



SLOVENSKI STANDARD
oSIST prEN ISO 22097:2020
01-februar-2020

Toplotnoizolacijski proizvodi za stavbe - Odsevni izolacijski proizvodi - Ugotavljanje toplotnih lastnosti (ISO/DIS 22097:2019)

Thermal insulation for buildings - Reflective insulation products - Determination of thermal performance (ISO/DIS 22097:2019)

Wärmedämmstoffe für Gebäude - Reflektierende Wärmedämm-Produkte - Bestimmung der Nennwerte der wärmetechnischen Eigenschaften (ISO/DIS 22097:2019)

ITEH STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: prEN ISO 22097
oSIST prEN ISO 22097:2020
<http://standards.iteh.ai/catalog/standards/sist/079157-08-01-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020>

ICS:

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

oSIST prEN ISO 22097:2020 **en,fr,de**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN ISO 22097:2020](https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020)

<https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020>

DRAFT INTERNATIONAL STANDARD

ISO/DIS 22097

ISO/TC 163/SC 3

Secretariat: SCC

Voting begins on:
2019-12-13Voting terminates on:
2020-03-06

Thermal insulation for buildings — Reflective insulation products — Determination of thermal performance

ICS: 91.120.10

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN ISO 22097:2020](https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020)<https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING



Reference number
ISO/DIS 22097:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN ISO 22097:2020
https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020](https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020)



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

European foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions, symbols and units	2
3.1 Terms and definitions	2
3.2 Symbols and units	3
4 Description of product types	3
4.1 Product classification	3
4.2 Product Type 1	3
4.3 Product Type 2	4
4.4 Product Type 3	4
4.5 Product Type 4	5
5 Methods of assessment	5
5.1 General	5
5.2 Thickness measurement	6
5.3 Test specimens	6
5.3.1 Size and number of specimens	6
5.3.2 Conditioning and specimen preparation	6
5.4 Determination of thermal resistance – outline	6
5.5 Determination of core thermal resistance of Product Type 1	7
5.5.1 Product thickness greater than 20 mm	7
5.5.2 Product thickness less than or equal to 20 mm	7
5.5.3 For all thicknesses and nominal thermal resistances	8
5.6 Determination of core thermal resistance of Product Type 2	8
5.6.1 Product Type 2 with surface indentations less than 2 mm in depth	8
5.6.2 Product Type 2 with surface indentations greater than or equal to 2 mm, but less than 5 mm in depth	8
5.6.3 Product Type 2 with surface indentations 5 mm in depth or greater	8
5.6.4 For all thicknesses and/or nominal thermal resistances	8
5.7 Determination of core thermal resistance of Product Type 3 (METHOD C)	8
5.7.1 Principle	8
5.7.2 Determination of the need for specimen conditioning	9
5.7.3 Air cavity and specimen installation	9
5.7.4 Hot box test conditions	11
5.7.5 Allowance for heat transfer around the specimen (edge surround)	11
5.7.6 Calculating the core thermal resistance of the product	13
5.8 Determination of the thermal performance of Product Type 4	13
5.9 Emissivity	14
5.9.1 General	14
5.9.2 Measurement of emissivity	14
6 Uncertainty	15
6.1 General	15
6.2 Thickness measurements	15
6.3 Use of thermocouples on thin samples in a guarded hot plate or in heat flow meter measurement	15
6.4 Use of dummy insulation specimens	15
6.5 Derivation of the core resistance of a Type 3 Product from hot box measurements	15
7 Expression of results	16
7.1 Results derived from hot plate and emissivity measurements (Products Type 1 & 2)	16
7.2 Results derived from hot box and emissivity measurements (Product Types 1, 2 & 3)	16
7.3 Results derived from emissivity measurements only (product Type 4)	16

ISO/DIS 22097:2019(E)

8	Report	17
Annex A (normative)	Decision making flow chart for identification of product types	18
Annex B (normative)	Selection of test methodology for product type 1 when using a hot plate method	19
Annex C (normative)	Selection of the measurement technique for product type 2	21
Annex D (normative)	Measurement of emissivity using a thermal infra-red apparatus	22
Annex E (normative)	“Dummy specimen” technique for the heat flow meter apparatus	28
	Bibliography	30

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN ISO 22097:2020](https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020)
<https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020>

European foreword

This document (prEN ISO 22087:xxxx) has been prepared by Technical Committee CEN/TC 89 “Thermal performance of buildings and building components”, the secretariat of which is held by SIS and with ISO/TC 163 under Vienna Agreement.

