

BS 3193:2008



BSI British Standards

Specification for thermally toughened glass panels for use in domestic appliances

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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 November 2008. It was prepared by Technical Committee CW/33, *Glass doors and panels for domestic appliances*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 3193:1993, which is withdrawn.

Information about this document

This edition of BS 3193 reflects the experience that the fragmentation test in Annex A can only be performed on panels at least 76 mm × 76 mm in area. It also incorporates a more realistic impact test in which the impactor is a loaded vessel as opposed to a steel ball.

WARNING. This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

The purpose of this standard is to provide manufacturers and users with an assurance that glass panels fitted in domestic appliances will provide a reasonable level of safe performance.

Glass is thermally toughened to increase the thermal and mechanical strength. In the event of breakage thermally toughened safety glass fractures into numerous small fragments, the edges of which are generally blunt.

Particular attention needs to be paid to the design of the surrounds and fittings for glass panels. The method used to fit glass panels into domestic appliances can adversely affect their performance.

This standard does not cover the abrasion or chemical resistance of glass panels. The performance of glass can deteriorate if it is subjected to excessive or careless treatment with harsh abrasive cleaning materials.

1 Scope

This British Standard specifies requirements for thermally toughened glass panels for use in domestic appliances where such panels can be exposed to thermal and/or physical shock.

Methods of test for fragmentation and for resistance to thermal shock and impact are given in Annexes A, B and C respectively. Recommendations for manufacturers of domestic appliances on the use of glass panels are given in Annex D. Guidance on handling glass is given in Annex E.

This British Standard does not specify performance requirements for glass panels in respect of abrasion or chemical resistance.

2 Terms and definitions

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

2.1 thermally toughened glass

glass, the surface of which has been rapidly cooled from near the softening point so that a residual compressive stress remains in the surface after complete cooling

NOTE Also known as "tempered" or "heat-treated" glass.

2.2 glass panel

panel of glass, with no sharp edges or sharp corners, that is made from toughened glass and is ready for installation, having undergone all finishing processes

2.3 asymmetric glass panel

glass panel processed in such a way, e.g. by printing on one side, that its two surfaces give significantly different test results when subjected to the specified tests

3 Performance requirements

3.1 General

When subjected to visual examination, glass panels (including edges and corners) shall be free from defects (e.g. chips, cracks, scratches, blisters or inclusions) of a magnitude that could impair performance in use or such that panels will no longer conform to 3.2 to 3.4.

3.2 Mode of fragmentation

When tested in accordance with Annex A, a sample of glass panel of not less than 76 mm × 76 mm, which is uninterrupted by holes, shall fragment in such a way that the number of particles counted in a 50 mm × 50 mm area shall be not less than 60.

NOTE The purpose of this test is to determine whether the glass has been adequately toughened.

3.3 Resistance to thermal shock

When tested in accordance with in Annex B, glass panels shall not fracture.

3.4 Resistance to impact

When tested in accordance with Annex C, flat glass panels that include a 300 mm × 300 mm area, which is uninterrupted by holes, shall not fracture.

NOTE A reliable test method has not been developed yet to allow this test requirement to be applied to glass panels that have a curved profile.

4 Marking

Glass panels shall be marked or labelled with, or a declaration shall be given by the manufacturer with respect to, the following information:

- a) the number and date of this British Standard, i.e. BS 3193:2008;¹⁾
- b) the manufacturer's identification or trade mark.

¹⁾ Marking BS 3193:2008 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Annex A (normative) Fragmentation test method**A.1 Principle**

A supported glass panel is shattered, the number of particles within a specified area are counted and the results are recorded.

A.2 Procedure

Support the glass panel over its whole area and ensure that particles will not be scattered upon fragmentation. If the fragmentation test is to be conducted on curved glass, support the sample to maintain the shape of the panel.

Shatter the glass with a centre punch placed 13 mm in from the mid-point of one of the longer edges of the glass. Within five minutes of fracture and without using any aid to vision (except spectacles if normally worn) count the particles in a 50 mm × 50 mm area located approximately at the centre of the area of coarsest fracture and excluding an area within 13 mm of any edge or hole.

A suitable method of counting the particles is to place over the glass a square of transparent material of 50 mm side and mark a spot of ink as each particle within the square is counted. To count particles at the edge of the square, select any two adjacent sides of the square and count all the particles intersected by these. Exclude all other intersected particles. Record the particle count obtained.

Annex B (normative) Thermal shock test**B.1 Principle**

A glass panel is heated and rapidly cooled, and any damage to the panel is recorded.

Each test is performed on a new glass panel. In the case of asymmetric glass panels (see 2.3) the thermal shock test is performed on both sides, using separate glass panels.

B.2 Procedure

Heat the glass panel to a temperature of $185\text{ °C} \pm 5\text{ °C}$ throughout and immediately quench it with a stream of water at a temperature that gives a temperature differential of 165 °C .

