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Windows and doors — Resistance to wind load — Test method

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National foreword

This British Standard is the UK implementation of EN 12211:2016. It supersedes BS EN 12211:2000 which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Fenêtres et portes - Résistance au vent - Méthode d'essai

Fenster und Türen - Widerstandsfähigkeit bei Windlast - Prüfverfahren

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Contents

Page

European foreword

This document (EN 12211:2016) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12211:2000.

The revision of this European Standard clarifies only the test method and does not affect existing test evidence of EN 12211:2000.

This European Standard is one of a series of standards for windows and doors.

In comparison with EN 12211:2000, the following significant changes were made:

a) Clause 3: Supplement of definition “closing condition”;

b) Sub-clause 3.2: Simplification of definition “test pressure”;

c) Sub-clause 5.4: Revision of definition „accuracy“;

d) Sub-clause 7.1: Addition of „closing condition“;

e) Clause 11: Supplement of necessary description of test specimen;

f) Annex A: Renumeration of figures;

g) Annex A: Revision of A.1 and A.2;

h) Annex A: Supplement of Figure A.4 (new) – Measuring points on single and double leaf doors (example);

i) Annex B: Revision of Figure B.1.

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1 Scope

This European Standard defines the test method to determine the resistance to wind load for completely assembled windows and pedestrian doorsets of any materials when submitted to positive or negative test pressures.

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

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

This European Standard is not intended to evaluate strength of the glass.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1026, *Windows and doors — Air permeability — Test method*

EN 12519, *Windows and pedestrian doors — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12519 and the following apply.

3.1
closing condition
3.1.1
closed
movable parts rest in or at the fixed parts 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
frontal displacement
movement of a point on a frame member measured normal to the member

3.3
frontal deflection
maximum frontal displacement of a frame member minus half the sum of the frontal displacements at each end of the member

3.4
relative frontal deflection
frontal deflection of a frame member divided by the length of the member over which the frontal deflection was measured, e.g. distance between the ends of the member

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.

For the purpose of these tests, three sets of test pressure are defined:

— P1 applied to measure deflections of parts of the test specimen;

— P2 pulsating pressure applied for 50 cycles to assess performance under repeated windloads;

— P3 applied to assess the safety of the test specimen under extreme conditions.

The values of P1, P2, P3 are related as follows: P2 = 0,5 P1 and P3 = 1,5 P1.

4 Principles of test

Application of a defined series of pressures (positive and negative) at which measurements and inspections are made to assess relative frontal deflection and resistance to damage from wind loads.

5 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 Devices, such as dial gauges or displacement transducers, for measuring displacements of measured points with a resolution of 0,1 mm and an accuracy of ± 5 %.

5.7 Means for fitting the measuring devices properly to ensure their stability during the test.

5.8 A measuring tape accurate to ± 1 mm to measure the necessary dimensions (e.g. frame members) of the test specimen.

6 Preparation of test specimen

6.1 Set-up of the 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 stiffness of the test rig and the fixing of the test specimen to it shall be sufficient to avoid adverse effects on the performance of the test specimen during testing.

The test specimen shall be cleaned and surfaces dry.

6.2 Set-up of measuring devices for frontal deflection

Measuring devices (see 5.6) shall be fixed in position at each end and at the centre of the frame member to be measured. Alternatively, a single measuring device shall be fixed at the centre of a rigid beam that is fixed to and supported as close as possible to the ends of the frame member to be measured.

NOTE A frame member could be part of the opening element or the fixed frame.

For positioning of measuring devices see Figure A.1 to A.4.

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 test.

The test specimen shall be brought into the defined closing condition in accordance with the manufacturer's instructions.

Figure B.1 shows the test sequence of the test to be carried out and the set of test pressures and their features to be applied.

The test for air permeability in accordance with EN 1026 shall be completed before testing the resistance to wind load to test pressures P1 and P2.

7.2 Deflection test

7.2.1 General

Record the length of the members whose frontal deflection is to be measured.

