BS ISO 2219:2010

BSI Standards Publication

Thermal insulation products for buildings — Factory-made products of expanded cork (ICB) — Specification

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National foreword

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 2219 was prepared by Technical Committee ISO/TC 87, *Cork*, and it is based on EN 13170.

This third edition cancels and replaces the second edition (ISO 2219:1989), of which it constitutes a technical revision.

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INTERNATIONAL STANDARD ISO 2219:2010(E)

Thermal insulation products for buildings — Factory-made products of expanded cork (ICB) — Specification

1 Scope

This International Standard specifies the requirements for factory-made products of expanded cork, which are used for the thermal insulation of buildings. The products are made with granulated cork agglomerated without additional binders and are delivered as boards without facings.

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

Products covered in this International Standard are also used in prefabricated thermal insulation systems and composite panels; the performance of systems incorporating these products is not covered.

This International Standard 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.

Products with a declared thermal resistance lower than 0,25 $m^2 \cdot K/W$, at 10 °C, or a declared thermal conductivity greater than 0,060 W/(m·K), at 10 °C, are not covered in this International Standard.

2 Normative references

The following referenced documents are indispensable for the application 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 354, *Acoustics — Measurement of sound absorption in a reverberation room*

ISO 633, *Cork — Vocabulary*

ISO 1182, *Reaction to fire tests for products — Non-combustibility test*

ISO 1716, *Reaction to fire tests for products — Determination of the heat of combustion (calorific value)*

ISO 2066, *Resilient floor coverings — Determination of moisture content of agglomerated composition cork*

ISO 2191, *Cork — Expanded pure agglomerated — Deformation under constant pressure*

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 9052-1, *Acoustics — Determination of dynamic stiffness — Part 1: Materials used under floating floors in dwellings*

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ISO 9053:1991, *Acoustics — Materials for acoustical applications — Determination of airflow resistance*

ISO 9229:2007, *Thermal insulation — Vocabulary*

ISO 11654, *Acoustics — Sound absorbers for use in buildings — Rating of sound absorption*

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

ISO 12491, *Statistical methods for quality control of building materials and components*

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

ISO 29466:2008, *Thermal insulating products for building applications — Determination of thickness*

ISO 29467, *Thermal insulating products for building applications — Determination of squareness*

ISO 29468, *Thermal insulating products for building applications — Determination of flatness*

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

ISO 29471:2008, *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity)*

ISO 29472, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*

ISO 29764, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*

ISO 29765, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

ISO 29767:2008, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*

ISO 29769, *Thermal insulating products for building applications — Determination of behaviour under point load*

ISO 29770, *Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products*

EN 1606, *Thermal insulating products for building applications — Determination of compressive creep*

EN 12086, *Thermal insulating products for building applications — Determination of water vapour transmission properties*

EN 12089:1997, *Thermal insulating products for building applications — Determination of bending behaviour*

EN 12090, *Thermal insulating products for building applications — Determination of shear behaviour*

EN 13172:2008, *Thermal insulating products — Evaluation of conformity*

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

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

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 633 and ISO 9229 and the following apply.

3.1
expanded cork board
cork board
manufactured product obtained from the expansion of granulated cork, which is agglutinated exclusively with its own natural binder exuded from cork cells by heating under pressure

3.2
level
given value which is the upper or lower limit of a requirement

NOTE The level is given by the declared value of the characteristic concerned.

3.3
class
combination of two levels of the same property between which the performance shall fall

4 Symbols, units and abbreviated terms

4.1 Symbols and units

α_p	is the practical sound-absorption coefficient	—
α_w	is the weighted sound-absorption coefficient	—
b	is the width	mm
c	is the compressibility	mm
d	is the thickness under a load of (2,5 ± 0,5) kPa	mm
d_B	is the thickness under a load of 2 kPa after removal of an additional load of 48 kPa	mm
d_L	is the thickness under a load of 250 Pa	mm
d_N	is the nominal thickness of the product	mm
d_s	is the thickness of the test specimen	mm
$\Delta\varepsilon_b$	is the relative change in width	%
$\Delta\varepsilon_d$	is the relative change in thickness	%
$\Delta\varepsilon_l$	is the relative change in length	%
$\Delta\varepsilon_s$	is the relative change in flatness	mm/m
ε	is the deformation under specified compressive load and temperature conditions	mm
ε_{ct}	is the compressive creep	%

