SLOVENSKI STANDARD
oSIST prEN 16012:2010

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Toplotnoizolacijski proizvodi za stavbe - Odsevni izolacijski proizvodi - Ugotavljanje nazivnih toplotnih lastnosti

Thermal insulation for buildings - Reflective insulation products - Determination of the declared thermal performance

Wärmedämmstoffe für Gebäude - Reflektierende Wärmedämm-Produkte - Bestimmung der Nennwerte der wärmetechnischen Eigenschaften

Isolation thermique des bâtiments - Produits d'isolation réfléchissants - Détermination de la performance thermique déclarée

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91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials

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Thermal insulation for buildings - Reflective insulation products - Determination of the declared thermal performance

Isolation thermique des bâtiments - Produits d'isolation réfléchissants - Détermination de la performance thermique déclarée

Wärmedämmstoffe für Gebäude - Reflektierende Wärmedämm-Produkte - Bestimmung der Nennwerte der wärmetechnischen Eigenschaften

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 16012:2010) has been prepared by Technical Committee CEN/TC 89 “Thermal performance of buildings and building components”, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

Introduction

Reflective (low emissivity) surfaces are utilised in a number of ways to enhance the thermal performance of insulating products. Their role is to reduce the heat transfer by radiation in some parts of the system. That reduction can be in the radiant heat transferred through a product that is wholly or partially transparent to infra-red radiation (e.g. very low density fibrous insulation) or a reduction in the radiant heat transfer across an air gap (or more precisely a gas gap) which can be either a component of an insulated structure or more imply an air gap created on either side of an insulation material in the building element.

Usually, to ensure an insulating product with externally facing low emissivity surfaces achieves the maximum thermal resistance when installed in the structure, it would be installed in such a way as to create an air cavity in front of each low emissivity surface. Unless otherwise stipulated by the manufacturer, the declared thermal performance should include an adjacent air space on either side of the product, and the declared thermal performance should also include a statement of the thickness of these airspaces included as part of the declared value. The declared value may, alternatively, be given as the combination of the thermal resistance of the "core" of the product together with the measured value of the emissivity of the surfaces. Since all conventional thermal insulation products declare their thermal performance on the basis of the value to be expected over a reasonable working life, this is also addressed in a limited manner in this standard in the assessment of emissivity of the surface(s) of reflective insulation.

How the thermal properties of insulation materials that utilise reflective surfaces are determined will depend on the form in which they are sold and how they are intended to be used. This standard describes a number of different approaches which can be utilised and specifies what approach to use for the different types of product. Where a product is already subject to a product specification that describes procedures for the measurement of the aged 90/90 fractile thermal conductivity or thermal resistance of the core insulation material, the following guidance should only be used to determine the component of its thermal performance that depends on the emissivity of its external faces. The declared value derived from this standard should enable the specifier make a choice of one material compared to others measured to the same level of confidence. However, it should be remembered that the declared value is only the first step, giving comparative performance values under specified conditions, and the design value may give more information for use by the designer in specific applications, especially under different climatic conditions.

1 Scope

This standard describes a set of procedures for using existing standardised CEN or ISO test and calculation methods to determine the declared thermal performance of reflective insulation products. This standard supports and does not replace existing CEN or ISO test methods.

This standard applies to any thermal insulation product that derives a substantial portion of its claimed thermal properties from the presence of one or more reflective or low emissivity surfaces together with any associated airspaces. It does not replace the existing procedures for the determination of the thermal performance of products already standardised under CEN/TC 88 where the declared value of these products does not specifically include any claims attributable to the emissivity of the facing.

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 823, *Thermal insulating products for building applications – Determination of thickness*

EN 1946-2:1999, *Thermal performance of building products and components – Specific criteria for the assessment of laboratories measuring heat transfer properties – Measurements by guarded hot plate method*

EN 1946-3:1999, *Thermal performance of building products and components – Specific criteria for the assessment of laboratories measuring heat transfer properties – Measurements by heat flow meter method*

EN 1946-4:2000, *Thermal performance of building products and components – Specific criteria for the assessment of laboratories measuring heat transfer properties – Measurements by hot box methods*

EN 12664:2001, *Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Dry and moist products of medium and low thermal resistance*

EN 12667:2001, *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 6946, *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method (ISO 6946:2007)*

EN ISO 7345, *Thermal insulation – Physical quantities and definitions (ISO 7345:1997)*

