BRITISH STANDARD

BS EN
1121:2000

Doors — Behaviour between two different climates — Test method

The European Standard EN 1121:2000 has the status of a British Standard

ICS 91.060.50

National foreword

This British Standard is the official English text version of EN 1121:2000, which is included in a package of new European Standards being prepared by CEN/TC 33 relating to doors. Other standards included in the package are EN 1294 and EN 12219. Although the English text versions of these European Standards will be adopted as British Standards as they become available, the existing British Standards for doors will be retained, but only until such time that the complete package of European Standards becomes available. The original group of British Standards will then be withdrawn and this will be notified in *Update Standards*.

The UK participation in its preparation was entrusted by Technical Committee B/538, Doors, windows, shutters, hardware and curtain walling, to Subcommittee B/538/2, Doors, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1121

June 2000

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Supersedes EN 79:1985

English version

Doors - Behaviour between two different climates - Test method

Portes - Comportement entre deux climats différents - Méthode d'essai

Türen - Verhalten zwischen zwei unterschiedlichen Klimaten - Prüfverfahren

This European Standard was approved by CEN on 14 February 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 1121:2000 E

Foreword

This European Standard 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 December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard supersedes EN 79:1985.

This standard is one of a series of standards for doors.

This standard includes six informative annexes describing the test procedures.

1 Scope

This European Standard defines the test method to be used for determining the behaviour of door leaves and doorsets between two different climates.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

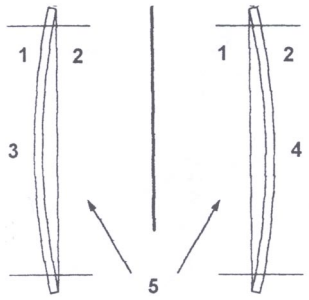
EN 952	Door leaves - General and local flatness - Measurement method
EN 12046-2	Operating forces - Test method - Part 2: Doors
EN 1026	Windows and doors - Air permeability - Test method
prEN 12519:1996	Doors and windows - Terminology

3 Definitions

For the purposes of this standard the definitions given in prEN 12519:1996 apply, together with the following:

3.1
Face 1, face 2
the orientation of face 1 and face 2 of the door with regard to the climates is defined in 6.1

3.2
Bow
Maximum deviation of the long edge of a door leaf measured in accordance with EN 952. According to its orientation, it can be positive or negative, see figure 1



1 Face 1
2 Face 2
3 Negative bow
4 Positive bow
5 Datum line as defined in EN 952

Figure 1 - Definition of positive and negative bow

4 Principle

The test is carried out by subjecting the doors to two different climates on either side for a period of time, and measuring the resulting bow of the longitudinal lock side edge at stages of the test. If required, the operating forces and the air permeability of the doors in their deformed state are also determined.

5 Apparatus

5.1 Basic equipment

The test facility shall consist of at least:

- a climate chamber or enclosure in which the required climatic conditions on the cold side can be maintained and adjusted within the stipulated tolerances;

- an opposite climate chamber or enclosure in which the required climatic conditions on the warm side can be maintained and adjusted within the stipulated tolerances;

- a frame for supporting the doors, which is sufficiently rigid that it will not be significantly deformed by any force that may be transmitted from the door leaf to the door frame;

- a device for measuring bow;

- a device for determining the operating forces in accordance with EN 12046-2 during exposure to the climatic stress.

5.2 Supplementary equipment

- a bank of filament infrared lamps (see informative Annex A) for heating face 2 of the door. The power of the apparatus shall be such that the surface temperature θ_3 shall be reached within 2 hours and maintained afterwards within a range of $\pm$ 5 °C.

The filament infrared lamps shall be positioned in such a way that the emitted radiation energy is distributed as evenly as possible over the door leaf. (See Annex A).

- Reference surfaces, having an absorption coefficient a_s in the visible field (0,4 µm to 0,7 µm) of at least 0,90 and a thermal resistance of between 0,1 Km²/W and 0,2 Km²/W, each consisting of an aluminium sheet with matt black finish, mounted on polystyrene thermally insulating material (extruded; lambda 0,03 W/mK) having a thermal resistance between 0,6 Km²/W and 0,7 Km²/W, and incorporating a temperature sensor;

NOTE 5 mm thickness of polystyrene is usually adequate.

- a device for measuring the surface temperatures of the door leaf;

- a device, installed in the climatic chamber, for determining the air permeability of the door between the test chambers in accordance with EN 1026;

or

- a device for deforming the door leaf mechanically, when determination of the air permeability of the doorset is carried out outside the climatic test chambers.

