SLOVENSKI STANDARD
SIST EN 1096-2:2001

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Steklo v stavbah - Steklo z nanosi - 2. del: Zahteve in preskusne metode za nanose razredov A, B in S

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

Glas im Bauwesen - Beschichtetes Glas - Teil 2: Anforderungen an und Prüfverfahren für Beschichtungen der Klassen A, B und S

Verre dans la construction - Verre à couche - Partie 2: Exigences et méthodes d'essai pour les couches de classes A, B et S

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EUROPEAN STANDARD
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English version

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

Verre dans la construction - Verre à couche - Partie 2: Exigences et méthodes d'essai pour les couches de classes A, B et S

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This European Standard was approved by CEN on 24 December 2000.

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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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

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of an identical text or by endorsement, at the latest by July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

This European Standard includes 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: Evaluation of conformity

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.

1 Scope

This European Standard specifies requirements and test methods related to artificial weathering and abrasion of coatings on-glass for use in buildings.

These tests are aimed at evaluating the resistance of the coating to attack by simulated natural weathering conditions as well as to abrasion.

This European Standard applies to Class A, B and S coatings, as defined in EN 1096-1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. The 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 (including amendments).

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

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1
coated annealed glass
a coated glass which has an annealed glass substrate.

3.2
toughened or heat strengthened coated glass
a coated glass which has to be toughened or heat strengthened to meet its final spectrophotometric properties.

3.3
coated toughened or heat strengthened glass
a coated glass which has a toughened or heat strengthened glass substrate.

4 Requirements

The coated glass complying to this European Standard shall respect the requirements related to the different characteristics given in Table 1.

Table 1 – Requirements

Characteristics	Test Method	Requirements	
		Visual Inspection	Spectrophotometric measurements
Condensation resistance	Annex B	- No defect, as defined in EN 1096-1, greater than 3 mm length - Maximum one defect between 2mm and 3 mm length - Maximum five defects between 1mm and 2 mm length In addition, no scratches, staining of the coating or clusters of pinholes greater than 1 mm shall be allowed (see EN 1096-1). When compared with the reference test piece, in both reflection and transmission, there shall be no significant colour change. This observation shall be made within 20 s[a].	The transmittance measured at 550 nm and 900 nm shall differ by no more than ± 0,03 from the corresponding measured value on the reference test piece. For a glass claimed to have a low emissivity coating the reflectance at 8 μm shall decrease by no more than 0,02.
Acid resistance	Annex C	No requirements	
Neutral salt spray resistance	Annex D	- No defect, as defined in EN 1096-1, greater than 3 mm length - Maximum one defect between 2 mm and 3 mm length - Maximum five defects between 1 mm and 2 mm length In addition, no scratches, staining of the coating or clusters of pinholes greater than 1 mm shall be allowed (see EN 1096-1). When compared with the reference test piece, in both reflection and transmission, there shall be no significant colour change. This observation shall be made within 20 s[a].	
Abrasion resistance	Annex E	No requirement other than to ensure that the abraded area is uniform	Total (diffuse plus direct) transmittance measured at 550 nm and 900 nm shall differ by no more than ± 0,05 from the corresponding value measured for the reference test piece.

[a] The time for observation is fixed to 20 s in order to have a reference period which can influence the visual inspection.

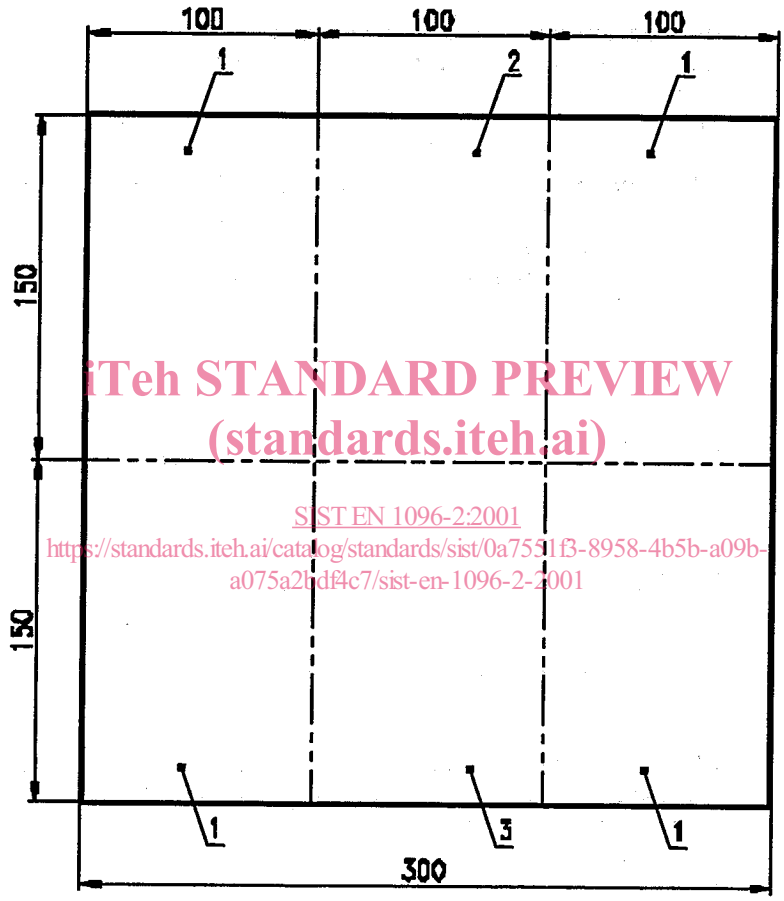
5 Samples and test pieces

5.1 Preparation

5.1.1 Coated annealed glass

A sample of 300 mm x 300 mm is needed for each test. For the three chemical durability tests, the test pieces are obtained by cutting the sample as shown in Figure 1. The abrasion test is undertaken on a 300 mm x 300 mm test piece. It is recommended that a spare sample be supplied in the event of one sample not being defect free.

