SLOVENSKI STANDARD
SIST EN 1096-4:2018

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Nadomešča:
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Steklo v gradbeništvu - Steklo z nanosi - 4. del: Standard za proizvod

Glass in building - Coated glass - Part 4: Product standard

Glas im Bauwesen - Beschichtetes Glas - Teil 4: Produktnorm

Verre dans la construction - Verre à couche - Partie 4: Norme de produit

Ta slovenski standard je istoveten z: EN 1096-4:2018

ICS:

81.040.20	Steklo v gradbeništvu	Glass in building

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EUROPEAN STANDARD

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EN 1096-4

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English Version

Glass in building - Coated glass - Part 4: Product standard

Verre dans la construction - Verre à couche - Partie 4: Norme de produit

Glas im Bauwesen - Beschichtetes Glas - Teil 4: Produktnorm

This European Standard was approved by CEN on 6 May 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 1096-4:2018) 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of an identical text or by endorsement, at the latest by February 2019, and conflicting national standards shall be withdrawn at the latest by February 2019.

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

This document supersedes EN 1096-4:2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with EU Regulation, see informative Annex ZA, which is an integral part of this document.

The main changes compared to the previous edition are the following:

a) The standard has been revised to fulfil the requirements of the Regulation (EU) No 305/2011 (Construction Product Regulation), modified by Regulations (EU) No 157/2014, (EU) No 568/2014 and (EU) No 574/2014;

b) The tolerance on emissivity is reduced to ±0,01 for coated glass with a declared normal emissivity lower than 0,10;

c) The solar factor, g, is listed within the spectrophotometric characteristics to be declared in the Declaration of Performances (DoP);

d) The durability/conformity assessment is listed within the characteristics to be declared in the DoP;

e) The mechanical resistance shall be given in the DoP by the characteristic bending strength of the glass substrate.

EN 1096, *Glass in building - Coated glass*, consists of the following parts:

— *Part 1: Definitions and classification*

— *Part 2: Requirements and test methods for class A, B and S coatings*

— *Part 3: Requirements and test methods for class C and D coatings*

— *Part 4: Product standard*

— *Part 5: Test method and classification for the Self-cleaning performances of coated glass surfaces*

This European Standard contains other aspects of importance for trade.

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

1 Scope

This European Standard covers the assessment and evaluation of constancy of performance (AVCP)of coated glass for use in buildings.

NOTE For glass products with electrical wiring or connections for, e.g. alarm or heating purposes, other directives, e.g. Low Voltage Directive, may apply.

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.

EN 356, *Glass in building - Security glazing - Testing and classification of resistance against manual attack*

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 1063, *Glass in building - Security glazing - Testing and classification of resistance against bullet attack*

EN 1096-1:2012, *Glass in building - Coated glass - Part 1: Definitions and classification*

EN 1096-2:2012, *Glass in building - Coated glass - Part 2: Requirements and test methods for class A, B and S coatings*

EN 1096-3:2012, *Glass in building - Coated glass - Part 3: Requirements and test methods for class C and D coatings*

EN 1096-5, *Glass in building - Coated glass - Part 5 - Test method and classification for the self-cleaning performances of coated glass surfaces*

EN 12600, *Glass in building - Pendulum test - Impact test method and classification for flat glass*

EN 12758, *Glass in building - Glazing and airborne sound insulation - Product descriptions and determination of properties*

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

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

EN 13501-2, *Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13501-5, *Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests*

EN 13541, *Glass in building - Security glazing - Testing and classification of resistance against explosion pressure*

EN 15998, *Glass in building - Safety in case of fire, fire resistance - Glass testing methodology for the purpose of classification*

ISO 9385, *Glass and glass-ceramics — Knoop hardness test*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1096-1, EN 1096-2 and EN 1096-3 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

3.1.1
factory production control
FPC
documented, permanent and internal control of production in a factory, in accordance with this standard

Note 1 to entry: See also Annexes A and B.

[SOURCE: Regulation (EU) No 305/2011]

3.1.2
product-type
set of representative performance levels or classes of a construction product, in relation to its essential characteristics, produced using a given combination of raw materials or other elements in a specific production process

[SOURCE: Regulation (EU) No 305/2011]

3.1.3
essential characteristic
characteristic of the construction product which relate to the basic requirements for construction works

Note 1 to entry: Basic requirements for construction work are given in the regulation (EU) No 305/2011, Annex I.

