SLOVENSKI STANDARD
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Toplotnoizolacijski proizvodi za stavbe - Odsevni izolacijski proizvodi (RI) - Specifikacija

Thermal insulation products for buildings - Factory made reflective insulation (RI) products - Specification

Wärmedämmstoffe für Gebäude - Werkmäßig hergestellte reflektierende Wärmedämmstoffe - Spezifikation

Produits isolants thermiques pour le bâtiment - Produits d'isolation réfléchissants manufacturés - Spécification

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ICS:

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

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Thermal insulation products for buildings - Factory made reflective insulation (RI) products - Specification

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 16863:2022) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This standard is one of a series of standards for thermal insulation products used in buildings but this standard can be used in other areas where appropriate. A list of all parts in a series can be found on the CEN website.

Introduction

Reflective insulation products are made from low emissive film(s) and infrared semi-transparent material layer(s) called spacers; like waddings of synthetic or natural fibres, synthetic foam or plastic filled with air bubbles.

Reflective (low emissivity at the appropriate wavelengths) surfaces are used to reduce the heat transfer by thermal radiation. This may occur across the product itself when it includes air cavities or a material that is wholly or partially transparent to infrared radiation, and/or across air gap(s) that are deliberately created between the external reflective surface(s) of the product and the structure of the building element.

Any product that is not covered by this product standard and it is intended to take advantage of adjacent low-emissivity air cavity(ies) may make a reference to test method EN 16012:2012+A1:2015 or its own product standard or its product specification.

1 Scope

This document covers factory-made reflective insulation (RI) products intended for use as thermal and acoustic insulation of buildings. The products are manufactured in the form of rolls or boards. They are made from low emissive film(s) and infrared semi-transparent material layer(s) or air cavities.

This document describes the methods and criteria for assessing the performance of factory-made reflective insulation products in relation to essential product characteristics and includes the procedures for assessment and verification of the constancy of performance.

Reflective insulation products require specific setup instruction(s) depending on their level of compressibility.

This document does not specify the required level of a given property to be achieved by a product to demonstrate fitness for purpose in a particular application. The levels required for a given application are to be found in regulations or non-conflicting standards.

This document does not cover:

— products intended to be used for the insulation of building equipment and industrial installations;

— products made of mineral wool, polystyrene or polyurethane foams (not inclusive) faced with aluminium or metalized foil on one or both external surfaces (which are already covered by a corresponding harmonized European product standard);

— membranes used as vapour control layer (VCL) or vapour-permeable roof or wall underlay (which are already covered by a specific harmonized European product standard).

2 Normative references

The following documents are referred to in the text in such a way that some or all 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.

EN 822:2013, *Thermal insulating products for building applications - Determination of length and width*

EN 823:2013, *Thermal insulating products for building applications - Determination of thickness*

EN 824:2013, *Thermal insulating products for building applications - Determination of squareness*

EN 826:2013, *Thermal insulating products for building applications - Determination of compression behaviour*

EN 1928:2000, *Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of watertightness*

EN 1931:2000, *Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of water vapour transmission properties*

EN 12114:2000, *Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method*

EN 12310-1:1999, *Flexible sheets for waterproofing - Part 1: Bitumen sheets for waterproofing - Determination of resistance to tearing (nail shank)*

EN 12311-1:1999, *Flexible sheets for waterproofing – Determination of tensile properties – Bitumen sheets for roof waterproofing*

EN 12431:2013, *Thermal insulating products for building applications - Determination of thickness for floating floor insulating products*

EN 13172:2012, *Thermal insulation products - Evaluation of conformity*

EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 13823:2020, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 13859-1:2014, *Flexible sheets for waterproofing - Definitions and characteristics of underlays - Part 1: Underlays for discontinuous roofing*

EN 15101-1:2013+A1:2019, *Thermal insulation products for buildings - In-situ formed loose fill cellulose (LFCI) products - Part 1: Specification for the products before installation*

EN 15715:2009, *Thermal insulation products — Instructions for mounting and fixing for reaction to fire testing — Factory made products*

EN 16012:2012+A1:2015, *Thermal insulation for buildings - Reflective insulation products - Determination of the declared thermal performance*

EN 16516:2017+A1:2020, *Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air*

EN 16733:2016, *Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering*

EN 29052-1:1992, *Acoustics - Determination of dynamic stiffness - Part 1: Materials used under floating floors in dwellings*

EN ISO 354:2003, *Acoustics - Measurement of sound absorption in a reverberation room (ISO 354:2003)*

EN ISO 1182:2020, *Reaction to fire tests for products - Non-combustibility test (ISO 1182:2020)*

