INTERNATIONAL STANDARD

ISO 1209-1

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Cellular plastics, rigid — Flexural tests —

Part 1:
Bending test

Plastiques alvéolaires rigides — Essais de flexion —

Partie 1: Essai de flexion

Reference number
ISO 1209-1:1990(E)

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.

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.

International Standard ISO 1209-1 was prepared by Technical Committee ISO/TC 61, *Plastics*.

Together with ISO 1209-2, ISO 1209-1 cancels and replaces ISO 1209:1976, which standardized only a bending test. The scope of ISO 1209 has been extended to include not only the bending test (ISO 1209-1) but also a similar method for determining flexural strength and apparent flexural modulus of elasticity (ISO 1209-2).

ISO 1209 consists of the following parts, under the general title *Cellular plastics, rigid — Flexural tests*:

— *Part 1: Bending test*

— *Part 2: Determination of flexural properties*

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Cellular plastics, rigid — Flexural tests —

Part 1:
Bending test

1 Scope

This International Standard specifies a method of test for assessing the behaviour of a bar of rigid cellular plastic under the action of three-point bending.

It may be used to determine either

a) the load for a specified deformation, or

b) the load at break.

The method uses small test specimens and does not produce pure bending, hence it does not permit the calculation of flexural strength or apparent flexural modulus (modulus of elasticity).

The method is not applicable to cellular plastics in which significant crushing is observed. Numerical values should be compared only when determined on materials of similar physical properties and dimensions.

This method is limited to materials of 20 mm thickness or greater.

2 Normative references

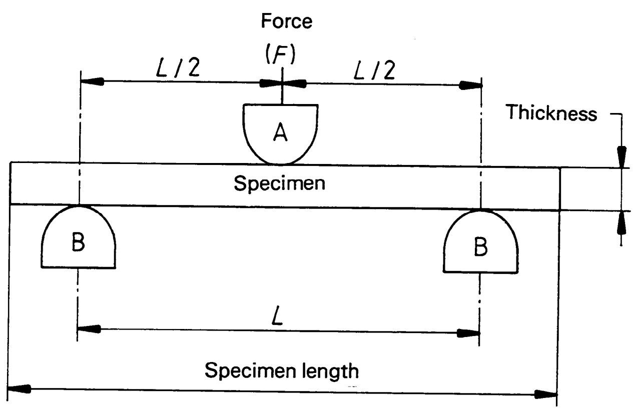
The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1209. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1209 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 1923:1981, *Cellular plastics and rubbers — Determination of linear dimensions.*

3 Principle

A load is applied at a uniform rate by means of a loading edge to a test specimen supported at two positions. The load is applied perpendicularly to the specimen at a position midway between the supporting positions (see figure 1). The load at a specified deflection or at break is recorded.



A Loading edge with cylindrical edge having a radius of 5 mm ± 0,2 mm

B Support edges with cylindrical edge having a radius of 5 mm ± 0,2 mm

L Distance between support edges

Figure 1 — Side view of test specimen and support edges

4 Apparatus

4.1 Test machine, consisting of either:

a) a universal mechanical-testing machine or

b) a bending-test machine,

capable of operating at a constant rate of movement of the moveable head.

The range of the testing machine shall be such that the applied load can be measured with an accuracy of ± 1 %.

4.2 Test specimen support, consisting of two parallel cylindrical support edges set in the same horizontal plane, each having an edge radius of 5 mm ± 0,2 mm. The length of the support edges shall be greater than the width of the test specimens.

The span between the support edges shall be 100 mm ± 1 mm.

4.3 Test specimen loading edge, having the same shape and dimensions as the support edges. The loading edge shall be located midway between and parallel to the support edges.

4.4 Dial-gauge micrometer, as described in ISO 1923.

5 Test specimens

5.1 Shape and dimensions

Each test specimen shall be a rectangular parallelepiped having the following dimensions:

— length: 120 mm ± 1,20 mm

— width: 25 mm ± 0,25 mm

— thickness: 20 mm ± 0,20 mm

5.2 Preparation

Test specimens shall be cut without deformation of the original cell structure. The test specimens may have a skin on one or more sides; if so, this fact shall be recorded.

5.3 Number

At least five specimens shall be tested for each sample. When testing materials which are suspected of being anisotropic, duplicate sets of test specimens shall be prepared having axes respectively parallel to and normal to the suspected direction of anisotropy.

When testing specimens with only one surface skin, unless otherwise specified, duplicate sets of test specimens shall be tested, one set with the skin in tension and one set with the skin in compression. Report the results separately.

5.4 Conditioning

The test specimens shall be conditioned in one of the atmospheres specified in ISO 291. Normal test conditions are 23 °C ± 2 °C and (50 ± 5) % R.H. Temperatures of −196 °C, −70 °C, −10 °C, 0 °C, 27 °C and 40 °C are preferred alternative temperatures, although other conditions may be used, for example those reflecting end use.

6 Procedure

Determine the dimensions of the test specimens in accordance with ISO 1923. Place a test specimen symmetrically upon the support edges so that the direction of loading is perpendicular to the longitudinal axis of the specimen (see figure 1).

Bring the loading edge into contact with the test specimen, ensuring that a minimum force is applied. Note this position as the zero-deflection point.

Apply a force by means of the loading edge moving at a rate of 10 mm/min ± 2 mm/min.

Record the force, in newtons, corresponding to a deflection of 20 mm ± 0,2 mm.

If the test specimen fractures before the deflection of 20 mm is reached, record the breaking force and deflection at the breaking point.

7 Expression of results

The result shall be reported as either

a) the force, in newtons, at 20 mm deflection, or

b) the breaking force, in newtons, and the corresponding deflection, in millimetres.

8 Precision

The precision of this method is not known because interlaboratory round-robin data are not yet available. This method may not be suitable for use in specifications or in the case of disputed results as long as these data are not available.

9 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) a description and identification of the material;

c) the presence or absence of skins or facings on test specimens and, if applicable, on which faces;

d) the conditioning procedure used;

e) the test conditions (temperature, humidity);

f) the direction of application of the force with respect to any anisotropy;

g) the presence of any crushing, if observed;

h) the individual test results;

i) the arithmetic mean of the test results and the standard deviation;

j) details of any deviation from this part of ISO 1209, and any incident that may have influenced the results;

k) the date of the test.

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