EN ISO 9288, *Thermal insulation - Heat transfer by radiation - Physical quantities and definitions (ISO 9288:1989)*

EN ISO 8990:1994, *Thermal insulation – Determination of steady-state thermal transmission properties – Calibrated and guarded hot box (ISO 8990:1994)*

ISO 8301:1991, *Thermal insulation – Determination of steady-state thermal resistance and related properties – Heat flow meter apparatus*

ISO 8302:1991, *Thermal insulation – Determination of steady-state thermal resistance and related properties – Guarded hot plate apparatus*

3 Definitions, symbols and units

3.1 Terms and definitions

For the purposes of this standard the terms and definitions given in EN ISO 7345, EN ISO 9288 and the following apply.

3.1.1
indentation
concave depression in the surface of the facing (foil) such that shallow air pockets are created when the surface is in contact with a smooth flat plate

3.1.2
core thermal resistance
thermal resistance of the product from face to face at the tested thickness, excluding the contribution of any low emissivity outer surface or any air space adjacent to the product

3.1.3
emissivity
ratio of the energy radiated by a surface relative to the energy radiated by a blackbody at the same temperature

NOTE It is a measure of a material's ability to radiate heat.

3.2 Symbols and units

Symbol	Quantity	Unit
P	perimeter	
U	sensor signal	V
ε	emissivity	-
λ	thermal conductivity	W/(m·K)
Φ	heat flow rate	W
Ψ	linear thermal transmittance	W/(m·K)
$\Delta\theta$	temperature difference	K

Subscripts	
L	low
H	high
e	edge
sur	surround

4 Description of product types

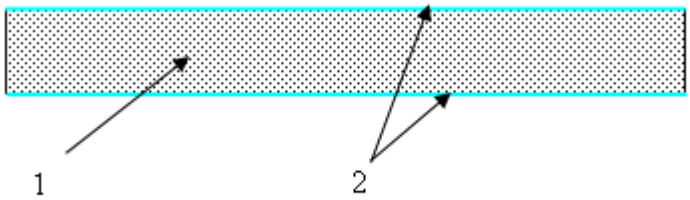
4.1 Product classification

This clause describes the various generic product types to which this standard refers. Product type is defined solely for the purpose of selecting the most appropriate test method (product type number does not refer to a generic species of product). The flow chart in Annex A further explains the process of assigning a given product to a product type.

4.2 Product Type 1

Product Type 1 has a regular geometry with parallel faces or is compressible so that the product can be contained between the apparatus hot and cold plates without significantly changing its nominal declared thermal properties. Its surfaces are smooth and flat with no discernible pattern with depth (any indentations shall be less than 2 mm).

EXAMPLE Including (but not limited to) foam insulation layer board with aluminium foil facing on each side (see Figure 1), mineral wool faced with aluminium foil, multi-foil insulation product which is stitched or seamed only at the edges and substantially flat with parallel faces.



Key

1 insulation

2 low emissivity surface or surfaces

Figure 1 — insulation board with aluminium foil facing on each side

NOTE 1 Many conventional solid insulation products such as polyurethane boards clad with reflective layers are already covered by their own product standards and, depending upon the basis of the declared performance, this standard might not be relevant.

NOTE 2 The emissivity of each of the outer surfaces can be different or the product can be faced on only one side.

4.3 Product Type 2

Product Type 2 has a regular geometry with parallel faces or is compressible so that the product can be contained between the test apparatus hot and cold plates without significantly changing its nominal declared thermal properties. Their surfaces will have indentations of less than 5 mm depth. If the indentations are greater than 5mm it is product type 3.

EXAMPLE Including, but not limited to, bubble foil insulation with aluminised surfaces (see Figure 2).

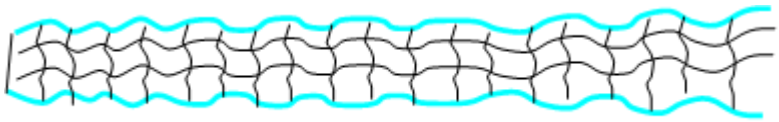


Figure 2 — Bubble foil insulation with aluminised surfaces

4.4 Product Type 3

Product Type 3 has an irregular geometry, does not have flat parallel faces, nor can it be compressed to produce flat and parallel faces without changing its nominal declared thermal properties. Its surfaces may or may not have indentations, the depth of which is not limited to any specific value.

