INTERNATIONAL STANDARD

ISO 20492-1

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Glass in buildings — Insulating glass —

Part 1:
Durability of edge seals by climate tests

Verre dans la construction — Verre isolant —

Partie 1: Résistance des fermetures de côté par essais climatiques

Reference number
ISO 20492-1:2008(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 20492-1 was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

ISO 20492 consists of the following parts, under the general title *Glass in buildings — Insulating glass*:

— *Part 1: Durability of edge seals by climate tests*

— *Part 2: Chemical fogging tests*

— *Part 3: Gas concentration and gas leakage*

— *Part 4: Test methods for the physical attributes of edge seals*

Introduction

This part of ISO 20492 consists of a series of procedures for testing the performance of pre-assembled, permanently sealed insulating glass units or insulating glass units with capillary tubes that have been intentionally left open. This part of ISO 20492 is intended to help ensure that

— energy savings are made, as the U-value and solar factor (solar-heat gain coefficient) do not change significantly;

— health is preserved, because sound-reduction and vision do not change significantly;

— safety is provided, because mechanical resistance does not change significantly.

This part of ISO 20492 also covers additional characteristics that are important to the trade and includes the marking of the product (i.e., the CE marking or markings of other regulatory groups).

It is necessary to consider distinct markets for insulating glass. As within each market there are technical differences with respect to rebate sizes, vision lines and methods of application, two approaches are included in this part of ISO 20492. Approach 1 addresses requirements for markets such as North America. Approach 2 addresses requirements for markets such as Europe. Each approach includes separate test methods and specifications pertaining to minimum requirements for the durability of edge seals as determined by climate tests.

This part of ISO 20492 does not cover physical requirements of sealed-glass insulating units such as appearance, thermo-physical properties, heat and light transmission and glass displacement.

The main intended uses of the insulating glass units are installations in buildings and construction, such as in windows, doors, curtain walling, skylights, roofs and partitions where protection against direct ultraviolet radiation exists at the edges.

NOTE In cases where there is no protection against direct ultraviolet radiation at the edges, such as structural-sealant glazing systems, it is still necessary to review factors such as sealant longevity when exposed to long term ultraviolet light and the structural properties of the sealant for these applications. For more information on the requirements for structural-sealant glazing applications, reference can be made to ASTM C1369 [1], ASTM C1249 [2] and ASTM C1265 [3].

The test methods in this part of ISO 20492 are intended to provide a means for testing the performance of the sealing system and construction of sealed, insulating glass units.

Sealed, insulating glass units tested in accordance with these method are not intended for long-term immersion in water.

The options for testing apply only to sealed, insulating glass units that are constructed with glass.

The methods of this part of ISO 20492 might not be applicable in certain cases, such as for insulating glass units containing spandrel glass or absorptive coatings, as these products can experience field temperatures that exceed the temperature limitations of the sealant.

Glass in buildings — Insulating glass —

Part 1:
Durability of edge seals by climate tests

1 Scope

This part of ISO 20492 establishes two methods for testing the durability of edge seals of insulating glass units by means of climate tests. The two methods are designated as Approach 1 for markets such as North America and Approach 2 for markets such as Europe.

This part of ISO 20492 is applicable to pre-assembled, permanently sealed, insulating glass units with one or two airspaces, and with capillary tubes that are intentionally left open to equalize pressure inside the unit with the surrounding atmosphere.

This part of ISO 20492 is not applicable to sealed, insulating glass units that contain a spandrel glass coating.

This part of ISO 20492 does not apply to insulating glass (IG) units whose function is decorative only.

2 Normative references

The following reference documents are indispensable for the application of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 760, *Determination of water — Karl Fischer method (General method)*

EN 572-1, *Glass in building — Basic soda lime silicate glass products — Definitions and general physical and mechanical properties*

EN 572-2, *Glass in building — Basic soda lime silicate glass products — Float glass*

EN 1279-1, *Glass in building — Insulating glass units — Part 1: Generalities, dimensional tolerances and rules for the system description*

ASTM E546, *Standard Test Method for Frost Dew Point of Sealed Insulating Glass Units*

ASTM E631, *Standard Terminology of Building Constructions*

ASTM C1036, *Standard Specification for Flat Glass*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1279-1, ASTM E631 and the following apply.

