INTERNATIONAL STANDARD

ISO 22509

First edition
2020-09

Glass in building — Heat strengthened soda lime silicate glass

Verre dans la construction — Verre de silicate sodo-calcique durci thermiquement

Reference number
ISO 22509:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Heat strengthened soda lime silicate glass has a higher resistance to thermal stress and an enhanced mechanical strength when compared to annealed soda lime silicate glass.

Glass in building — Heat strengthened soda lime silicate glass

1 Scope

This document specifies product definitions, product characteristics (i.e. tolerances, flatness, edgework), fracture characteristics, including fragmentation, and the physical and mechanical characteristics of flat heat strengthened soda lime silicate glass for use in buildings.

This document does not cover surface finished glasses (e.g. sandblasted, acid etched) after heat strengthening.

This document does not cover curved (bent) glass.

Other requirements, not specified in this document, can apply to heat strengthened soda lime silicate glass which is incorporated into assemblies (e.g. laminated glass or insulating glass units), or undergoes an additional treatment (e.g. coating). The additional requirements are specified in the appropriate glass product standard. Heat strengthened soda lime silicate glass, in this case, does not lose its mechanical or thermal characteristics.

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.

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

ISO 11479-1, *Glass in building — Coated glass — Part 1: Physical defects*

ISO 16293-1, *Glass in building — Basic soda lime silicate glass products — Part 1: Definitions and general physical and mechanical properties*

ISO 16293-2, *Glass in building — Basic soda lime silicate glass products — Part 2: Float glass*

ISO 16293-5, *Glass in building — Basic soda lime silicate glass products — Part 5: Patterned glass*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
heat strengthened soda lime silicate glass
heat strengthened 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 increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics

Note 1 to entry: Thermal durability and mechanical strength are generated by the level of surface compression. These properties are not size dependent.

3.2
air cushion process
process in which the glass is supported by an air cushion with or without additional rollers

Note 1 to entry: In this process, the glass is between horizontal and 45° of horizontal.

3.3
edge deformation
deformation of the edge caused by the tong marks

3.4
edge lift
edge dip
distortion produced in horizontally *heat strengthened glass* (3.1), at the leading and trailing edge of the plate, as a result of the glass not being supported by a roller during the heat strengthening process

Note 1 to entry: This is a distortion produced by a deviation from surface flatness.

3.5
perimeter deformation
distortion around the edge of *heat strengthened glass* (3.1) manufactured by *air cushion process* (3.2)

3.6
local distortion
local deformation of vertically *heat strengthened glass* (3.1) underneath the tong marks

3.7
overall bow
deformation of the whole pane of *heat strengthened glass* (3.1) caused by the heating and cooling process

3.8
roller wave distortion
periodic deformation produced in horizontally *heat strengthened glass* (3.1) as a result of the glass during heat strengthening process being in contact with the rollers

Note 1 to entry: This is a surface distortion produced by a deviation in surface flatness.

3.9
wave distortion
distortion in *heat strengthened glass* (3.1) manufactured by the *air cushion process* (3.2) as a result of the heat strengthening process

4 Glass products

Heat strengthened glass shall be made from a monolithic glass corresponding to ISO 16293-1:

— when float glass is used it shall be in accordance to ISO 16293-2;

— when patterned glass is used it shall be according to ISO 16293-5;

— when coated glass is used it shall be according to ISO 11479-1.

NOTE There is no international standard for drawn sheet glass. Therefore, see EN 572-4 or national standards.

Glass nominal thicknesses other than those covered in the above international standards are possible.

5 Fracture characteristics

5.1 General

In the event of breakage, heat strengthened glass fractures in a manner similar to annealed glass (see Clause 8).

Fragmentation in service may not correspond exactly to that described in Clause 8, due to restraint from fixing and external actions or due to the cause of fracture.

There can be different fragmentations if heat strengthened glass is used in laminated glass.

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

5.2 Fragmentation

This test method is employed to demonstrate that heat strengthened glass breaks in the manner expected for this product. The fragmentation test (see Clause 8) details the fracture pattern, especially the maximum surface area of "islands".

This fragmentation behaviour ignores any influence of support conditions and is a representation of the effect of the surface pre-stress.

6 Dimensions and tolerances

6.1 Nominal thickness and thickness tolerances

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

Table 1 — Nominal thicknesses and tolerances

Nominal thickness mm	Float glass tolerances mm	Patterned glass tolerances mm
3	±0,3	±0,5
4	±0,3	±0,5
5	±0,3	±0,5
6	±0,3	±0,5
8	±0,6	±0,8
10	±0,6	±1,0
12[a]	±0,8	±1,5

[a] This thickness is only produced by some manufacturers. Therefore, consult the manufacturer for availability.

