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**Thermal insulating products  
for building applications —  
Determination of tensile strength  
parallel to faces**

*Produits isolants thermiques destinés aux applications du bâtiment —  
Détermination de la résistance à la traction parallèlement aux faces*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 88, *Thermal insulating materials and products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 29766:2008), which has been technically revised.

The main changes are as follows:

- the term "accuracy" has been replaced by "uncertainty of measurement" in [Clause 5](#);
- the conditioning and testing conditions in [6.4](#) and [7.1](#) have been modified;
- some editorial changes have been made.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Thermal insulating products for building applications — Determination of tensile strength parallel to faces

## 1 Scope

This document specifies the equipment and procedures for determining the tensile strength of a product parallel to its faces. It is applicable to thermal insulating products.

This document can be used to determine whether the product has sufficient strength to withstand stresses during transportation and application.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

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*

ISO 29466, *Thermal insulating products for building applications — Determination of thickness*

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

## 3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1 tensile strength parallel to faces

$\sigma_t$   
maximum recorded tensile force parallel to the product faces during the pulling operation, divided by the cross-sectional testing area of the specimen

## 4 Principle

A specimen is attached to two clamps that are fastened in a tensile testing machine and pulled apart at a given speed.

The maximum tensile force is recorded and the tensile strength of the specimen is calculated.

## 5 Apparatus

Any test equipment or method which provides the same result with at least the same uncertainty of measurement may be used.

**5.1 Tensile testing machine**, appropriate for the range of force and displacement involved, capable of having a constant crosshead speed adjusted to  $(10 \pm 1)$  mm/min and capable of measuring the force with an uncertainty of measurement of not more than  $\pm 1$  %.

**5.2 Two clamps**, designed so as to avoid failure of the specimen in the area of the clamps.

The clamps shall be positioned so that the tensile stress is uniformly distributed during the test.

An example of suitable equipment is shown in [Figure 1](#).

