
**Thermal insulation products —
Aerogel blanket for buildings —
Specification**

*Produits isolants thermiques — Aérogels en matelas pour les
bâtiments — Spécifications*

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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*.

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.

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Introduction

Aerogel insulations are widely used globally because of their superior properties including ease of handling and effective insulating performance. Testing of aerogel insulation to meet sustainable construction needs provides users with a basis for choosing the insulation.

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Thermal insulation products — Aerogel blanket for buildings — Specification

1 Scope

This document specifies the requirements for factory-made aerogel blankets, which are used for the thermal insulation of building applications. This document specifies insulation that exhibits thermal insulating performance through high porosity and nano-sized pores by compounding aerogel with net-like fibrous material, e.g. polyester, glass fibre, ceramic fibre. The products are delivered as a blanket type.

This document describes product characteristics and includes procedures for testing, evaluation of conformity and marking and labelling.

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.

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 846:2019, *Plastics — Evaluation of the action of microorganisms*

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

ISO 12576-1, *Thermal insulation — Insulating materials and products for buildings — Conformity control systems — Part 1: Factory-made products*

ISO 12624, *Thermal insulating products for building equipment and industrial installations — Determination of trace quantities of water soluble chloride, fluoride, silicate, sodium ions and pH*

ISO 16535, *Thermal insulating products for building applications — Determination of long-term water absorption by immersion*

ISO 29465, *Thermal insulating products for building applications — Determination of length and width*

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

ISO 29469, *Thermal insulating products for building applications — Determination of compression behaviour*

ISO 29470, *Thermal insulating products for building applications — Determination of the apparent density*

ISO 29767, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the following terms and definitions 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

aerogel

insulating material that has high porosity derived from a nanoporous structure formed by replacement of the liquid component of a gel with air

3.1.2

aerogel blanket

aerogel insulation which has been made into a blanket by combining *aerogel* (3.1.1) with a flexible matrix material as carrier

3.2 Symbols and units

Symbol	Quantity	Unit
b	width	mm
L	length	mm
t	thickness	mm
λ	thermal conductivity	W/(m·K)
$\Delta\lambda_a$	ageing increment of thermal conductivity ($\lambda_a - \lambda_i$)	W/(m·K)
λ_D	declared thermal conductivity as determined by ISO 10456, and expressed with two significant digits	W/(m·K)
λ_a	time averaged value of thermal conductivity over 25 years	W/(m·K)
λ_{mean}	mean thermal conductivity	W/(m·K)
$\lambda_{\text{mean},a}$	mean of the aged values of thermal conductivity	W/(m·K)
$\lambda_{\text{mean},i}$	mean of the initial values of thermal conductivity	W/(m·K)
$\lambda_{90/90}$	90 % fractile with a confidence level of 90 % for the thermal conductivity	W/(m·K)
k_a	factor related to the number of test results of aged thermal conductivity	-
k_i	factor related to the number of test results of initial thermal conductivity	-
s_λ	estimate of the standard deviation of the thermal conductivity	W/(m·K)
$s_{\lambda,a}$	estimate of the standard deviation of the aged values of thermal conductivity	W/(m·K)
$s_{\lambda,i}$	estimate of the standard deviation of the initial values of thermal conductivity	W/(m·K)

3.3 Abbreviated terms

3.3.1 Abbreviated terms

Abbreviated term	Meaning
ABI	Aerogel blanket insulation

Abbreviated term	Meaning
ITT	Initial type test
FPC	Factory production control

3.3.2 Abbreviated terms for declared properties

Abbreviated term	Declared property
CS(Y)	Declared level for compressive strength
CS(10)	Declared level for compressive strength at 10 % deformation
Cl	Declared level for chloride content
T	Declared level for thickness

4 Requirements

4.1 General

Product properties shall be assessed in accordance with [Clause 5](#). To be in conformance with this document, products shall meet the requirements of [4.2](#) and [4.3](#), as appropriate.

The test methods for determination of each property are given in [Table 5](#), which also shows the required test specimen dimensions and the minimum number of test specimens required to give one test result.

One test result for a product property is the average of the measured values on the number of test specimens given in [Table 5](#).

4.2 For all applications

4.2.1 Linear dimensions

Length and width shall be measured in accordance with ISO 29465 for each of the four specimens.

A minimum of four measurements shall be made for each dimension. Each value shall be within the tolerances specified in [Table 1](#).

The thickness of aerogel insulation shall be measured in accordance with ISO 29466 by using a square plate under pressure of not less than 250 Pa and shall be subject to the tolerances detailed in [Table 1](#). The pressure employed during measurement shall be disclosed.

Tighter tolerances can be necessary for certain applications; this shall be agreed to by the supplier and purchaser.

Table 1 — Dimensional tolerances

Length (%)	Width (%)	Thickness (%)	
±5	±5	T1	−0 / +3
		T2	−0 / +5
		T3	−0 / +10
		T4	−0 / +15
		T5	−0 / +20
If more restrictive tolerances are required, these shall be agreed between purchaser and supplier.			

4.2.2 Density

Density shall be determined in accordance with ISO 29470 in each of the four specimens and reported as the average of the four specimens.

4.2.3 Thermal conductivity

For thermal conductivity testing, the specimen shall be conditioned according to 5.2.

Thermal conductivity shall be based upon measurements carried out in accordance with ISO 8301 or ISO 8302.

The measured values shall be expressed with three significant figures and the test mean temperatures shall be according to Table 2 (10 °C or 23 °C) depending on the usage environment and requirement.

The declared thermal conductivity shall be determined in accordance with ISO 10456.

The test method for aged value of thermal conductivity due to moisture and the test method for thermal conductivity relation to moisture content shall be carried out as specified in Annex B and Annex C.

Table 2 — Thermal conductivity category

Thermal conductivity (λ)	Test mean temperature
	10 °C
	23 °C

4.3 Specific applications

4.3.1 Reaction to fire

Application of these tests presupposes awareness of possible legislation regarding reaction to fire in the individual territories where the product is to be used. The fire properties with respect to reaction to fire should be assessed.

4.3.2 Water absorption

The test shall be conducted in accordance with the test method in ISO 29767 or in ISO 16535.

ISO 29767 specifies the equipment and procedures for determining the short-term water absorption of specimens by partial immersion.

ISO 16535 specifies the equipment and procedures for determining the long-term water absorption of test specimens.

4.3.3 Compressive strength

Compressive strength at 10 % deformation shall be determined in accordance with ISO 29469. The test result shall not be less than the declared level, CS(10\Y), given in Table 3.

One test result for a product is the average of the measured values on the number of four specimens.

The compressive strength shall be measured in the direction normal to the surface of the board.

Table 3 — Levels for compressive strength at 10 % deformation

Level	Requirement kPa
CS(10\Y)1	≥ 1