



BSI Standards Publication

**Thermal insulation for building equipment and industrial installations — Aluminosilicate wool products — Specification**

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## National foreword

This British Standard is the UK implementation of ISO 20310:2018.

The UK participation in its preparation was entrusted to Technical Committee B/540/8, Mirror committee for ISO/TC 163 - Thermal Performance and Energy use in the built Environment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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**Thermal insulation for building  
equipment and industrial  
installations — Aluminosilicate wool  
products — Specification**

*Isolation thermique pour les équipements du bâtiment et les  
installations industrielles — Produits en laine d'aluminosilicate —  
Spécifications*



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## Foreword

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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*.

# Thermal insulation for building equipment and industrial installations - Aluminosilicate wool products - Specification

## 1 Scope

This document specifies the classification, requirements and test methods for factory-made aluminosilicate wool products which are used for thermal insulation of industrial installations and building equipment, for non-refractory applications. The products are delivered as blanket, module, felt, board, paper, textile and other forms.

This document describes product characteristics and testing methods, 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 836, *Terminology for refractories*

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

[ISO 8894-1](#), *Refractory materials — Determination of thermal conductivity — Part 1: Hot-wire methods (cross-array and resistance thermometer)*

[ISO 9229](#), *Thermal insulation — Vocabulary*

[ISO 10635](#), *Refractory products — Methods of test for ceramic fibre products*

[ISO 13787](#), *Thermal insulation products for building equipment and industrial installations — Determination of declared thermal conductivity*

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

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in [ISO 9229](#), ISO 836 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 <https://www.iso.org/obp>

**3.1**  
**aluminosilicate wool**  
**ASW**

amorphous High Temperature Insulating Wool (HTIW) manufactured predominantly from molten raw minerals

Note 1 to entry: The main ingredients are  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$ , and may contain  $\text{ZrO}_2$  and  $\text{Cr}_2\text{O}_3$ .

**3.2**  
**aluminosilicate module**

*aluminosilicate wool* (3.1) blanket formed into thick sections by needling, stacking or folding sheets, compressed to a higher density and typically supplied with integral anchoring systems

**3.3**  
**aluminosilicate paper**

thin and flexible insulating material formed on a paper-making machine

## 4 Symbols and abbreviated terms

### 4.1 Symbols

$b$	width	mm
$d$	thickness	mm
$l$	length	mm
$d_N$	nominal thickness of the product	mm
$\lambda$	thermal conductivity	$\text{W}/(\text{m} \cdot \text{K})$
$\lambda_D$	declared thermal conductivity	$\text{W}/(\text{m} \cdot \text{K})$
$\rho_a$	apparent density	$\text{kg}/\text{m}^3$
$\rho_D$	nominal apparent density	$\text{kg}/\text{m}^3$

### 4.2 Abbreviated terms

ITT	initial type test
FPC	factory production control

## 5 Requirements

### 5.1 General

Product properties shall be tested in accordance with [Clause 6](#). To comply with this document, products shall meet the requirements of [5.2](#) to [5.8](#), where applicable.

The test methods to be used 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](#).

For FPC, see [Annex A](#).

## 5.2 Classification

Products shall be classified into one of six types according to the classification temperature per [Table 1](#).

**Table 1 — Type and classification temperature — unit: Celsius**

Classification	Classification temperature <sup>a</sup> °C	Recommended service temperature <sup>b</sup> °C
Type I	1 000	800
Type II	1 200	1 000
Type III	1 250	1 100
Type IV	1 350	1 200
Type V	1 400	1 250
Type VI	1 500	1 350

<sup>a</sup> The classification is determined by permanent linear change testing at the classification temperature.

<sup>b</sup> Recommended service temperatures are recommended for long-term use. Generally they are 150 °C to 200 °C lower than classification temperatures, based on actual usage and specific conditions. Service temperature of aluminosilicate wool, ceramic wool and mineral wools are given in [Annex C](#).

## 5.3 Permanent linear change

Permanent linear change upon heating shall not be greater than 4,0 %. The test temperature shall be at the classification temperature as per [Table 1](#).