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ε_t	is the total thickness reduction	%
F_p	is the compressive force at the critical point	kN
H	is the moisture content	%
k	is a factor related to the number of test results available	—
l	is the length	mm
$\bar{\lambda}$	is the mean thermal conductivity	W/(m·K)
λ_D	is the declared thermal conductivity	W/(m·K)
λ_i	is one test result of thermal conductivity	W/(m·K)
$\lambda_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity	W/(m·K)
n	is the number of test results	—
R_D	is the declared thermal resistance	m^2·K/W
R_i	is one test result of thermal resistance	m^2·K/W
$\bar{R}$	is the mean thermal resistance	m^2·K/W
$R_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal resistance	m^2·K/W
ρ_a	is the apparent density	kg/m^3
S_b	is the deviation from squareness on length and width	mm/m
S_d	is the deviation from squareness on thickness	mm
S_{max}	is the deviation from flatness	mm
s_R	is the estimate of the standard deviation of the thermal resistance	m^2·K/W
s_λ	is the estimate of the standard deviation of the thermal conductivity	W/(m·K)
s'	is the dynamic stiffness	MN/m^3
σ_{10}	is the compressive stress at 10 % deformation	kPa
σ_b	is the bending strength	kPa
σ_c	is the declared stress (for compressive creep)	kPa
σ_{mt}	is the tensile strength perpendicular to faces	kPa
W_p	is the short-term water absorption	kg/m^2
τ	is the shear strength	kPa
Z	is the water-vapour resistance	m^2·h·Pa/mg

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4.2 Abbreviated terms and symbols used in designations

AF_r	is the declared level of air-flow resistance
AP	is the declared level of practical sound-absorption coefficient
AW	is the declared level of weighted sound-absorption coefficient
CC(i_1/i_2 %/y) σ_c	is the declared level for compressive creep
CP	is the declared level for compressibility
CS(10)	is the declared level for compressive stress at 10 % deformation
DS(TH)	is the level for dimensional stability under specified temperature and humidity conditions
DS(T+)	is the declared value for dimensional stability at a specified temperature
DLT	is the declared value for the deformation under specified load and temperature
L	is the declared class for length tolerances
PL(P)	is the declared level of point load at the critical point
SD	is the declared level for dynamic stiffness
T	is the declared class for thickness tolerances
TR	is the declared level for tensile strength perpendicular to faces
W	is the declared class for width tolerances
WS	is the declared level for short-term water absorption
Z	is the declared value for water-vapour resistance
i	is the letter used in the designation code to indicate the relevant class or level of a declared property
y	is the letter used in the designation code to indicate the number of years for extrapolation (compressive creep)
ICB	expanded insulation cork board
ITT	initial type test

5 Requirements

5.1 General

Product properties shall be assessed in accordance with Clause 6. To comply with this International Standard, products shall meet the requirements of 5.2 and of 5.3, as appropriate.

One test result for a product property is the average of the measured values on the number of specimens given in Table 6.

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5.2 For all applications

5.2.1 Thermal resistance and thermal conductivity

Thermal resistance and thermal conductivity shall be based upon measurements carried out in accordance with ISO 8302 or ISO 8301 for thick products.

The thermal resistance and thermal conductivity shall be determined in accordance with the procedures given in Annex A and declared by the manufacturer according to the following.

— The reference mean temperature shall be 10 °C.

— The measured values shall be expressed with three significant figures.

— For products of uniform thickness, the thermal resistance, R_D, shall always be declared. The thermal conductivity, λ_D, shall be declared where possible. Where appropriate, for products of non-uniform thickness (i.e. for sloped and tapered products), only the thermal conductivity, λ_D, shall be declared.

