

Glass in building — Determination of thermal transmittance (U value) — Calculation method

The European Standard EN 673:1997, incorporating amendments A1:2000 and A2:2002, has the status of a British Standard

ICS 81.040.20

National foreword

This British Standard is the UK implementation of EN 673:1997, incorporating amendments A1:2000 and A2:2002.

The UK participation in its preparation was entrusted by Technical Committee B/520, Glass and glazing in building, to Subcommittee B/520/4, Properties and glazing methods.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Board and comes into effect on 15 June 1998

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English version

Glass in building — Determination of thermal transmittance (U value) — Calculation method

(includes amendments A1:2000 and A2:2002)

Verre dans la construction —
Détermination du coefficient de transmission
thermique, U —
Méthode de calcul
(inclut les amendements A1:2000 et A2:2002)

Glas im Bauwesen —
Bestimmung des
Wärmedurchgangskoeffizienten(U -Wert) —
Berechnungsverfahren
(enthält Änderungen A1:2000 und A2:2002)

This European Standard was approved by CEN on 8 October 1997. Amendment A1:2000 was approved by CEN on 23 September 2000 and amendment A2:2002 was approved by CEN on 1 November 2002.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 129, Glass in building, the Secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1998, and conflicting national standards shall be withdrawn at the latest by May 1998.

CEN/TC 129/WG 9, Light and energy transmission, thermal insulation, prepared a working draft based on the document ISO/DIS 10292, *Thermal insulation of glazing: Calculation rules for determining the steady state U value of double or multiple glazing*, prepared by ISO/TC 160, Glass in building.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This amendment EN 673:1997/A1:2000 to EN 673:1997 has been prepared by Technical Committee CEN/TC 129, Glass in building, the Secretariat of which is held by IBN.

This amendment to the European Standard EN 673:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A2

This document (EN 673:1997/A2:2002) has been prepared by Technical Committee CEN/TC 129, Glass in building, the Secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

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Contents

	Page
Foreword	2
1 Scope	3
2 Normative references	3
3 Symbols	4
4 Definitions	5
5 Basic formulae	5
6 Basic material properties	7
7 External and internal heat transfer coefficients	9
8 Declared values: standardized boundary conditions	10
9 Expression of the results	10
10 Test report	11
Annex A (normative) Determination of normal and corrected emissivity	12
Annex B (normative) Iteration procedure for glazing with more than one gas space	13
Annex C (informative) Bibliography	14

1 Scope

This European Standard specifies a calculation method to determine the thermal transmittance of glazing with flat and parallel surfaces.

This European Standard applies to uncoated glass (including glass with structured surfaces, e.g. patterned glass), coated glass and materials not transparent in the far infrared, which is the case for soda lime silicate glass products (called hereafter soda lime glass), borosilicate glass and glass ceramic. It also applies to multiple glazing comprising such glasses and/or materials. It does not apply to multiple glazing which include in the gas space sheets or foils that are far infrared transparent. The procedure specified in this European Standard determines the U value¹⁾ (thermal transmittance) in the central area of glazing.

The edge effects due to the thermal bridge through the spacer of a sealed glazing unit or through the window frame are not included. Furthermore, energy transfer due to solar radiation is not taken into account.

The document for the calculation of the overall U value of windows, doors and shutters (see C.1) makes normative reference to the U value calculated for the glazing components according to this standard.

For the purpose of product comparison, a vertical position of the glazing is specified. In addition U values are calculated using the same procedure for other purposes, in particular for predicting:

- heat loss through glazing;
- conduction heat gains in summer;
- condensation on glazing surfaces;
- the effect of the absorbed solar radiation in determining the solar factor (see C.2).

Reference should be made to C.4 and C.5 or other European Standards dealing with heat loss calculations for the application of glazing U values determined by this standard.

A procedure for the determination of emissivity is also given.

The rules have been made to be as simple as possible whilst remaining consistent with accuracy.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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.*

prEN 1098, *Glass in building — Determination of thermal transmittance (U value) — Calibrated and guarded hot box method.*

¹⁾ In some countries the symbol k has been used up to now.

3 Symbols

A	constant	—
c	specific heat capacity of gas	J/(kg·K)
d	thickness of material layer (glass or alternative glazing material)	m
F	volume fraction	—
h	— heat transfer coefficient	W/(m ² ·K)
	— also thermal conductance	W/(m ² ·K)
M	number of material layers	—
n	exponent	—
N	number of spaces	—
r	thermal resistivity of glass (glazing material)	m·K/W
P	gas property	—
R_n	normal reflectance (perpendicular to the surface)	—
s	width of gas space	m
T	absolute temperature	K
U	thermal transmittance	W/(m ² ·K)
ΔT	temperature difference	K
ϵ	corrected emissivity	—
ϵ_n	normal emissivity (perpendicular to the surface)	—
ρ	gas density	kg/m ³
σ	Stefan-Boltzmann's constant $5,67 \times 10^{-8}$	W/(m ² ·K ⁴)
μ	dynamic viscosity of gas	kg/(m·s)
λ	— thermal conductivity of gas in space	W/(m·K)
	— also wavelength	µm
θ	temperature on the Celsius scale	°C
Dimensionless numbers		
Gr	Grashof number	—
Nu	Nusselt number	—
Pr	Prandtl number	—

Subscripts

c	convection
e	external
i	internal
j	j -th material layer
g	gas
m	mean
n	normal
r	radiation
s	space
t	total
1;2	first, second etc.