3.1
standard laboratory conditions
ambient temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %

3.2
standard moisture-adsorption capacity
capacity of a desiccant material to adsorb a quantity of moisture under controlled limit environmental conditions

3.3
controlled limit environmental conditions
environment temperature of 10 °C with a dew-point temperature of – 5 °C, giving a relative humidity of 32,8 %

3.4
moisture penetration index
amount of drying capacity consumed after standardized ageing conditions

3.5
accuracy
accuracy of the test method itself within statistical confidence limits of 99 %

3.6
frost/dew point
temperature at which water, organic vapour or other chemicals begin to appear on the interior glass surface of a sealed, insulating glass unit

3.7
sealed, insulating glass unit
pre-assembled unit consisting of panes of glass that are sealed at the edges and separated by dehydrated space(s), intended for use in buildings

NOTE The unit is normally used for windows, window walls, picture windows, sliding doors, patio doors, or other types of fenestration.

4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviations apply.

I moisture penetration index (can be expressed in decimal or in percentage terms)

I_{av} average value of the moisture penetration index, I, based on five measurements

m_c mass of dish plus desiccant plus water adsorbed from 32 % r.h. air

m_f mass of dish plus desiccant plus water initially adsorbed plus water adsorbed when subjected to the climate conditions in the chamber

m_i mass of dish plus desiccant plus water initially adsorbed

M_m mass of desiccant in mixtures with non-desiccant material

m_r mass of dish plus desiccant plus water adsorbed in equilibrium with a defined reference level of relative humidity of air, or dish plus dried desiccant at high temperatures

M_t total mass of desiccant when, for the purpose of testing, in a mixture with non-desiccant material, the non-desiccant material is replaced by the same volume of desiccant

m_o mass of dish when empty, clean and dry

R ratio between the masses of desiccant M_m and M_t

r.h. relative humidity

T_c standard moisture adsorption capacity of desiccant

$T_{c,av}$ average standard moisture adsorption capacity of desiccant, T_c, obtained over two measurements

T_f final moisture content of desiccant

$T_{f,u}$ uncorrected final moisture content of desiccant

T_i initial moisture content of desiccant

$T_{i,av}$ average initial moisture content of desiccant, T_i, obtained over four measurements

$T_{i,u}$ uncorrected initial moisture content of desiccant

Θ temperature of test specimens in test chamber

Θ_c temperature of the central test specimen in test chamber during constant temperature phase

Θ_h high temperature of the central test specimen in the test chamber during the high humidity/temperature cycling phase

Θ_l low temperature of the central test specimen in the test chamber during the high humidity/temperature cycling phase

Θ_s temperature of the central test specimen in the test chamber as the cycle moves between high temperature and low temperature and vice versa

5 Requirements

5.1 Approach 1 — Final frost/dew point

The six test specimens that complete the weather cycle and high-humidity phases of the test in 6.1 shall be unbroken and without deposits in the airspaces.

The final frost/dew points of all airspaces shall be – 40 °C or colder when measured in accordance with ASTM E546 or equivalent.

5.2 Approach 2 — Moisture-penetration index

The following values shall be verified on test specimens that are submitted to the climate test.

— The average moisture penetration index, I_{av}, over the five test specimens shall not exceed 0,20.

— The average moisture penetration index, I_{av}, shall be the average over five test specimens. Where a test specimen is broken, a spare test specimen shall be used instead.

NOTE Breakage of the glass in a test specimen does not constitute failure of the test specimen.

— The specimen with the highest moisture penetration index, I, shall have an index value that does not exceed 0,25.

6 Test methods

6.1 Approach 1

6.1.1 Principle

The frost/dew point of the test specimens is measured and the test specimens are then pre-conditioned for a specified time in a high-humidity chamber with constant high temperature and high humidity. The test specimens are then placed in a weather-cycling chamber where temperature, UV and moisture are varied to specified parameters for a specified number of cycles. After cycling, the test specimens are then returned to the high-humidity chamber for final conditioning. After final conditioning, the test specimens are evaluated for the final frost/dew point.