EN ISO 9053-1:2018, *Acoustics - Determination of airflow resistance - Part 1: Static airflow method (ISO 9053-1:2018)*

EN ISO 1716:2018, *Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716:2018)*

EN ISO 6946:2017, *Building components and building elements - Thermal resistance and thermal transmittance - Calculation methods (ISO 6946:2017, Corrected version 2021-12)*

EN ISO 9229:2020, *Thermal insulation - Vocabulary (ISO 9229:2020)*

EN ISO 11654:1997, *Acoustics - Sound absorbers for use in buildings - Rating of sound absorption (ISO 11654:1997)*

EN ISO 11925-2:2020, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)*

EN ISO 12572:2016, *Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method (ISO 12572:2016)*

EN ISO 16535:2019, *Thermal insulating products for building applications - Determination of long-term water absorption by immersion (ISO 16535:2019)*

EN ISO 29767:2019, *Thermal insulating products for building applications - Determination of short-term water absorption by partial immersion (ISO 29767:2019)*

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229:2020 (with the exception of 3.7.15 and 3.7.16), EN 16012:2012+A1:2015 and the following apply.

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

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
reflective insulation product
RI product
product made from low emissive film(s) incorporating infrared semi-transparent material layer(s) and/or to air cavities, of which there are three types (see Figure 1 to Figure 3)

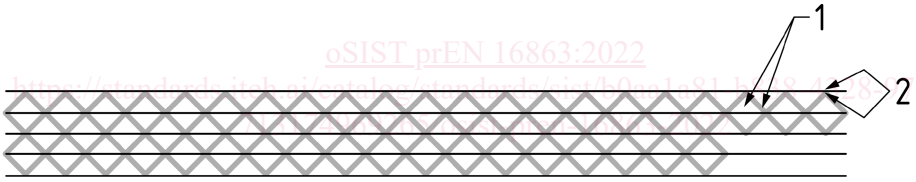

Figure 1 — Type A – Alveolar reflective insulation comprising an inner shaped foam layers combined with aluminium coated foils creating triangular shaped cavities similar to a honeycomb structure

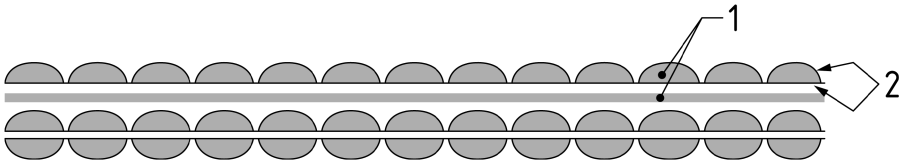

Figure 2 — Type B – Bubble foil comprising external reflective film and one or more layers of plastic filled with air bubbles, in single or several layers or separated by synthetic fibres, foam, quilt and/or wadding

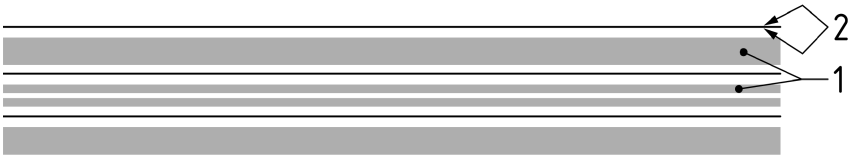

Figure 3 — Type C – Multi-foils reflective insulation comprising internal reflective film(s) separated by synthetic or natural fibres, foam, quilt, plastic filled with air bubbles and/or wadding that may be faced with external reflective foil(s)

3.1.2
roll
flexible reflective insulation product, supplied rolled or flat

3.1.3
board
rigid or semi-rigid reflective insulation product of rectangular shape and cross section in which the thickness is uniform and substantially smaller than the other dimensions

3.1.4
compressibility
measure of the relative volume change of a fluid or a solid as a response to a pressure change

3.1.5
core thermal resistance
thermal resistance of the product from face to face at the tested thickness, excluding the contribution of any air space(s)/layer(s) adjacent to the product

3.1.6
emissivity
ratio of the energy radiated from a material's surface to that radiated from a perfect emitter, known as a blackbody, at the same temperature and wavelengths and under the same viewing conditions

3.2 Symbols, units and abbreviated terms

β*	thickness difference (see thickness reduction level test in section 14.13.3)	mm
β	thickness reduction (see section 14.13.3)	%
b	width	mm
C	airflow coefficient	$m^3/(s.Pa^n)$
d	thickness	mm
d_B	thickness under a load of 2 kPa after removal of an additional load of 48 kPa	mm
d_c	compressed thickness of the product under 20 kPa	mm
d_L	thickness of the product under 250 Pa	mm
d_N	nominal thickness	mm
d_{3Pa}	thickness of the product under 3 Pa	mm
d_{25Pa}	thickness of the product under 25 Pa	mm
ε	emissivity of a surface	–
ε_i	one test result of emissivity of a surface	-

