
**Thermal insulating products for building
applications — Determination of
squareness**

*Produits isolants thermiques destinés aux applications du bâtiment —
Détermination de l'équerrage*



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Terms and definitions.....	1
3 Principle	2
4 Apparatus	2
5 Test specimens	3
6 Procedure	3
7 Calculation and expression of results	4
8 Accuracy of measurement	5
9 Test report	5

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 29467 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 824:1994 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, <i>Thermal insulating products for building applications — Determination of length and width</i>	EN 822
ISO 29466, <i>Thermal insulating products for building applications — Determination of thickness</i>	EN 823
ISO 29467, <i>Thermal insulating products for building applications — Determination of squareness</i>	EN 824
ISO 29468, <i>Thermal insulating products for building applications — Determination of flatness</i>	EN 825
ISO 29469, <i>Thermal insulating products for building applications — Determination of compression behaviour</i>	EN 826
ISO 29470, <i>Thermal insulating products for building applications — Determination of the apparent density</i>	EN 1602
ISO 29471, <i>Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23°C/50 % relative humidity)</i>	EN 1603
ISO 29472, <i>Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions</i>	EN 1604
ISO 29764, <i>Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions</i>	EN 1605
ISO 29765, <i>Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces</i>	EN 1607
ISO 29766, <i>Thermal insulating products for building applications — Determination of tensile strength parallel to faces</i>	EN 1608
ISO 29767, <i>Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion</i>	EN 1609
ISO 29768, <i>Thermal insulating products for building applications — Determination of linear dimensions of test specimens</i>	EN 12085
ISO 29769, <i>Thermal insulating products for building applications — Determination of behaviour under point load</i>	EN 12430

ISO 29770, <i>Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products</i>	EN 12431
ISO 29771, <i>Thermal insulating materials for building applications — Determination of organic content</i>	EN 13820
ISO 29803, <i>Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)</i>	EN 13497
ISO 29804, <i>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</i>	EN 13494
ISO 29805, <i>Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes</i>	EN 13496

Thermal insulating products for building applications — Determination of squareness

1 Scope

This International Standard specifies the equipment and procedure for determining the deviation from squareness for length, width and/or thickness of full-size products. It is applicable to thermal insulating products. The method is normally applicable to products with straight edges. For products of other shape, e.g. profiled edges, the method can be adapted accordingly.

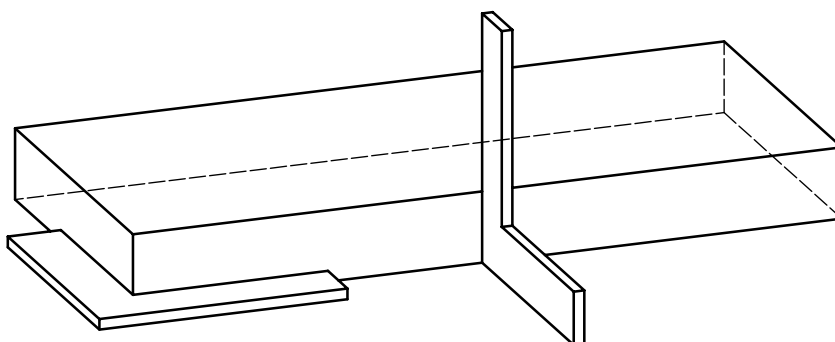
2 Terms and definitions

For the purposes of this document, the following term and definition apply.

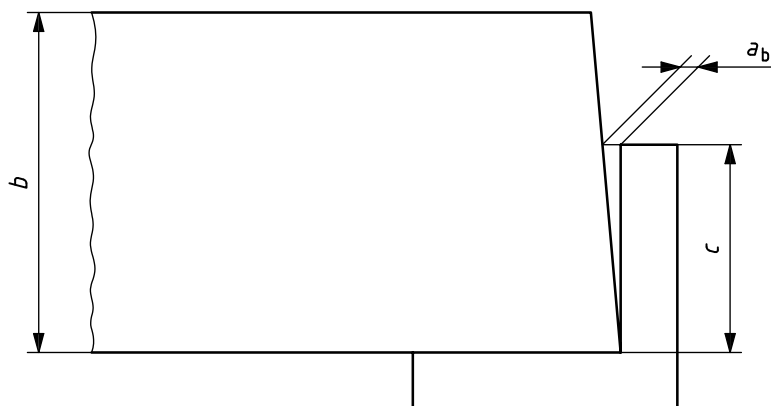
2.1

deviation from squareness

distance from one limb of a perfect square (see Figures 1, 2 and 3) to the edge of the product at a given distance from a corner



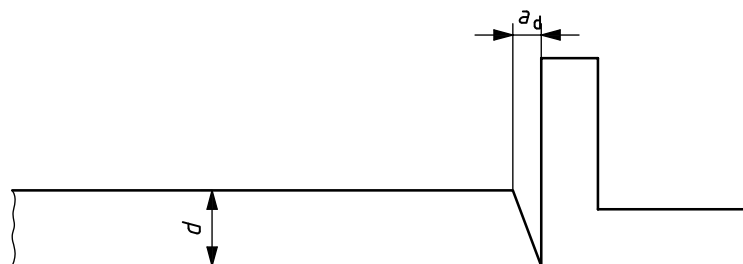
**Figure 1 — Example of the measurement of the length- and width-edge squareness
and of thickness-edge squareness**



Key

- b length or width of the product depending on which corner is being controlled
- a_b deviation from squareness of the length or width
- c length of inner side of the square

Figure 2 — Example of the measurement of length- and width-edge squareness



Key

- d thickness of the product
- a_d deviation from squareness

Figure 3 — Example of the measurement of the thickness-edge squareness

3 Principle

Apply a metal square to the product edges and measure the deviation between one limb of the metal square and the product's edge (see Figure 1).

