

Thermal insulation for buildings - Reflective insulation products - Determination of thermal performance (ISO 22097:2023)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 22097:2023 sisaldab Euroopa standardi EN ISO 22097:2023 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 22097:2023 consists of the English text of the European standard EN ISO 22097:2023.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 28.06.2023.	Date of Availability of the European standard is 28.06.2023.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 91.120.10

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis-ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis-ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Thermal insulation for buildings - Reflective insulation
products - Determination of thermal performance (ISO
22097:2023)

Isolation thermique des bâtiments - Produits isolants
réfléchissants - Détermination de la performance
thermique (ISO 22097:2023)

Wärmedämmstoffe für Gebäude - Reflektierende
Wärmedämmprodukte - Bestimmung der
wärmetechnischen Eigenschaften (ISO 22097:2023)

This European Standard was approved by CEN on 26 May 2023.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

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

European foreword

This document (EN ISO 22097:2023) has been prepared by Technical Committee ISO/TC 163 "Thermal performance and energy use in the built environment" in collaboration with Technical Committee CEN/TC 89 "Thermal performance of buildings and building components" the secretariat of which is held by SIS.

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 December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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

This document supersedes EN 16012:2012+A1:2015.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 22097:2023 has been approved by CEN as EN ISO 22097:2023 without any modification.

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	2
3.1 Terms and definitions	2
3.2 Symbols and units	2
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	6
5.1 General	6
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	7
5.5 Determination of core thermal resistance of product Type 1	7
5.5.1 Test thicknesses	7
5.5.2 Product thickness greater than 20 mm	7
5.5.3 Product thickness less than or equal to 20 mm	8
5.5.4 For all thicknesses and nominal thermal resistances	8
5.6 Determination of core thermal resistance of Product Type 2	8
5.6.1 General	8
5.6.2 Product Type 2 with surface indentations less than 2 mm in depth	8
5.6.3 Product Type 2 with surface indentations greater than or equal to 2 mm, but less than 5 mm in depth	8
5.6.4 Product Type 2 with surface indentations 5 mm in depth or greater	8
5.6.5 For either all thicknesses or nominal thermal resistances, or both	9
5.7 Determination of core thermal resistance of product Type 3 (Method C)	9
5.7.1 Principle	9
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	12
5.7.5 Allowance for heat transfer around the specimen (edge surround)	12
5.7.6 Calculating the core thermal resistance of the product	14
5.8 Determination of the thermal performance of product Type 4	14
5.9 Emissivity	15
5.9.1 General	15
5.9.2 Measurement of emissivity	15
6 Uncertainty	16
6.1 General	16
6.2 Thickness measurements	16
6.3 Use of thermocouples on thin samples in a guarded hot plate or in heat flow meter measurement	16
6.4 Use of dummy insulation specimens	16
6.5 Derivation of the core resistance of a Type 3 product from hot box measurements	16
7 Expression of results	17

7.1	Results derived from hot plate and emissivity measurements (products Type 1 and 2)	17
7.2	Results derived from hot box and emissivity measurements (product Types 1, 2 and 3)	17
7.3	Results derived from emissivity measurements only (product Type 4)	18
8	Report	18
Annex A (normative)	Decision making flow chart for identification of product types	19
Annex B (normative)	Selection of test methodology for product type 1 when using a hot plate method	20
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

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 3, *Thermal insulation products, components and systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 89, *Thermal performance of buildings and building components*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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 infra-red radiation (e.g. very low-density fibrous insulation). They 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 either the nominal thickness or the test thickness, or both. When installed in buildings, the final thickness depends upon the degree of handling and fixing, which is not addressed in this document. The purpose of this document 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 document 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 depends on the form in which they are sold and how they are intended to be used. This document 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, 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 document 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 document supports and does not replace existing CEN or ISO test methods.

This document 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 can 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.

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

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*

ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation methods*

ISO 7345, *Thermal performance of buildings and building components — Physical quantities and definitions*

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*

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

ISO 9229, *Thermal insulation — Vocabulary*

ISO 9288, *Thermal insulation — Heat transfer by radiation — Vocabulary*

ISO 10456:2007, *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values*

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*

ISO 29466:2022, *Thermal insulating products for building applications — Determination of thickness*

3 Terms, definitions and symbols

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

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

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

3.1 Terms and definitions

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* (3.1.3) 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 document, the following symbols and units apply.