[SOURCE: Regulation (EU) No 305/2011]

3.1.4
performance of a construction product
performance related to the relevant essential characteristics, expressed by level or class, or in a description

[SOURCE: Regulation (EU) No 305/2011]

3.1.5
level
result of the assessment of the performance of a construction product in relation to its essential characteristics, expressed as a numerical value

[SOURCE: Regulation (EU) No 305/2011]

3.1.6
class
range of levels, delimited by a minimum and a maximum value, of performance of a construction product

[SOURCE: Regulation (EU) No 305/2011]

3.1.7
type testing
TT
determination of the performance of a product (characteristic, durability), on the basis of either actual tests or other procedures (such as conventional, standardised, tabulated or general accepted values, standardised or recognised calculation methods, test reports when made available, ...), in accordance with this European Standard and that demonstrates compliance with this European Standard

3.1.8
test report
document that covers the results of tests undertaken on a representative sample of the product from production or on a prototype design of the product

3.1.9
product description
document that details the relevant parameters, e.g. process conditions, structure, etc., for defining a product that complies with the standard and that includes specific reference(s) to characteristics that are modified by the production process

3.1.10
product family
group of products determined by the manufacturer, which is made with similar components and method of coating deposition and which is tested for FPC using the same test method

3.1.11
significant change
variation in performance beyond the permitted tolerance for the characteristic and which is not covered by substitution rules

3.2 Symbols

ε and ε'	normal emissivity of both sides of a coated glass
ε_i	emissivity of a test specimen measured during factory production control
τ_v	light transmittance
ρ_v and ρ'_v	light reflectance of both sides of a coated glass
τ_e	energy transmittance
ρ_e and ρ'_e	energy reflectance of both sides of a coated glass
g	solar factor
d	subscript indicating that the value is a declared value
m	subscript indicating that the value is a determined value obtained by measurement, calculation or other means

4 Product description and characteristics

4.1 Product description

For conformity purposes, the coated glass manufacturer is responsible for the preparation and maintenance of a product description. This description shall describe the product and/or product family.

Disclosure of the product description shall be at the discretion of the coated glass manufacturer or his agent except in the case of regulatory requirements.

The product description shall contain at least the following:

- a reference to EN 1096-1, EN 1096-2, EN 1096-3, EN 1096-4 and when relevant EN 1096-5, and all other standards with which the manufacturer claims compliance,
- the type of coating, i.e. online, off-line,
- the method of coating deposition, e.g. chemical-vapour deposition, sputtering, etc.
- the materials making up the layer(s) of the coating,
- the order of stacking of the layers,
- the glass substrates,
- the classification of the coated glass.

NOTE The product description can include an identity card (see EN 1096-1:2012, Annex A).

The layers may be listed either in full, i.e. chemical composition, or by a manufacturer's code.

Product families shall be defined in terms of the above product description taking into account the criteria for demonstrating equivalence of coatings (see EN 1096-2:2012, Annex F and EN 1096-3:2012, Annex B).

The substitution of materials and/or components shall maintain the conformity with the product description. The substituting materials and/or components can be added to the product family and also the product description when compliance has been demonstrated.

4.2 Determination of the characteristic’s performances

4.2.1 Characteristic of coated glass

4.2.1.1 General

The characteristics of coated glass, listed in Table 1, are in general those of the glass substrate and can be found in the appropriate product standard (see 4.2.1.2). Since they are not changed significantly by the coating process, they shall be used for coated glass.

For glass substrates covered by European specifications, generally accepted values, declared values, or calculated values of the characteristics listed in Table 1 shall be used.

If glass panes are used which are not covered by harmonized European Specifications (as defined in regulation EU305/2011), it shall be demonstrated that those glasses have a chemical composition and a mechanical stability over time equivalent to the requirements of the relevant standard listed.

Certain coated glasses can be toughened or heat strengthened. These final products should comply with the appropriate product standard and the performance of the coated glass should be determined on the final product in accordance with EN 1096-2:2012, Annex A or EN 1096-3:2012, Annex A.

Table 1 —Characteristics of glass substrates

Characteristic	Symbol	Unit
Density	ρ	kg/m^3
Hardness (Knoop hardness in accordance with ISO 9385)	*HK* 0,1/20	Dimensionless
Young's modulus	E	GPa
Poisson's ratio	μ	Dimensionless
Characteristic bending strength	$f_{g;k}$	MPa
Resistance against sudden temperature changes and temperature differentials	-	K
Specific heat capacity	c	J/(kg.K)
Coefficient of linear expansion	α_l	K^{-1}
Thermal conductivity	λ	W/(m.K)
Mean refractive index to visible radiation	n	Dimensionless

4.2.1.2 Glass panes used as substrates for the production of coated glass

The glass substrates used for the production of coated glass shall be selected according to EN 1096-1:2012, Clause 5.

4.2.2 Determination of characteristics of coated glass

4.2.2.1 General

If the coated glass manufacturer wishes to claim that any performance characteristic is independent of the production equipment used, then the factory production control system shall be in accordance with this document including his specific process control conditions.

The information supplied with the incoming glass may be used for the characteristics listed in 4.2.2.3 to 4.2.2.11, as the coating process does not alter the values.

4.2.2.2 Safety in the case of fire - Resistance to fire

Fire resistance shall be determined in accordance with EN 13501-2.