ε_{mean}	mean of a number of test results of emissivity of a surface	-
$\varepsilon_{90/90}$	90 % fractile with a confidence level of 90 % for emissivity	–
ε_{D}	declared value of emissivity	–
k	factor related to the number of test results	–
λ_D	Declared thermal conductivity for homogeneous products	W/m·K
l	length	mm
n	exponent related to air permeability	–
n	number of test results	–
$R_{90/90}$	90 % fractile with a confidence level of 90 % for the thermal resistance	m^2·K/W
$R_{\mathrm{D(core)}}$	core thermal resistance	m^2·K/W
$R_{\mathrm{(core)}}$	thermal resistance of the core	m^2·K/W
$R_{\mathrm{(HFD)}}$	total thermal resistance with heat flow downward	m^2·K/W
$R_{\mathrm{(HFH)}}$	total thermal resistance with horizontal heat flow	m^2·K/W
$R_{\mathrm{(HFU)}}$	total thermal resistance with heat flow upwards	m^2·K/W
R_{i}	one test result of thermal resistance	m^2·K/W
R_{mean}	mean of a number of test results for thermal resistance	m^2·K/W
s_{d}	water vapour diffusion-equivalent air layer thickness	m
s_{R}	estimate of the standard deviation of the thermal resistance	m^2·K/W
s_{ε}	estimate of the standard deviation of emissivity	-
S_b	deviation from squareness on length and width	-
S_d	deviation from squareness on thickness	-
σ_{mt}	tensile strength perpendicular to faces	kPa
σ_{t}	tensile strength parallel to faces	kPa
W_{lp}	long-term water absorption by partial immersion	kg/m^2
W_{p}	short-term water absorption	kg/m^2
X_t	total thickness reduction at time t	mm
Z	water vapour resistance	m^2·h·Pa/mg
AF_r	level airflow resistivity	kPa·s/m^2
αp	level of practical sound absorption coefficient	$m^3/(s \cdot Pa^n)$
αw	level of weighted sound absorption coefficient	-
CP	level for compressibility	-
μ	value for water vapour diffusion resistance factor	-
s	level of dynamic stiffness	MN/m^3
T	thickness tolerances	
TR	level for tensile strength perpendicular to faces	

4 Characteristics

4.1 Reaction to fire

The reaction to fire indicates the behaviour of the construction product in the event of fire. When tested in accordance with the test methods given in 5.1, relevant for the claimed class, the test results shall be expressed as a class in accordance with EN 13501-1:2018 and Annex A.

If a product(s) covered by this document has passed fire performance testing in accordance with the appropriate EN test methods, the established assigned class shall apply to the product(s) without carrying out further reaction to fire tests. If (a) product(s) covered by this document is/are made from one or more of the materials belonging to the “No contribution to fire” category – having passed the testing in accordance with the appropriate EN test methods – they need not be tested further.

4.2 Propensity to undergo continuous smouldering combustion

The continuous glowing combustion is the propensity of products to undergo continuous smouldering continuously when exposed to an open flame. When tested in accordance with 5.2, the results are expressed either as:

— no propensity to undergo continuous smouldering, or

— propensity to undergo continuous smouldering, or

— assessment not possible.

4.3 Water permeability

4.3.1 Short-term water absorption

Short term water absorption indicates the behaviour of products when subject to a short period of immersion in water. When tested in accordance with 5.3.1, results are expressed in kilograms per square meters.

4.3.2 Long term water absorption

Long term water absorption indicates the behaviour of products when subject to a long period of immersion in water. When tested in accordance with 5.3.2, results are expressed in kilograms per square meters.

4.3.3 Water penetration

Water penetration indicates a product’s ability to prevent or limit the passage of water through it. When tested in accordance with 5.3.3, the result is expressed as one of the “W” categories, as per Table 1.

Table 1 — Category of Water penetration

Category	Water penetration
W1	No water penetration
W2	Maximum 100 ml water passing through
W3	More than 100 ml water passing through

4.4 Water vapour diffusion resistance

Water vapour diffusion resistance indicates the resistance to water vapour diffusion.

When tested in accordance with 5.4, the property is expressed as the water vapour resistance, Z, or the water vapour diffusion resistance factor, μ, or water vapour diffusion-equivalent air layer thickness, s_d. All test results for Z, μ or s_d should be within the tolerance of the declared value.

