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Windows and doors — Air permeability — Test method

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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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).

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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 the first edition (ISO 6613:1980), which has been technically revised.

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

— Pedestrian doorsets are added to the scope.

— The title has been adjusted.

— The standard has been adapted to the current state of the art on the basis of EN 1026.

— The technical content is described more precisely.

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 International Standard defines the test method to be used to determine the air permeability of completely assembled windows and doorsets of any material, when submitted to positive or negative test pressures. This test method is designed to take account of conditions in use, when the window or doorset is installed in accordance with the manufacturer's specification and the requirements of relevant International Standards and codes of practice.

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

2 Normative references

The following document is 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 terminological 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
closing condition
3.1.1
closed
movable part rest in or at the fixed part in a way in which they may be fastened (latched and/or locked)

3.1.2
fastened
where the movable part is restrained at one or more points and shall be described by at least one of the two as listed below:

3.1.2.1
latched
movable part is returned to its closed position and restrained by either

a) a self - engaging fastener or

b) a roller catch or

c) a latch

3.1.2.2
locked
movable part is further restrained in the closed position by additional operations (of e.g. handle, key, automatic devices or electronic devices) to engage integrated locking devices (e.g. nutbolts or deadbolts) which will affect the product's characteristics

3.1.3
secured
any action(s) which prevent unauthorised release of the fastening device(s) to allow exit or entry (e.g. child safety, burglary)

3.2
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.

3.3
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

Note 1 to entry: Air permeability should be expressed in cubic metres per hour (m^3/h).

3.4
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 (see Figures 1 to 6)

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

3.5
length of opening joint
length of the line of discontinuity as defined in 3.4 (see Figures 1 to 6)

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

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.

3.6
overall area
area of the test specimen measured parallel to the glazing or the leaf (see Figures 1 to 6)

Note 1 to entry: The overall area should be expressed in square metres (m^2).

4 Principles of test

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 = ± (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 see last calibration certificate of the instrument.

NOTE 2 For vocabulary of metrology see ISO/IEC Guide 99:2007.

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 test specimen

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

When this is not so, 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 the determination of 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 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. After that the test specimen shall 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 Annex A).

7.3.2 Measurement of air permeability for windows and external pedestrian doorsets

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 stabilise before the air permeability is measured.

NOTE This clause may be applicable to internal doorsets alternatively to 7.3.3.

7.3.3 Measurement of air permeability for internal pedestrian doorsets

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 stabilise before the air permeability is measured.

7.4 Overall air permeability of 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. After that the test specimen shall 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 doorsets or 7.3.3 for pedestrian internal doorsets (see Annex A).

8 Test result

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 expressing in °C and 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 less 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 3.5 and the overall area as defined in 3.6 calculate the air permeability in terms of m^3 / (h · m) and m^3 / (h · 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 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) Reference to this International Standard;

b) the name of the test institution;

c) 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) exposed face: opening inwards or outwards;

g) description of the closing conditions, as tested:

— closed,

— latched,

— 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 were screw-fixed) shall be clearly depicted in these drawings (see e.g. Figures 1 to 6);

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

j) test method;

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

l) test climates used;

m) test result.