6.1.2 Test specimens

Each test specimen shall measure (355 ± 6) mm wide by (505 ± 6) mm high and shall be composed of two or three panes of clear, tinted or coated annealed, heat-strengthened, tempered or laminated glass.

The double-glazed test specimens shall be fabricated with at least one pane of clear, uncoated glass. The triple-glazed test samples shall be fabricated with at least one outer pane of clear, uncoated glass. The other outer pane shall be fabricated with a glass that allows easy viewing of the frost/dew point.

For double-glazed test specimens, the glass and airspace thicknesses of the test specimens shall be 4 mm glass with 12 mm airspace, or 5 mm glass with 6 mm airspace.

For triple-glazed test specimens, 4 mm glass with 6 mm airspaces shall be used.

The tolerances of glass thickness shall be in accordance with ASTM C1036.

The airspace tolerances shall be ± 0,8 mm.

A minimum of six double-glazed test specimens shall be submitted for testing.

NOTE 1 However, it is recommended to submit an additional three test specimens in case of breakage.

Triple-glazed, sealed, insulating glass units that have a plastic film as the intermediate airspace divider shall be acceptable as test specimens.

NOTE 2 The overall sealed, insulating glass unit thickness has some limits. Testing laboratories are usually able to accommodate 30 mm overall thickness. If thicker sealed, insulating glass units are being tested, it is necessary to contact the testing laboratory prior to manufacturing to ascertain their capabilities for testing thicker units.

Each test specimen shall be permanently and legibly marked with the designation of the manufacturer, the date of fabrication (month or quarter and year) and orientation intended in the field (for units constructed with coated glass).

During all stages of exposure and storage, the test specimens shall be held in a vertical position, with equal support to all panes and no compression loading.

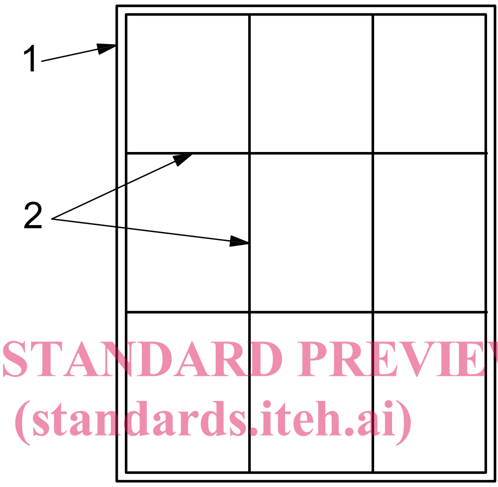
The selection of sealed, insulating, glass units for testing shall be made at random, except for sealed, insulating, glass units that have been damaged in transit. Damaged sealed, insulating, glass units shall not be tested.

Test specimens representing units that are gas-filled shall be fabricated using the same hole-sealing and gas-filling techniques as those used for manufacturing. For example, if a gas-filling plug is used in manufacturing the sealed insulating glass unit, then it should also be used in manufacturing the test specimens.

It is not necessary for the submitted test specimens to be filled with gas provided that the gas is classified as inert. Test specimens that represent sealed, insulating, glass units that are normally filled with an inert gas during manufacture may be submitted air-filled for testing, as long as the test specimens have been manufactured with the same techniques as the sealed, insulating, glass units.

The test specimens representing sealed-glass insulating units that include tubes intended to be left open shall be fabricated with one tube. This tube shall be left open during testing. Test specimens representing sealed, insulating glass units that include tubes intended to be closed off after shipping shall be fabricated with one tube. The exterior end of this tube shall be closed prior to testing.

For test specimens representing sealed-glass insulating units that include internal components in the airspace, the grid formed by these components shall divide the test specimen into nine equal areas (3 × 3; see Figure 1).



Key

1 insulating glass spacer/edge seal

2 internal grids

Figure 1 — Test specimen with internal grids

Measures shall be taken to ensure that there is a clear view of the interior glass surface for the detection of frost.

NOTE 3 Stains or scum that cannot be removed through cleaning are allowed to remain on the exterior glass surface of the specimen after the accelerated weathering test. To counteract this, for example, place a mask of plastic tape 50 mm by 50 mm (or larger) on the central region of both exterior glass surfaces before exposing the test specimen to weathering conditions. Remove the mask for frost/dew point measurement.