This document is currently submitted to the CEN Enquiry.

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 xx xxxx, and conflicting national standards shall be withdrawn at the latest by xx xxxx.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document will supersede EN 16012:2012+A1:2015.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN ISO 22097:2020](https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020)

<https://standards.iteh.ai/catalog/standards/sist/6ff79b51-9c21-4e82-9c0e-0878249266c9/osist-pren-iso-22097-2020>

Introduction

Reflective (low emissivity at the appropriate wavelength) surfaces are utilized in a number of ways to enhance the thermal performance of insulating products. Their role is to reduce the heat transfer by thermal radiation in some parts of the system. This is achieved because low emissivity surfaces reduce the radiant heat transferred through a product that is wholly or partially transparent to infrared radiation (e.g. very low-density fibrous insulation). They will also reduce the radiant heat transfer across any air gap or gaps that are present in the system. In some cases, air gaps can be an intrinsic part of the structure and in other cases the insulation can be installed in such a way as to deliberately create an air gap between the reflective surfaces and the structure.

When correctly installed in buildings, the thermal performance of reflective insulation products can be influenced quite significantly by such air gaps, hence the value of thermal performance reported from any of the test procedures should also be accompanied by a statement indicating the presence of, and sizes of, any adjacent air spaces. For maximum versatility and reduced confusion, the measured values from any test should 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. This does not preclude the provision of values indicating the total thermal resistance of a product and one or two airspaces (where relevant) as additional information, provided full details of the product and the air spaces are included. Some reflective insulation products have poorly defined thickness due to the nature of the materials and the manufacture. Care is thus needed to define the nominal thickness and/or the test thickness. When installed in buildings, the final thickness will depend upon the degree of handling and fixing – which cannot be addressed in this standard. The purpose of this standard is to provide harmonized procedures to give reproducible measured thermal performance values that can be readily compared with other thermal insulation products.

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. In the absence of any quantified and certified data on the aged performance of a facing over a normal lifetime for a building material, the ageing of the low emissivity surface is assessed by use of an accelerated ageing procedure.

How the thermal properties of insulation materials that utilize 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 utilized and specifies which 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. However, it should be remembered that the measured value is only the first step, giving comparative performance values under specified conditions, and the design value can give more information for use by the designer in specific applications, especially under different climatic conditions.

Thermal insulation for buildings — Reflective insulation products — Determination of thermal performance

1 Scope

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

This European Standard applies to any thermal insulation product that derives a proportion of its claimed thermal properties from the presence of one or more reflective or low emissivity surfaces together with any associated airspace(s). It does not replace the existing procedures for the determination of the thermal performance of products already covered by an existing harmonized product standard where the declared value of these products does not specifically include any claims attributable to the emissivity of the facing. It does not, and cannot, give an in-use or design value of thermal performance, but provides standardized information from which these may be determined.

2 Normative references

The following documents are referred to in the text in such a way that some or all of 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 823, *Thermal insulating products for building applications — Determination of thickness*

EN 1946-1, *Thermal performance of building products and components — Specific criteria for the assessment of laboratories measuring heat transfer properties — Part 1: Common criteria*

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

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

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

EN 12664, *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, *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)*

EN ISO 7345, *Thermal insulation — Physical quantities and definitions (ISO 7345)*

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

EN ISO 9229, *Thermal Insulation — Vocabulary (ISO 9229)*

ISO/DIS 22097:2019(E)

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

EN ISO 10456, *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values (ISO 10456)*

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*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms, definitions, symbols and units**3.1 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 7345, EN ISO 9288, EN ISO 9229 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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(s) 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 1 to entry: It is a measure of a material's ability to radiate heat.

3.1.4**reflective surface****low emissivity surface**

surface which has a low emissivity at the appropriate wavelength within the temperature range found in building elements

3.1.5**reflective insulation**

insulation product which has one or both external face(s) comprising a reflective (low emissivity) surface

3.2 Symbols and units

For the purposes of this standard, the following symbols and units apply.

