
International Standard



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Polymeric materials, cellular flexible — Determination of compression set

Matériaux polymères alvéolaires souples — Détermination de la rémanence à la compression

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Descriptors : cellular materials, cellular plastics, foam rubber, compression tests, compression set.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

International Standard ISO 1856 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This second edition was submitted directly to the ISO Council, in accordance with clause 5.10.1 of part 1 of the Directives for the technical work of ISO. It cancels and replaces the first edition (i.e. ISO 1856-1972), which had been approved by the member bodies of the following countries :

Australia	Greece	Romania
Austria	Hungary	South Africa, Rep. of
Belgium	India	Spain
Brazil	Iran	Switzerland
Canada	Israel	Thailand
Chile	Italy	Turkey
Czechoslovakia	Japan	United Kingdom
Egypt, Arab Rep. of	Netherlands	USA
France	New Zealand	USSR
Germany, F.R.	Poland	

The member body of the following country had expressed disapproval of the document on technical grounds :

Sweden

Polymeric materials, cellular flexible — Determination of compression set

1 Scope and field of application

This International Standard specifies three methods for determining the compression set of flexible cellular materials.

At present, this International Standard applies only to latex, and polyurethane foams of thickness greater than 2 mm. Methods for other materials will be added as required.

2 Reference

ISO 1923, *Rigid cellular plastics — Determination of linear dimensions*.¹⁾

3 Definition

compression set: The difference between the initial thickness and the final thickness of a test piece of the cellular material after compression for a given time at a given temperature and after a given recovery time, this difference being referred to the initial thickness.

4 Principle

Maintaining a test piece for a specified time at a specified temperature under constant deflection and noting the effect on the thickness of the released test piece.

5 Apparatus

5.1 Compression device, consisting of two flat plates having dimensions larger than those of the test pieces, with spacers and clamps such that the plates are held parallel to each other and the space between the plates is adjustable to the required deflected height.

For testing thin materials, a requisite number of square photographic glass mounting slides shall be provided. The thickness of the slides shall be between 1 and 1,5 mm and the length of side shall be between 50 and 55 mm.

5.2 Means of measuring the dimensions of test pieces in accordance with ISO 1923.

6 Test pieces

6.1 Requirements

Test pieces shall have parallel top and bottom surfaces and essentially vertical sides. They shall be 50 ± 1 mm long, 50 ± 1 mm wide and 25 ± 1 mm thick. All test pieces shall be free from contamination and skin on the vertical sides.

When thin materials are to be tested, sufficient test pieces, of dimensions 50 mm × 50 mm, shall be taken so that the sum of their thicknesses before compression is at least 25 mm. The test pieces shall be plied together and interleaved with the photographic mounting slides where the number of plies is greater than two, and the complete assembly shall be treated during the test as a single thick test piece.

6.2 Samples showing orientation

If samples show orientation of the cellular structure, the direction in which the compression is to be carried out shall be agreed between the interested parties. Normally, testing should be carried out in that direction in which the finished product will be stressed under service conditions.

6.3 Number of test pieces

Five 25 mm thick test pieces, or five assemblies in the case of thin materials, shall be tested.

6.4 Conditioning

Materials shall not be tested for at least 72 h after manufacture. Prior to the test, the test pieces shall be conditioned for at least 16 h in one of the following atmospheres:

20 ± 2 °C, 65 ± 5 % relative humidity; or

23 ± 2 °C, 50 ± 5 % relative humidity; or

27 ± 2 °C, 65 ± 5 % relative humidity.

¹⁾ At present at the stage of draft. (Revision of ISO/R 1923-1972 and ISO/R 1794-1971.)

7 Procedure

The test may be carried out by either method A, method B or method C or all three. The three methods may, however, not give the same results.

7.1 Method A (compression at 70 °C)

After the test piece has been conditioned as specified in 6.4, measure its initial thickness in accordance with ISO 1923. In the case of thin materials, calculate the thickness of the foam (d_o) by deducting the aggregate thickness of the glass slides from the measured total thickness of the assembly of glass slides and test pieces measured with the assembly in the horizontal position.

Place the test piece or assembly between the plates of the compression device; compress it by either 50 % or 75 % of its thickness and maintain it under this condition. In special cases, a compression of 90 % may be agreed upon.

Within 15 min, place the compressed test piece or assembly in an oven at 70 ± 1 °C and leave it for 22 h.

Remove the apparatus from the oven and within 1 min remove the test piece from the apparatus and place it on a surface of low thermal conductivity, such as wood. The surface shall be at laboratory temperature. The test piece shall be allowed to recover for 30 min at the same temperature as that used for conditioning.

Remeasure its thickness (d_r). In the case of thin materials, care shall be taken not to disturb the assembly. Calculate the thickness (d_r) by deducting the aggregate thickness of the glass slides from the measured total thickness of the assembly of glass slides and test pieces.

7.2 Method B (compression at standard conditioning temperature)

Use the procedure specified for method A, but maintain the test piece under compression for 72 h at the same temperature as that used for conditioning the test piece.

7.3 Method C (compression under specially specified conditions)

Use the procedure specified for method A using the specially specified time, temperature and level of compression.

8 Calculation and expression of results

8.1 The compression set, expressed as a percentage, is given by the formula :

$$\frac{d_o - d_r}{d_o} \times 100$$

where

d_o is the original thickness of the test piece;

d_r is the thickness of the test piece after recovery.

8.2 Report the value of the compression set, followed by the test conditions, in parentheses, in the order : level of compression, time, temperature.

For example : value % (50 %, 22 h, 70 °C).

9 Test report

The test report shall include the following information :

- a description of the material;
- the temperature and humidity at which the test piece was conditioned;
- the method used;
- the thickness of the test piece, if other than that specified;
- all the values of compression set, calculated and expressed in accordance with clause 8;
- the median value of compression set.