4.5 Micro-biological growth (for products containing vegetable or animal fibre layers)

4.5.1 Mould and biological resistance

Mould and biological resistance indicate the extent to which materials might be disintegrated by microorganisms such as bacteria, algae or fungi. When tested in accordance with 5.5.2, results are expressed either as:

— no propensity to favour mould development, or

— propensity to favour mould development, or

— assessment not possible.

4.6 Release of dangerous substances to the indoor environment

Release of dangerous substances to the indoor environment refers to volatile organic compounds (VOCs), which are organic chemicals with a high vapour pressure (resulting from a low boiling point) at ordinary room temperature. This causes large numbers of molecules to evaporate or sublimate from the compound and enter the surrounding air; a trait known as volatility. VOCs are numerous, varied, and ubiquitous. When tested in accordance with 5.6, results are expressed as concentration in µg/m³.

4.7 Tensile strength parallel to faces

A product's tensile strength parallel to its faces when tested in accordance with 5.7 results are expressed as an index TR.

4.8 Resistance to tearing

A product's resistance to tearing indicates its ability to resist damage caused by exposed nails. When tested in accordance with 5.8, results are expressed in N.

4.9 Compressive resistance (only for load bearing application in floors)

A product's compressive resistance indicates the compression behaviour of test specimens as a response to changes in pressure.

In the case of load bearing applications, it indicates the ability of the product to resist damage when exposed to uniform compression loads. When tested in accordance with 5.9, results are expressed as:

— compressive strength and corresponding strain; or

— compressive stress at 10 % strain; or

— compression modulus of elasticity.

4.10 Sound absorption index (only for sound insulation application)

The sound absorption index indicates the coefficient of acoustic materials. When tested in accordance with 5.10, results are expressed as a weighted sound absorption coefficient, α_w.

4.11 Impact noise transmission index (only for sound insulation in floor application)

4.11.1 Dynamic stiffness

Dynamic stiffness indicates the dynamic rigidity of material constituting resilient products and gives a parameter by which to determine the acoustic insulation of products used in floor installations. When tested in accordance with 5.11.1, the result, *s*, is expressed in level with steps of 1 MN/m^3.

4.11.2 Compressibility

Compressibility indicates the thickness of thermal insulating products for impact sound insulation. When tested in accordance with 5.11.2, results are expressed as thickness d_L, d_F and d_B, in mm.

4.11.3 Air flow resistivity

Air flow resistivity indicates how easily air can enter a porous material and the resistance that the air flow meets thorough the material. When tested in accordance with 5.11.3, results are expressed as AF_R in levels with steps of 1 $kPa \cdot s/m^2$.

4.12 Direct airborne sound insulation index (only for sound insulation application)

4.12.1 Air flow resistivity

See 4.11.3.

4.12.2 Air flow permeability

Air flow permeability indicates the behaviour of the product when subjected to positive or negative air pressure differences. When tested in accordance with 5.12.2, results are expressed as coefficient C expressed in $m^3/(s.Pa^n)$ and exponent n for appropriate pressure differences.

4.13 Thermal resistance

4.13.1 Core thermal resistance

The core thermal resistance gives the thermal behaviour of the product from face to face at the tested thickness, excluding the contribution of any air space(s)/layer(s) adjacent to the product. When tested in accordance with 5.13.1, results are expressed as $R_{(core)}$ in $m^2.K/W$, and declared in accordance with Annex B. Examples of determination of the declared values of core thermal resistance, $R_{D(core)}$, are given in Annex C.

NOTE Measurements with a heat flow meter (METHOD A) or guarded hot plate (METHOD B) permit a direct determination of the core thermal resistance. When measured in a hot box, the core thermal resistance is deducted from the total thermal resistance by removing the thermal performance of the two vertical low emissivity air gaps.

4.13.2 Emissivity

The emissivity is defined (see 3.1.6) as the ratio of the energy radiated from the tested material's surface relative to that radiated from a perfect emitter, known as a blackbody, at the same temperature and wavelengths and under the same viewing conditions. When tested in accordance with 5.13.2, results are expressed as ε, a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter) and declared in accordance with Annex B. Examples of determination of the declared values of emissivity, ε_D, are given in Annex C.

NOTE 1 The thermal resistance of adjacent air spaces can be affected by ageing of the low emissive facing. However, initial measurements already take into account the potential ageing of the low emissivity surface.

NOTE 2 Guidance and example calculations of the thermal resistance of air cavities are given in Annex D.