NOTE If several displacements or deflections are to be measured, they can be recorded either during one sequence of test pressure steps to P1 or during as many sequences to P1 as there are measurements to be made.

7.2.2 Positive pressure

Apply three pressure pulses, each 10 % greater than the test pressure P1. The time to reach the maximum pressure shall not be less than 1 s and it shall be sustained for at least 3 s.

All the gauges shall be set to zero or have their initial reading recorded.

Apply test pressure equal P1 according to the classification required for the test specimen, at a rate not exceeding 100 Pa/s, either incrementally or continuously.

When the pressure P1 has been applied for 30 s, record the required frontal deflection(s) or frontal displacement(s).

Reduce the test pressure to 0 Pa, at a rate not greater than 100 Pa/s and after (60 ± 5) s record the residual frontal deflection(s) or frontal displacement.

7.2.3 Negative pressure

Apply procedure specified in 7.2.2 using negative test pressures.

7.3 Repeated pressure test

The test specimen shall be subjected to 50 cycles including negative and positive pressures, with the following features:

— test pressure equal P2;

— first step is negative, next is positive as is the last of the sequence of 50 impulses;

— variation from –P2 to +P2 and the reverse shall take (7 ± 3) s; value P2 is maintained at least for (7 ± 3) s.

After completion of the 50 cycles, open and close the moving parts of test specimen and note damage or functioning defects if any.

Repeat the test for air permeability in accordance with EN 1026.

7.4 Safety test

The test specimen shall be subjected to one cycle including negative and positive test pressure with the following features:

— test pressure equal P3;

— negative test pressure is applied first;

— variation from 0 Pa to — P3 and back from — P3 to 0 Pa shall take (7 ± 3) s, the maximum test pressure P3 shall be maintained for (7 ± 3) s;

— positive test pressure is applied after a (7 ± 3) s rest at 0 Pa;

— variation from 0 Pa to +P3 and back to 0 Pa shall be the same duration as for the negative test pressure -P3.

After the safety test record whether the test specimen remains closed and describe any parts of the test specimen which have become detached.

8 Deflection

Deflection(s) and displacement, under pressure steps +P1 and –P1 shall be recorded. Relative frontal deflections shall be calculated in the form of fractions with the numerator equal to 1 and the denominator expressed to 3 significant figures.

9 Repeated pressure

Record any damage and operating defects.

10 Safety test

Any damage and failure which occurs as well as any operating difficulties shall be recorded.

11 Test report

The test report shall state the wind load measurement devices used for the test, a drawing of the face and sections of the test specimen showing the relevant members, the displacement measuring points and, if needed, record on a drawing or a photograph of the test specimen the location of any damage and operating defects.

The report shall contain as a minimum the following information:

a) reference to this European 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 at least one of the following closing conditions:

— 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;

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

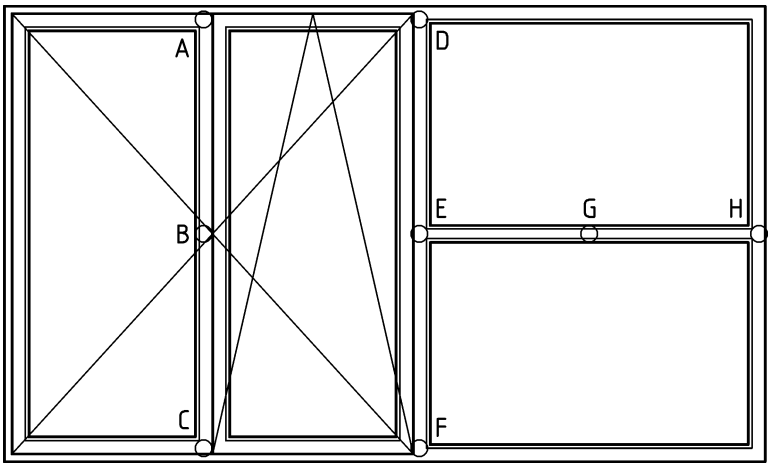
j) test procedures, including storage and conditioning prior to test, and mounting the test specimen ready for test;

k) test climates used;

l) test results.

