
**Thermal insulation products for building
equipment and industrial installations —
Determination of declared thermal
conductivity**

*Produits isolants thermiques pour l'équipement du bâtiment et les
installations industrielles — Détermination de la conductivité thermique
déclarée*

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Foreword

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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 13787 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

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Foreword

This document (EN ISO 13787:2003) has been prepared by Technical Committee CEN/TC 89 "Thermal performance of buildings and building components", the secretariat of which is held by SIS, in collaboration with Technical Committee ISO/TC 163 "Thermal performance and energy use in the built environment".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

Annexes A, B and C are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This standard gives the procedure for the determination of the declared thermal conductivity of thermal insulation materials and products, which are used for the insulation of building equipment and industrial installations.

For this area of application the thermal conductivity values are usually expressed over a wide range of temperatures.

This standard describes the procedure necessary for the determination of the thermal conductivity values, which the manufacturer shall declare.

The values are expressed in the form of a curve or in tabular form which shows thermal conductivity as a function of temperature.

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1 Scope

This standard establishes the procedure for the determination and verification of the declared thermal conductivity as a function of temperature of thermal insulating materials and products used for the insulation of building equipment and industrial installations.

The informative annex B also gives an optional method for establishing the thermal conductivity curve or table from measured values.

The standard is not applicable to thermal insulating products used in building envelopes. For the procedures which are used for these products, see ISO 10456, "Building materials and products – Procedures for determining declared and design thermal values".

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12667	<i>Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance.</i>
EN ISO 7345:1995	<i>Thermal insulation - Physical quantities and definitions (ISO 7345:1987).</i>
EN ISO 8497	<i>Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes (ISO 8497:1994).</i>
prEN ISO 9229:1997	<i>Thermal insulation - Definitions of terms (ISO/DIS 9229:1997).</i>
ISO 8301	<i>Thermal insulation - Determination of steady-state thermal resistance and related properties - Heat flow meter apparatus.</i>
ISO 8302	<i>Thermal insulation - Determination of steady-state thermal resistance and related properties - Guarded hot plate apparatus.</i>

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 7345:1995, prEN ISO 9229:1997 and the following apply.

3.1

reference mean temperature

mean temperature selected for use as the basis for physical property measurement and expression of data for those materials where physical properties change with temperature

3.2

declared value

value declared by a manufacturer which is derived from measured values under specified conditions and rules

3.3

declared thermal value

expected value of a thermal property of a building material or product

— assessed from measured data at reference conditions of temperature and humidity;

— given for a stated fraction and confidence level according to the determination method in this standard;

— corresponding to a reasonable expected service lifetime under normal conditions.

NOTE The declared thermal value includes the effects of ageing and dispersion in the measured values.

3.4

declared thermal conductivity curve

curve giving the thermal conductivity at different temperatures for a material or product conditioned in equilibrium with a standard atmosphere (23 °C, 50 % relative humidity) based on the declared thermal values

4 Principles for the determination of declared thermal conductivity

The manufacturer shall present his proposed declared thermal conductivity of the material or product in the form of a curve as a function of the mean temperature or a table with a number of values in accordance with 5.1.

The product shall then be subjected to a test according to clause 5, with test specimens representative of the product.

If the test is passed, the proposed declared thermal conductivity curve or table becomes the declared thermal conductivity curve or table.

NOTE 1 An alternative procedure to the one given in the standard is given in annex A.

NOTE 2 An optional statistical method to establish the declared thermal conductivity curve is given in annex B.

5 Determination and verification of declared thermal conductivity

5.1 Measurement of thermal conductivity

The test specimens shall be aged, if necessary, before measurements are made. As an alternative, a correction factor for ageing shall be applied.

NOTE Ageing procedures are found in product specifications, where relevant.

Measurements shall be carried out in accordance with ISO 8301, ISO 8302 or EN 12667 for flat test specimens and EN ISO 8497 for cylindrical test specimens.

The temperature difference between the hot and cold faces shall range from 10 K to 40 K for flat test specimens. The temperature difference shall be chosen to maximize the accuracy of the measurement. For cylindrical specimens, tested in accordance with EN ISO 8497, these requirements on temperature difference do not apply, but the temperature difference shall not be smaller than 10 K.

Measurements shall be made at three different mean temperatures at least.

For mean temperatures up to 500 °C, the curve determined in the test shall be based upon measurements at intervals of a maximum of 100 K, over the whole service temperature range stated by the manufacturer.

Thermal conductivity shall also be measured at temperatures close to inflexion points or other irregularities of the curve.

For mean temperatures greater than 500 °C, the curve determined in the test shall be based upon measurements at intervals of a maximum of 200 K. (standards.iteh.ai)

No extrapolation of test results beyond the measured temperature range is permitted. The measured thermal conductivities shall be rounded up to the nearest 0,001 W/(m·K).

The results shall be expressed either by a temperature/thermal conductivity curve or by a table. The comparison with the proposed curve or table is only made at the temperatures of measurement.

5.2 Procedure for verification

Select three different samples. Take the test specimens from these samples at random, as required.

Measure the thermal conductivity of the test specimen from the first sample in accordance with the method described in 5.1.

Compare the results of the measurements with the values obtained from the proposed curve or table.