— The declared thermal resistance, R_D, and the declared thermal conductivity, λ_D shall be given as limit values representing at least 90 % of the production, determined with a confidence level of 90 %.

— The value of the thermal conductivity, $\lambda_{90/90}$, shall be rounded up to the nearest 0,001 W/(m·K) and declared as λ_D, in levels with steps of 0,001 W/(m·K).

— The declared thermal resistance, R_D, shall be calculated from the nominal thickness, d_N, and the corresponding thermal conductivity, $\lambda_{90/90}$.

— The value of the thermal resistance, $R_{90/90}$ (when calculated from the nominal thickness, d_N, and the corresponding thermal conductivity, $\lambda_{90/90}$) shall be rounded down to the nearest 0,05 m^2·K/W, and declared as R_D, in levels with steps of 0,05 m^2·K/W.

— The value of $R_{90/90}$, for those products for which only the thermal resistance is measured directly, shall be rounded down to the nearest 0,05 m^2 K/W and declared as R_D in levels with steps of 0,05 m^2·K/W.

Examples of the determination of declared values of thermal resistance, R_D, and thermal conductivity, λ_D, are given in Annex C.

5.2.2 Length and width

The length, l, and width, b, shall be determined in accordance with ISO 29465. No test result shall deviate from the nominal values by more than the tolerances given in Tables 1 and 2 for the declared classes.

Table 1 — Classes for length tolerances

Class	Tolerances mm
L1	±3
L2	±5

Table 2 — Classes for width tolerances

Class	Tolerances mm
W1	±2
W2	±3

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The commonly used linear dimensions of ICB boards are

— length: 1 000 mm, and

— width: 500 mm.

5.2.3 Thickness

The thickness, d, shall be determined in accordance with ISO 29466:2008, method B.2, under a pressure of (2,5 ± 0,5) kPa. No test result shall deviate from the nominal thickness, d_N, by more than the tolerances given in Table 3 for the declared class.

Table 3 — Classes for thickness tolerances

Class	Thickness, d	Tolerances
T1	20 mm $\leqslant d \leqslant$ 50 mm	±1 mm
T2	$d >$ 50 mm	±2 %, maximum ±2 mm

5.2.4 Squareness

The squareness shall be determined in accordance with ISO 29467. The deviation from squareness on length and width, S_b, shall not exceed 4 mm/m. The deviation from squareness on thickness, S_d, shall not exceed 2 mm.

5.2.5 Flatness

The flatness shall be measured according to ISO 29468. The deviation from flatness, S_{max}, shall not exceed 2 mm.

5.2.6 Dimensional stability

5.2.6.1 Dimensional stability under constant normal laboratory conditions

The dimensional stability under constant normal laboratory conditions (temperature 23 °C/relative humidity 50 %) shall be determined in accordance with ISO 29471 after storage for 48 h. The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed 0,5 %; the relative change in flatness, $\Delta\varepsilon_s$, shall not exceed 1 mm/m.

5.2.6.2 Dimensional stability under specified temperature and humidity conditions

The dimensional stability under specified temperature and humidity conditions shall be determined in accordance with ISO 29472. The test shall be carried out after storage for 48 h at a temperature of (23 ± 2) °C and a relative humidity of (90 ± 5) %. The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed 0,5 %; the relative change in thickness, $\Delta\varepsilon_d$, shall not exceed 1 %.

This test shall not be performed when the more severe test described in 5.3.2.2 is used.

5.2.7 Bending strength

The bending strength, σ_b, shall be determined in accordance with EN 12089:1997, method B. For handling purposes, the bending strength shall not be lower than 130 kPa.

5.2.8 Reaction to fire

The reaction to fire classification (Euroclasses) shall be determined in accordance with EN 13501-1.

5.2.9 Durability characteristics

5.2.9.1 General

The appropriate durability characteristics have been considered and are covered in 5.2.9.2, 5.2.9.3 and 5.2.9.4.

5.2.9.2 Durability of reaction to fire against ageing/degradation

The reaction to fire performance of products of expanded cork does not change with time.