Dimensions in millimetres



Key

1 Test pieces
2 Reference test piece for visual inspection
3 Reference test piece for spectrophotometric measurement

Figure 1 - Plan for cutting a sample into test pieces

5.1.2 Toughened or heat strengthened coated glass

As the test pieces cannot be cut from test samples, a special procedure has to be employed to obtain the test pieces (see annex A).

5.1.3 Coated toughened or heat strengthened glass

Use coated annealed glass samples for testing this type of coated glass.

5.2 Storage

The test pieces shall be stored inside a room at a temperature of (23 ± 5)°C with a relative humidity less than 80%. Storage shall prevent dust, chemicals or condensation reacting with the test pieces.

The test pieces shall not be stored for more than three months before performing the test.

5.3 Marking

The test pieces shall be marked on the uncoated glass surface. The following information shall be marked:

- manufacturers coating reference
- test pieces number 1 to 4
- code for test

Glasses with coating on both surfaces shall be marked without damaging the coating.

The two reference test pieces shall be marked as the test pieces plus "ref".

6 Initial evaluation of test pieces

6.1 Preparation

All test pieces shall be cleaned with demineralised water and with a soft tissue. Drying shall also be done with a soft tissue. If necessary this cleaning procedure can be repeated.

6.2 Visual inspection

The test pieces shall be subjected to a visual inspection under an artificial sky in accordance with EN 1096-1. The inspection shall take place in both transmission and reflection.

The test pieces shall be observed at a distance of 600 mm. All test pieces shall be defect free. No scratches or pinholes shall be observed. If a test piece contains defects it shall be replaced.

NOTE The replacement of test pieces is to avoid any misinterpretation of the testing results.

6.3 Spectrophotometric measurements

6.3.1 Coated annealed glass

A measurement sample shall be cut from the centre of the reference test piece. The actual size shall be dependent on the type of equipment being used for the measurements. The transmittance of the measurement sample shall be measured with radiation of normal incidence at the following wavelengths:

- 550 nm (representative wavelength for light and solar transmittance);
- 900 nm (representative wavelength for solar transmittance).

For glass claiming to have a low emissivity coating a measurement of the reflectance shall be made at 8 μm using radiation of nearly normal incidence.

6.3.2 Toughened or heat strengthened coated glass

As the measurement sample cannot be cut from the reference test piece, a special procedure has to be employed to make the measurement (see annex A).

7 Duration of the tests

The durations of the tests are set out in Table 2.

Table 2 - Duration of the tests

Test	Test duration for class		
	A	B	S
Condensation resistance	21 days	4 days	14 days
Acid resistance	5 cycles	1 cycle	5 cycles
Neutral salt spray[a]	21 days	10 days	[a]
Abrasion resistance	500 strokes	50 strokes	500 strokes

[a] The neutral salt spray test is excluded for Class S coatings as they are subject to frequent cleaning in the applications for which they are used in accordance with EN 1096-1.

8 Test methods

8.1 General

The coated glass complying to this part of the European Standard shall pass the tests given in annexes B, C, D and E which are designed to verify the chemical and mechanical characteristics of the coating.

The tests are as follows:

- condensation resistance test (see annex B)
- acid resistance test (see annex C)
- neutral salt spray test (see annex D)
- abrasion resistance test (see annex E)

Annex F gives criteria to demonstrate equivalence of coatings, i.e. an indications of whether or not the coated glass needs to be tested.

These tests are evaluated by their effect on the visual quality of the product and its spectrophotometric properties. Whilst it would be feasible to evaluate the spectrophotometric properties across the entire spectrum a number of representative wavelengths have been picked. These wavelengths represent transmission of light and energy, together with reflectance relating to emissivity.

Each test shall be carried out without interruption. The only exception is the acid resistance test which can be interrupted after each cycle. However, any interruption shall not exceed three days.

Testing shall start as soon as possible after the test pieces have been cleaned. The exception is the abrasion resistance test where testing shall commence within 30 min of the test piece being cleaned.

Care shall be taken to ensure the test pieces are clean and uncontaminated.

8.2 Positioning of test pieces in the test cabinets

The test pieces shall have their coated side oriented upwards, the pieces presenting an angle of (15 ± 5)° with the vertical, and the coated side shall face away from the door.

For consistent results, a certain quantity of glass shall be present. For 300 l cabinet the total weight of the glasses shall be (7,5 ± 0,5) kg. An insufficient quantity of coated glass shall be compensated with uncoated clear glasses.

In the centre of the test pieces a piece of 6 mm clear glass is placed, with the reference thermocouple attached (see Figure 2).

The following spacing shall be maintained:

- distance from the walls — not less than 100 mm
- distance between bottom of the test pieces and water — not less than 200 mm
- spacing between adjoining test pieces — not less than 20 mm; not more than 40 mm

Where there is an insufficient quantity of coated glass for testing, it is required to use uncoated clear glasses to fill up a cabinet.