INTERNATIONAL STANDARD

ISO 29769

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Thermal insulating products for building applications — Determination of behaviour under point load

Produits isolants thermiques destinés aux applications du bâtiment — Détermination du comportement sous charge ponctuelle

Reference number
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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 29769 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

Introduction

This International Standard comprises the original EN 12430:1998 and its Amendment 1:2006 prepared by Technical Committee CEN/TC 88, *Thermal insulating materials and products*, which has been amended by ISO/TC 163/SC 1 with reference to conditioning and testing conditions in tropical countries.

This International Standard is one of a series of documents specifying test methods, based on existing European Standards, that are being adopted by ISO. This "package" of standards includes the following group of interrelated documents.

International Standard	Respective EN standard
ISO 29465, *Thermal insulating products for building applications — Determination of length and width*	EN 822
ISO 29466, *Thermal insulating products for building applications — Determination of thickness*	EN 823
ISO 29467, *Thermal insulating products for building applications — Determination of squareness*	EN 824
ISO 29468, *Thermal insulating products for building applications — Determination of flatness*	EN 825
ISO 29469, *Thermal insulating products for building applications — Determination of compression behaviour*	EN 826
ISO 29470, *Thermal insulating products for building applications — Determination of the apparent density*	EN 1602
ISO 29471, *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity)*	EN 1603
ISO 29472, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*	EN 1604
ISO 29764, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*	EN 1605
ISO 29765, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*	EN 1607
ISO 29766, *Thermal insulating products for building applications — Determination of tensile strength parallel to faces*	EN 1608
ISO 29767, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*	EN 1609

ISO 29768, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*	EN 12085
ISO 29769, *Thermal insulating products for building applications — Determination of behaviour under point load*	EN 12430
ISO 29770, *Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products*	EN 12431
ISO 29771, *Thermal insulating materials for building applications — Determination of organic content*	EN 13820
ISO 29803, *Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)*	EN 13497
ISO 29804, *Thermal insulation products for building applications — Determination of the tensile bond strength of the adhesive and of the base coat to the thermal insulation material*	EN 13494
ISO 29805, *Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes*	EN 13496

Thermal insulating products for building applications — Determination of behaviour under point load

1 Scope

This International Standard specifies equipment and procedures for determining the behaviour of products under a force applied to a small area of a test specimen at a given speed. This International Standard is applicable to thermal insulating products.

This International Standard can be used to determine whether the products have sufficient strength to withstand the forces applied directly to them either during installation or during application, mainly caused by pedestrian traffic.

NOTE The test methods given in the main body of this International Standard and in Annex A are reported and interpreted in different ways. The similarities that exist between the methods are not sufficient to permit reasonable comparisons to be made.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 29768, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
point load
compressive force applied to a test specimen by a circular indenter with a circular cross section of 50 cm^2, equivalent to a diameter of 79,8 mm

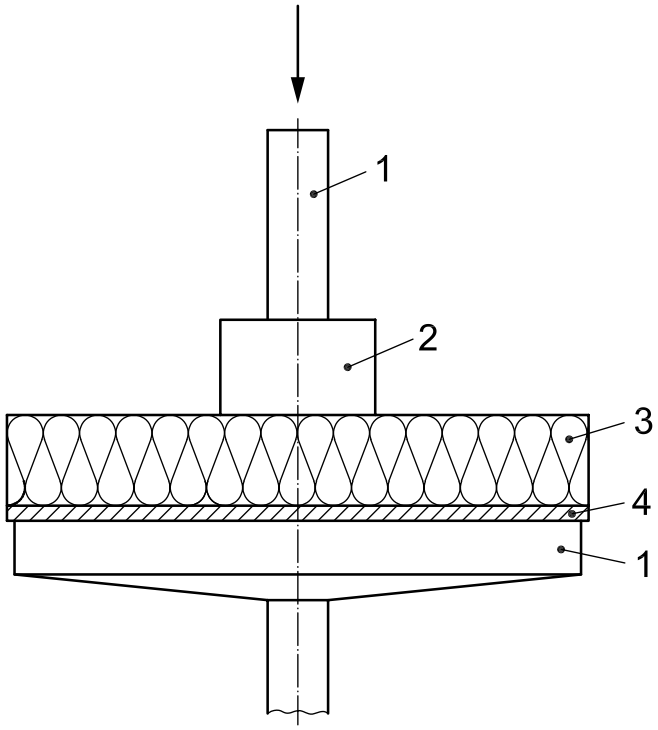
3.2
critical point
point on the force-deformation curve where a straight line, forming a tangent to the curve, separates from the curve [see Figure 4 a)]

4 Principle

A point load is applied with an indenter at a given speed in an axial direction perpendicular to the major faces of a squarely cut square test specimen and the compressive force at the critical point and/or the force for a given deformation is calculated.

