SLOVENSKI STANDARD
SIST EN ISO 13787:2003

01-december-2003

Toplotnoizolacijski proizvodi za opremo stavb in industrijske napeljave – Ugotavljanje nazivne toplotne prevodnosti

Thermal insulation products for building equipment and industrial installations - Determination of declared thermal conductivity (ISO 13787:2003)

Wärmedämmstoffe für die Haustechnik und für betriebstechnische Anlagen - Bestimmung des Nennwertes der Wärmeleitfähigkeit (ISO 13787:2003)

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Détermination de la conductivité thermique déclarée (ISO 13787:2003)

Ta slovenski standard je istoveten z: EN ISO 13787:2003

ICS:

91.100.60	Tæ^¦ã¦ã¦ãÁ æÁ[]][ç[Á§\:ç[}[Á§[[æ&ã¦]	Thermal and sound insulating materials

SIST EN ISO 13787:2003   **en**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 13787

April 2003

ICS 91.100.60

English version

Thermal insulation products for building equipment and industrial installations - Determination of declared thermal conductivity (ISO 13787:2003)

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Détermination de la conductivité thermique déclarée (ISO 13787:2003)

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This European Standard was approved by CEN on 9 October 2002.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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EN ISO 13787:2003 (E)

Contents

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, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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EN ISO 13787:2003 (E)

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.

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	*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.*
EN ISO 7345:1995	*Thermal insulation - Physical quantities and definitions (ISO 7345:1987).*
EN ISO 8497	*Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes (ISO 8497:1994).*
prEN ISO 9229:1997	*Thermal insulation - Definitions of terms (ISO/DIS 9229:1997).*
ISO 8301	*Thermal insulation - Determination of steady-state thermal resistance and related properties - Heat flow meter apparatus.*
ISO 8302	*Thermal insulation - Determination of steady-state thermal resistance and related properties - Guarded hot plate apparatus.*

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.

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3.4
declared thermal conductivity curve (standards.iteh.ai)
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.

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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.

