



# SLOVENSKI STANDARD

## SIST EN 1096-4:2005

01-marec-2005

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**Steklo v stavbah – Steklo z nanosi – 4. del: Ovrednotenje skladnosti/standard za izdelek**

Glass in building - Coated glass - Part 4: Evaluation of conformity/Product standard

Glas im Bauwesen - Beschichtetes Glas - Teil 4: Konformitätsbewertung/Produktnorm

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

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ICS 81.040.20

English version

## Glass in building - Coated glass - Part 4: Evaluation of conformity/Product standard

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

Glas im Bauwesen - Beschichtetes Glas - Teil 4:  
Konformitätsbewertung/Produktnorm

This European Standard was approved by CEN on 27 May 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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## Contents

Page

Foreword.....	4
1 Scope.....	5
2 Normative references .....	5
3 Terms, definitions and symbols .....	6
3.2 Symbols .....	7
4 Requirements .....	7
4.1 Product description .....	7
4.2 Conformity with the definition of coated glass.....	8
4.3 Determination of the characteristic's performances.....	8
4.3.1 Characteristic of coated glass .....	8
4.3.2 Determination of characteristics of coated glass.....	10
4.4 Durability.....	12
4.5 Dangerous substances.....	12
5 Evaluation of conformity .....	12
5.1 General .....	12
5.2 Initial type testing of the product (see 5.1.2).....	13
5.2.1 General.....	13
5.2.2 Initial type testing of coated glass.....	14
5.2.3 Initial type testing of characteristic's performances.....	15
5.3 Factory production control and inspection of samples in accordance with a prescribed test plan (see 5.1, 1a and b).....	15
5.4 Initial inspection of factory and of factory production control (see 5.1, 1c).....	16
5.5 Continuous surveillance and assessment of the factory production control (see 5.1, 1c).....	17
6 Marking and/or labelling.....	17
6.1 General .....	17
6.2 Product marking.....	17
6.3 Product characteristics .....	17
6.4 "Characteristics/performance identification paper" .....	18
7 Initial type testing; sampling and measurement of photometric and energy characteristics.....	18
7.1 Sampling .....	18
7.1.1 General.....	18
7.1.2 Sample specification .....	18
7.2 Measurement of photometric and energy characteristics.....	18
Annex A (normative) Factory production control.....	20
A.1 Factory Production Control Requirements .....	20
A.1.1 General.....	20
A.1.2 Organisation .....	20
A.1.3 Control system .....	20
A.2 Marking .....	21
A.3 Inspection and testing tables of coated glass product production.....	21
A.3.1 Information on Tables A.1 and A.2.....	21
A.3.2 Comments specific to Table A.1.....	22
A.3.3 Comments specific to Table A.2.....	23
A.3.4 Use of proxy testing.....	23
Annex B (informative) Tests for factory production control .....	28

B.1	General .....	28
B.2	Radiometric properties .....	28
B.2.1	Sampling .....	28
B.2.2	Measurements .....	28
B.3	Information on ensuring durability conformity.....	29
Annex C (informative) Provisions for voluntary involvement of third party(ies) .....		30
C.1	General .....	30
C.2	Voluntary tasks for third parties .....	30
C.3	Marking and labelling.....	30
(informative) Clauses of this European Standard addressing the provisions of EU Construction Products Directive .....		31
ZA.1	Scope and relevant characteristics.....	31
ZA.2	Procedure(s) for the attestation of conformity of coated glass products .....	33
ZA.2.1	System(s) of attestation of conformity .....	33
ZA.2.2	EC Certificate and Declaration of conformity .....	35
ZA.3	CE marking and labelling .....	37
Bibliography .....		39

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## Foreword

This document (EN 1096-4:2004) has been prepared by Technical Committee CEN/TC 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 April 2005, and conflicting national standards shall be withdrawn at the latest by July 2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, B, C or D, which is an integral part of this document.

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

No existing document is superseded.

This part of the document does not stand-alone, it is a part of one document:

- EN 1096-1, *Glass in building – Coated glass – Part 1: Definitions and classification*
- EN 1096-2, *Glass in building - Coated glass - Part 2: Requirements and test methods for class A, B and S coatings*
- EN 1096-3, *Glass in building - Coated glass - Part 3: Requirements and test methods for class C and D coatings*
- EN 1096-4, *Glass in building - Coated glass - Part 4: Evaluation of conformity/Product standard*

This document contains other aspects of importance of trade.

