SLOVENSKI STANDARD
SIST EN 15682-1:2013

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Steklo v gradbeništvu - HS-preskus kaljenega zemljoalkalijskega silikatnega varnostnega stekla - 1. del: Definicije in opis

Glass in building - Heat soaked thermally toughened alkaline earth silicate safety glass - Part 1: Definition and description

Glas im Bauwesen - Heißgelagertes thermisch vorgespanntes Erdalkali-Silicat-Einscheibensicherheitsglas - Teil 1: Definition und Beschreibung

Verre dans la construction - Verre de silicate alcalinoterreux de sécurité trempé et traité Heat Soak - Partie 1 : Définition et description

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81.040.20	Steklo v gradbeništvu	Glass in building

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EUROPEAN STANDARD

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EN 15682-1

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English Version

Glass in building - Heat soaked thermally toughened alkaline earth silicate safety glass - Part 1: Definition and description

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 15682-1:2013) 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of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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

EN 15682 is composed of the following parts:

— EN 15682-1, *Glass in building — Heat soaked thermally toughened alkaline earth silicate safety glass — Part 1: Definition and description*

— EN 15682-2, *Glass in building — Heat soaked thermally toughened alkaline earth silicate safety glass — Part 2: Evaluation of conformity/Product standard*

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Heat soaked thermally toughened alkaline earth silicate safety glass has a safer breakage behaviour when compared with annealed glass. It also has a known level of residual risk of spontaneous breakage arising from the possible presence of critical nickel sulphide (NiS) inclusions in the thermally toughened alkaline earth silicate glass.

NOTE 1 In this case it is about a statistical mean out of a big quantity of glass. It is impossible to determine separated subjects from it for a building where definitely no “break” produced by NiS occurs. The breaking of glass caused by other influences is not included herewith.

When used to offer protection under accidental human impact, heat soaked thermally toughened alkaline earth silicate safety glass also should be classified according to EN 12600.

NOTE 2 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 the heat soak process system together with tolerances flatness, edgework, fragmentation and physical and mechanical characteristics of monolithic flat heat soaked thermally toughened alkaline earth silicate safety glass for use in buildings. Information on curved heat soak thermally toughened alkaline earth silicate safety glass is given in Annex B, but this product does not form part of this document.

Other requirements, not specified in this document, can apply to heat soaked thermally toughened alkaline earth silicate safety glass which is incorporated into assemblies, e.g. laminated glass or insulating units, or undergo an additional treatment, e.g. coating. The additional requirements are specified in the appropriate product standard EN 15682-2. In this case, heat soaked thermally toughened alkaline earth silicate glass does not lose its mechanical or thermal characteristics.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

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

3.1
heat soaked thermally toughened alkaline earth silicate safety glass
glass within which a permanent surface compressive stress has been induced in order to give it greatly increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics and which has a known level of residual risk of spontaneous breakage due to the presence of critical nickel sulphide (NiS) inclusions

Note 1 to entry: 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 do not depend on the size of the pane.

3.2
residual risk
statistical risk of spontaneous breakage of heat soaked thermally toughened alkaline earth silicate safety glass due to the presence of critical nickel sulphide inclusions

3.3
flat heat soaked thermally toughened alkaline earth silicate safety glass
heat soaked thermally toughened alkaline earth silicate safety glass that has not been given a previously determined profile during manufacture

3.4
heat soaked enamelled thermally toughened alkaline earth silicate safety glass
heat soaked thermally toughened alkaline earth silicate safety glass which has a ceramic frit fired into the surface during the toughening process becoming an integral part of the glass after toughening

3.5
horizontal toughening
process in which the glass is supported on horizontal rollers

3.6
vertical toughening
process in which the glass is suspended by tongs

3.7
heat soak process
process which consists of a heating phase, a holding phase and a cooling phase, which in average should result in no more than one NiS related breakage per 400 tonnes of heat soaked thermally toughened alkaline earth silicate safety glass

4 Glass products

Heat soaked thermally toughened alkaline earth silicate safety glass is made from a monolithic alkaline earth silicate glass product generally corresponding to one of the following standards:

— coated glass according to EN 1096-1;

— basic alkaline earth silicate glass according to EN 14178-1.

5 Manufacturing processes

5.1 General

Heat soaked thermally toughened alkaline earth silicate safety glass is manufactured as follows:

Basic alkaline earth silicate glass products (see Clause 4) are cut to size, shaped and edge worked (see Clause 9).