Annex A
(informative)

Deflection measurements



Key

A, B, C, D, E, F, G,H measuring points set on a frame linked to test rig

NOTE In the following formulae the second letter p or o denotes the test pressure P1 or zero.

EXAMPLE

B_p the measurement at test pressure = P1

B_o the measurement at test pressure = 0 Pa

$B_p - B_o$ frontal displacement of meeting stile.

$E_p - E_o$ frontal displacement of mullion.

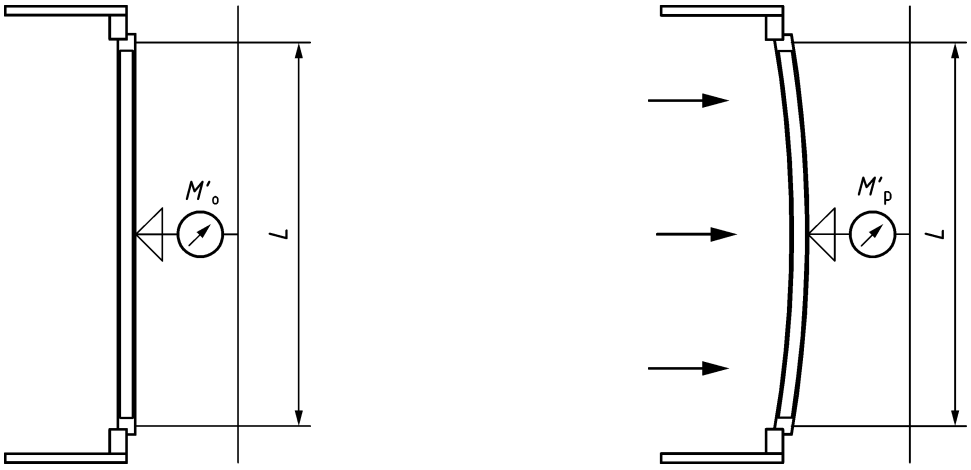
$G_p - G_o$ frontal displacement of transom.

$$(B_p - B_o) - \frac{(A_p - A_o) + (C_p - C_o)}{2} = \text{ frontal deflection meeting stile}$$

$$(E_p - E_o) - \frac{(D_p - D_o) + (F_p - F_o)}{2} = \text{frontal deflection of mullion}$$

$$(G_p - G_o) - \frac{(E_p - E_o) + (H_p - H_o)}{2} = \text{frontal deflection of transom}$$

Figure A.1 — Measuring points on a double leaf window and fixed parts

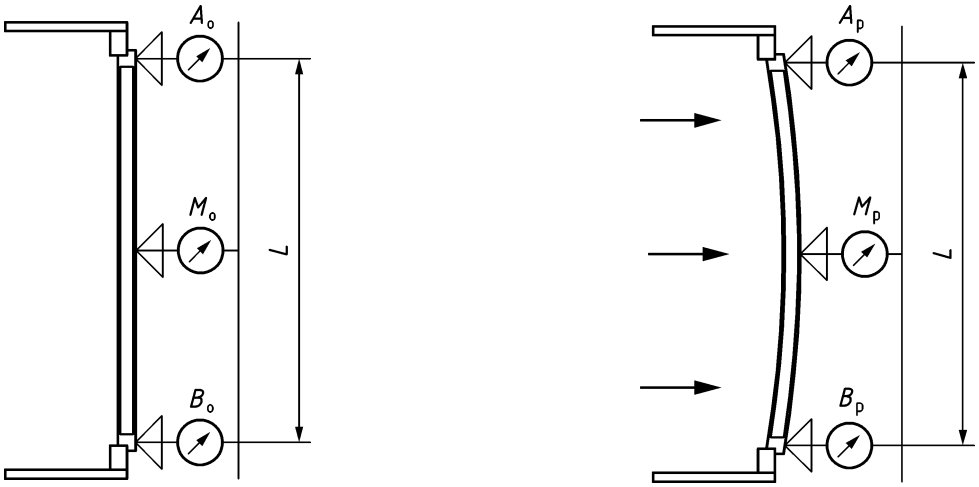


Test pressure equal 0 Pa **Test pressure equal P1**

Key

L	width and/or height
M'_o	frontal deflection at test pressure equal 0 Pa
M'_p	frontal deflection at test pressure equal P1
Frontal deflection	$F_p = M'_p - M'_o$
Relative frontal deflection	$F_{rp} = \frac{F_p}{L}$