## 1 Scope

This document covers the evaluation of conformity and the factory production control 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 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 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 572-1, *Glass in building — Basic soda lime silicate glass products - Part 1: Definitions and general physical and mechanical properties*

EN 572-2, *Glass in building — Basic soda lime silicate glass products - Part 2: Float glass*

EN 572-3, *Glass in building — Basic soda lime silicate glass products - Part 3: Polished wired glass*

EN 572-4, *Glass in building — Basic soda lime silicate glass products - Part 4: Drawn sheet glass*

EN 572-5, *Glass in building — Basic soda lime silicate glass products - Part 5: Patterned glass*

EN 572-6, *Glass in building — Basic soda lime silicate glass products - Part 6: Wired patterned glass*

EN 572-7, *Glass in building — Basic soda lime silicate glass products - Part 7: Wired or unwired channel shaped glass*

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

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

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

EN 1748-1-1, *Glass in building - Special basic products - Borosilicate glasses – Part 1-1: Definition and general physical and mechanical properties*

EN 1748-2-1, *Glass in building - Special basic products - Glass ceramics – Part 2-1: Definitions and general physical and mechanical properties*

EN 1863-1, *Glass in building – Heat strengthened soda lime silicate glass Part 1: Definition and description*

## EN 1096-4:2004 (E)

EN 12150-1, *Glass in building – Thermally toughened soda lime silicate safety glass –Part 1: Definition and description*

EN 12337-1, *Glass in building –Chemically strengthened soda lime silicate glass - Part 1: Definition and description*

EN ISO 12543-1, *Glass in building – Laminated and laminated safety glass - Part 1: Definitions and description of component parts (ISO 12543-1:1998)*

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 13024-1, *Glass in building – Thermally toughened borosilicate safety glass - Part 1: Definition and description*

prEN 13474, *Glass in building – Design of glass panes*

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*

prEN 13501-5, *Fire classification of construction products and building elements - Part 5: Classification using data from fire exposure roof tests*

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

EN 14178-1, *Glass in building - Basic earth alkaline silicate glass products – Part 1: Float glass*

prEN 14179-1, *Glass in building – Heat soaked thermally toughened soda lime silicate safety glass – Part 1 Definition and description*

prEN 14321-1, *Glass in building – Thermally toughened alkaline earth silicate safety glass Part 1: Definition and description*

## 3 Terms, definitions and symbols

### 3.1

#### Terms and definitions

For the purpose of this document, the terms and definitions given in EN 1096-1, 2 and 3 and the following apply:

#### 3.1.1

##### initial type testing

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 document that demonstrates compliance with this document



**3.1.2****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

**3.1.3****product description**

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

**3.1.4****significant change**

variation in performance beyond the permitted tolerance for the characteristic

**3.2 Symbols**

$\varepsilon$  and  $\varepsilon'$  emissivity of both sides of a coated glass pane

$\tau_V$  light transmittance

$\rho_V$  and  $\rho_V'$  light reflectance of both sides of a coated glass pane

$\tau_e$  energy transmittance

$\rho_e$  and  $\rho_e'$  energy reflectance of both sides of a coated glass pane

$\varepsilon_i$  emissivity of a test specimen measured during factory production control

Additional subscripts:

d indicates that the value is a declared value

m indicates that the value is a determined value obtained by measurement, calculation or other means

**4 Requirements****4.1 Product description**

For conformity purposes, the coated glass manufacturer<sup>1</sup> 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 description shall contain at least a normative part. The description may also contain an informative part, when the manufacturer foresees further development of the product.

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<sup>1</sup> The terms 'manufacturer' and 'producer' are understood as being synonyms (see CPD working document NB-CPD/02/019 – issued 24 April 2002 – page 1)

## EN 1096-4:2004 (E)

The normative part of the description shall contain the following:

- Reference to EN 1096 Parts 1, 2 and 3 and all other standards with which the manufacturer claims compliance.
- Type of coating, i.e. on-line, off-line.
- 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.
- Glass substrates.
- Classification of the coated glass.
- Identity card (see EN 1096-1)

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 normative part of the product description taking into account the criteria for demonstrating equivalence of coatings (see EN 1096-2, Annex F and EN 1096-3, 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 Conformity with the definition of coated glass

Products shall conform with the manufacturer's product description and fulfil the definition and requirements for coated glass as defined in EN 1096-1.

### 4.3 Determination of the characteristic's performances

#### 4.3.1 Characteristic of coated glass

##### 4.3.1.1 General

The characteristics of coated glass are in general those of the glass substrate (see 4.3.1.2).