5 Apparatus

5.1 Compression-testing machine, appropriate to the range of force and displacement involved and having one rigid, polished, fixed or vertically movable square or circular plane plate, the length of one side (or the diameter) of which is at least as large as the length (or the diagonal length) of the test specimen (see Figure 1).



Key

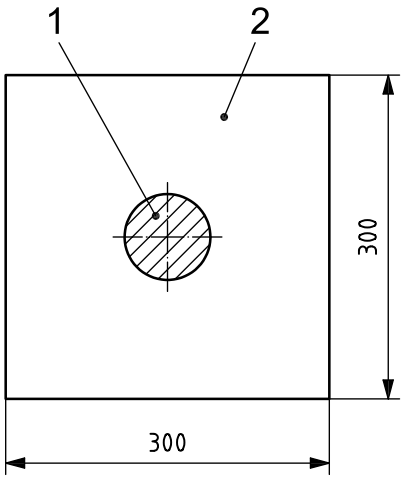
1 connection to the testing machine
2 indenter
3 test specimen
4 supporting plate

Figure 1 — Test set-up

5.2 Cylindrical indenter, steel, with a diameter of (79,8 ± 0,1) mm, connected to a vertically movable or fixed support.

If appropriate, the indenter shall be connected to the compression machine through a centrally positioned ball joint to ensure that only an axial force is applied to the relevant area of the test specimen. The indenter or the supporting plate shall be capable of moving at a constant speed in accordance with 7.2 (see Figures 2 and 3).

Dimensions in millimetres



Key

1 cylindrical indenter
2 test specimen

Figure 2 — Test specimen

Dimensions in millimetres

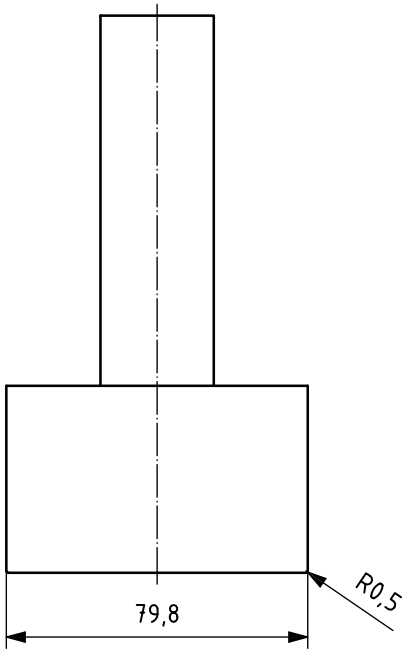


Figure 3 — Cylindrical indenter

5.3 Displacement-measuring device, capable of a continuous measurement of the displacement of the indenter or the movable plate, permitting a reading to ± 5 % or ± 0,1 mm, whichever is the smaller (see 5.1.1).

5.4 Force-measuring sensor, fitted to the machine plate or the indenter, to measure the force produced by the reaction of the test specimen upon the plate and the indenter.

This sensor shall be such that either its own deformation during the course of the measuring operation is negligible compared with that being measured or its deformation shall be taken into account by calculation. In addition, it shall allow the continuous measurement of the force, permitting a reading to ± 1 %.

5.5 Recording device, for the simultaneous recording of the force, F, and the displacement, X, which provides a curve of F as a function of X (see 7.2).

6 Test specimens

6.1 Dimensions of test specimens

Test specimens shall maintain the original product thickness. Any skins, facings, and/or coatings shall be retained. The test specimens shall be squarely cut and square with sides having dimensions of 300 mm × 300 mm. Other dimensions may be specified in the relevant product standard or any other international or European technical specification or may be agreed between parties.

The linear dimensions shall be determined in accordance with ISO 29768, to the nearest millimetre.

The tolerance on parallelism and flatness between the two major faces of the test specimens shall not be greater than 0,5 % of the test specimen side with a maximum of 0,5 mm.

6.2 Number of test specimens

The number of test specimens shall be as specified in the relevant product standard. If the number is not specified, then at least three test specimens shall be used. In the absence of a product standard or any other international or European technical specification, the number of test specimens may be agreed between parties.

6.3 Preparation of test specimens

Test specimens shall be cut so that the specimen base is normal to the direction of compression of the product in its application. The test specimens shall be cut and prepared by methods that do not change the original structure of the product. Moulded skins that do not remain with the product in use shall be removed.

Rectangular test specimens with parallel major faces shall be cut from the product so that the test specimen base is normal to the direction of the force that is experienced in its application.

6.4 Conditioning of test specimens

The test specimens shall be stored for at least 6 h at (23 ± 5) °C. In case of dispute, they shall be stored at (23 ± 2) °C and (50 ± 5) % relative humidity for the time specified in the relevant product standard.