The testing methodology specified in EN 15998 shall be used for glass products that are claiming fire resistance.

4.2.2.3 Safety in the case of fire - Reaction to fire

Reaction to fire shall be determined in accordance with EN 13501-1.

4.2.2.4 Safety in the case of fire - External fire performance (for roof coverings only)

Where the manufacturer wishes to declare external fire performance (e.g. when subject to regulatory requirements), the product shall be tested and classified in accordance with EN 13501-5.

4.2.2.5 Safety in use - Bullet resistance: shatter properties and resistance to attack

Bullet resistance shall be determined and classified in accordance with EN 1063.

4.2.2.6 Safety in use - Explosion resistance: impact behaviour and resistance to impact

Explosion resistance shall be determined and classified in accordance with EN 13541.

4.2.2.7 Safety in use - Burglar resistance: shatter properties and resistance to attack

Burglar resistance shall be determined and classified in accordance with EN 356.

4.2.2.8 Safety in use - Pendulum body impact resistance: shatter properties (safe breakability) and resistance to impact

Pendulum body impact resistance shall be determined and classified in accordance with EN 12600.

4.2.2.9 Safety in use - Mechanical resistance: Resistance against sudden temperature changes and temperature differentials

The resistance against sudden temperature changes and temperature differentials is a generally accepted value. That value is given in the standards for the appropriate glass substrate (see 4.2.1.2)

4.2.2.10 Safety in use - Mechanical resistance: Resistance against wind, snow, permanent load and/or imposed loads of the glass unit

The mechanical resistance is a characteristic value. The value to be declared shall be the characteristic bending strength of glass, as defined in the standards for the appropriate glass substrate.

4.2.2.11 Protection against noise - Direct airborne sound reduction

The sound reduction indexes shall be determined in accordance with EN 12758.

The values to be declared shall be rounded down to the nearest whole number.

4.2.2.12 Energy conservation and heat retention - Thermal properties

The thermal transmittance value (U-value) shall be determined in accordance with the following procedure:

a) The normal emissivity ε shall be the declared normal emissivity of the coating manufacturer. If the information is not available, the normal emissivity shall be determined in accordance with EN 12898 and Annex C of this standard.

b) The U-value shall be determined by calculation in accordance with EN 673, with the normal emissivity as defined above and the nominal thickness of the glass panes.

4.2.2.13 Energy conservation and heat retention - Radiation properties: Light transmittance and reflectance

The light transmittance and light reflectance shall be determined either:

a) in accordance with the following procedure:

   1) The light transmittance and light reflectance of one sample of coated glass shall be determined in accordance with EN 410 and Annex C. The exact thicknesses of the glass shall be measured.

   2) The light transmittance and the light reflectance of any other thickness shall be calculated according to EN 410.

   3) The tool used to calculate the light transmittance and the light reflectance shall be validated.

b) or measured following EN 410 and Annex C.

The tolerances on the light transmittance and light reflectance are given in Annex C.

Subject to 5.2.1, the information supplied about the radiation properties of the incoming glass may be used if the coating process does not alter the values.

4.2.2.14 Energy conservation and heat retention - Radiation properties: Solar energy characteristics

The solar direct transmittance, the solar direct reflectance and the total solar energy transmittance (solar factor or g-value) shall be determined either:

a) in accordance with the following procedure:

1) The solar direct transmittance and solar direct reflectance of one sample of coated glass shall be determined in accordance with EN 410 and Annex C. The exact thicknesses of the glass shall be measured.

2) The solar direct transmittance, the solar direct reflectance and the total solar energy transmittance (solar factor or g-value) of any other thickness shall be calculated according to EN 410.

3) The tool used to calculate the solar direct transmittance, the solar direct reflectance and the total solar energy transmittance (solar factor or g-value) shall be validated.

b) or measured following EN 410 and Annex C.

The tolerances on the calculated solar energy characteristics are given in Annex C

Subject to 5.2.1, the information supplied about the radiation properties of the incoming glass may be used if the coating process does not alter the values.

When relevant, the solar factor calculated from both sides can be declared. In that case, it shall be declared as g / g'. The same orientation convention as for ρ_e / ρ'_e shall be observed.

4.2.2.15 Durability / Conformity with the definition of coated glass

Products shall conform to the definition, to the manufacturer product description and fulfil the requirements of coated glass as defined in EN 1096-1.

The type testing concerns the product aspects as listed in Table 2.

Table 2 — Product aspects to be checked if product belongs to the group of coated glass

Type of coating	Characteristics	Requirement
A, B and S	Condensation resistance	EN 1096-2:2012, Clause 4
	Acid resistance	
	Neutral salt spray resistance	
	Abrasion resistance	
C and D	Radiation resistance	EN 1096-3:2012, Clause 4

The type declared on the DoP should be consistent with the commercial documentations.