##### 4.3.1.2 Characteristics of the glass panes used as substrates for the production of coated glass

The glasses given in Table 1 may be used for the manufacture of coated glass:

**Table 1 - Glass types used as substrates for the production of coated glass**

Glass type	Reference
Basic soda lime silicate glass products	EN 572-1, 2, 3, 4, 5, 6, 7
Special basic glass products	EN 1748-1-1, EN 1748-2-1
Alkaline earth silicate glass products	EN 14178-1
Thermally toughened soda lime silicate safety glass	EN 12150-1
Heat soaked thermally toughened soda lime silicate safety glass	prEN 14179-1 EN 13024-1
Thermally toughened borosilicate safety glass	prEN 14321-1
Thermally toughened alkaline earth silicate safety glass	
Heat strengthened soda lime silicate glass	EN 1863-1
Chemically strengthened soda lime silicate glass	EN 12337-1
Laminated and laminated safety glass	EN ISO 12543-1

Note: Certain coated glasses can be toughened or heat strengthened. These final products should comply with the appropriate product standard, e.g. EN 12150, EN 1863, etc., and the performance of the coated glass should be determined on the final product.

The characteristics of the glass substrates are listed in Table 2 and the values can be found in the appropriate product standard, e.g. EN 572-1, EN 1748-1-1, etc.

For the characteristics listed in Table 2, for the glass pane types, generally accepted values or calculated values shall be used.

Since the majority of the characteristics of Table 2 are not changed significantly by the coating process, they shall be used for coated glass. The characteristics being those for the glass substrate with the following exceptions:

Resistance to fire	4.3.2.1
Emissivity	4.3.2.11
Light transmittance and reflectance	4.3.2.12
Solar energy characteristics	4.3.2.13

Table 2 — Example of characteristics for glass substrates

Characteristic	Symbol	Unit
Generally accepted values:		
- density	$\rho$	kg/m <sup>3</sup>
- hardness	HK <sub>0,1/20</sub>	GPa
- Young's modulus	$E$	Pa
- Poisson's ratio	$\mu$	Dimensionless
- Characteristic bending strength	$f_{g,k}$	Pa
- Resistance against sudden temperature changes and temperature differentials		K
- Specific heat capacity	$c$	J/(kg.K)
- Coefficient of linear expansion	$\alpha$	K <sup>-1</sup>
- Thermal conductivity (for $U$ -value)	$\lambda$	W/(m.K)
- Mean refractive index to visible radiation	$n$	Dimensionless
- Emissivity	$\varepsilon$	Dimensionless
Measured values:		
- light transmittance	$\tau_v$	Dimensionless
- solar direct transmittance	$\tau_e$	Dimensionless
Calculated values:		
- total solar energy transmittance	$g$	Dimensionless

#### 4.3.2 Determination of characteristics of coated glass

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.

##### 4.3.2.1 Safety in the case of fire - Resistance to fire

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

Note: EN 357 may be used as a classification reference specific to fire resistant glazed elements.

##### 4.3.2.2 Safety in the case of fire - Reaction to fire

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

##### 4.3.2.3 Safety in the case of fire - External fire behaviour

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 prEN 13501-5.

Note: Compliance with this requirement is not possible until a version of prEN 13501-5 later than 2002 becomes available.

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

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

**4.3.2.5 Safety in use - Explosion resistance: impact behaviour and resistance to impact**

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

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

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

**4.3.2.7 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.

**4.3.2.8 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 (see Table 1) for the appropriate glass substrate.

**4.3.2.9 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. That value is given in the standards (see Table 1) for the appropriate glass substrate.

As long as on the concerned construction or building site no part of prEN 13474 is applicable then the current method of determining mechanical resistance in the country of destination shall be applied.

The manufactured or supplied thickness of coated glass shall conform to the ordered thickness.

**4.3.2.10 Protection against noise - Direct airborne sound reduction**

The sound reduction indexes shall be determined in accordance with EN 12758. However, the information supplied with the incoming glass may be used, as the coating process does not alter the values.

**4.3.2.11 Energy conservation and heat retention - Thermal properties**

The thermal transmittance value ( $U$ -value) shall be determined by calculation in accordance with EN 673 with:

- emissivity  $\varepsilon$ : the declared value of the coating manufacturer. If the information is not available, the emissivity shall be determined in accordance with EN 12898.
- nominal thickness of the glass panes

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

The light transmittance and reflectance shall be determined in accordance with EN 410. 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.