SLOVENSKI STANDARD
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Steklo v gradbeništvu - Ugotavljanje toplotne prehodnosti (U-vrednost) - Metoda toplotnega pretoka

Glass in building - Determination of thermal transmittance (U value) - Heat flow meter method

Glas im Bauwesen - Bestimmung des Wärmedurchgangskoeffizienten (U-Wert) - Wärmestrommesser-Verfahren

Verre dans la construction - Détermination du coefficient de transmission thermique, U - Méthode du fluxmètre

Ta slovenski standard je istoveten z: **EN 675:2011**

ICS:

81.040.20	Steklo v gradbeništvu	Glass in building

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EUROPEAN STANDARD

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English Version

Glass in building - Determination of thermal transmittance (U value) - Heat flow meter method

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Glas im Bauwesen - Bestimmung des Wärmedurchgangskoeffizienten (U-Wert) - Wärmestrommesser-Verfahren

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Foreword

This document (EN 675:2011) has been prepared by Technical Committee CEN/TC 129 “Glass in building”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by December 2011, and conflicting national standards shall be withdrawn at the latest by December 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 675:1997.

The main change in this edition is that the internal and external heat transfer coefficients have been amended slightly to reflect changes to EN 673. Clarification is also given in the scope that the procedure specified in this European Standard should generally only be considered when the calculation method detailed in EN 673 is inappropriate or unsuitable.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

CEN/TC 129/WG 9 "Light and energy transmission, thermal insulation" prepared a working draft based on the document ISO/DIS 10293 "Glass in building - Determination of steady-state *U* values (thermal transmittance) of multiple glazing - Heat flow meter method", document that was prepared by ISO/TC 160, "Glass in building". This was published in 1997 as EN 675.

The document for the calculation of the overall *U* value of windows, doors and shutters (see [2]) gives normative reference to the *U* value evaluated for the glazing components according to this standard.

For the purposes of product comparison, a vertical position of the glazing is specified (see Clause 10).

U values evaluated according to the present standard are used for product comparison as well as for other purposes, in particular for predicting:

— heat loss through glazing;

— conduction heat gains in summer;

— condensation on glazing surfaces;

— the effects of the absorbed solar radiation in determining the solar factor (see [1]).

Reference should be made to [2], [3], [4] or other European Standards dealing with heat loss calculations for the application of glazing *U* values determined by this Standard.

1 Scope

This European Standard specifies a measurement procedure to determine the thermal transmittance of glazing with flat and parallel surfaces. For the purpose of this Standard, structured surfaces may be considered to be flat..

This European Standard applies to multiple glazing with outer panes which are not transparent to far infrared radiation (in the wavelength range 5µm to 50µm), which is the case for soda lime silicate glass products, borosilicate glass and glass ceramics. Internal elements can be far infrared transparent.

The procedure specified in this European Standard determines the *U* value (thermal transmittance) in the central area of glazing. The edge effects due to the thermal bridge through the spacer of an insulating glass unit or through the window frame are not included. Energy transfer due to solar radiation is also excluded.

The procedure specified in this European Standard should be considered only when the thermal transmittance of the glazing cannot be calculated in accordance with EN 673.

The determination of the thermal transmittance is performed for conditions which correspond to the average situation for glazing in practice.

NOTE Patterned glass is an example of a glass with a structured surface;

2 Normative references

The following referenced documents are indispensable for the application 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.

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

EN 12898, *Glass in building — Determination of the emissivity*

ISO 8301, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Heat flow meter apparatus*

ISO 8302, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1
***U* value**
parameter of glazing which characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and states the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side.

NOTE The *U* value is given in watts per square metre Kelvin [$W/(m^2 \cdot K)$]

3.2
declared value
U value obtained under standardized boundary conditions.

NOTE See 11.2.