The sealed insulating glass units should be sealed a minimum of 4 weeks from the date of manufacture to allow for stabilization before testing.

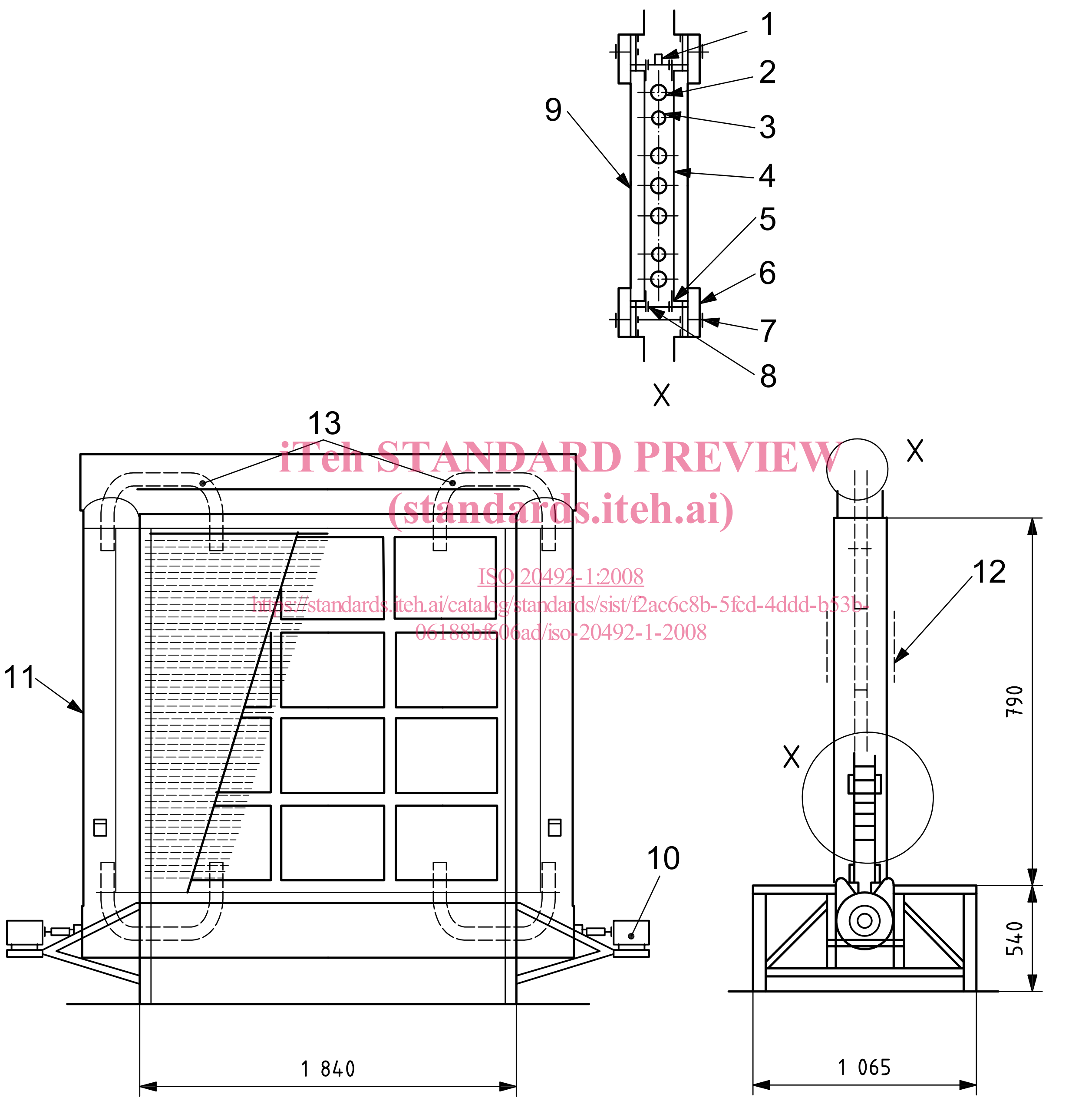
Breakage of only two test specimens as a result of testing shall be permitted throughout the test. If more than two test specimens are broken during the test, the relevant set of test specimens shall fail the test. Breakage due to laboratory handling is not considered as test breakage. Units broken due to laboratory handling shall be replaced and tested from the beginning.