The prepared glass panes are then thermally toughened (see 5.2).

The thermally toughened panes are then subjected to the heat soak process cycle.

After manufacture the heat soaked thermally toughened alkaline earth silicate glass shall comply with the fragmentation test (see Clause 10) and mechanical strength requirement (see 11.4).

5.2 Toughening process

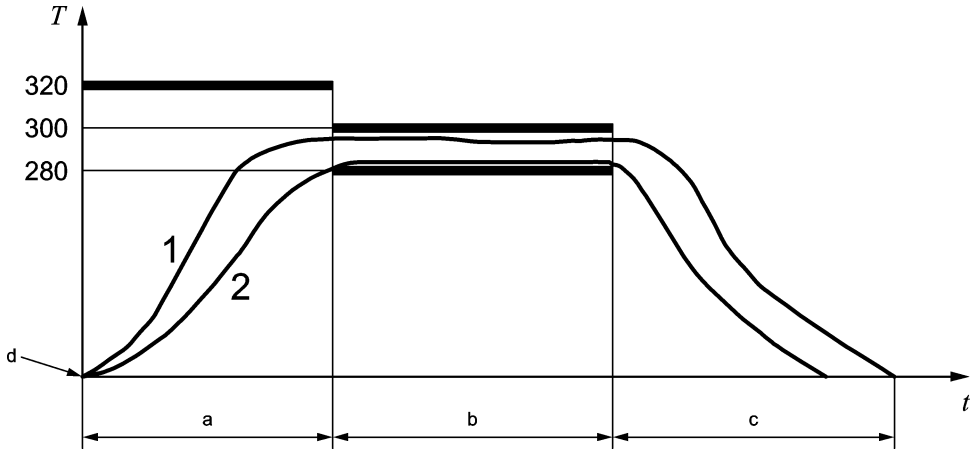
The cut, shaped and edge worked glasses are toughened. The horizontal or vertical toughened glass shall comply with the flatness criteria (see 8.3).

The thermally toughened alkaline earth silicate glass shall have a level of fragmentation that will ensure that after the glass has been through the heat soak process, and subsequently tested to the fragmentation test (see Clause 10), it shall comply with 10.5.

5.3 Heat soak process cycle

5.3.1 General

The heat soak process cycle consists of a heating phase, a holding phase and a cooling phase (see Figure 1).



Key

T	glass temperature at any point, °C	d	ambient temperature
t	time, h	a	heating phase
1	first glass to reach 280 °C	b	holding phase
2	last glass to reach 280 °C	c	cooling phase

Figure 1 — Heat soak process cycle

5.3.2 Heating phase

The heating phase commences with all the glasses at ambient temperature and concludes when the surface temperature of the last glass reaches 280 °C. The time to reach this temperature is defined in the calibration process. This time will be dependent on the size of the oven, the amount of glass to be treated, the separation between glasses and the heating system capacity.

The glass separation and rate of heating should be controlled to minimise the risk of glass breakage as a result of thermal stress.

To facilitate economic heating, the air temperature within the oven may exceed 320 °C. However, the glass surface temperature shall not be allowed to exceed 320 °C. The period of glass surface temperature in excess of 300 °C shall be minimised.

When the temperature of the glass exceeds 300 °C, care should be taken to ensure that the properties of the heat soaked thermally toughened alkaline earth silicate safety glass are not significantly altered, i.e. they continue to meet Clause 10.

5.3.3 Holding phase

The holding phase commences when the surface temperature of all the glasses has reached a temperature of 280 °C. The duration of the holding phase is minimum 2 h.

Precise oven control is necessary in order to ensure that the glass surface temperature shall be maintained in the range of 290 °C ± 10 °C during the holding phase.

5.3.4 Cooling phase

The cooling phase commences when the last glass to reach 280 °C has completed its holding phase, i.e. been held for two hours at 290 °C ± 10 °C. During this phase the glass temperature shall be brought down to ambient temperature.

The cooling phase can be concluded when the air temperature in the oven reaches 70 °C.

The rate of cooling should be controlled to minimise the risk of glass breakage as a result of thermal stress.

6 Heat soak process system

6.1 General

The heat soak process system consists of:

— the oven (see 6.2);

— the glass support (see 6.3);

— separation system (see 6.4).