Direct the cold water onto a central part of the panel from a $5\text{ mm} \pm 0.2\text{ mm}$ internal diameter tube, the end of which is $150\text{ mm} \pm 2\text{ mm}$ above the centre of the horizontal test panel. Use at least 1 L of cold water at a rate of 10 mL/s to 15 mL/s. Record whether the panel fractures.

Annex C (normative) Impact test**C.1 Principle**

A loaded vessel is dropped 10 times in succession onto a glass panel, and any damage to the panel is recorded. In the case of asymmetric glass panels (see 2.3) the impact test is performed on both sides using separate glass panels.

C.2 Apparatus

- C.2.1** A *loaded vessel*, having a bottom of copper or aluminium, which is flat over a diameter of $120\text{ mm} \pm 10\text{ mm}$ and has edges rounded to a radius of at least 10 mm, uniformly filled with sand or shot so that the total mass of the vessel plus sand or shot is at least 1.8 kg.
- C.2.2** A *means of dropping the vessel flat*, from a height of $150\text{ mm} \pm 2\text{ mm}$, measured from the bottom of the vessel to the upper surface of the glass panel.
- C.2.3** *Supporting fixture*, as shown in Figure C.1, composed of two steel frames, with machined borders, fitting one over the other and faced with rubber gaskets of hardness $50 \pm 10\text{ IRHD}$ (Shore hardness A.50). The upper frame shall have a mass of $3\text{ kg} \pm 0.5\text{ kg}$. The lower frame shall rest on a steel box that collects the broken glass and vessel should the panel break; the lower frame is separate from the box for maintenance purposes but this is not essential. The steel box on which the lower frame rests shall be welded onto a sheet of steel resting on a sheet of rubber of hardness $50 \pm 10\text{ IRHD}$ placed on a rigid base, e.g. a substantial concrete base.

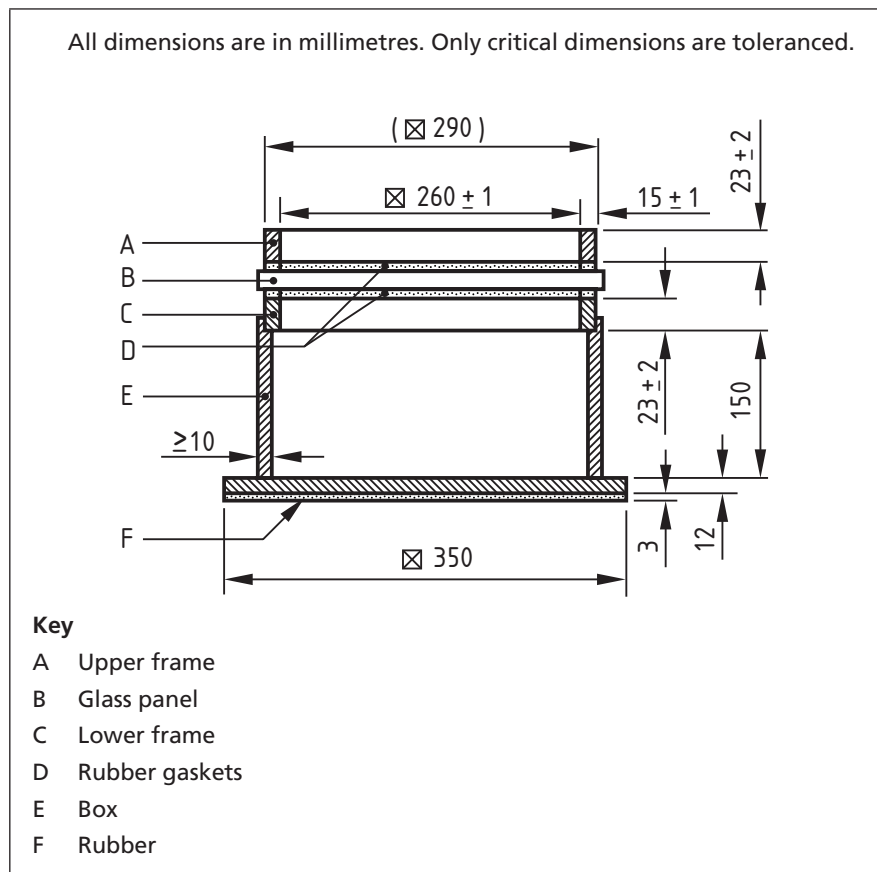
C.3 Procedure

Condition the glass panel at $20\text{ °C} \pm 5\text{ °C}$ for at least 4 h immediately preceding the test.

Place the glass panel between the upper and lower frames of the apparatus; ensure that the plane of the panel is perpendicular $\pm 3^\circ$ to the incident direction of the vessel. Release the vessel so that the point of impact of the centre of its base is within 25 mm of the centre of the test piece.

