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Windows and doors — Air permeability — Test method

Fenêtres et portes – Perméabilité à l'air – Méthode d'essai

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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.

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 162, *Doors, windows and curtain walling*.

This second edition cancels and replaces ISO 6613:1980 and ISO 8272:1985, which have been technically revised.

The main changes are as follows:

— pedestrian door sets have been added to the scope;

— the title has been revised;

— this document has been adapted to the current state of the art on the basis of Reference [1];

— the technical content has been precised.

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.

Windows and doors — Air permeability — Test method

1 Scope

This document specifies the test method to determine the air permeability of completely assembled windows and pedestrian door sets of any material, when exposed to positive or negative test pressures.

This test method is designed to take account of conditions in use, when the window or door set is installed in accordance with the manufacturer's specification and the requirements of relevant International Standards and codes of practice.

This document does not apply to joints between the window or door frame and the building construction.

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 22496, *Windows and pedestrian doors — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22496 and the following 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/

3.1
closed
closing condition where movable parts rest in or at the fixed parts in a way in which the movable parts can be *fastened* (3.2) [*latched* (3.3) and/or *locked* (3.4)]

3.2
fastened
closing condition where the movable part is restrained at one or more points by latching and/or locking

3.3
latched
fastened (3.2) condition where the movable part is returned to its *closed* (3.1) position and restrained

Note 1 to entry: The movable part is restrained by either:

a) a self-engaging fastener, or

b) a roller catch, or

c) a latch.

3.4
locked
fastened (3.2) condition where the movable part is further restrained in the *closed* (3.1) position by additional operations to engage integrated locking devices which affect the product's characteristics

Note 1 to entry: The restraining in the closed position is done by additional operations of, for example, handle, key, automatic devices or electronic devices.

Note 2 to entry: Integrated locking devices are, for example, nut bolts or deadbolts.

3.5
test pressure
difference between the static air pressures inside and outside of the test chamber

Note 1 to entry: The test pressure is positive if the static air pressure inside the chamber of the test apparatus is higher than that outside the test chamber.

Note 2 to entry: The test pressure is negative if the static air pressure inside the chamber of the test apparatus is lower than that outside the test chamber.

Note 3 to entry: The intended "outside" of the specimen shall be facing to the side, from where the positive pressure is applied.

3.6
air permeability
amount of air passing through all joints between casement or leaf and frame profiles of a test specimen caused by the *test pressure* (3.5)

3.7
opening joint
line of discontinuity between either a frame and its matched component or two components which can be opened by means of their building hardware

Note 1 to entry: Conventionally, this discontinuity is as seen from the opening face of the test specimen.

Note 2 to entry: See Figures 1 to 6.

3.8
length of opening joint
length of the line of discontinuity between either a frame and its matched component or two components which can be opened by means of their building hardware

Note 1 to entry: The length of joint should be expressed in metres.

Note 2 to entry: Actual length of gaskets or seals fitted into the underlying profiles of the components or joints of components built into opening parts are not relevant.

Note 3 to entry: See Figures 1 to 6.

3.9
overall area
area of the test specimen measured parallel to the glazing or the leaf

Note 1 to entry: The overall area should be expressed in square metres.

Note 2 to entry: See Figures 1 to 6.

4 Principles of test

The test consists of the application of a defined series of test pressures (positive and negative) and at each test pressure measurement of the air permeability with a suitable test device.

5 Test apparatus

5.1 A chamber with an open side to which the test specimen can be fitted. It shall be constructed so as to be able to withstand the test pressures without deflecting to an extent likely to influence the test results.

5.2 Means for applying controlled test pressure to the test specimen.

5.3 Means of producing rapid changes in test pressure, controlled within defined limits.

5.4 Instrument suitable for measuring the quantity of air flow into or out of the chamber with an accuracy of ±5 % of the measured value for air flows greater than 1 m^3/h and an accuracy of ±0,05 m^3/h for air flows equal to or smaller than 1 m^3/h.

NOTE 1 Accuracy is equal to plus minus the sum of the amount of the error plus the amount of the expanded measurement uncertainty. For values of both error and expanded measurement uncertainty, refer to the last calibration certificate of the instrument.

NOTE 2 For vocabulary of metrology, see ISO/IEC Guide 99.

5.5 Means of measuring the test pressure applied across the test specimen, within an accuracy of ±5 %.

5.6 Means of sealing all joints of the test specimen, when required.

6 Preparation of the test specimen

The test specimen shall be fixed as intended for use without any twists or bends which can influence the test results. The test specimen shall be fully operable.

The test specimen shall be cleaned and its surfaces shall be dry.

Ventilation devices, if any, shall be taped over, except when it is required to determine the amount of air flow through such devices.