NOTE Annex B gives an example of such a device.

6 Preparation

6.1 Orientation of the doors

The orientation of the faces of the door shall be defined by the manufacturer prior to its installation in the test chamber. (See also tables 1 and 2).

Closing side = face 1, if the door normally opens outwards, or

Closing side = face 2, if the door normally opens inwards.

If this information is missing, the door shall be tested in the orientation least favourable for the classification.

NOTE Which orientation is least favourable for the classification depends on the test required. One orientation may be worse for operating forces and the other for air permeability. It may therefore be necessary to test the door in both orientations.

6.2 Mounting

If possible, the door and its frame shall be mounted in the test facility in accordance with the manufacturer's normal fixing instructions. However, the door frame shall be fixed in such a way that its bow does not exceed 1,0 mm under test.

6.3 The door's closing condition

6.3.1 During exposure to the climates

The door shall be latched and unlocked, unless this is inconsistent with the hardware of the door set.

6.3.2 When determining bow

The bow shall be determined with the door unlatched.

NOTE This means that the door is slightly open and that the door leaf is under the minimum stress.

If the bow of the door leaf is measured in a different state, this shall be recorded and the reasons given.

6.3.3 When determining air permeability

If the air permeability of the door is to be measured, this shall be done with the door closed and locked.

7 Measurement methods and accuracy

7.1 Bow

The bow of the door leaf shall be measured in accordance with the procedure specified in 4.2 of EN 952. The deviation shall be measured and recorded to an accuracy of 0,1 mm.

7.2 Operating forces

The operating forces shall be determined in accordance with EN 12046-2 when specified in the test procedure. Each determination of operating forces shall be completed before the loss of bow has exceeded 10 % of the bow measured previously.

7.3 Air permeability

If required, air permeability shall be measured in accordance with EN 1026 when specified in the test procedure. Alternatively, the air permeability may be determined away from the climatic test facility provided that the door is maintained in its deformed condition within 10 % (e.g. as shown in

Annex B). For this the door leaf is deformed mechanically in such manner as to reproduce the bow caused by the climatic stress.

NOTE 1 It is recommended that all air permeability checks are carried out in the climate chambers without moving the frame of the test specimen.

If during the determination of the air permeability the bow of the door leaf has changed by more than 10 %, the bow shall be reset by changing the pressure applied to the jack, and the measurement of air permeability repeated. This shall be carried out either in the climate chambers or outside. If the measurement of air permeability is carried out outside the climate chambers, the loss of bow of the leaf shall not exceed 10 % of the bow measured previously. If necessary, the closing edge of the leaf shall be deformed mechanically with an appropriate device so as to reproduce the bow measured previously.

NOTE 2 Annex B shows an example of such a device.

8 Test conditions

Table 1 - Test climate a to d

Test climates	Required climates			
	Side 1		Side 2	
	Air temperature (θ_1) °C	Relative humidity (φ_1) %	Air temperature (θ_2) °C	Relative humidity (φ_2) %
a	23 ± 2	30 ± 5	18 ± 2	50 ± 5
b	23 ± 2	30 ± 5	13 ± 2	65 ± 5
c	23 ± 2	30 ± 5	3 ± 2	85 ± 5
d	23 ± 2	30 ± 5	-15 ± 2	No requirements

θ_1 air temperature on side 1

θ_2 air temperature on side 2

φ_1 relative humidity on side 1

φ_2 relative humidity on side 2

The mean values of temperature and relative humidity shall be kept as close as practicable to the nominal values. The stated tolerances are maximum allowable deviations.

Table 2 - Test climate e

Test climates	Required climates			
	Side 1		Side 2	
e	Air temperature (θ_1) °C	Relative humidity (φ_1) %	Air temperature (θ_2) °C	Relative humidity (φ_2) %
	20 min. 30 max.	No requirements	Reference temperature $\theta_3 = \theta_1 + (55 \pm 5)$	No requirements

θ_1 air temperature on side 1

θ_3 reference temperature for heating up the door surface by radiation
The reference temperature is the average temperature of at least three reference surfaces as described in 5.2, placed on the surface of the door leaf or on the test frame

φ_1 relative humidity on side 1

φ_2 relative humidity on side 2

The mean values of temperature and relative humidity shall be kept as close as practicable to the nominal values. The stated tolerances are maximum allowable deviations.