The oven shall be calibrated (see 6.5 and Annex A), and this determines the method of operation of the heat soak process system during manufacture of heat soaked thermally toughened alkaline earth silicate safety glass.

6.2 Oven

The oven shall be heated by convection and shall allow an unhindered air circulation around each glass pane. In the event of glass breakage the airflow shall not be hindered. The airflow in the oven shall be led parallel to the glass surfaces.

The openings for the air ingress/egress should be designed to ensure that fragments of broken glass do not cause blockages.

6.3 Glass support

Glasses may be supported vertically or horizontally. The glasses shall not be fixed or clamped, they have to be supported to allow free movement.

NOTE Vertically means true vertical or up to 15° either side of true vertical.

The distance between glasses affects the airflow, heat exchange and the heating time. Glass to glass contact shall not be allowed.

6.4 Glass separation

The glasses shall be separated in a manner that does not hinder the airflow. The separators shall also not hinder the airflow, e.g. see Figure 2.

Dimensions in millimetres

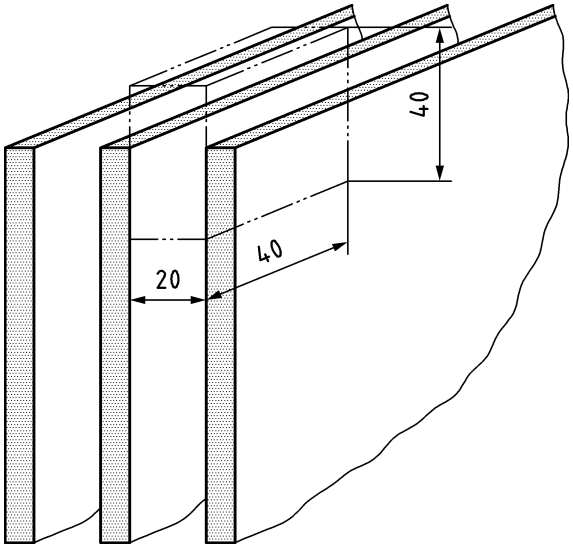


Figure 2 — Example of a vertical glass support

The minimum separation of the glasses shall be determined during the calibration of the oven (see 6.5 and Annex A).

Generally, a minimum separation of 20 mm is recommended. See Figure 3.

NOTE If glasses of very different sizes are put on the same stillage, they will require greater separation in order to prevent glass breakage when the furnace is opened after the heat soak process. The same applies to glasses with holes, notches and cut-outs.

Dimensions in millimetres

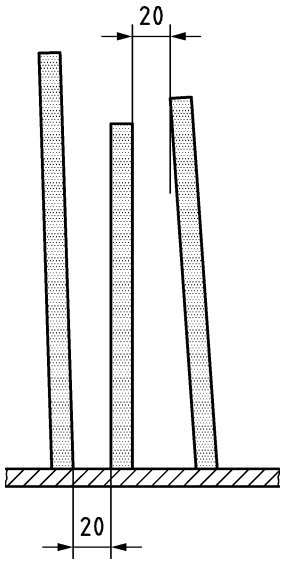


Figure 3 — Recommend separation between glass

The positioning of the separators, material of the manufacture and their shape shall be specified during the calibration test of the oven and shall be reproduced during the manufacturing process.

6.5 Calibration

The heat soak system, e.g. oven, glass separation, separators, etc., shall be calibrated (see Annex A).

The calibration shall determine the heating phase of the process, glass separation distance, the positioning, material and shape of separators, the type and positioning of stillage(s), and define the operating conditions for use during manufacture.

7 Fracture characteristics

In the event of breakage, heat soaked thermally toughened alkaline earth silicate safety glass fractures into numerous small pieces, the edges of which are generally blunt.

NOTE Fragmentation in service does not always correspond to that described in Clause 10, due to restraint from fixing or reprocessing (e.g. laminating), or due to the cause of fracture.

8 Dimensions and tolerances

8.1 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
4	±0,2
5	±0,2
6	±0,2
8	±0,3
10	±0,3
12	±0,3
15	±0,5

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 6), which may be present.

8.2 Width and length (sizes)

8.2.1 General

When heat soaked thermally toughened alkaline earth silicate 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 4. It shall be made clear which dimension is the width, *B*, and which is the length, *H*, when related to its installed position.