
**Glass in building — Laminated glass
and laminated safety glass —**

**Part 4:
Test methods for durability**

*Verre dans la construction — Verre feuilleté et verre feuilleté de
sécurité —*

Partie 4: Méthodes d'essai concernant la durabilité

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Contents

Page

Foreword.....	iv
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Test specimens.....	1
5 High-temperature test.....	2
5.1 Principle.....	2
5.2 Size and number of test specimens.....	2
5.3 Procedures.....	2
5.3.1 General.....	2
5.3.2 Procedure A (short high temperature test).....	2
5.3.3 Procedure B (long high temperature test).....	2
5.4 Expression of results.....	2
5.5 Test report.....	3
6 Humidity test.....	3
6.1 Principle.....	3
6.2 Size and number of test specimens.....	3
6.3 Procedures.....	3
6.3.1 Test with condensation.....	3
6.3.2 Test without condensation.....	4
6.4 Expression of results.....	4
6.5 Test Report.....	4
7 Radiation tests.....	4
7.1 Principle.....	4
7.2 Size and number of test specimens.....	5
7.3 Simulated solar radiation methods.....	5
7.3.1 Method A: Radiation wall.....	5
7.3.2 Method B: Mercury vapour arc lamp.....	6
7.3.3 Method C: Xenon arc source.....	6
7.4 Procedure.....	7
7.5 Expression of results.....	7
7.5.1 Laminated glass and laminated safety glass.....	7
7.5.2 Fire-resistant laminated glass and fire-resistant laminated safety glass.....	7
7.6 Test report.....	8
Annex A (normative) Retesting guidelines for durability testing of laminated glass and laminated safety glass.....	9
Annex B (informative) Possible arrangement of the test apparatus for the radiation test described in 7.3.1.....	10
Bibliography.....	12

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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 129, *Glass in building*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 12543-4:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- editorial changes have been made;
- the clause on radiation tests has been revised and a new type of lamp has been added;
- the expression of the results of the radiation tests has been modified.

A list of all parts in the ISO 12543 series can be found on the ISO website.

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.

Glass in building — Laminated glass and laminated safety glass —

Part 4: Test methods for durability

1 Scope

This document specifies test methods relating to resistance to high temperature, humidity and radiation for laminated glass and laminated safety glass for use in building.

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 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 9050, *Glass in building — Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors*

ISO 12543-1, *Glass in building — Laminated glass and laminated safety glass — Part 1: Definitions and description of component parts*

3 Terms and definitions

ISO 12543-4:2021

For the purposes of this document, the terms and definitions given in ISO 12543-1 apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Test specimens

Test specimens should be representative of standard production. Test specimens shall either be specially manufactured to the test size or be cut from larger panes. Test specimens with cut edges shall contain at least one edge from the original pane from which it was cut.

The original edge should be marked.

If the final product as produced by the fabricator has all its edges sealed or protected, the test specimen shall also have all its edges sealed or protected.

The method of supporting the test specimen shall not cover two edges of the test specimen. If the test specimen is cut from a larger pane, at least one original edge shall not be covered.

Retesting guidelines for durability testing of laminated glass and laminated safety glass given in [Annex A](#) shall be considered.

5 High-temperature test

5.1 Principle

The purpose of this test is to determine whether the laminated glass and laminated safety glass are able to withstand exposure to high temperatures over an extended period of time without their properties becoming substantially altered. The changes in properties are judged by the occurrence of bubbles, delamination and cloudiness (not discoloration).

5.2 Size and number of test specimens

The test specimens shall not be smaller than 300 mm × 200 mm. There shall be three test specimens.

5.3 Procedures

5.3.1 General

The high-temperature test may be carried out using either an oven or boiling water. The test temperature is 100 °C. The tolerances of the test temperature depend on the test method used and are as follows:

- a) Oven (100 ± 2) °C: in an oven, the heating-up time is dependent on load and the type and thickness of the laminated glass being tested. Generally speaking, for samples up to 10 mm thickness, this should be assumed to be 30 min. For thick samples, i.e. thicker than 10 mm, a heating-up time of 3 min/mm glass thickness shall be assumed. The maximum shall be 2 h. Alternatively, the heating-up time for samples thicker than 10 mm may be determined by calibration.
- b) Boiling water $100 \left(\pm \frac{0}{2} \right)$ °C: to remove the risk of thermal breakage in the boiling water, test samples should be placed in water at 60 °C for 10 min before transferring to the water at 100 °C.

5.3.2 Procedure A (short high temperature test)

Heat the three test specimens to a temperature of 100 °C.

Maintain the test temperature for a period of 2 h.

Take the test specimens out and allow them to cool to room temperature by storing them vertically under natural convection and radiation. The assessment of the test samples may be carried out when the glass surface temperature is lower than 30 °C.

5.3.3 Procedure B (long high temperature test)

Heat the three test specimens to a temperature of 100 °C.

Maintain the test temperature for a period of 16 h.

Take the test specimens out and allow them to cool to room temperature by storing them vertically under natural convection and radiation. The assessment of the test samples may be carried out when the glass surface temperature is lower than 30 °C.

5.4 Expression of results

Inspect the samples at a distance between 300 mm and 500 mm in front of a white diffuse background.

Record the number and extent of the faults occurring in the test specimen.

NOTE Bubbles, delamination, haze and cloudiness indicate faults, but discoloration does not.