In tropical countries, different conditioning and testing conditions can be relevant. In this case, the conditions shall be 27 °C and 65 % RH and be stated clearly in the test report.

7 Procedure

7.1 Test conditions

The test shall be carried out at (23 ± 5) °C. In case of dispute it shall be carried out at (23 ± 2) °C and (50 ± 5) % relative humidity.

In tropical countries, different conditioning and testing conditions can be relevant. In this case, the conditions shall be 27 °C and 65 % RH and be stated clearly in the test report.

7.2 Test procedure

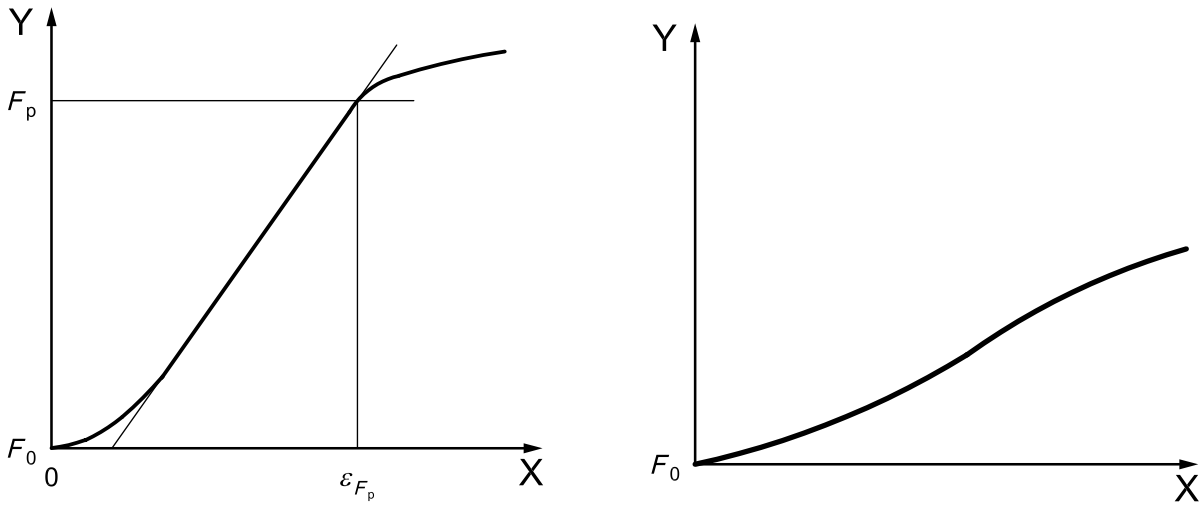
Measure the linear dimensions to the nearest millimetre in accordance with ISO 29768.

Place the test specimen in the compression testing machine on the fixed plate so that the indenter is centrally located above the test specimen (see Figure 1).

Preload with a force of (2,5 ± 0,25) N corresponding to a pressure of (500 ± 50) Pa.

Compress the area of the test specimen under the indenter with the indenter set to move at a constant speed of (50 ± 5) mm/min and record the force-deformation curve.

The test shall be stopped when the critical point can be determined [see Figure 4 a)] and/or when the deformation reaches 20 % [see Figure 4 b)].



a) **b)**

Key

X deformation

Y compressive force

F_p compressive force at the critical point

F_0 force corresponding to the preload

ε_{Fp} deformation at F_p

Figure 4 — Examples of force-deformation curves

8 Calculation and expression of results

8.1 General

The result is the mean value of the measurements that shall be expressed to two significant figures. Results should not be extrapolated to other thicknesses.

The results for any given thickness shall be expressed as described in 8.2 to 8.4.

8.2 Compressive force/deformation at the critical point

F_p is the compressive force at the critical point for the test specimen, expressed in kilonewtons.

ε_{Fp} is the deformation at the critical point, expressed in millimetres.

In the case of force-deformation curves without a yield point as shown in Figure 4 b), the calculation of the F_p is not relevant.

8.3 Point load at a given deformation

If required, record the point load at a deformation of 5 mm, expressed in kilonewtons. If required, the point load may be recorded for other deformations too.

8.4 Force-deformation curve

When the force-deformation curve is without a yield point (see Figure 4b), the force-deformation curve shall be given for all test specimens and the maximum force-deformation (expressed as absolute or relative deformation) as specified in the relevant product standard or any other international or European technical specification or by agreement between parties.

9 Accuracy of measurement

Following the experience from a “round robin test” where comparable test equipment and test specimen preparation were used, the accuracy can be estimated as given in Table 1.

Table 1 — Estimated accuracy of load and strength values

Strength/stress	**Load resulting in a deformation of** 2 % **or** 5 % approximate %	**Point load strength** σ_p approximate %
95 % repeatability limit	5	8
95 % reproducibility limit	15	25

The above mentioned terms are applied in accordance with ISO 5725-2.