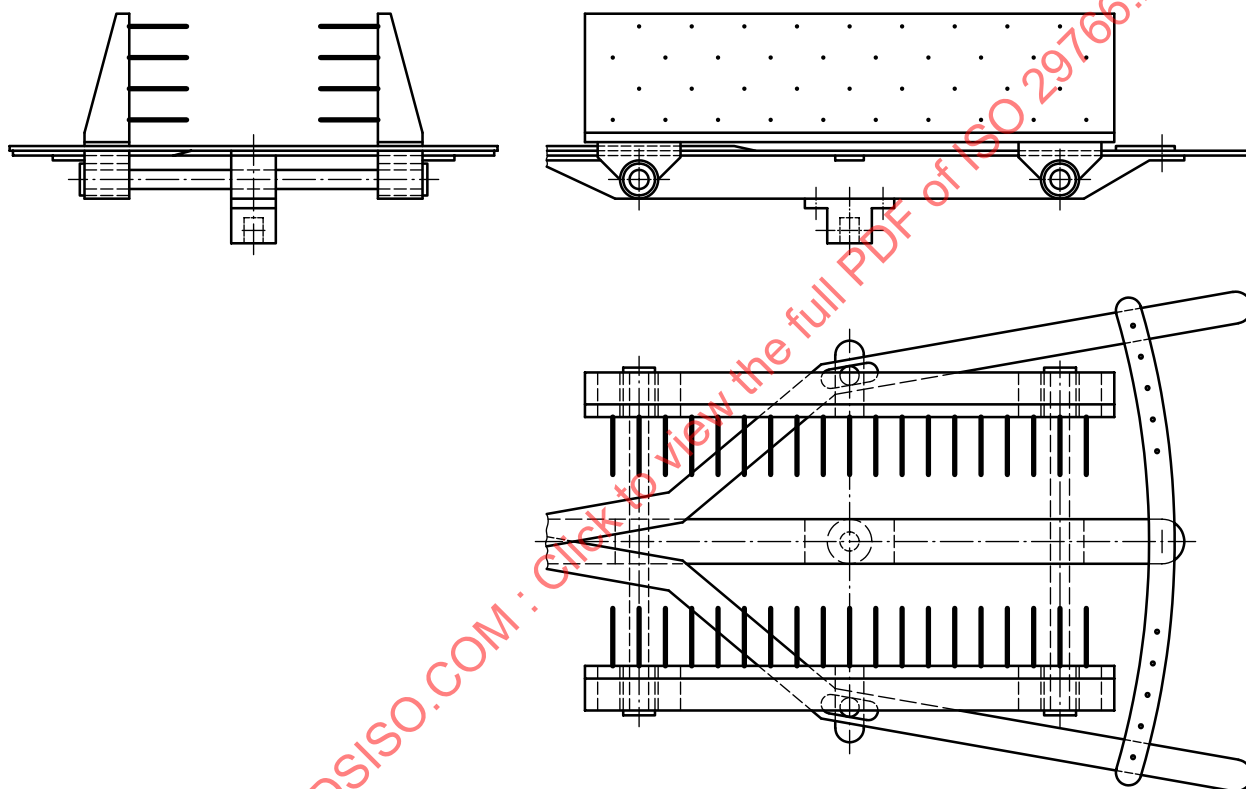


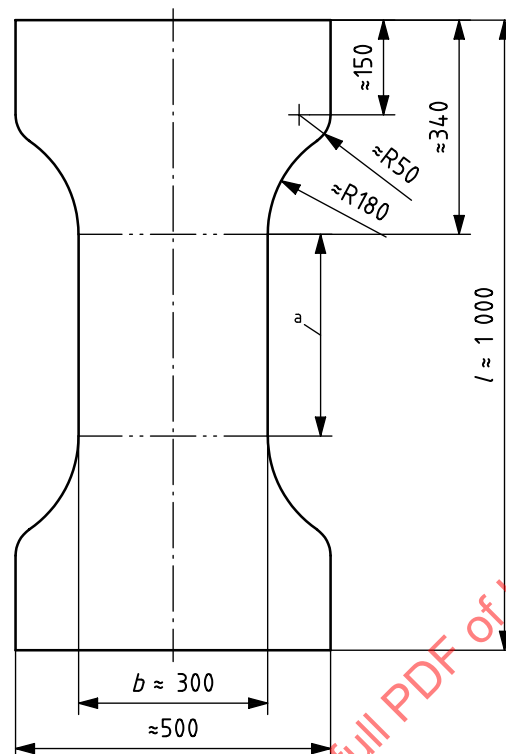
Figure 1 — Example of a suitable clamp

## 6 Test specimens

### 6.1 Dimensions of test specimens

The thickness of the specimens shall be the original product thickness including any skins, facings and/or coatings. The specimens shall be cut with the shape and with the dimensions shown in [Figure 2](#). For small products or because of equipment limitations, the specimen length and width shall be adjusted proportionally, but with a minimum length of 500 mm. Other specimen shapes which provide the same result to at least the same accuracy may be used.

Dimensions in millimetres



a Testing area.

**Figure 2 — Test specimen shape and dimensions**

## 6.2 Number of test specimens

The number of specimens shall be as specified in the relevant product standard. If the number is not specified, then at least three specimens shall be used.

In the absence of a product standard or any other technical specification, the number of specimens may be agreed between parties.

## 6.3 Preparation of test specimens

The specimens shall be cut from the full-size product so that the length direction corresponds to the direction in which the tensile force is applied to the product in its application.

Specimens shall be prepared by methods that do not change the original structure of the product.

**NOTE** Special methods of preparation, when needed, are given in the relevant product standard or any other technical specification.

## 6.4 Conditioning of test specimens

The specimens shall be conditioned for at least six hours at  $(23 \pm 5) ^\circ\text{C}$ . In case of dispute, they shall be conditioned at  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \%$  relative humidity (RH) for the time stated in the relevant product standard.

In tropical climates, different conditioning and testing conditions can be relevant. In this case, the conditions shall be  $(27 \pm 2) ^\circ\text{C}$  and  $(65 \pm 5) \%$  RH and be clearly stated in the test report.

## 7 Procedure

### 7.1 Test conditions

Testing shall be carried out at  $(23 \pm 5) ^\circ\text{C}$ . In case of dispute, it shall be carried out at  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \% \text{RH}$ .

In tropical climates, different conditioning and testing conditions can be relevant. In this case, the conditions shall be  $(27 \pm 2) ^\circ\text{C}$  and  $(65 \pm 5) \% \text{RH}$  and be clearly stated in the test report.

### 7.2 Test procedure

Measure the thickness,  $d$ , expressed in millimetres to the nearest millimetre, of the testing area in accordance with ISO 29466.

Measure the length,  $l$ , of the specimen and the width,  $b$ , of the testing area, both expressed in millimetres to the nearest millimetre, in accordance with ISO 29768.

Attach the specimen centrally between two clamps to distribute the stress uniformly. Place it carefully in the tensile testing machine and increase the tensile force at a constant speed of the crosshead (see [5.1](#)) until failure occurs.

Record the maximum tensile force in kilonewtons.

Record the way in which the product failed. Discard any specimen that fails outside the testing area (see [Figure 2](#)).

## 8 Calculation and expression of results

Calculate the tensile strength,  $\sigma_t$ , expressed in kilopascals, parallel to faces, using [Formula \(1\)](#):

$$\sigma_t = \frac{F_m}{d \times b} \quad (1)$$

where

- $F_m$  is the maximum tensile force recorded, expressed in kilonewtons (kN);
- $d$  is the thickness of the testing area, expressed in metres;
- $b$  is the width of the testing area, expressed in metres.

The result shall be expressed as the mean value of the measurements, expressed to two significant figures.

## 9 Accuracy of measurement

Following the experience from an interlaboratory test, where comparable test equipment and specimen preparation were used, the precision,  $\sigma_v$ , for tensile strength can be estimated as given below:

- 95 % repeatability limit: approximately 3 %;
- 95 % reproducibility limit: approximately 10 %.

The above-mentioned terms shall be applied in accordance with ISO 5725-1 and ISO 5725-2.