbols given in ISO 52000-1 and the following apply.

Symbol	Name of quantity	Unit
g	total solar energy transmittance	—
U	thermal transmittance	W/(m²·K)
G	thermal conductance	W/(m²·K)
α	absorptance	—
ρ	reflectance	—
τ	transmittance	—

4.2 Subscripts

For the purposes of this document, the subscripts given in ISO 52000-1 and the following apply.

B	solar protection device
g	glazing
e	solar energy
v	visible
tot	total
ext	external
int	internal
integr	integrated

5 Description of the methods

5.1 Outputs

The possible outputs of this document are the following:

— the total solar energy transmittance for a glazing in combination with an external or internal or integrated solar protection device, g_{tot};

— the total solar direct transmittance for a glazing in combination with an external or internal solar protection device, $\tau_{e,tot}$;

— the total light transmittance for a glazing in combination with an external or internal solar protection device, $\tau_{v,tot}$.