10 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) product identification:

   1) product name, factory, manufacturer or supplier,

   2) production code number,

   3) type of product,

   4) packaging,

   5) form in which the product arrived at the laboratory,

   6) other information as appropriate, e.g. nominal thickness, nominal density;

c) test procedure:

   1) pre-test history and sampling, e.g. who sampled and where,

   2) conditioning,

   3) any deviation from Clauses 6 and 7,

   4) conditioning and testing conditions in tropical countries, if applicable,

   5) date of testing,

   6) general information relating to the test, e.g. position of facing (or coating), if any, in relation to the tested face,

   7) events that can have affected the results;

NOTE It is expected that information about the apparatus and identity of the person responsible for the test be available in the laboratory, but it is not necessary that it be recorded in the report.

d) results: all individual values and the mean value for F_p and/or point load for a given deformation and/or force-deformation curve.

Annex A
(normative)

Modifications to the general test method for cellular glass products

For cellular glass products, the test method described in this International Standard shall be modified in accordance with Clauses A.1 to A.4.

A.1 Apparatus

A.1.1 Positioning device, mounted on the plane plate, allowing the precise positioning of the test specimen relative to the compression testing machine.

The same part of the slab should always be tested to permit reproducibility and comparability of the results (see Figures A.1 and A.2).

A.2 Test Specimen

Test specimens shall be full-size products or quarter sections cut to take into account the positions shown in Figures A.1 and A.2.

Dimensions in millimetres

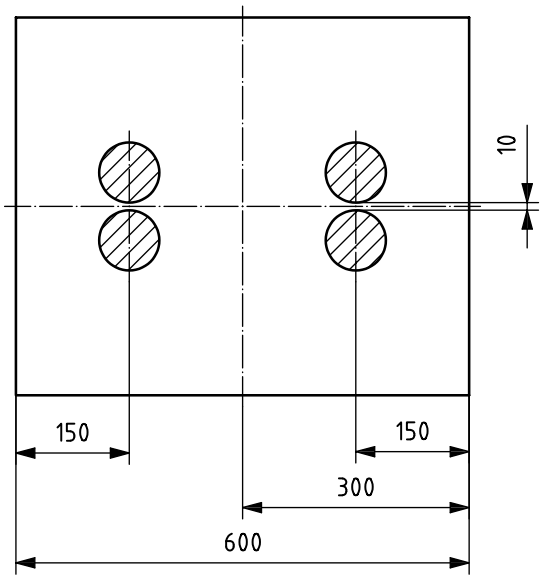


Figure A.1 — Indenter positions for products having a length of 600 mm

Dimensions in millimetres

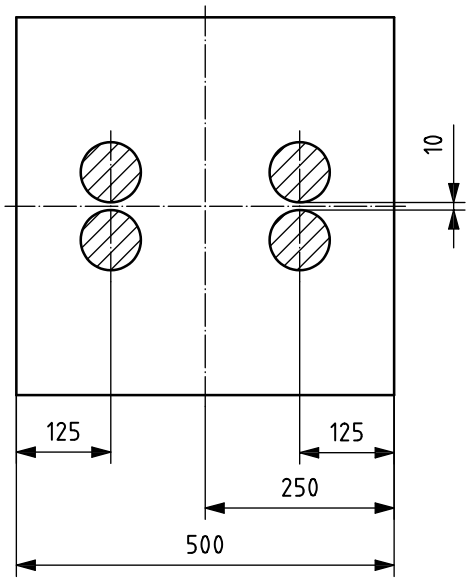


Figure A.2 — Indenter positions for products having a length of 500 mm

A.3 Procedure

Position the test specimen under the circular indenter of the compression-testing machine using the positioning device. Make sure that the area being tested is selected in accordance with the requirements of Figures A.1 and A.2.

Figures A.1 and A.2 show the four indenter positions for products having a length of 600 mm and 500 mm, respectively. For other dimensions, see the relevant product standard.

Apply a preload of (100 ± 10) N and read the deformation caused by the indenter or adjust the deformation reading to zero.

Increase the force on the indenter to (1 000 ± 10) N using a displacement speed of (2 ± 0,5) mm/min.

Turn the test specimen over and repeat the test on the other major face.

A.4 Calculation and expression of results

Calculate the deformation, P_d, of the test specimen as the net displacement of the indenter under the forces 100 N and 1 000 N.

For each test specimen, the results of the four individual measurements on each major face are determined and the average of the four individual measurements is calculated for each major face.

The deformation, P_d, of the test specimen at the thickness, d, measured in accordance with 7.2, is the largest of the two average values determined for the two faces, expressed in millimetres.

The test result is the average value obtained from three test specimens.

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