## 5.4 Thermal conductivity

The manufacturer shall make declaration for the thermal conductivity  $\lambda_D$ . The table or curve of conductivity versus temperature (from 200 °C up to 1 100 °C, where applicable) shall be given according to [ISO 13787](#). Thermal conductivity shall be based upon measurements carried out in accordance with ISO 8302 up to 800°C and shall be in accordance with [ISO 8894-1](#) or [ISO 10635](#) for temperatures above 800 °C.

## 5.5 Dimensions

The length,  $l$ , and width,  $b$ , shall be determined in accordance with ISO 29465. The thickness,  $d$ , shall be determined in accordance with [ISO 10635](#). No test result shall deviate from the nominal values by more than the tolerances given in [Table 2](#).

**Table 2 — Board, blanket, felt and paper dimension tolerances**

Product type	Length tolerance	Width tolerance	Thickness	
			Nominal	Tolerance
Board	±5 mm	±5 mm	—	+3 mm -2 mm
Blanket	+∞ -0	+15 mm -2 mm	10 mm < 20 mm	+4 mm -2 mm
			≥20 mm	+8 mm -4 mm
Felt	±4 mm	±3 mm	<15 mm	+2 mm -2 mm
			≥15 mm	+3 mm -3 mm
Paper	+∞ -0	+∞ -0	< 2 mm	+0,3 mm -0,2 mm
			≥2 mm	+0,5 mm -0,5 mm

### 5.6 Apparent density

The tolerance of apparent density,  $\rho_D$ , from the nominal density,  $\rho_a$ , as measured by [ISO 10635](#) shall not be more than ±10 %.

### 5.7 Shot content

The mass of the shot content, as measured by [ISO 10635](#), with a diameter larger than 0,212 mm shall not be more than 20,0 % of the total mass.

### 5.8 Tensile strength

The tensile strength of the blanket and felt as measured by [ISO 10635](#) shall be in accordance with the requirements in [Table 3](#).

**Table 3 — Tensile strength for blanket and felt**

Nominal density kg/m <sup>3</sup>	Tensile strength kPa
<64	≥14
64 to 95	≥20
96 to 127	≥28
128 to 159	≥42
160 to 192	≥56
>192	≥70

The tensile strength of paper as measured by [ISO 10635](#) shall be in accordance with the requirements in [Table 4](#).

**Table 4 — Tensile strength of paper**

Thickness mm	Tensile strength kPa
<2,0	≥250
2,0 to 2,9	≥200
3,0 to 3,9	≥150
≥4,0	≥100

## 6 Test methods

### 6.1 Sampling

Test specimens shall be taken from the same sample, with a total area not less than 1 m<sup>2</sup>, and sufficient to cover the tests needed. The shorter side of the sample shall not be less than 300 mm or the full size of the product, whichever is the smaller.

### 6.2 Conditioning

The test specimens shall be dried at 110 °C until constant mass is reached.

The constant mass is reached when the change of mass between three consecutive weighings made 24 h apart is less than 0,1 % of the total mass (see [ISO 12570](#)). The conditioning should be noted on the test report.

### 6.3 Testing

#### 6.3.1 Test methods and specimen requirements

[Table 5](#) provides the dimensions of the test specimens, the minimum number of measurements required to obtain one test result.

Testing may be performed on unfaced/uncoated product if the facing/coating is shown to have no relevance to the test result.

**Table 5 — Test methods, test specimens and specific conditions**

Subclause		Test method	Test specimen length and width	Minimum number of measurements to get one test result
No.	Title			
<a href="#">5.4</a>	Thermal conductivity	ISO 8302, <a href="#">ISO 8894-1</a> , or <a href="#">ISO 10635</a>	ISO 8302, <a href="#">ISO 8894-1</a> or <a href="#">ISO 10635</a>	1
<a href="#">5.5</a>	Length and width	ISO 29465	Full-size	3
	Thickness	<a href="#">ISO 10635</a>	Full-size	4
<a href="#">5.6</a>	Apparent density	<a href="#">ISO 10635</a>	Full-size	1
<a href="#">5.7</a>	Shot content	<a href="#">ISO 10635</a>	<a href="#">ISO 10635</a>	3
<a href="#">5.3</a>	Permanent linear change	<a href="#">ISO 10635</a>	100 mm × 100 mm	2
<a href="#">5.8</a>	Tensile strength	<a href="#">ISO 10635</a>	230 mm × 75 mm	5

### 6.3.2 Thermal conductivity

Thermal conductivity shall be determined in accordance with ISO 8302 up to 800 °C, [ISO 8894-1](#) and [ISO 10635](#) for temperatures above 800 °C.