4 Apparatus

4.1 Flat surface.

4.2 Metal rule or metal tape, graduated in millimetres and permitting reading to 0,5 mm.

4.3 Metal square, with limbs at least 500 mm long with a deviation from squareness of not more than $\pm 0,1$ mm when measured at 500 mm from the corner.

Any test equipment that provides the same result with at least the same accuracy may be used.

5 Test specimens

5.1 Dimensions of test specimens

The test specimens shall be the full-size product.

5.2 Number of test specimens

The number of test specimens shall be as specified in the relevant product standard.

In the absence of a product standard, the number of test specimens may be agreed between parties.

5.3 Conditioning of test specimens

The test specimens should be stored for at least 6 h at $(23 \pm 5) ^\circ\text{C}$. In case of dispute, they shall be stored at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ 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 $27 ^\circ\text{C}$ and 65% RH and be stated clearly in the test report.

6 Procedure

6.1 Determination of the squareness of the length and width edges

6.1.1 Test conditions

The test should 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 $(50 \pm 5) \%$ relative humidity.

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

6.1.2 Test procedure

Lay the test specimen on a flat surface and measure the deviation from squareness of length and width as follows.

- a) Place the metal square along one of the sides of the test specimen with the right angle of the square aligned against the adjoining edge as shown in Figure 2.
- b) Measure the distance, a_b , between the edge of the test specimen and the edge of the metal square, at a distance, c , from the corner, to the nearest 0,5 mm, where
 - 1) for the test specimens with a side of less than 500 mm, c is the maximum width or length of the specimen,
 - 2) for the test specimens with a side equal to or greater than 500 mm, c is the length of the inner side of the square (see Figure 2).
- c) Repeat for all corners of the test specimen having angles smaller than or equal to 90° .
- d) If there is any significant deviation from linearity of the edges in the length or the width, this shall be reported as the maximum deviation from linearity, a_{max} , expressed in millimetres (see Figure 4).

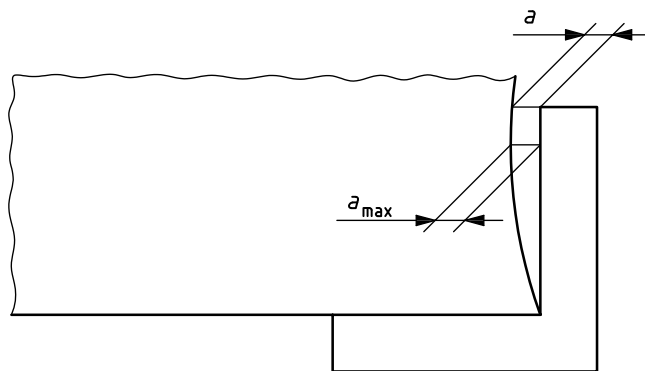


Figure 4 — Example of the measurement of the deviation from linearity of an edge

6.2 Determination of the squareness of the thickness edge

6.2.1 Test conditions

The test should 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 $(50 \pm 5) \%$ relative humidity.

6.2.2 Test procedure

Lay the test specimen on a flat surface and measure the deviation from squareness of the thickness as follows.

- Place the metal square on the flat surface against one edge of the test specimen as shown in Figure 3.
- Measure the distance, a_d , to the nearest 0,5 mm between the edge of the test specimen and the edge of the square at the point of the greatest deviation along the side.
- Repeat for all sides.
- Turn the test specimen over and repeat steps a) to c).
- Report the largest figure as the deviation from squareness of the thickness edge.

7 Calculation and expression of results

7.1 Calculation of the deviation from the squareness of the length and width edges

Calculate deviation from squareness, S_b , using Equation (1):

$$S_b = \frac{a_b}{c} \quad (1)$$

where

a_b is the measured value, expressed in millimetres;

c is the measured value, expressed in millimetres.

Express the deviation from squareness, S_b , in millimetres per metre and round to the nearest millimetre per metre.

7.2 Calculation of the deviation from squareness of the thickness edge

Calculate deviation from squareness, S_d , using Equation (2):

$$S_d = a_d \quad (2)$$

where a_d is the maximum measured value, expressed in millimetres.

Round the deviation, S_d , to the nearest millimetre and report the thickness of the test specimen.

8 Accuracy of measurement

NOTE It has not been possible to include a statement of the accuracy of the method in this edition of this International Standard, but it is intended to include such a statement when this International Standard is next revised.

9 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 products,
 - 4) packaging,
 - 5) the 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. from where and by whom,
 - 2) conditioning,
 - 3) any deviation from Clauses 5 and 6,
 - 4) conditioning and testing conditions in tropical countries, if applicable,
 - 5) date of testing,
 - 6) general information relating to the test,
 - 7) events that can have affected the results;
- d) results: all individual values and the maximum value for deviation from squareness, expressed in millimetres per metre for the length and width; the deviation from squareness, expressed in millimetres for the thickness; and any deviation from linearity. See Figures 2 and 3.

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

