SLOVENSKI STANDARD
SIST EN 13024-1:2012

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Nadomešča:
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Steklo v gradbeništvu - Kaljeno borosilikatno varnostno steklo - 1. del: Definicija in opis

Glass in building - Thermally toughened borosilicate safety glass - Part 1: Definition and description

Glas im Bauwesen - Thermisch vorgespanntes Borosilicat-Einscheiben-Sicherheitsglas - Teil 1: Definition und Beschreibung

Verre dans la construction - Verre borosilicate de sécurité trempé thermiquement - Partie 1: Définition et description

Ta slovenski standard je istoveten z: **EN 13024-1:2011**

ICS:

81.040.20	Steklo v gradbeništvu	Glass in building

SIST EN 13024-1:2012 **en,fr,de**

EUROPEAN STANDARD

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English Version

Glass in building - Thermally toughened borosilicate safety glass - Part 1: Definition and description

Verre dans la construction - Verre borosilicate de sécurité trempé thermiquement - Partie 1: Définition et description

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Foreword

This document (EN 13024-1:2011) 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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.

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 13024-1:2002.

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

EN 13024 is divided into the following parts:

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

— EN 13024-2, *Glass in building — Thermally toughened borosilicate safety glass — Part 2: Evaluation of conformity/Product standard*.

This European Standard differs from EN 13024-1:2002 as follows:

a) some figures have been revised and new figures have been added;

b) in Clause 3, new terms and definitions have been added;

c) Subclause 6.2.3 "Tolerances and squareness" has been completely revised; the squareness of rectangular glass panes is now expressed by the difference between its diagonals and the limits of squareness are described by deviation between diagonals;

d) Clauses 6 and 7 have been completely revised;

e) normative Annex A "Determination of U value" has been deleted;

f) a new informative Annex dealing with an alternative method for the measurement of roller wave distortion has been added.

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

Thermally toughened borosilicate safety glass has a higher thermal shock resistance and a safer breakage behaviour when compared with annealed glass. When it should be used to offer protection under accidental human impact, thermally toughened borosilicate safety glass also should be classified according to EN 12600.

NOTE CEN/TC 129/WG 8 is producing standards for the determination of the design strength of glass and is preparing a design method.

1 Scope

This European Standard specifies tolerances, flatness, edgework, fragmentation and physical and mechanical characteristics of monolithic flat thermally toughened borosilicate safety glass for use in buildings.

Information on curved thermally toughened borosilicate safety glass is given in Annex A, but this product does not form part of this standard.

Other requirements, not specified in this standard, can apply to thermally toughened borosilicate safety glass which is incorporated into assemblies, e.g. laminated glass or insulating glass units, or undergo an additional treatment, e.g. coating. The additional requirements are specified in the appropriate product standard. Thermally toughened borosilicate safety glass, in this case, does not lose its mechanical or thermal characteristics.

This European Standard does not cover glass sandblasted after toughening.

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

EN 1288-3, *Glass in building — Determination of the bending strength of glass — Part 3: Test with specimen supported at two points (four point bending)*

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

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

3 Terms and definitions

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

3.1
curved thermally toughened borosilicate safety glass
thermally toughened borosilicate safety glass which has been deliberately given a specific profile during manufacture

NOTE The information is given in Annex A.

3.2
edge deformation
deformation of the edge because of the tong marks

3.3
edge lift (also referred to as edge dip)
distortion produced in horizontal toughened glass, at the leading and trailing edge of the plate

NOTE This is a distortion produced by a reduction in surface flatness.

3.4
enamelled thermally toughened borosilicate safety glass
thermally toughened borosilicate safety glass which has a ceramic frit fired into the surface during the toughening process

NOTE 1 After toughening, the ceramic frit becomes an integral part of the glass.

NOTE 2 In the UK, this glass is also known as opaque thermally toughened borosilicate safety glass.