5.2.9.3 Durability of thermal resistance against ageing/degradation

The thermal conductivity of products of expanded cork does not change with time. This is covered in 5.2.1 for thermal conductivity, 5.2.2 for length and width, and 5.2.6 or 5.3.2 for dimensional stability.

5.2.9.4 Durability of compressive strength against ageing/degradation

The durability of compressive strength is covered in 5.3.7 (compressive creep).

5.2.10 Moisture content

Moisture content, H, shall be determined in accordance with ISO 2066. The product shall be protected from rain during storage. Under these conditions, no test result shall exceed a mass fraction of 8 %.

5.2.11 Apparent density

The apparent density, ρ_a, shall be determined in accordance with ISO 29470. The product shall be protected from rain during storage. Under these conditions, no test result shall exceed 130 kg/m^3.

5.3 For specific applications

5.3.1 General

If there is no requirement for properties described in this subclause for a product in use, then the property does not need to be determined and declared by the manufacturer.

5.3.2 Dimensional stability under specified conditions

5.3.2.1 Dimensional stability at specified temperature

The dimensional stability at specified temperature shall be determined in accordance with ISO 29472. The test shall be carried out after storage for 48 h at (70 ± 2) °C. The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed 0,5 %. The relative change in thickness, $\Delta\varepsilon_d$, shall not exceed 1 %.

5.3.2.2 Dimensional stability under specified temperature and humidity conditions

The dimensional stability under specified temperature and humidity conditions shall be determined in accordance with ISO 29472. The test shall be carried out after storage for 48 h at a temperature of (70 ± 2) °C and a relative humidity of (90 ± 5) %. The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed 0,5 %. The relative change in thickness, $\Delta\varepsilon_d$, shall not exceed 1 %.

5.3.3 Deformation under specified compressive load and temperature

The deformation under specified load and temperature conditions, ε, shall be carried out in accordance with ISO 29764. No test result shall be greater than the declared level, DLT.

5.3.4 Compressive stress at 10 % deformation

The compressive stress at 10 % deformation, σ_{10}, shall be determined in accordance with ISO 2191. No test result shall be lower than the value given in Table 4 for the declared level.

Table 4 — Levels for compressive stress at 10 % deformation

Level	Requirement kPa
CS(10) 90	$\geqslant$ 90
CS(10)100	$\geqslant$ 100
CS(10)110	$\geqslant$ 110

5.3.5 Tensile strength perpendicular to faces

The tensile strength perpendicular to the faces, σ_{mt}, shall be determined in accordance with ISO 29765. The value of tensile strength shall be declared in steps of 10 kPa. No test result shall be lower than the value given in Table 5 for the declared level.

Table 5 — Levels for tensile strength perpendicular to faces

Level	Requirement kPa
TR 40	$\geqslant$ 40
TR 50	$\geqslant$ 50
TR 60	$\geqslant$ 60

5.3.6 Point load

The compressive force at the critical point, F_p, shall be determined in accordance with ISO 29769 and declared in levels with steps of 50 N. No test result shall be lower than the declared level, PL(P).

5.3.7 Compressive creep

Compressive creep, ε_{ct}, and total thickness reduction, ε_t, shall be determined after at least 122 days of testing at a declared stress, σ_c, given in steps of at least 1 kPa, and the results shall be extrapolated 30 times to obtain the declared levels in accordance with EN 1606. The compressive creep shall be declared in levels, i_2, and the total thickness reduction shall be declared in levels, i_1, with steps of 0,5 % at the declared stress. No test result shall exceed the declared levels.

EXAMPLE For the declaration of levels for compressive creep:

Level	Test time days	Extrapolation time years	Declared stress kPa	Requirement %
CC (i_1/i_2 %/10) σ_c	122	10	σ_c	$i_1/i_2 \leqslant i$
CC (i_1/i_2 %/25) σ_c	304	25	σ_c	$i_1/i_2 \leqslant i$
CC (i_1/i_2 %/50) σ_c	608	50	σ_c	$i_1/i_2 \leqslant i$

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NOTE Referring to the designation code CC(i_1/i_2/y) σ_c in Clause 7, a declared level CC(2,5/2/10)50, for example, indicates a value not exceeding 2 % for compressive creep and 2,5 % for a total relative thickness reduction after extrapolation at 10 years (i.e. 30 times 122 days of testing) under a declared stress of 50 kPa.