7 Test procedure

7.1 Preliminaries

The ambient temperature and humidity close to the test specimen shall be within the range of 10 °C to 30 °C and 25 % to 75 % RH, and the test specimen shall be conditioned thus for at least 4 h immediately before testing.

Temperature shall be measured to within ±3 °C and relative humidity to within ±5 %. Atmospheric pressure shall be measured to within ±1 kPa.

The test pressure shall be applied in steps of 50 Pa up to 300 Pa and from 300 Pa in steps of 150 Pa.

The air permeability result shall be stated with three significant digits. The accuracy shall also be stated (see 5.4).

7.2 Air permeability of the test chamber

7.2.1 General

Determine the procedure to follow in accordance with what is known about the air permeability of the test chamber.

7.2.2 Test chamber with known air permeability

Assume the air permeability of the test chamber is zero if it is less than 5 % of the maximum air permeability permitted throughout the range of the classification that is attributed to the test specimen.

If this is not the case, measure the air permeability of the test chamber as described in 7.2.3 unless it is known and shown to be approximately constant within the limit of accuracy of the measurement recorded by the test laboratory.

In no case shall the air permeability of the test chamber exceed 30 % of the overall air permeability of the test specimen and the test chamber.

7.2.3 Test chamber with unknown air permeability

Seal all joints in the test specimen with adhesive tape or an airtight sheet covering the whole test specimen.

Measure the air permeability of the test chamber with negative test pressures as described in 7.4, but without pressure pulses.

After determining the air permeability of the test chamber, remove the adhesive tape or airtight sheet covering the test specimen. In no case shall the air permeability of the test chamber exceed 30 % of the overall air permeability of the test specimen and the test chamber.

7.3 Overall air permeability of the test specimen and the test chamber — Positive pressures

7.3.1 General

All the opening parts of the test specimen shall be opened and closed at least once before the test. The test specimen shall then be brought into the closing condition in accordance with the manufacturer's requirements.

Measure the air permeability of the test specimen with positive test pressures as described in 7.3.2 or 7.3.3 (see Figures A.1 and A.2).

7.3.2 Measurement of the air permeability for windows and external pedestrian door sets

Apply three pressure pulses each 10 % greater than the maximum test pressure to be used in the test or 500 Pa, whichever is greater. The time to reach the maximum test pressure shall be not less than 1 s and the pressure shall be sustained for at least 3 s. Apply positive test pressure steps as specified in 7.1. Measure and record the air permeability at each step. The duration of each step shall be sufficient to allow the test pressure to stabilize before the air permeability is measured.

This subclause is applicable to alternative internal door sets to 7.3.3.

7.3.3 Measurement of the air permeability for internal pedestrian door sets

Apply three pressure pulses each 10 % greater than the maximum test pressure to be used in the test or 150 Pa, whichever is greater. The time to reach the maximum test pressure shall be not less than 1 s and the pressure shall be sustained for at least 3 s. Apply positive test pressure steps as specified in 7.1.

Measure and record the air permeability at each step. The duration of each step shall be sufficient to allow the test pressure to stabilize before the air permeability is measured.

7.4 Overall air permeability of the test specimen and the test chamber — Negative pressures

All the openable parts of the test specimen shall be opened and closed at least once before the test. The test specimen shall then be brought into the defined closing condition in accordance with the manufacturer's instructions.

Measure the air permeability of the test specimen and test chamber with negative test pressures as described in 7.3.2 for windows and pedestrian external door sets or 7.3.3 for pedestrian internal door sets (see Figures A.1 and A.2).

8 Test results

8.1 Adjust the result of the air flow measurements of the test specimen, Q_x, at each step to calculate the air flow, Q_0, at normal conditions (T_0 = 293 K, p_0 = 101,3 kPa), considering the actual temperature, T_X, expressed in Celsius degrees and the atmospheric pressure, p_x, expressed in kPa, during the test.

$$Q_0 = Q_x \cdot \frac{293}{273+T_x} \cdot \frac{p_x}{101,3} \quad (1)$$

where

Q_0 is the air flow, in cubic metre per hour ($\frac{m^3}{h}$);

Q_x is the air flow measurements of the test specimen, in cubic metre per hour ($\frac{m^3}{h}$);

T_X is the actual temperature, in degree Celsius (°C);

p_x is the atmospheric pressure, in kilo Pascal (kPa).

8.2 For a test specimen, the air permeability at each step is equal to the overall air permeability adjusted in accordance with 8.1 minus the air permeability of the chamber, when not zero, adjusted in accordance with 8.1.

8.3 Using the length of the opening joint as defined in 3.7 and the overall area as defined in 3.9, calculate the air permeability in terms of $m^3/(h \cdot m)$ and $m^3/(h \cdot m^2)$ expressing the results to two significant figures.

8.4 Record on a graph the air permeability, Q_0, related to the length of the joint, Q_L, and the overall area, Q_A, for each pressure step.