NOTE 3 The application of the ceramic frit may be by a continuous process or discontinuous application, e.g. screen printing. The enamelled surface could be partially or wholly covered.

3.5
flat thermally toughened borosilicate safety glass
thermally toughened borosilicate safety glass which has not been deliberately given a specific profile during manufacture

3.6
thermally toughened borosilicate safety glass
glass within which a permanent surface compressive stress, additionally to the basic mechanical strength, has been induced by a controlled heating and cooling process in order to give it greatly increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics

NOTE The mechanical properties, i.e. thermal durability and mechanical strength, and safety properties, i.e. fragmentation characteristics, are generated by the level of surface compression. These properties are not size dependent.

3.7
horizontal process
process in which the glass is supported on horizontal rollers

3.8
local distortion
local deformation of vertically toughened glass underneath the tong marks

3.9
overall bow
deformation of the whole pane of horizontally and vertically toughened glass caused by the heating and cooling process

3.10
roller wave distortion
distortion produced in horizontally toughened glass as a result of the glass during the toughening process being in contact with the rollers

NOTE This is a surface distortion produced by a reduction in surface flatness.

3.11
vertical process
process in which the glass is suspended by tongs

4 Glass products

Thermally toughened borosilicate safety glass is made from a monolithic glass generally corresponding to one of the following standards:

— borosilicate glass according to EN 1748-1-1;

— coated glass according to EN 1096-1.

Glass of nominal thicknesses other than those covered in the above standards is possible.

5 Fracture characteristics

The fracture characteristics of thermally toughened borosilicate safety glass are directly related to the amount of surface compression; these properties are not size dependent.

When the thermally toughened borosilicate safety glass is manufactured with the correct degree of surface compression then in the event of breakage thermally toughened borosilicate safety glass fractures into numerous small pieces, the edges of which are generally blunt.

NOTE 1 The degree of surface compression required is dependent upon glass type and thickness.

NOTE 2 The fracture characteristics of glass are unaffected by temperatures between – 50 °C and + 100 °C.

The fragmentation described in Clause 8 is undertaken on unrestrained test specimens.

The fragmentation in service may not always correspond to that determined during the fragmentation test due to the imposition of other stresses, i.e. from fixing or from reprocessing (e.g. laminating).

6 Dimensions and tolerances

6.1 Nominal thickness and thickness tolerances

The nominal thicknesses and thickness tolerances are those given in the relevant product standard (see Clause 4), some of which are reproduced in Table 1.

Table 1 — Nominal thicknesses and thickness tolerances

Dimensions in millimetres

Nominal thickness *d*	Thickness tolerances for glass type	
	Float	Drawn sheet, rolled, cast
3	± 0,2	- 0,4 / + 0,5
4	± 0,2	- 0,4 / + 0,5
5	± 0,2	- 0,4 / + 0,5
6	± 0,2	- 0,4 / + 0,5
6,5	± 0,2	- 0,4 / + 0,5
7,5	± 0,3	- 0,4 / + 0,5
8	± 0,3	- 0,4 / + 0,8
9	± 0,3	- 0,9 / + 1,0
10	± 0,3	- 0,9 / + 1,0
11	± 0,3	- 0,9 / + 1,0
12	± 0,3	- 0,9 / + 1,0
13	± 0,5	- 0,9 / + 1,0
15	± 0,5	- 0,9 / + 1,0

The thickness of a pane shall be determined as for the basic product. The measurement shall be taken at the centres of the 4 sides, and away from the area of any tong marks (see Figure 2), which may be present.

6.2 Width and length (sizes)

6.2.1 General

When thermally toughened borosilicate safety glass dimensions are quoted for rectangular panes, the first dimension shall be the width, *B*, and the second dimension the length, *H*, as shown in Figure 1. It shall be made clear which dimension is the width, *B*, and which is the length, *H*, when related to its installed position.