8.1 Verification of the test temperatures

Air temperatures shall be measured to an accuracy of $\pm$ 0,5 °C, within planes parallel to each face of the door leaf, at a distance of (100 $\pm$ 50) mm. They shall be measured at 3 points, at least, located in the centre of the door leaf and symmetrically to the vertical axis of the door leaf, within 100 mm of the top and the bottom of the leaf. If more points are measured, they shall be arranged symmetrically to the vertical and horizontal axes of the door leaf. The average of the results from all the measuring points on each face shall be taken as the temperature of the climate applied on that face.

NOTE This procedure does not apply to the measurement of the surface temperature when heating is achieved by radiation (face 2 in climate “e”). In this case, the procedure for measuring the surface temperature is specified in table 2.

8.2 Air velocity

Air velocities shall be sufficient to ensure that the maximum difference in air temperature registered within the plane of measurement in front of each side of the door leaf does not exceed 2 °C.

NOTE Air velocities $\geq$ 0,3 m/s are usually adequate.

8.3 Surface temperature and radiation properties of the test chamber walls

The difference between the air temperature and the temperature of those surfaces of the test chamber visible from the test specimen shall not exceed 3 °C when testing to climates a, b, c or d. Those surfaces shall have an emission coefficient ε in range $\lambda \geq 0{,}7$ μm of at least 0,85.

NOTE This can normally be achieved by painting with a paint that contains no metallic pigments.

9 Procedure

The measurement methods shall comply with clause 7.

9.1 Test sequence with set of climates a, b, or c

9.1.1 Testing doors with no special requirements

- measurement of initial bow;

- determination of operating forces;

- exposure of the doorset to the set of climates specified in table 1;

- measurement of final bow;

- determination of operating forces;

- calculation of the difference between final and initial bow.

The exposure to the specified set of climates shall not be less than 7 days and not more than 28 days. In between those two durations, the exposure shall be terminated if during 3 successive days the increase in deformation is less than 0,1 mm per day.

NOTE See sequence of test procedures illustrated in Annex C.

9.1.2 Testing doors with requirements for air permeability

- measurement of initial bow;

- determination of operating forces;

- exposure of the doorset to the set of climates specified in table 1 or table 2;

- measurement of final bow;

- determination of operating forces;

- measurement of air permeability;

- calculation of the difference between final and initial bow.

The exposure to the specified set of climates shall not be less than 7 days and not more than 28 days. In between those two durations, the exposure shall be terminated if during three successive days, the increase in deformation is less than 0,1 mm per day.

NOTE See sequence of test procedures illustrated in Annex D.

9.2 Supplementary test to climate d or e

9.2.1 Sequence

- preliminary testing to climate a or b or c;

- conditioning of the doorset in a climate of (20 ± 2) °C and (65 ± 5) % RH for at least 7 days;

- measurement of bow;

- exposure to climate d specified in table 1 or climate e specified in table 2;

- measurement of bow;

- determination of operating forces;

- calculation of the difference between the bow before and after exposure to climate d or climate e.

9.2.2 Duration of exposure

9.2.2.1 Climate d

The exposure shall not exceed 7 days. It can be terminated sooner if, during 3 successive days, the increase in deformation is less than 0,1 mm per day.

NOTE See sequence of test procedures illustrated in Annex E.

9.2.2.2 Climate e

The exposure is maintained for (24 ± 0,5) hours.

The measurement of bow and the determination of operating forces are carried out while the heating is on.

NOTE See sequence of test procedures illustrated in Annex E.

9.3 Deviation from the test procedure

Any deviation from the test procedure shall be described and reasons given.

NOTE See Annex F.

10 Test report

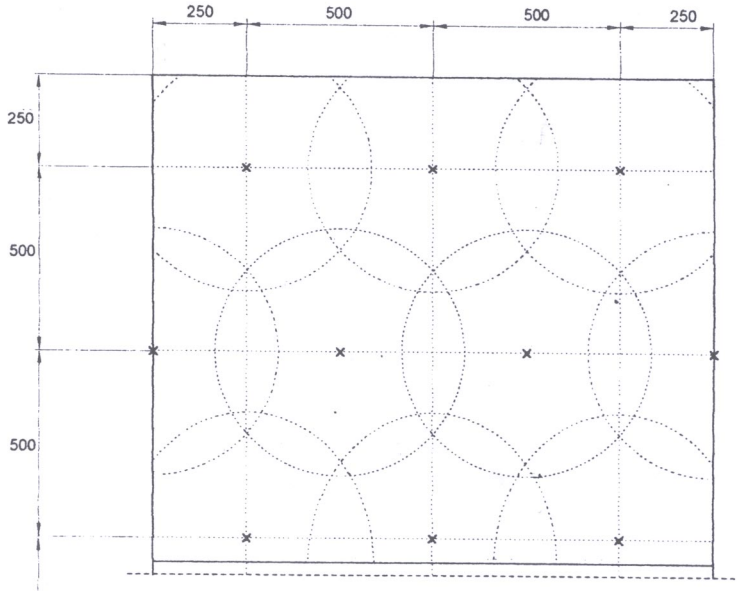
The test report shall contain as minimum the following information:

- name of the test institution;
- all necessary references to identify the door;
- all relevant details concerning the dimensions of the door, its materials, design, construction and manufacture and its surface finish and fittings. Also its method of delivery to the test laboratory;
- drawings of details of the door to scale of 1:2 or larger;
- brief description of the test methods;
- storage and conditioning prior to test, and mounting of the door ready for test;
- test climates used;
- results and their accuracy;
- any particularities (e.g. deviation from the normal test procedure, with reasons);
- reference to this European Standard.

Annex A (informative)

Description and arrangement of infrared lamps

Type of lamp	Filigran infrared lamp
Input energy	250 W
Angle of radiation	80 °
Position	in grid pattern
Distance between the lamps	(500 ± 20) mm (see figure A.1)



x Position of the infrared lamp
----- Cone of radiation

Figure A.1 - Description and arrangement of infrared lamps

By changing the distance of the infrared lamps to the specimen surface the temperature on the reference plates can be adjusted.

Annex B (informative)

Procedure for measuring air permeability outside the climate chambers

B.1 Description of the test

In order to determine the air permeability of doors with bowed leaves away from the climatic test facility, the bow at the lock side is reproduced mechanically. The air permeability is then measured in accordance with EN 1026 using conventional test apparatus.

B.2 Test procedure

- mount the door in the conventional test apparatus;

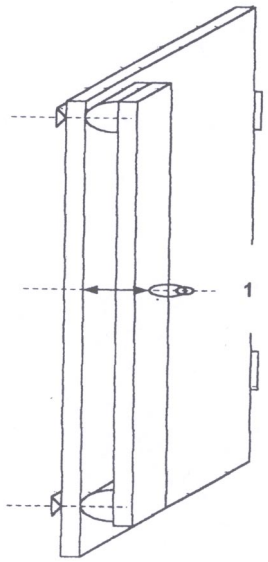
- deform the lock side edge of the door leaf mechanically, by means of a pneumatic or hydraulic jack, until the bow achieved during the climatic test is reproduced (see figure B.1);

- maintain the pressure applied to the jack at a constant level;

- close and lock the door;

- measure the air permeability in accordance with EN 1026;

- open the door and check the bow.

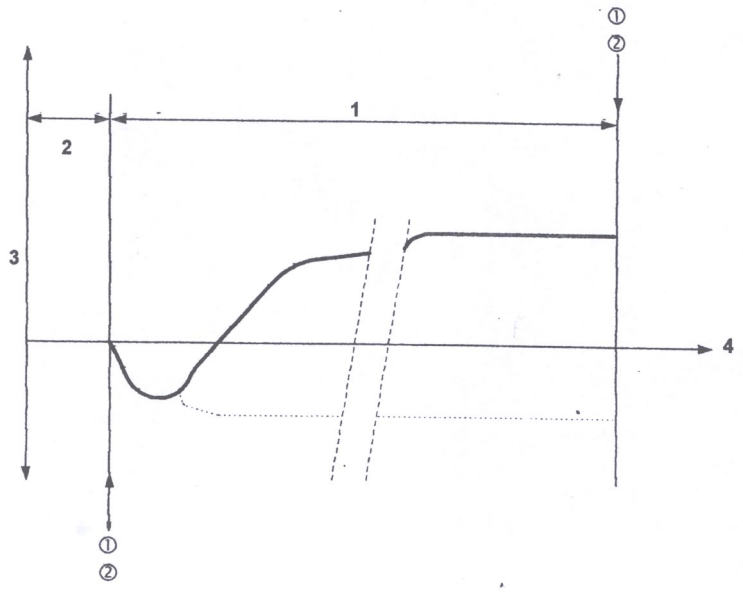


1 Pneumatic or hydraulic jack

Figure B.1 - Device for mechanical deformation of the door leaf

Annex C (informative)