Impact each glass panel 10 times in succession. Record whether the panel fractures and stop the test if it fractures before 10 impacts have been completed.

Figure C.1 Support for glass panels in the impact test



Annex D (informative)

Guidance for manufacturers of domestic appliances on the use of glass panels

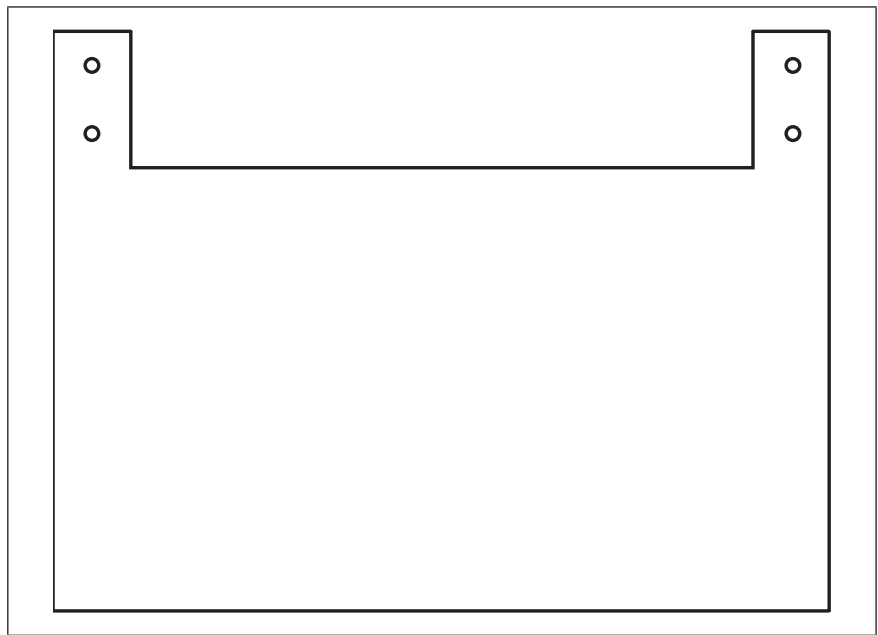
Manufacturers using glass panels in domestic appliances should observe the following recommendations.

- a) Where panels are hinged onto holes drilled in the glass, the distance between the edge of the glass and the edge of the hole should be not less than 1.5 times the thickness of the glass.
- b) The hole should be bushed with non-metallic material in order to prevent the hinge fixings from damaging the glass inside the hole during assembly or during subsequent customer usage, which can cause early fragmentation of the glass panel.
- c) All sharp edges and corners should be dressed.
- d) Rigid contact between metal and glass should be avoided especially when glass panels are likely to be subject to thermal stresses.
- e) The method used to hold glass panels in appliances should not produce additional stress in the panels over the temperature range they could encounter. Allowance should be made for any difference in coefficients of thermal expansion of the glass and its support, by permitting movement of one in relation to the other.
- f) When designing an appliance, manufacturers should minimize thermal gradients that could arise in the glass panel during use of the appliance.
- g) Appliances should be designed such that the temperature of the panel is not allowed to exceed 300 °C to ensure that the characteristics of the glass do not change.

NOTE In normal use toughened glass can be expected to withstand temperatures up to 300 °C.

- h) Appliance manufacturers should state in their appliance operating instructions that harsh abrasive cleaners and sharp metal scrapers should not be used, as they can scratch the glass surface and result in premature failure.
- i) Suitable thermal shock and impact tests should be performed on the panel installed in the appliance, to ensure that the safety characteristics of the glass are not detrimentally affected by the design of the appliance.
- j) Wherever possible, notches, cut-outs and sudden major changes in shape, e.g. Figure D.1, should be avoided as they can create areas of high local stress that might result in premature failure of the glass panel.

Figure D.1 Sudden major changes in shape



Annex E (informative)

Guidance on handling glass

To prevent damage to glass panels between the glass processor and the appliance manufacture, individual glass panels are interleaved with a protective material to avoid scratching.

Glass panels need to be transported vertically in suitable containers with additional protection to protect the edges of the panels.

Appliance manufacturers need to ensure the glass panels are stored vertically and are protected until final assembly.

Glass panels need to be handled carefully during the assembly process so that edges are not damaged. Jigs and fixtures have to be suitably lined so as to prevent contact between the glass panel and metal parts of the jigs and fixtures.

Workbenches have to be kept clean to ensure that the glass panel is not scratched during the assembly process by sharp debris accumulated on the workbench, e.g. metal swarf and loose screws.

Glass panels have to be stored vertically and interleaved with protective material. When transporting glass panels they need to be protected and secured.

Packaging of the final product needs to ensure that any clamping pressure from the handling system is not transmitted on to the glass panel in the product.

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