Figure A.2 — Single gauge measurements relative to the frame

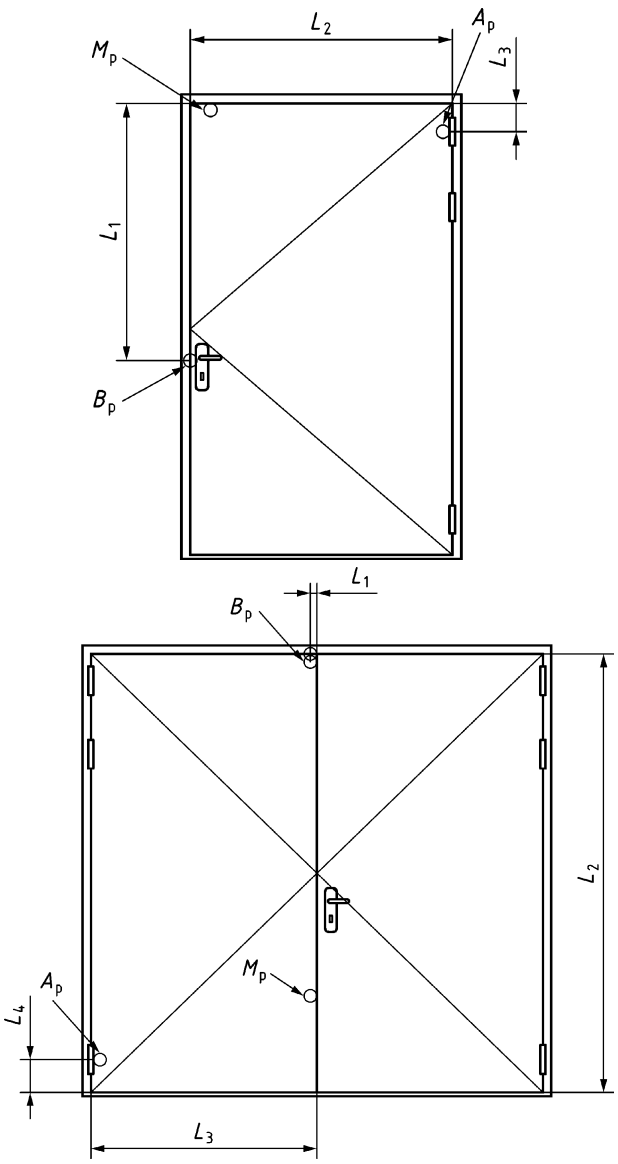


Test pressure equal 0 Pa **Test pressure equal P1**

Key

A_o	frontal deflection at top at test pressure equal 0 Pa
A_p	frontal deflection at top at test pressure equal P1
B_o	frontal deflection at bottom at test pressure equal 0 Pa
B_p	frontal deflection at bottom at test pressure equal P1
L	width and/or height
M_o	frontal deflection at centre at test pressure equal 0 Pa
M_p	frontal deflection at centre at test pressure equal P1
Frontal displacement	$D_p = M_p - M_o$
Frontal deflection	$F_p = (M_p - M_o) - \frac{(A_p - A_o) + (B_p - B_o)}{2}$
Relative frontal deflection	$F_{rp} = \frac{F_p}{L}$