The thickness of a pane shall be determined as for the basic product. The measurement shall be taken at the centres of the four 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 heat strengthened 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. For heat strengthened glass manufactured from patterned glass, the direction of the pattern should be specified relative to one of the dimensions.

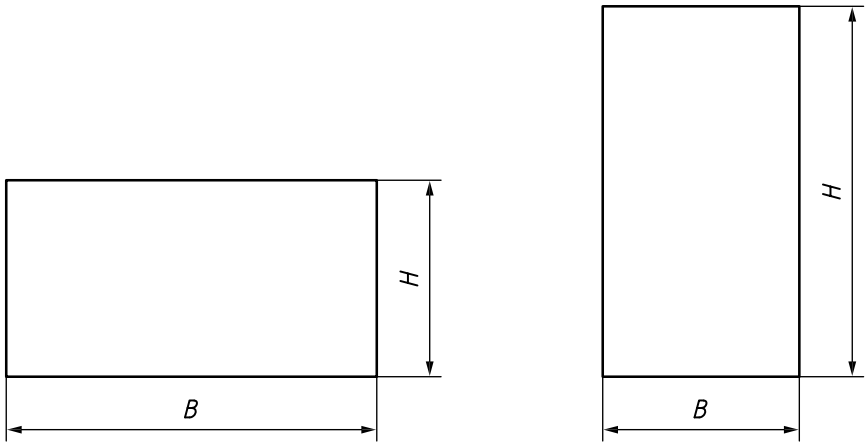


Figure 1 — Examples of width, *B*, and length, *H*, relative to the pane shape

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.

Table 2 — Tolerances, *t*, 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**, $d > 8$
≤1 000	±2	±3
1 000 < *B* or *H* ≤ 2 000	±3	±3
2 000 < *B* or *H* ≤ 3 000	±4	±4
>3 000	±4	±5

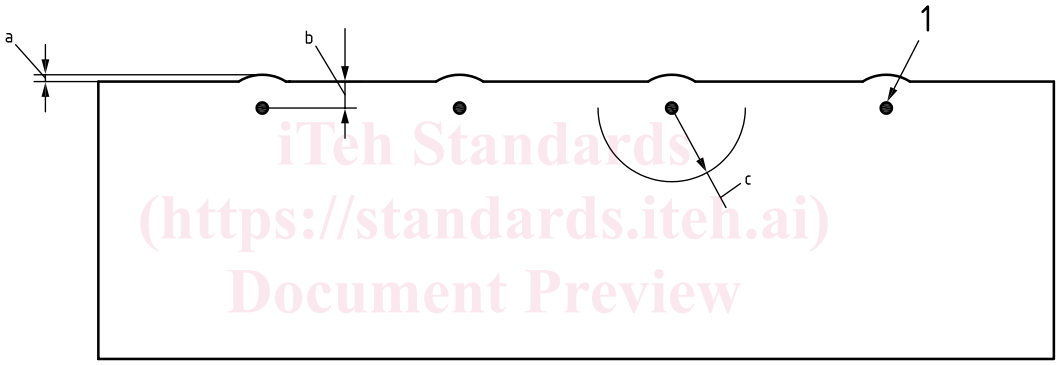
Table 3 — Limit deviations, *v*, for the difference between diagonals

Dimensions in millimetres

Nominal dimension, *B* or *H*	Limit deviation, *v*, on the difference between diagonals	
	Nominal glass thickness, $d \leq 8$	Nominal glass thickness, $d > 8$
≤ 1 000	4	6
1 000 < *B* or *H* ≤ 2 000	6	6
2 000 < *B* or *H* ≤ 3 000	8	8
> 3 000	8	10

6.2.4 Edge deformation produced by vertical heat strengthening

The tongs used to suspend the glass during heat strengthening 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.



Key

1 tong mark

a Deformation in the tolerances of Table 2.

b Up to 20 mm.

c 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 heat strengthening 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, patterned), glass dimensions, i.e. the nominal thickness, the dimensions, the ratio between the dimensions and the type of heat strengthening process employed.

There are six kinds of distortion:

a) overall bow (see Figure 3);

b) roller wave distortion (for horizontally heat strengthened glass only) (see Figure 4);

c) edge lift (for horizontally heat strengthened glass only) (see Figure 5);