The thermal conductivity shall be determined for the full temperature range of the product (from 200 °C up to 1 100 °C, where applicable). For factory production control, see [Annex A](#).

Thermal conductivity shall be determined directly at measured thickness. In the event that this is not possible, it shall be determined by measurements on other thicknesses of the product provided that the product is of similar chemical and physical characteristics and is produced on the same production unit.

When measured thickness is used for testing of thermal resistance and thermal conductivity, the test thickness should be the smallest of the measured values on the test specimens (not the mean value), as far as possible to avoid any air gaps during testing.

## 7 Designation code

A designation code for the product shall be given by the manufacturer. The following shall be included except when there is no requirement for a property described in [6.3](#):

- the aluminosilicate wool abbreviated term, ASW;
- the product type;
- the classification, from I to IV;
- a table or formula of thermal conductivity for the full temperature range (See [Table 6](#));
- the nominal apparent density,  $\rho_D$ , in kg/m<sup>3</sup>;
- the nominal thickness,  $d$ , in mm;
- a reference to this document, i.e. ISO 20310.

The designation code for an ASW product is illustrated by the following example.

EXAMPLE ASW Board — Class III —  $\rho_D$  128 —  $d$  50 — ISO 20310

**Table 6 — Declaration for thermal conductivity**

Mean temperature °C	Declaration for thermal conductivity W/(m · K)
300	0,07
500	0,11
800	0,20
1 100	0,32

## 8 Product conformity

### 8.1 General

The manufacturer shall be responsible for the conformity of their product with the requirements of this document.

The manufacturer or their authorized representative shall make available, in response to a request, a certificate or declaration of conformity as appropriate. [Annex B](#) contains information on evaluation of product conformity.

## 8.2 Initial type testing

All characteristics defined in [Clause 5](#), if declared, shall be subject to initial type testing in accordance with [Annex A](#).

## 8.3 Factory production control

The minimum frequencies of tests in the factory production control shall be in accordance with [Annex A](#). When indirect testing is used, the correlation to direct testing shall be established in accordance with ISO 12576-1.

## 9 Marking and labelling

Products which refer to this document shall be marked clearly on the product, label or packaging, with the following information:

- product name or other identifying characteristic;
- name or identifying mark and address of the manufacturer or their authorized representative;
- shift, or time of production or traceability code;
- designation code as given in [Clause 7](#);
- type of facing, if any;
- number of pieces or area in the package, as appropriate.

## Annex A (normative)

### Factory production control

**Table A.1 — Minimum product testing frequencies**

Subclause		Minimum testing frequencies
No.	Title	Direct testing
<a href="#">5.3</a>	Permanent linear change	Once per week for blanket, other products once per year
<a href="#">5.4</a>	Thermal conductivity	1 time per year
<a href="#">5.5</a>	Dimension	1 per 2 h
<a href="#">5.6</a>	Apparent density	1 per 2 h
<a href="#">5.7</a>	Shot content	1 per day
<a href="#">5.8</a>	Tensile strength	Once per 4 h for blanket and paper

The minimum testing frequencies, expressed in test results, shall be understood as the minimum for each production unit/line under stable conditions. In addition to the testing frequencies given above, testing of the relevant properties of the product shall be repeated when changes or modifications are made that are likely to affect the properties of the product. For mechanical properties, the testing frequencies given are independent of the change of the product. In addition, the manufacturer shall establish rules for process adjustments related to these properties when changing the product.

## **Annex B** (informative)

### **Evaluation of conformity**

The evaluation of conformity should be carried out in accordance with the most appropriate system in ISO 12576-1 and should be based on initial type testing (ITT) and factory production control (FPC) by the manufacturer, including product assessment and tests on samples taken at the factory.

Grouping products is possible if a valid demonstration of the relation between products is given.

