INTERNATIONAL STANDARD

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Thermal insulating products for building applications — Determination of compression behaviour

Produits isolants thermiques destinés aux applications du bâtiment — Détermination du comportement en compression

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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 29469 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 826:1996 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 compression behaviour

1 Scope

This International Standard specifies the equipment and procedures for determining the compression behaviour of specimens. It is applicable to thermal insulating products and can be used to determine the compressive stress in compressive creep tests and for applications in which insulation products are exposed only to short-term loads.

The method can be used for quality control purposes and can also be employed to obtain reference values from which design values can be calculated using safety factors.

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
relative deformation
ε
ratio of the reduction in thickness of the test specimen to its initial thickness, d_0, measured in the direction of loading and expressed as a percentage

3.2
compressive strength
σ_m
ratio of the maximum compressive force, F_m, reached when the strain, ε, at yield [see Figure 1 b)] or rupture [see Figure 1 a)] is less than 10 %, to the initial cross-sectional area of the test specimen

3.3
compressive stress at 10 % strain
σ_{10}
ratio of the compressive force, F_{10}, at 10 % strain, ε_{10}, to the initial cross-section of the test specimen [see Figure 1, c) and d)] for products presenting 10 % strain before possible yield or rupture

3.4
compression modulus of elasticity
E
compressive stress divided by the corresponding strain below the proportional limit, when the relationship is linear (see Figure 1)

4 Principle

A compressive force is applied at a given rate of displacement perpendicular to the major faces of a squarely cut test specimen and the maximum stress supported by the specimen calculated.

When the value of the maximum stress corresponds to a strain of less than 10 %, it is designated as compressive strength and the corresponding strain is reported. If no failure is observed before the 10 % strain has been reached, the compressive stress at 10 % strain is calculated and its value reported as compressive stress at 10 % strain.

5 Apparatus

5.1 Compression testing machine, designed to suit the range of force and displacement involved and having two very rigid, polished, square or circular plane parallel platens with a minimum side length (or diameter) equal to the side length (or diagonal) of the test specimen.

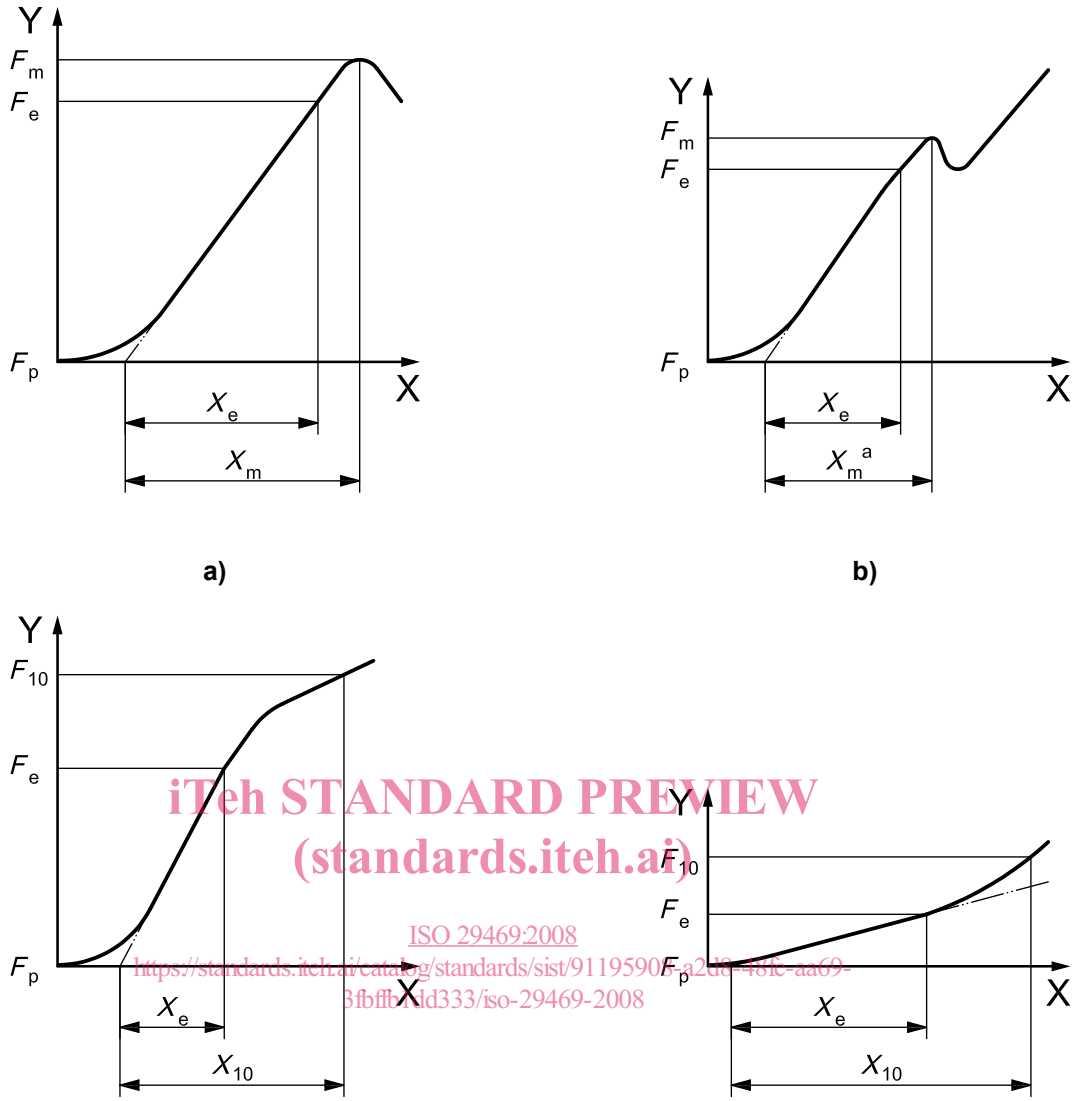
One of the platens shall be fixed and the other shall be movable, with a centrally positioned ball joint to ensure that only axial force is applied to the specimen, if appropriate. The movable platen shall be capable of moving at a constant rate of displacement in accordance with Clause 7.

5.2 Displacement measuring device, fitted to the compression testing machine, which allows continuous measurement of the displacement of the movable platen to an accuracy of ± 5 % or ± 0,1 mm, whichever is smaller (see 5.3).

5.3 Force measuring device, comprised of a sensor fitted to one of the machine platens to measure the force produced by the reaction of the specimen on the platens. This sensor shall be such that either its own deformation during the measuring operation is negligible compared with that of the object being measured or its own deformation shall be taken into account by calculation. In addition, it shall allow the continuous measurement of the force to an accuracy of ± 1 %.

5.4 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).

NOTE The curve gives additional information on the behaviour of the product and possibly enables the determination of the compression modulus of elasticity.



Key

X displacement
Y force

F_p force corresponding to the preload
F_m maximum force
X_m displacement at maximum force
F_{10} force at 10 % strain
X_{10} displacement at 10 % strain
F_e force corresponding to X_e (conventional proportional limit)
X_e displacement in the conventional elastic zone

[a] X_m is smaller than 10 %.

Figure 1 — Examples of force displacement curves