International Standard ISO 7214

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Cellular plastics — Polyethylene — Methods of test

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Cellular plastics — Polyethylene — Methods of test

1 Scope and field of application

1.1 This International Standard specifies methods for testing flexible and semi-rigid cellular plastics made from polyethylene. Cellular plastics containing copolymers of ethylene or blends of polymers with polyethylene may also be tested by the procedures of this International Standard provided these materials have characteristics similar to polyethylene as described in ISO 1872 or copolymers of ethylene.

1.2 Basic tests suitable for characterization of cellular polyethylene irrespective of end use are described in clause 7. Clause 8 describes supplementary tests for the determination of properties that are relevant to certain uses.

1.2.1 Basic tests

	Sub-clause
Apparent density	7.1
Compressive stress	7.2
Compression set	7.3
Tensile strength and elongation	7.4
Thermal stability	7.5
Water absorption	7.6

1.2.2 Supplementary tests

	Sub-clause
Dynamic cushioning performance	8.1
Compressive creep	8.2
Thermal conductivity	8.3
Water vapour transmission rate	8.4
Dynamic stiffness	8.5

2 References

ISO 527, *Plastics — Determination of tensile properties.* [1]

ISO 844, *Cellular plastics, rigid — Compression test.*

ISO 845, *Cellular rubbers and plastics — Determination of apparent density.*

ISO 1663, *Cellular plastics, rigid — Determination of water vapour transmission rate.*

ISO 1856, *Polymeric materials, cellular flexible — Determination of compression set.*

ISO 1872/1, *Plastics — Polyethylene and ethylene-copolymer thermoplastic materials — Part 1 : Designation.* [2]

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

ISO 1926, *Cellular plastics, rigid — Determination of tensile properties.*

ISO 2581, *Cellular plastics, rigid — Determination of apparent thermal conductivity by means of a heat flow meter.*

ISO 2896, *Cellular plastics, rigid — Determination of water absorption.*

ISO 4613/1, *Plastics — Ethylene/vinyl acetate copolymer thermoplastics (E/VAC) — Part 1 : Designation.* [3]

ISO 4651, *Cellular rubbers and plastics — Determination of dynamic cushioning performance.*

ISO 7616, *Cellular plastics — Rigid materials — Determination of compressive creep under specified load and temperature conditions.* [4]

1) At present at the stage of draft. (Revision of ISO/R 572-1966.)

2) At present at the stage of draft. (Revision of ISO 1872-1972.)

3) At present at the stage of draft.

4) At present at the stage of draft. (Revision of ISO/TR 2799-1978.)

3 Test specimens

3.1 Cut the specimens so that the edges are clean and the sides are planar and normal to the surface. Take the specimens from parts of the sample in such a way that for each property investigated a representative value can be determined. If the sample is believed to be anisotropic, cut specimens in directions so oriented that the properties pertaining to the directions most important for practical purposes can be determined.

The numbers, shapes, and dimensions of specimens shall comply with the requirements of clauses 7 and 8. The surfaces of specimens shall be essentially in the same conditions as that of the surface of the material as it is used in practice, except as required by specific test procedures.

4 Conditioning

At least 72 h shall elapse between manufacture of the material and the testing of the specimens. The material shall be stored under normal ambient conditions until the specimens are prepared. Unless otherwise specified in clauses 7 and 8, condition the specimens immediately before testing for at least 16 h at a temperature of 23 ± 2 °C. The conditioning time period may form part of the 72 h period.[1) 2)]

5 Atmosphere during test

Test the specimens at 23 ± 2 °C and 50 ± 5 % relative humidity, unless otherwise specified.

6 Apparatus

6.1 Measurement of dimensions

Where possible, use the apparatus described in ISO 1923. However, if the specimens are not planar over the area of measurement because they are cut from curved articles, measure dimensions not exceeding 30 mm by means of a hand-held dial gauge with a circular foot of 20 mm diameter. Up to 1 kPa pressure may be applied to the foot, provided that the deformation of the specimen is less than the required accuracy of measurement.

7 Basic tests

7.1 Apparent density

Perform the test in accordance with ISO 845.

7.2 Compression test

Perform the compression test in accordance with ISO 844. For materials less than 10 mm thickness, stack to at least 10 mm. Use the following details :

7.2.1 Select a standard speed for the advancement of the compression platen of the testing machine from ISO 527 such that the rate of compression is as close to a rate of 50 % of initial specimen thickness per minute as possible.

7.2.2 Determine compressive stress at 10 %, 25 % and 50 % deformation.

7.3 Compression set

Perform the test in accordance with ISO 1856. Compress the specimen to a deformation of 25 % of its original thickness for 22 h at 23 ± 2 °C. Measure the thickness after 30 min and 24 h recovery periods.[2)]

7.4 Tensile test

Determine the tensile strength and elongation at break in accordance with ISO 1926 and the following details :

7.4.1 The grip of the testing machine shall move at a uniform speed of 100 mm/min.

7.4.2 For material less than 10 mm thick, test the material in the thickness supplied.

7.4.3 Test material 10 mm or greater in thickness at 10 ± 1 mm thickness.

7.5 Thermal stability at elevated temperature

Perform the test in accordance with the principles of ISO 7616. Determine the temperature at which either length, width, or thickness changes by more than 5 % by carrying out dimensional stability tests at a series of temperatures at 5 K intervals. The thickness of the specimen shall be that of the material supplied. Specimen length and width for materials thinner than 20 mm shall be the same as specified for 20 mm thick specimens in ISO 7616.

7.6 Water absorption

Perform the test in accordance with the principles of ISO 2896. The thickness of the specimen shall preferably be that of the material supplied.

1) Some materials may require up to 30 days ageing after manufacture for physical properties to stabilize.

2) If the intended application is under tropical conditions, the recommended temperature is 27 ± 2 °C and the relative humidity is 65 ± 5 %.

8 Supplementary tests

8.1 Dynamic cushioning performance

Perform the test in accordance with ISO 4651.

8.2 Compressive creep

Determine compressive creep curves at 23 °C and 40 °C by measuring compressive deformation under constant load at intervals up to a maximum of 1 000 h elapsed time. As a minimum requirement, determine the compressive deflection at 0,1 h, 1 h, 24 h and 168 h intervals after the load has been applied.

The applied load shall be such that the initial compressive stress is one-tenth of the compressive stress at 10 % deformation (as determined in accordance with 7.2), unless another stress is agreed upon by the interested parties as being more in accordance with the stress likely to occur in practice.

Use either square or cylindrically-shaped specimens. The area of each loaded face shall not be less than 25 cm^2. The height of the specimen shall not exceed half the width or diameter of the loaded faces. Measure the initial height of the specimen 60 ± 5 s after the load is applied.

8.3 Thermal conductivity

Perform the test in accordance with ISO 2581, or by an absolute method, at a mean temperature of 23 °C.

8.4 Water vapour transmission

Determine the water vapour transmission rate, water vapour permeance and permeability in accordance with ISO 1663. Specimens shall be of the same thickness as the material supplied. Thin specimens can be tested using a thin wire mesh support, if necessary.

8.5 Dynamic stiffness

Perform the test in accordance with a national standard until an International Standard for the determination of dynamic stiffness has been published.

9 Test report

The report on each test carried out shall include the following information :

a) reference to this International Standard;

b) identification and description of the product tested;

c) dimensions of test specimens;

d) direction in which the force was applied in relation to anisotropy;

e) presence or absence of skins (or facings) on test specimens and, if applicable, on which faces, and whether the material is homogenous or laminated;

f) individual test results and the arithmetic mean;

g) any deviation from the testing and conditioning procedures specified.