# International Standard 7616

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# Cellular plastics, rigid — Determination of compressive creep under specified load and temperature conditions

*Plastiques alvéolaires rigides — Détermination du fluage sous compression dans des conditions spécifiées de charge et de température*

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## Foreword

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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.

International Standard ISO 7616 was prepared by Technical Committee ISO/TC 61, *Plastics.*

It cancels and replaces Technical Report ISO/TR 2799-1978, of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Cellular plastics, rigid — Determination of compressive creep under specified load and temperature conditions

## 1 Scope and field of application

This International Standard specifies a method for the determination of compressive creep of rigid cellular plastics under specified load and temperature conditions. This method is for use in measuring the creep resistance of materials to be used in the thermal insulation of buildings (see ISO 4898).

## 2 References

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

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

ISO 4898, *Rigid cellular plastics — Specification for materials used in the thermal insulation for buildings.*

ISO 7850, *Cellular plastics, rigid — Determination of compressive creep.*

## 3 Principle

Determination of compressive creep under specified conditions of load, temperature and time.

## 4 Apparatus

**4.1 Dial-gauge micrometer,** as specified in ISO 1923.

**4.2 Test chamber,** capable of being maintained within ± 2 °C of the required temperatures.

**4.3 Loading device,** consisting of two flat plates, at least one of which shall be movable, so arranged that they compress the test specimen in a vertical direction. The movable plate shall be guided in such a manner as to be self-aligning and with its lateral movement restricted to less than 1 mm. The plates shall be capable of being loaded as required without bending and so that during the period of test the static stress does not change by more than ± 5 %. The distance between the plates shall be capable of being measured to within 0,1 mm. The apparatus shall be placed on a substantial support to minimize the effects of vibration.

## 5 Test specimen

### 5.1 Specimens

The test specimens shall be, as nearly as possible, rectangular parallelepipeds with a square base of 50 ± 1 mm. A thickness of 50 ± 1 mm is recommended, but it shall be not less than 20 mm. If the sample thickness is greater than 50 mm, the test specimen shall be a cube with all dimensions equal to the thickness. The distance between any two opposite faces shall not vary by more than 1 % (tolerance on parallelism).

NOTE — Test results on test specimens of different thickness may not be comparable.

### 5.2 Preparation

Specimens shall be cut from the sample so that the direction of test corresponds to the direction in which the compressive forces will be applied in the intended use. If this direction is unknown, then two sets of specimens shall be tested in the two principal directions of anisotropy.

Specimens shall be prepared by cutting with either a mechanical saw or a knife. A jig shall be used to assure the rectangularity of the specimens and the parallelism of the faces.

Material skins that form an integral part of the product in use shall be retained.

### 5.3 Number

At least three specimens shall be tested at each temperature and applied load.

### 5.4 Conditioning

The test specimens shall be conditioned in the standard conditioning atmosphere specified in ISO 291 of 23 ± 2 °C and (50 ± 5) % relative humidity for at least 16 h prior to testing.

## 6 Procedure

**6.1** Immediately after conditioning, determine the dimensions of each specimen, including the thickness ($d_1$), to the nearest 0,1 mm, using the dial-gauge micrometer (4.1). Determine each dimension by making measurements in several locations and calculating the average of the values.

**6.2** Place the test specimens in the unheated test chamber (4.2) at the standard atmosphere specified in ISO 291 and apply one of the stresses specified in the table to each test specimen, using the loading device described in 4.3. After 48 h and without unloading the test specimen, measure the thickness ($d_2$) at standard conditions.

**6.3** Heat the test chamber to the temperature required for the stress applied to the test specimen in 6.2, according to the table, and maintain that temperature for the specified time. At the end of that time period and without unloading the test specimen, measure the thickness ($d_3$).

NOTE — The influence of temperature on the material under a given load may be of particular interest. In this case, a differential measurement may be indicated. This measurement is preferably carried out with the same specimen because the deviations for a property of this nature may be substantial within a given group of test specimens.

**6.4** Other test conditions (temperature, load, and time) are permitted by agreement between the interested parties; these test conditions shall be included in the test report (see ISO 7850).

## 7 Expression of results

**7.1** Calculate the compressive deformation $D_t$, as a percentage, of a specimen as determined in accordance with 6.2, from the equation

$$D_t = \frac{d_1 - d_2}{d_1} \times 100$$

where

$d_1$ is the initial thickness of the specimen, after conditioning, but prior to application of the load;

$d_2$ is the thickness of the specimen under load at standard atmospheric condition after the application of the load for 48 h.

**7.2** Calculate the difference in compressive deformation $D_d$, as a percentage between the loaded specimen at standard atmospheric conditions (6.2) and at elevated temperature (6.3), using the equation

$$D_d = \frac{d_2 - d_3}{d_2} \times 100$$

where

$d_2$ is as defined in 7.1;

$d_3$ is the thickness of the specimen under load at the elevated test temperature after the specified time period.

## 8 Precision and accuracy

**8.1** The precision of this method is not known because interlaboratory round robin data are not available.

**8.2** The accuracy of this method cannot be determined because standard reference materials are not available.

## 9 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) a description of the product including the presence of skin, if any;

c) the thickness of the test specimen if other than 50 mm;

d) the orientation of the test specimen in relation to the applied force (see 5.2);

e) the test conditions used: set 1, set 2, or others (see 6.4);

f) the individual values and the average for percentage compressive deformations $D_t$ and $D_d$ (see clause 7);

g) any unusual behaviour observed during the test likely to have affected the test results and the quality or the performance of the material in its intended use.

**Table**

| Set of test conditions | Loading time at standard conditions h | Test at high temperature | | |
|---|---|---|---|---|
| | | Temperature °C | Stress kPa | Time |
| 1 | 48 | 70 | 40 | 7 d |
| 2 | 48 | 80 | 20 | 48 h |