6.1.3 Apparatus

6.1.3.1 High-humidity test chamber, capable of maintaining (60 ± 3) °C and 95 % ± 5 % r.h. The high-humidity test chamber shall be protected from overheating with protective devices, including one or more temperature sensors and a continuous temperature-recording device placed in an area in the chamber that monitors the average temperature inside the chamber.

6.1.3.2 Weather-cycle test chamber, capable of providing the required test conditions specified in 6.1.4.6 to 6.1.4.16. (see Figures 2 to 4). Modifications to the weather-cycle test chamber shall be acceptable as long as the required test conditions indicated in 6.1.4.2 are met. The chamber shall be protected from overheating and from overcooling with protective devices. It shall be equipped with one or more temperature sensors and a continuous temperature-recording device placed in an area that monitors the average temperature inside the chamber.

Dimensions in millimetres

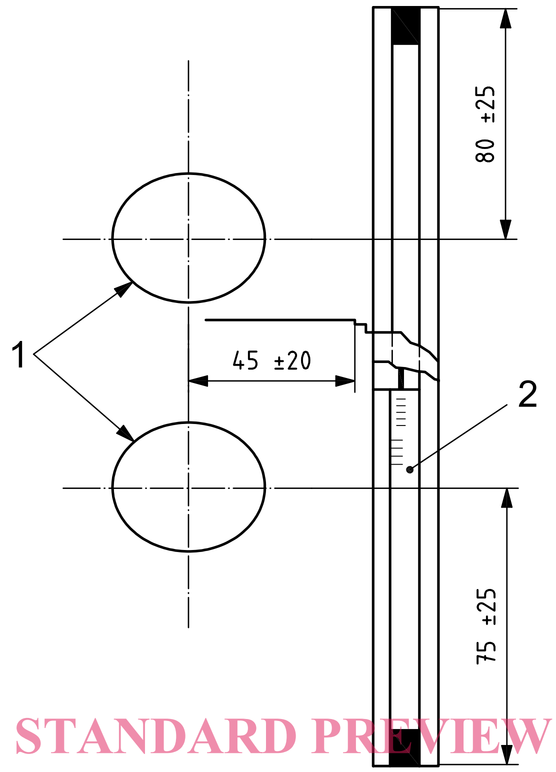


Key

1 fog or mist spray
2 cooling coil
3 fluorescent black light lamp F72T12BL/HO
4 heating coil
5 rubber pad
6 polystyrene insulation
7 rubber washer
8 clamping device
9 test specimen
10 fan motor
11 air duct
12 insulation
13 air flow

Figure 2 — Typical weather-cycle test chamber (Approach 1)

Dimensions in millimetres



Key

1 fluorescent black light lamps F72T12BL/HO

2 test specimen

Figure 3 — Location of fluorescent black-light lamp relative to the test specimen

NOTE The weather-cycle test apparatus is a modification of the device developed by the Institute for Research in Construction (IRC) of the National Research Council of Canada. One modification is to expose each test specimen to two black light lamps.

DANGER — Light from the ultraviolet sources used in this test method is harmful, especially to the eyes. Appropriate protective measures should be implemented as prescribed by the light source manufacturer.

6.1.3.3 Ultraviolet light source, consisting of two fluorescent black-light lamps, type F72T12BL/HO, for each test specimen (see Figure 2). Each lamp shall be replaced when its ultraviolet light intensity falls below 10 W/m^2 (1 000 μW/cm^2) when measured with a long-wave ultraviolet meter that is in direct contact with the lamp.

6.1.4 Procedure

6.1.4.1 In accordance with ASTM E546 or equivalent, determine the initial frost/dew point of all airspaces on all test specimens that have been submitted.

6.1.4.2 Place six test specimens in the high-humidity test chamber and arrange the test specimens so that each specimen has at least 6 mm (1/4 in) clearance all around.

6.1.4.3 Expose the six test specimens in the high-humidity test chamber to a temperature of (60 ± 3) °C and 95 % ± 5 % r.h.