4 Basic formula

The U value depends on the thermal resistance of the multiple glazing and on the external and internal surface heat transfer coefficients according to the relation:

$$\frac{1}{U} = R + \frac{1}{h_e} + \frac{1}{h_i} \tag{1}$$

where

R is the thermal resistance of the multiple glazing in square metres Kelvins per Watt $\left(m^2 \cdot K/W\right)$

h_e is the external surface heat transfer coefficient in watts per square metre Kelvin $\left[W/\left(m^2 \cdot K\right)\right]$

h_i is the internal surface heat transfer coefficient in watts per square metre Kelvin $\left[W/\left(m^2 \cdot K\right)\right]$

According to this standard the surface to surface thermal resistance is determined by measurements taken using the heat flow meter method. Thereupon the declared U value is determined according to Equation (1) with the values for the internal and external heat transfer coefficients specified in 11.2.

The external surface is the surface of the glazing intended to face the outside of the building in use. The internal surface is the surface of the glazing intended to face the inside of the building in use.

5 Brief outline of the measuring procedure

The surface to surface thermal resistance of the multiple glazing is determined by means of the heat flow meter method laid down in ISO 8301. The recommendations of that standard shall be complied with except for variations contained in this standard and for variations resulting from the special structure of the specimen.

Within the present context further requirements are necessary, viz. the size of the test specimens and the performance of the measurements are laid down to meet special requirements for measuring multiple glazing (see Clauses 6 to 13).

6 Test apparatus

For the measurement of the thermal resistance of the specimen, the single-specimen apparatus with symmetrical configuration or a double specimen apparatus as shown in Figures 1 and 2 is used.

The single-specimen apparatus consists of a heating and a cooling unit between which the specimen or a reference sample for the calibration of the apparatus is sandwiched. The cooling unit has surface dimensions as large as those of the heating unit.

A heat flow meter is positioned in the centre of the hot plate surface and the cold plate surface. These heat flow meters face each other on either sides of the specimen or the reference sample. On each side of the heat flow meters a thin natural or synthetic foam rubber sheet is placed to ensure sufficient thermal contact. Surface contact is obtained by applying pressure. The foam rubber sheets have the same dimensions as the surface area of the heating unit.

The double-specimen apparatus consists of a heating unit and two outer cooling units. The heating unit is sandwiched between the specimen to be measured and a control sample. For calibration a reference sample shall be introduced at the position of the specimen. On each side of the reference sample/specimen and the control sample heat flow meters are placed. On each side of the heat flow meters a thin foam rubber sheet is placed to ensure sufficient thermal contact. The surface dimensions of all elements and the positioning of the heat flow meters in the central area of the assembly are the same as for the single specimen apparatus.

For both apparatus the heating unit shall be of such a size as to completely cover the surface of the reference sample/specimen and in the case of the double apparatus of the control sample. Heat losses from the outer edges of the heat flow meter apparatus shall be restricted by edge insulation or by controlling the surrounding air temperature or by both.

For both apparatus the metering area of the heat flow meters shall have a circular or square shape and a minimum size of 75 cm^2. Its maximum size shall lie within an area of 50 cm x 50 cm. The metering area shall further be surrounded by a protective zone consisting of the same material in the same thickness (with a tolerance of ± 0,1 mm) covering the whole sample area (see Figures 1 and 2).

Thermocouples are mounted in pairs. They are positioned to face each other and shall have direct contact to the surfaces of the reference sample/specimen and in the case of the double apparatus the control sample.

At least three thermocouple positions shall be chosen, one positioned in the centre of the metering area of the heat flow meters and two others diametrically opposite in a distance of 2/3 from the centre of the metering area to its perimeter. Additional thermocouples may be arranged in such a way that an optimum cover of the metering area is achieved.

Such thermocouples shall have a thickness not exceeding 0,2 mm; the junctions shall be flattened so as not to exceed 0,2 mm and a contact material (e.g. zinc oxide loaded silicon grease or metal tape) shall be used to insure a good thermal contact between the junction and the specimen.