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

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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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┌─────────────────────────────┐
│ Proposed declared thermal   │
│ conductivity curve          │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Selection of three different│
│ samples                     │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Measurements on one         │
│ specimen over the entire    │
│ given temperature range,    │
│ see 5.1                     │
└─────────────────────────────┘
```

Every measured value ≤ corresponding value of the proposed declared curve — no → None of the measured values exceeding the curve by more than 10 % — no →

yes (down)   yes (down)

Measurement of one new specimen of each of the other two samples over the entire given temperature range

None of the measured values exceeding the curve by more than 10 % — no →

yes

Convert the thermal conductivities of the two last measurements to the corresponding reference temperatures of the measurement on the first specimen

Calculate the average thermal conductivity of the three values at the reference temperatures of the measurement on the first specimen

All the average thermal conductivity values ≤ corresponding values on the proposed curve — yes / no

Test passed   Test not passed

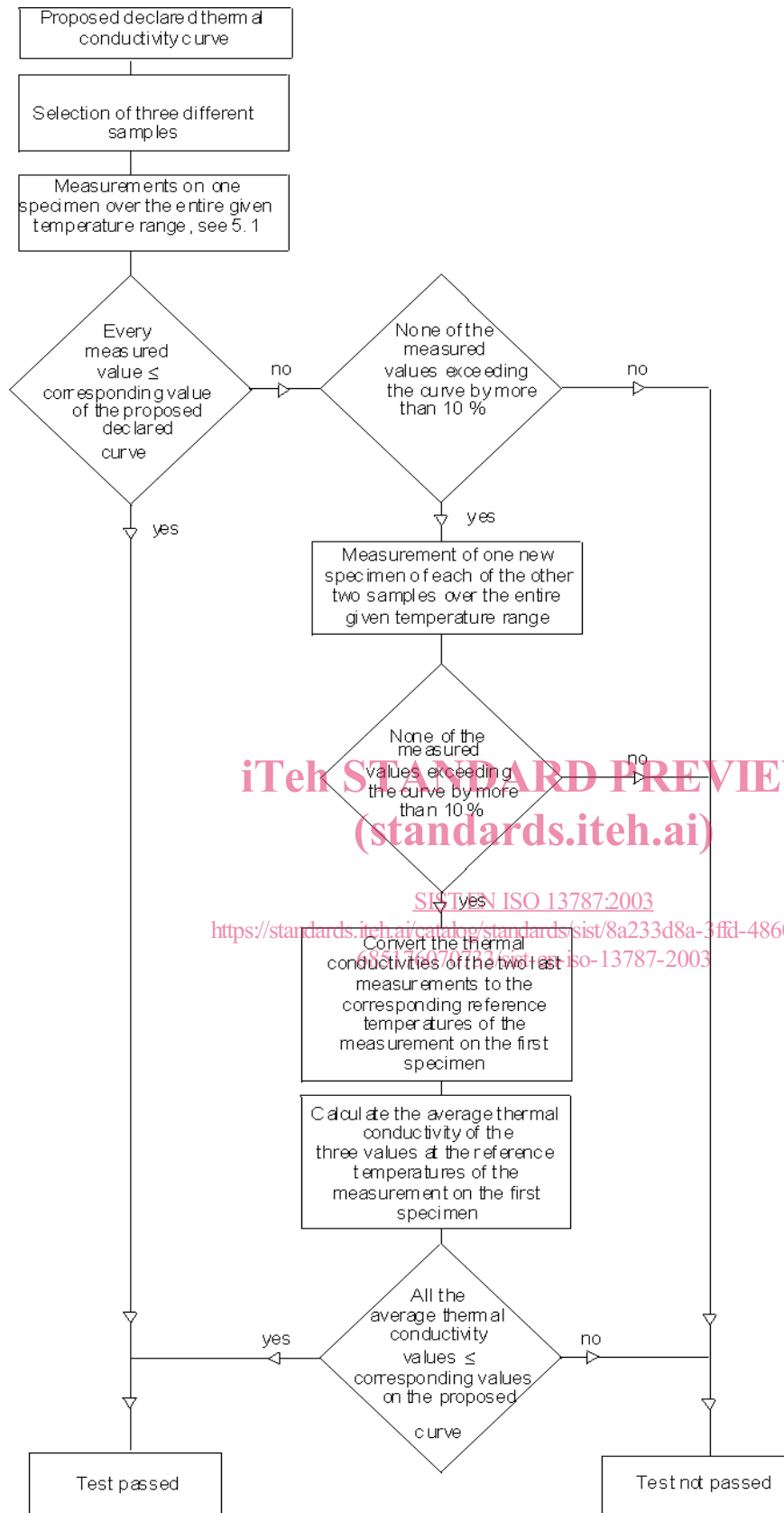NOTE For detailed procedure, see clause 5

Figure 1 - Flow chart for verifying the thermal conductivity

Annex A
(informative)

Verification based on curve comparison

A.1 General

The procedure given in the main body of the standard, to verify by a test that a proposed declared thermal conductivity curve may be used as the declared thermal conductivity curve, is based on a comparison made for a limited number of values. This annex shows how to compare the curves to exclude the possibility that a curve based on the measured values could locally exceed the proposed declared curve and can be used to compare the proposed curve with the curve obtained on the basis of the measured values.

A.2 Principle

The manufacturer proposes the declared thermal conductivity in the form of a curve as a function of the mean temperature.

A test is carried out based on the following principles:

— the thermal conductivity is measured at various temperatures;

— a "best fitting" curve is developed;

— this curve is compared with the proposed declared curve.

A.3 Test

A.3.1 Measurement of thermal conductivity

The thermal conductivity is measured in accordance with 5.1.

A.3.2 Procedure for comparison and decision

Three different samples are selected.

A first test specimen is measured in accordance with the method described in 5.1.

After making the measurements, the results are mathematically described by a formula which is the lowest degree polynomial leading to a coefficient of correlation at least equal to $r = 0,95$. For the purpose of this annex, this curve is also the measured curve.

— If the measured curve is always less than or equal to the proposed declared curve, the proposed declared curve becomes the declared curve.

— If at least one point of the measured curve exceeds the proposed declared curve by 10 % or more, the test has failed.

— If the measured curve locally exceeds the proposed declared curve by less than 10 %, two new test specimens are measured in accordance with the method described in 5.1, one specimen being taken from each of the two remaining selected samples.

The results of all the measurements carried out on the three test specimens are mathematically described by a formula which is the lowest degree polynomial leading to a coefficient of correlation at least equal to $r = 0,95$. For the purpose of this annex, this curve is also the best fitted curve.