- If the measured values are all less than or equal to the thermal conductivities derived from the proposed curve or table, the test is passed and the proposed curve or table becomes the declared curve or table.
- If one or more of the measured values exceeds the corresponding thermal conductivity of the proposed curve or table by 10 % or more, the test has failed.
- If there are measured values above the values on the proposed curve or in the table but none of them exceeds the corresponding thermal conductivity by 10 %, then two new test specimens shall be measured in accordance with the method described in 5.1, one specimen being taken from each of the two remaining samples.

For temperatures \leq below 100 °C, measure the thermal conductivities of the second and third specimen at temperatures within \pm 5 K of the values measured for the first specimen. Increase this to \pm 10 K for temperatures above 100 °C.

If none of the new measurements exceeds the proposed curve or table by 10 % or more, the measured thermal conductivities shall be converted to the temperatures at which the measurements for the first curve were made, using the slope of the first curve to make the conversion.

Results of the measurements above the proposed curve or the value in the table by 10% or more shall constitute a failure of the test.

Calculate the values of thermal conductivity at the corresponding temperatures by calculating the mean of the three values measured or converted at each temperature.

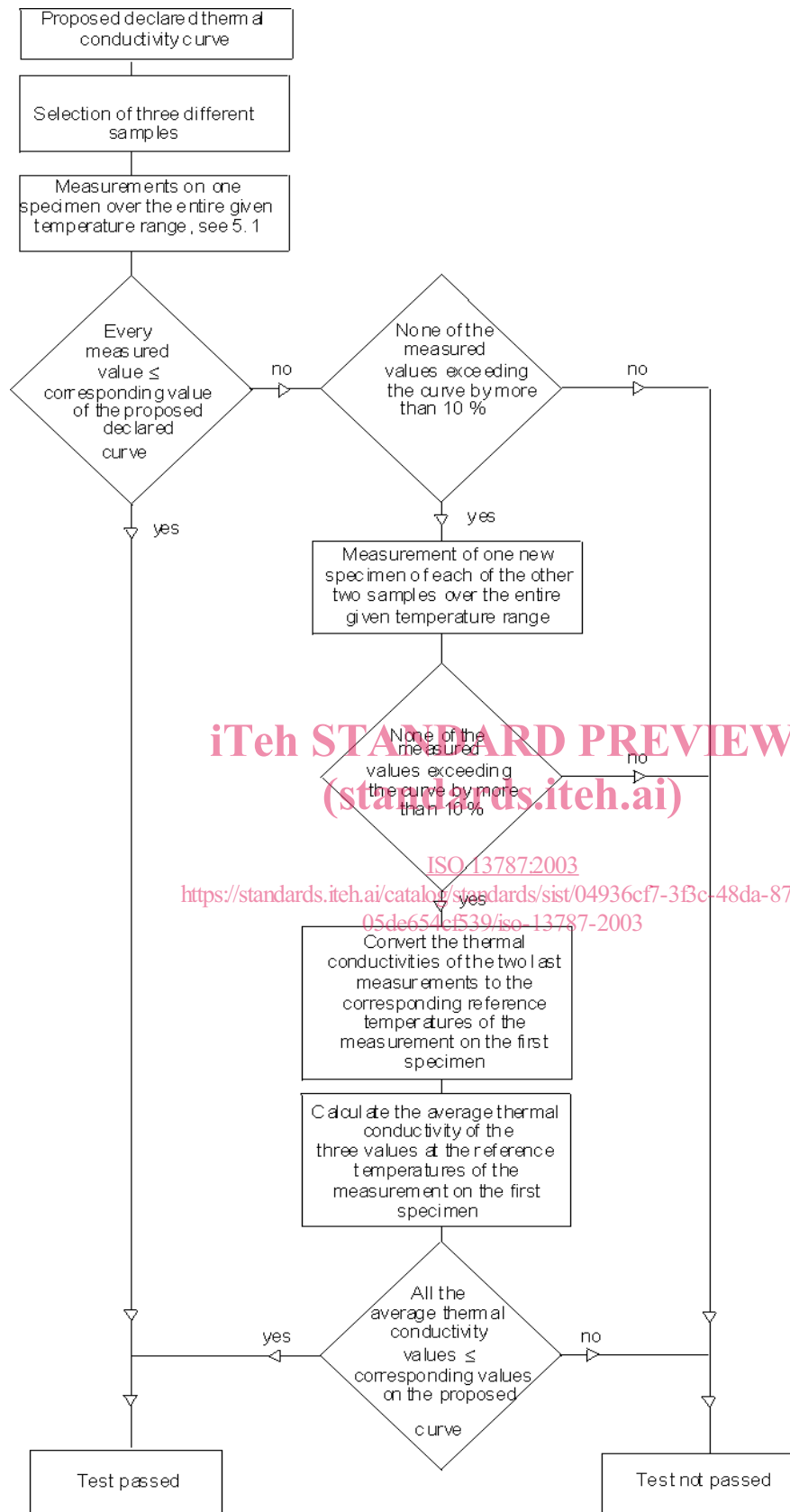
- If all these new mean values are lower than or equal to the corresponding thermal conductivities of the proposed declared curve, the test has passed, in which event the proposed declared curve or table becomes the declared curve or table.
- If one or more of the new mean values is higher than the corresponding thermal conductivity of the proposed declared curve or table, the test has failed.

The verification procedure is described in the flow chart in Figure 1 and illustrated in annex C.

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NOTE For detailed procedure, see clause 5

Figure 1 - Flow chart for verifying the thermal conductivity