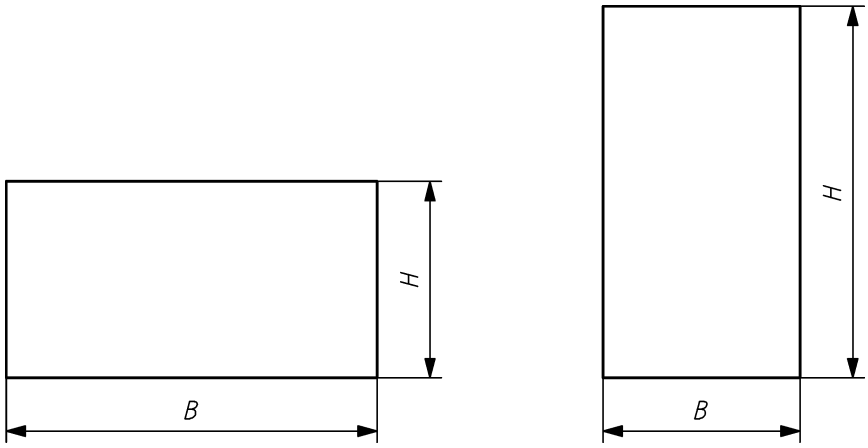

Figure 1 — Examples of width, *B*, and length, *H*, relative to the pane shape

6.2.2 Maximum and minimum sizes

For maximum and minimum sizes, the manufacturer should be consulted.

6.2.3 Tolerances and squareness

The nominal dimensions for width and length being given, the finished pane shall not be larger than the nominal dimensions increased by the tolerance *t*, or smaller than the nominal dimensions reduced by the tolerance *t*. Limits are given in Table 2.

The squareness of rectangular glass panes is expressed by the difference between its diagonals.

The difference between the two diagonal lengths of the pane of glass shall not be larger than the deviation limit *v* as specified in Table 3.

The limits of squareness are described by deviation between diagonals. Limits are given in Table 3.

Table 2 — Tolerances on width, *B*, and length, *H*

Dimensions in millimetres

Nominal dimension of side, *B* or *H*	Tolerance, *t*	
	nominal glass thickness, $d \leq 8$	nominal glass thickness, $d > 8$
≤ 2 000	± 3,0	± 4,0
2 000 < *B* or *H* ≤ 3 000	± 4,0	± 5,0
> 3 000	± 5,0	± 6,0

Table 3 — Limit deviations for the difference between diagonals

Dimensions in millimetres

Limit deviation *v* on the difference between diagonals		
Nominal dimension *B* or *H* in mm	**nominal glass thickness, *d* ≤ 8**	**nominal glass thickness, *d* > 8**
≤ 2 000	≤ 4	≤ 6
2 000 < *B* or *H* ≤ 3 000	≤ 6	≤ 8
> 3 000	≤ 8	≤ 10

6.2.4 Edge deformation produced by the vertical process

The tongs used to suspend the glass during toughening result in surface depressions, known as tong marks (see Figure 2). The centres of the tong marks are situated up to a maximum of 20 mm in from the edge. A deformation of the edge less than 2 mm can be produced in the region of the tong mark and there may also be an area of optical distortion. These deformations are included in the tolerances in Table 2.

Key

1 deformation
2 up to 20 mm
3 tong mark
4 100 mm radius maximum area of optical distortion

Figure 2 — Tong mark deformation

6.3 Flatness

6.3.1 General

By the very nature of the toughening process, it is not possible to obtain a product as flat as annealed glass. This difference in flatness depends on the type of glass, e.g. coated etc., glass dimensions, i.e. the nominal thickness, the dimensions and the ratio between the dimensions, and the toughening process employed, i.e. vertical or horizontal.

There are four kinds of distortion:

— overall bow (see Figure 3);

— roller wave distortion (for horizontally toughened glass only) (see Figure 4);

— edge lift (for horizontally toughened glass only) (see Figure 5);