Symbol	Quantity	Unit
P	perimeter	m
R	thermal resistance	m ² K/W
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

Symbol	Quantity
L	low
H	high
e	edge
sur	surround
90/90	90 % fractile with a confidence level of 90%

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4 Description of product types

4.1 Product classification

oSIST prEN ISO 22097:2020

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). Together with 4.2, 4.3 and 4.4, the flow charts in Annexes A, B and C shall be followed in assigning a given product to a product type.

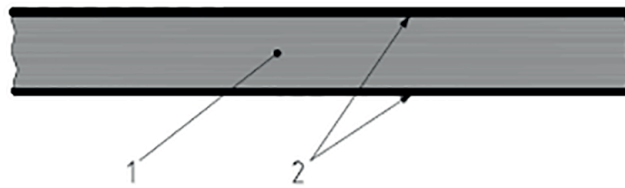
In 4.2, 4.3 and 4.4, the product type is determined by reference to its compressibility or otherwise to achieve flat parallel surfaces. This implies the removal of measurable air gaps between the specimen and the hot and cold plates of the test apparatus whilst not unduly reducing the overall thickness of the specimen to be tested.. The thickness shall be determined using the procedures in 5.2 and shall, if less than the nominal thickness, be the thickness subsequently used for the measurement of the core thermal resistance and given in the test report. Otherwise, the nominal thickness shall be used.

4.2 Product Type 1

A product shall be classified as Type 1 when it has a regular geometry with parallel faces or is compressible so that the product can be contained between, and in full contact with, the hot and cold plates of the apparatus without significantly compressing the product below its nominal thickness or the thickness measured using the procedure in Clause 5 of this standard, whichever is the lesser. This is usually achieved when its surfaces are predominantly smooth and flat with no discernible depth of pattern or indentation.

EXAMPLE Including (but not limited to) multi-foil insulation product which is stitched or seamed only at the edges and substantially flat with parallel faces (see also the limitation in Clause 1) and some other insulation materials with aluminium foil facing on each side (see Figure 1).

ISO/DIS 22097:2019(E)

**Key**

- 1 insulation core
- 2 low emissivity surface or surfaces

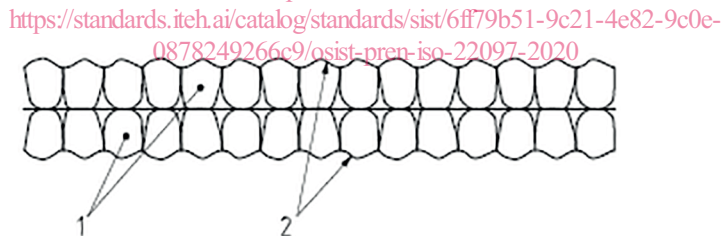
Figure 1 — Example of insulation material with reflective facing on each side

4.3 Product Type 2

A product shall be classified as Type 2 when it 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 compressing the product below its nominal thickness or the thickness measured using the procedure in [Clause 5](#) of this standard, whichever is the lesser. In addition, the surface or surfaces may not be flat and smooth and can have indentations of less than 5 mm depth when measured using the pin and plate described in EN 823, subclause B.1, or an alternative method with at least the same level of accuracy. The pin shall be placed in the lowest point of any indentation but shall not pierce the surface.

NOTE If the indentations are 5 mm or greater, it is product Type 3.

EXAMPLE Including, but not limited to, some types of bubble foil insulation with reflective surfaces (see [Figure 2](#)).

**Key**

- 1 air filled plastic bubbles
- 2 reflective surface(s)

Figure 2 — Example of bubble foil insulation with reflective surfaces

4.4 Product Type 3

A product shall be classified as Type 3 when

- it has irregular thickness geometry and does not have flat parallel faces; or
- cannot be compressed between the plates to produce flat and parallel faces free of air spaces without a significant reduction in its thickness below the nominal thickness or the thickness measured using the procedure in [Clause 5](#) of this standard, whichever is the lesser.

NOTE 1 Its surfaces might or might not have indentations, the depth of which is not limited to any specific value.

NOTE 2 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, as shown in [Figure 3](#).