Test procedure for doors without special requirements



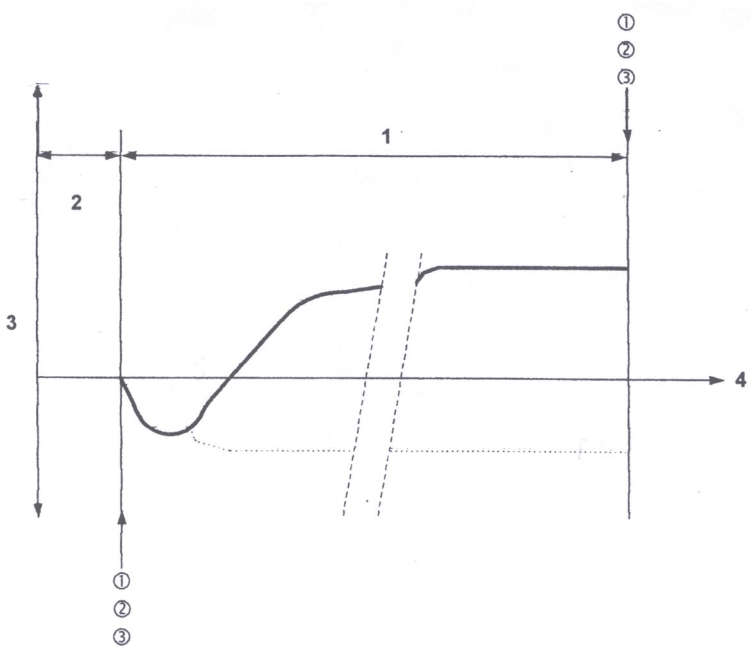
_____	door leaves with hygroscopic material
- - - -- - - -	door leaves without hygroscopic material
(1)	determination of bow
(2)	determination of operating forces

1 Exposure to differential test climate a, b or c maintained for 7 to 28 days
2 Conditioning
3 Deviation
4 Time

Figure C.1 - Test procedure for doors without special requirements

Annex D (informative)

Test procedure for doors with requirements for air permeability



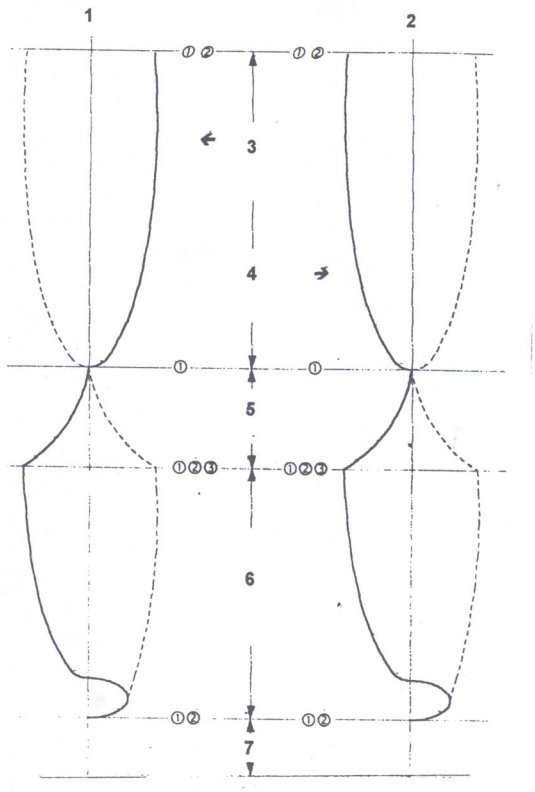
_____	door leaves with hygroscopic material
- - - -- - - -	door leaves without hygroscopic material
(1)	determination of bow
(2)	determination of operating forces
(3)	determination of air permeability

1 Exposure to differential test climate a, b or c maintained for 7 to 28 days
2 Conditioning
3 Deviation
4 Time

Figure D.1 - Test procedure for doors with requirements for air permeability

Annex E (informative)

Supplementary tests to climate d or e



_____	door leaves with hygroscopic material
- - - -- - - -	door leaves without hygroscopic material
(1)	determination of bow
(2)	determination of operating forces
(3)	determination of air permeability if required

1 Climate d
2 Climate e
3 Exposure to frost (7 days)
4 Heat by radiation (24 hours)
5 Conditioning at least 7 days
6 Exposure to differential test climate a, b or c; maintained for 7 to 28 days
7 Conditioning

Figure E.1 - Supplementary tests to climate d or e

Annex F (informative)

Simplified method for testing several different door leaves in one frame of a particular design

If several door leaves are to be tested for use in identical frames, then the critical level of bow of the door leaf with regard to the maximum permissible air permeability may be determined in advance. For this purpose one of the door leaves shall be deformed mechanically. By progressive deformation of the edge of the door leaf, it is possible to determine the maximum bow at which the air permeability does not exceed the permissible values. Any door which does not exceed this maximum bow during the climatic test then meets the appropriate classification.

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