Figure A.3 — Three gauge measurements relative to the frame



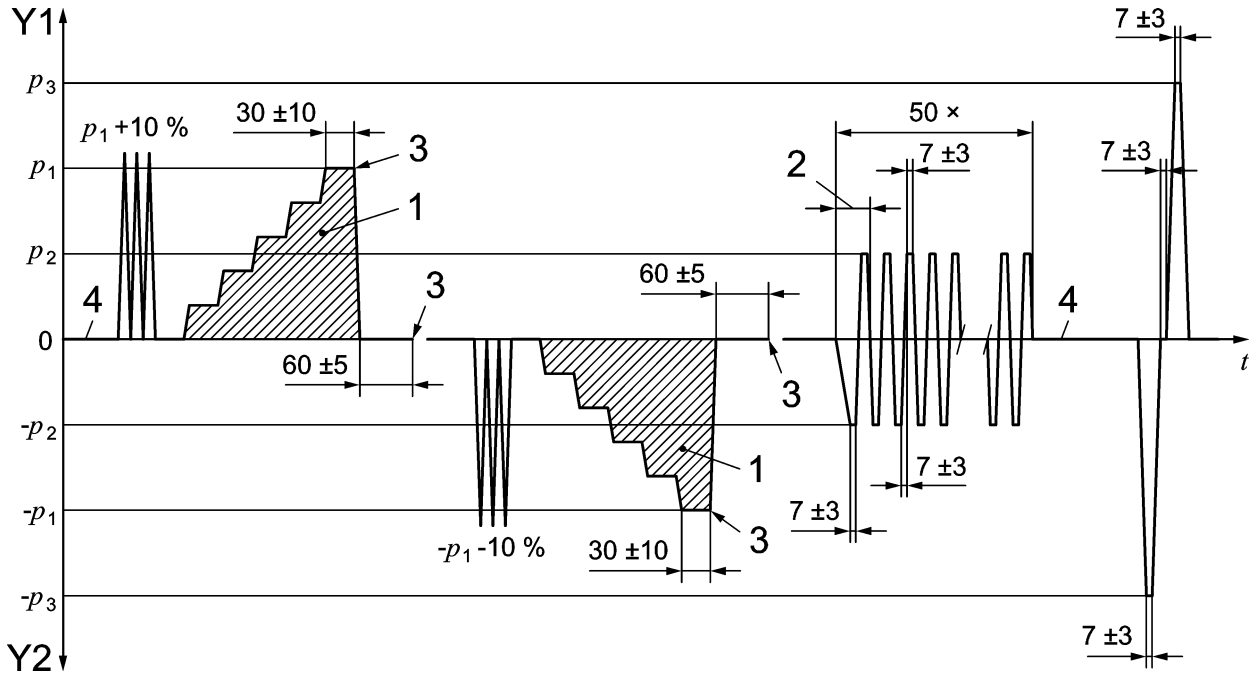
Key

A_p	frontal deflection at door hinge at test pressure equal P1
A_o	frontal deflection at door hinge at test pressure equal 0 Pa
B_p	frontal deflection at lock at test pressure equal P1
B_o	frontal deflection at lock at test pressure equal 0 Pa
L_1, L_2, L_3	distance
M_p	frontal deflection at centre at test pressure equal P1
M_o	frontal deflection at centre at test pressure equal 0 Pa
Frontal deflection	$F_p = (M_p - M_o) - \frac{(A_p - A_o) + (B_p - B_o)}{2}$
Relative frontal deflection (single leaf door)	$F_{rp} = \frac{F_p}{L_1 + L_2 + L_3}$
Relative frontal deflection (double leaf door)	$F_{rp} = \frac{F_p}{L_1 + L_2 + L_3 + L_4}$

Figure A.4 —Measuring points on single and double leaf doors (example)

Annex B
(informative)

Resistance to wind load test sequence



Key

1	increments or continuous rate not exceeding 100 Pa/s	Y1	positive pressure
2	cycle, negative and positive pressure	Y2	negative pressure
3	frontal displacement or residual frontal deflection	*t*	time in seconds (s)
4	air permeability test		

Figure B.1 — Sequence of testing

Bibliography

ISO/IEC Guide 99:2007, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

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