5.3.8 Shear strength

The shear strength, τ, shall be determined in accordance with EN 12090. No test result shall be lower than 50 kPa.

5.3.9 Water absorption

The short-term water absorption by partial immersion, W_p, shall be determined in accordance with ISO 29767:2008, method A. No test result shall exceed 0,5 kg/m^2.

5.3.10 Water-vapour transmission

Water-vapour transmission properties shall be determined in accordance with EN 12086 and declared as the water-vapour resistance, Z. No test result shall be less than the declared value, Z.

5.3.11 Dynamic stiffness

The dynamic stiffness, s', shall be determined in accordance with ISO 9052-1, without pre-loading. The value of dynamic stiffness shall be declared in levels with steps of 1 MN/m^3. No test result shall exceed the declared level, SD.

For products having a declared level of compressibility (see 5.3.12.3) lower or equal to 2 mm, if the imposed load exceeds 5,0 kPa, the dynamic stiffness shall be determined under the imposed load plus the self-weight of the screed.

5.3.12 Compressibility

5.3.12.1 Thickness, d_L

The thickness under a load of 250 Pa, d_L, shall be determined in accordance with ISO 29770. No test result shall deviate from the nominal thickness, d_N, by more than the tolerances given in Table 3 for the labelled class.

5.3.12.2 Thickness, d_B

The thickness, d_B, shall be determined in accordance with ISO 29770 with a pause of 120 s before measuring d_B.

5.3.12.3 Compressibility, c

The compressibility, c, shall be determined as the difference between d_L and d_B and declared in levels with steps of 1 mm. No test result shall exceed the declared level, CP.

5.3.12.4 Long-term thickness reduction

If the imposed load on the screed exceeds 5,0 kPa, only products having a declared level of compressibility lower or equal to 2 mm shall be used and their long-term thickness reduction shall be determined.

NOTE The levels of the imposed load on the screed are taken from ENV 1991-2-1[2].

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The total relative thickness reduction, ε_t, shall be determined after 122 days of testing at the imposed load plus the self-weight of the screed, in accordance with EN 1606, and extrapolated 30 times, corresponding to 10 years. The 10-year value shall not exceed the declared level of compressibility c (see 5.3.12.3).

5.3.13 Sound absorption

The sound absorption coefficient shall be determined in accordance with ISO 354. The sound-absorption characteristics shall be calculated in accordance with ISO 11654 using the values for the practical sound-absorption coefficient, α_p, at the frequencies: 125 Hz, 250 Hz, 500 Hz, 1 000 Hz, 2 000 Hz and 4 000 Hz, and the single number value for the weighted sound-absorption coefficient α_w.

The values of α_p and α_w shall be rounded to the nearest 0,05 and declared in levels with steps of 0,05. No test result of α_p and α_w shall be lower than the declared level, AP and AW, respectively.

5.3.14 Air-flow resistance

The air-flow resistance, AF_r, shall be determined in accordance with ISO 9053:1991, Method A. The value of air-flow resistance shall be declared in levels with steps of 1 kPa·s/m^3. No test result shall be lower than the declared value.

5.3.15 Release of dangerous substances

A test method covering continuous glowing combustion is under development and this International Standard will be amended when it is available.

6 Test methods

6.1 Sampling

Test specimens shall be taken from the same sample, formed by at least five boards (2,5 m^2) and sufficient to cover the required tests. For each test, one test specimen shall be taken out per board, at a minimum distance of 50 mm from the edges.

6.2 Conditioning

Prior to testing and unless otherwise stated in the test method concerned, test specimens shall be stored at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) % for at least 24 h. Before the determination of the moisture content, no conditioning shall be carried out.

6.3 Procedure

6.3.1 General

Table 6 gives the dimensions of the test specimens, the minimum number of measurements required to get one test result and any specific conditions, when necessary.