## Annex C (informative)

### Service temperature of aluminosilicate wool, ceramic wool and mineral wools

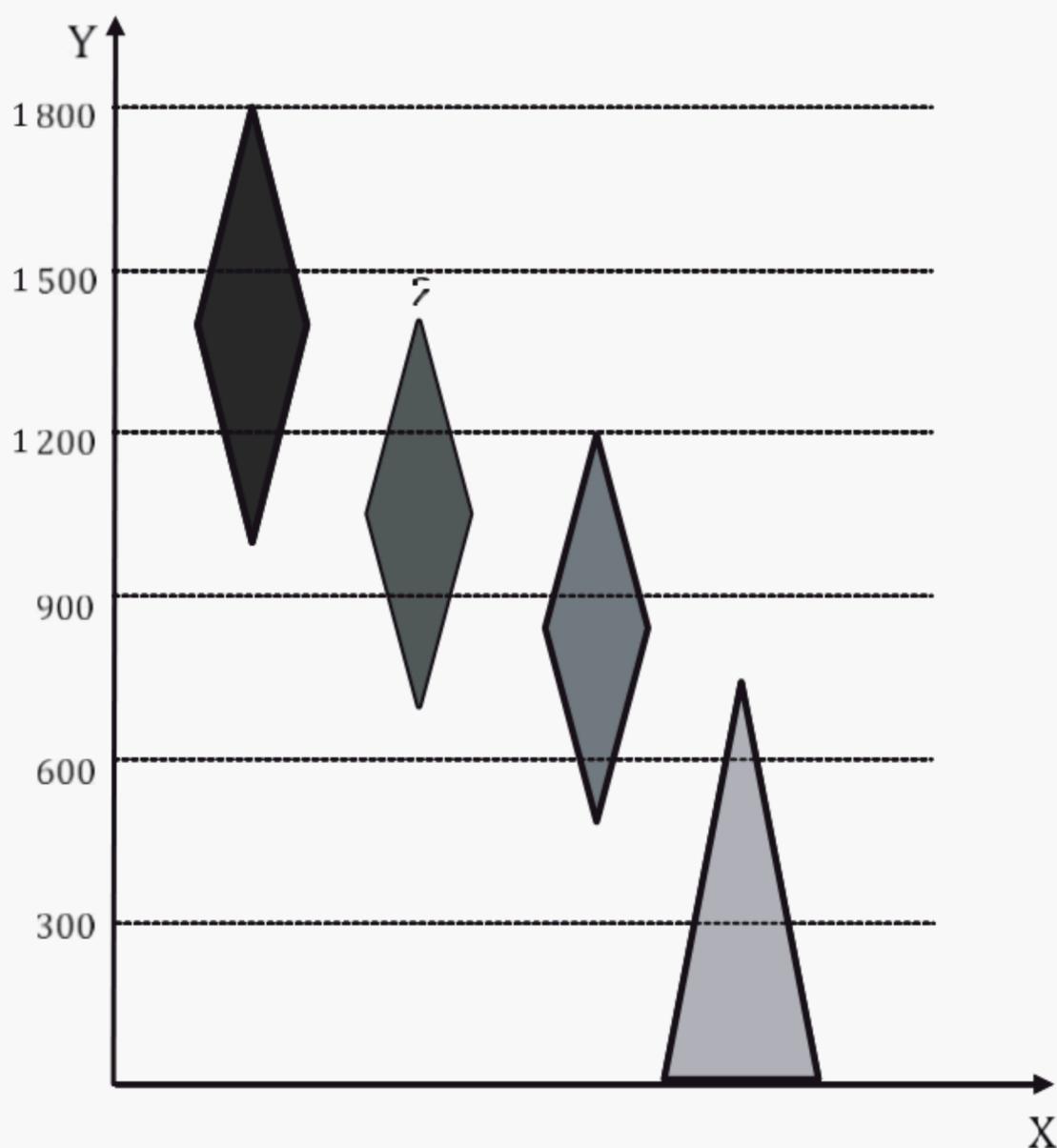


Figure C.1 — Service temperature ranges

#### Key

- X type of wool
- Y temperature
- 1 polycrystalline wool
- 2 aluminosilicate wool
- 3 alkaline-earth-silicate wool (AES)
- 4 mineral wools (glass and rock wool)

## Bibliography

- [1] [ISO 12570](#), *Hygrothermal performance of building materials and products — Determination of moisture content by drying at elevated temperature*
- [2] GB/T 16400-2015, *Aluminosilicate wool and its product for thermal insulation*
- [3] BS EN 1094-1:2008, *Insulating refractory products Part 1: Terminology, classification and methods of test for high temperature insulation wool products*

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