NOTE It could include stitching or seams. A typical example would be the stitched multi-foil reflective insulation products, or sealed “pockets” or “pillows” made from reflective foil sheets. Product type 3 cannot be measured in a Guarded Hot Plate or Heat Flow Meter apparatus

4.5 Product Type 4

Product Type 4 is a thin film or sheet, less than 2 mm thickness, used singly or in multiple layers, which makes use of a low emissivity surface to increase the thermal resistance of adjacent or enclosed air spaces, but which have no significant thermal resistance of its own.

5 Methods of assessment

5.1 General

The measurement of thermal performance of insulation products requires a knowledge of the nominal declared thickness of the product together with its actual thickness (to determine the test conditions), an assessment of the surface of the material to determine the appropriate test method, and a set of commonly agreed specimen conditioning rules, temperature conditions for the hot and cold sides of the test equipment, and a set of common procedures for the mounting of the specimens in the apparatus. Other details governing the operation of test equipment for measurement of thermal resistance are defined in the relevant test standard(s). This section outlines the specific additional details that are to be considered when testing a product with reflective surfaces using one of the standard test methods, and provides guidance on the choice of the most appropriate method for the material type.

5.2 Thickness measurement

With the exception of thin single layer films or sheets, the declared thickness of all types of product which are in excess of 2 mm thickness shall be determined using the procedures in EN 823. The thickness of thin films and sheets (< 2 mm) does not need to be measured.

5.3 Conditioning and specimen preparation

Specimens shall be conditioned prior to test using the guidance in the relevant test method appropriate to the product type and as given in clause 5.9.

In the case of product supplied in compressed form, the material shall be allowed to recover fully before conditioning for test.

5.4 Determination of thermal resistance – outline

Four different methods are defined in this standard. Some methods are more appropriate than others for different forms of reflective insulation materials which have been described in section 4 of this standard. The actual measured performance using each method gives comparable performance values.

Of the four methods, three provide a measurement of thermal resistance as follows:

— METHOD A: Guarded Hot Plate Apparatus meeting the requirements of ISO 8302, EN 1946-2, EN 12664 and EN 12667;

— METHOD B: Heat Flow Meter Apparatus meeting the requirements of ISO 8301, EN 1946-3, EN 12664 and EN 12667;

— METHOD C: Hot Box Apparatus meeting the requirements of EN ISO 8990;

and the fourth method is based upon the measurement of surface emissivity:

— METHOD D: Measurement of emissivity and calculation.

The choice of method relevant for each Product Type is elaborated below, together with the flow charts in Annexes A, B and C.

5.5 Measurement of core thermal resistance of Product Type 1

5.5.1 Product thickness greater than 20 mm

5.5.1.1 Thermal resistance expected to be greater than 0.5 m²·K/W

Use either:

— METHOD A: Measure in a guarded hot plate apparatus, or

— METHOD B: Measure in a Heat flow meter apparatus.

5.5.1.2 Thermal resistance expected to be 0.5 m²·K/W or less

Use either:

— METHOD A: Measure in a guarded hot plate apparatus, or

— METHOD B: Measure in a Heat flow meter apparatus.

In each case thermocouples shall be attached to the specimen surface (using the procedures specified in EN 12664).

5.5.2 Product thickness less than or equal to 20 mm

5.5.2.1 Thermal resistance expected to be greater than 0.5 m²·K/W

Use either:

— METHOD A: Measure in a guarded hot plate apparatus using thermocouples embedded in the hot and cold plates, or

— METHOD B: Measure in a heat flow meter apparatus using the “dummy specimen” technique given in Annex E.

If thermocouples are to be fixed to aluminium or other metal foil the bare thermocouple wire shall be electrically isolated from the foil by a strip of thin adhesive tape.

5.5.2.2 Thermal resistance expected to be 0.5 m²·K/W or less

Use either:

— METHOD A: Measure in a guarded hot plate apparatus using thermocouples attached to the specimen surface (the procedures specified in EN 12664:2001 will have to be used), or

— METHOD B: Measure in a heat flow meter apparatus using the “dummy specimen” technique given in Annex E.

If thermocouples are to be fixed to aluminium or other metal foil the bare thermocouple wire shall be electrically isolated from the foil by a strip of thin adhesive tape.