9 Test report

The test report shall state the airflow measurement devices used for the test and, if needed, record on a drawing or a photograph of the test specimen, the location of any significant points or air leakage observed. The report shall contain as a minimum the following information:

a) a reference to this document, i.e. ISO 6613:2023;

b) the name of the test institution;

c) the date of the test;

d) all necessary references to identify the test specimen and the method of sampling;

e) all relevant details concerning the dimensions of the test specimen, its materials, design, construction and manufacture and its surface finish and fittings, including building hardware, locking points, their position and specific design (e.g. with/without rear-engaging, mushroom cams), relevant gaskets and/or seals with positions of the gaps where they are seated;

f) the exposed face: opening inwards or outwards;

g) a description of the closing conditions, as tested:

   — closed,

   — latched, and

   — locked;

h) dimensioned drawings of all relevant details of the test specimen including cross-section; the fixing of the frame strikers (number of screws used for the fixing and details into which material they are screw-fixed) shall be clearly depicted in these drawings (see Figures 1 to 6);

i) presence of ventilation, type and condition (i.e. closed, taped over, etc.);

j) the test method;

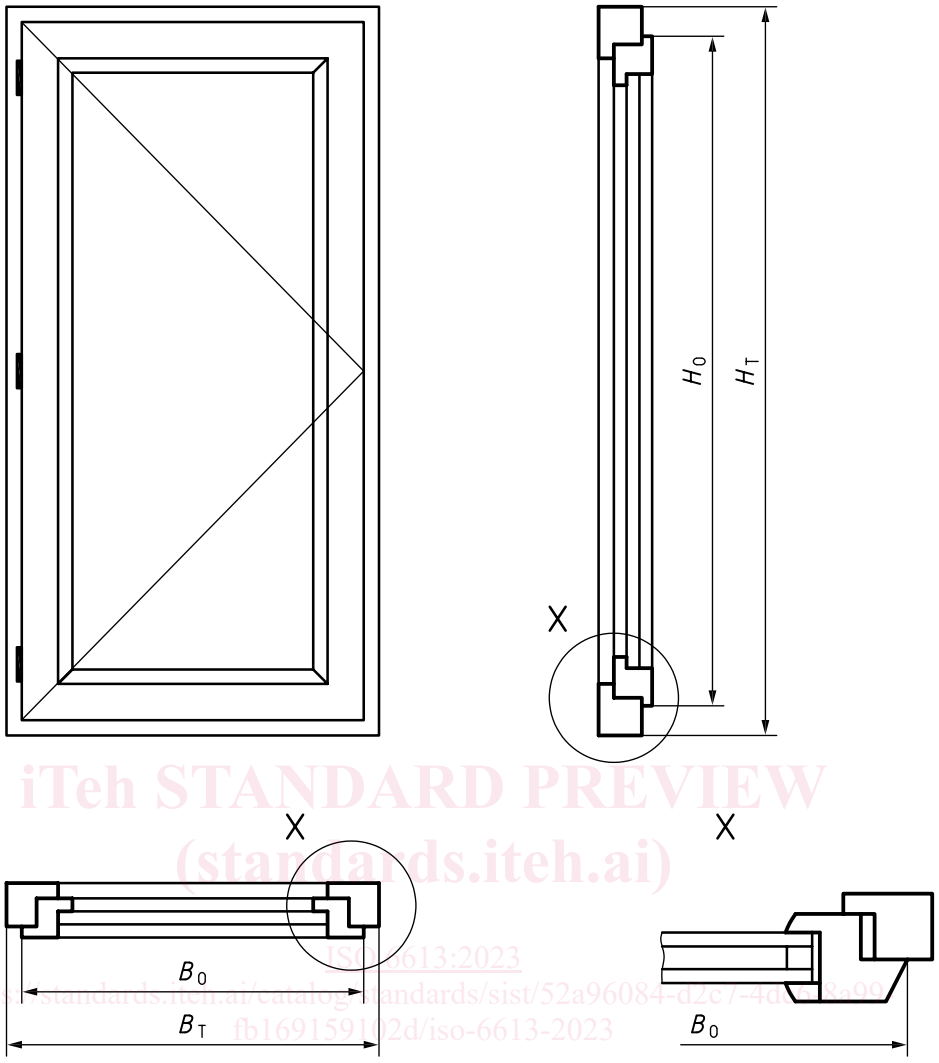
k) the test procedures, including storage and conditioning prior to the test, and mounting the test specimen ready for test; measurement uncertainty;

l) the test climates used;

m) the test result;

n) any deviations from the procedure;

o) any unusual features observed.



Key

B_o casement width
B_T frame width
H_o casement height
H_T frame height

The length of opening joints is: $2\ H_0 + 2\ B_0$.

The overall area is: $H_T \times B_T$.

Figure 1 — Single leaf test specimen