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Table 6 — Test methods, test specimens and specific conditions

Dimensions in millimetres

Subclause		Test method	Test specimen length and width[a]	Minimum number of measurements to get one test result	Specific conditions
No.	Title				
5.2.1	Thermal resistance and thermal conductivity	ISO 8302 or ISO 8301	See ISO 8302 or ISO 8301	1	—
5.2.2	Length and width	ISO 29465	Full-size board	3	—
5.2.3	Thickness	ISO 29466:2008	Full-size board	3	Method in B.2 pressure of (2,5 ± 0,5) kPa
5.2.4	Squareness	ISO 29467	Full-size board	3	—
5.2.5	Flatness	ISO 29468	Full-size board	3	—
5.2.6	Dimensional stability under constant normal laboratory conditions	ISO 29471:2008	Full-size board or 200 × 200	3	Method A
	Dimensional stability under specified temperature and humidity conditions	ISO 29472	Full-size board or 200 × 200	3	—
5.2.7	Bending strength	EN 12089:1997	$150 \times (5 \times d_N)$	5	Method B
5.2.8	Reaction to fire	See EN 13501-1			—
5.2.10	Moisture content	ISO 2066	200 × 200 or 300 × 300 or 500 × 500	5	—
5.2.11	Apparent density	ISO 29470	Full-size board	5	—
5.3.2.1	Dimensional stability at specified temperature	ISO 29472	Full-size board or 200 × 200	3	—
5.3.2.2	Dimensional stability under specified temperature and humidity conditions	ISO 29472	Full-size board or 200 × 200	3	—
5.3.3	Deformation under specified compressive load and temperature	ISO 29764	100 × 100	5	—
5.3.4	Compressive stress at 10 % deformation	ISO 2191	100 × 100	3	—
5.3.5	Tensile strength perpendicular to faces	ISO 29765	100 × 100 or 200 × 200	5	—
5.3.6	Point load	ISO 29769	300 × 300	5	—
5.3.7	Compressive creep	EN 1606	100 × 100	3	—
5.3.8	Shear strength	EN 12090	250 × 50 or 250 × 100	5	—
5.3.9	Water absorption	ISO 29767:2008	200 × 200	3	Method A
5.3.10	Water-vapour transmission	EN 12086	100 × 100	5	[b]
5.3.11	Dynamic stiffness	ISO 9052-1	200 × 200	3	—

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Table 6 (*continued*)

Dimensions in millimetres unless otherwise specified

Subclause		Test method	Test specimen length and width[a]	Minimum number of measurements to get one test result	Specific conditions
No.	**Title**				
5.3.12	Thickness, d_L	ISO 29770	200 × 200	3	—
	Thickness, d_B				—
	Long-term thickness reduction	EN 1606	200 × 200	3	—
5.3.13	Sound absorption	ISO 354	Minimum 10 m^2	1	To be reported
5.3.14	Air-flow resistance	ISO 9053:1991	Apparatus dependent	3	Method A
5.3.15	Release of dangerous substances	[c]	—	—	—

[a] Full-size product thickness except for 5.2.8.

[b] Exception: when testing products with a water-vapour barrier, in accordance with EN 12086, the specimen thickness to measure is equal to the water-vapour barrier thickness plus 2 mm to 3 mm.

[c] Not yet available.

6.3.2 Thermal resistance and thermal conductivity

Thermal resistance and thermal conductivity shall be determined in accordance with ISO 8302 or ISO 8301 for thick products and under the following conditions:

— at a mean temperature of (10 ± 0,3) °C;

— after conditioning in accordance with 6.2.

NOTE Thermal resistance and thermal conductivity can also be measured at mean temperatures other than 10 °C, providing that the accuracy of the relationship between temperature and thermal properties is documented.

Thermal resistance and thermal conductivity shall be determined directly at a measured thickness. In the event that this is not possible, they shall be determined by measurements on other thicknesses of the product, providing that

— the product is of similar chemical and physical characteristics and is produced on the same production unit, and

— it can be demonstrated, in accordance with ISO 8301, that the thermal conductivity does not vary by more than 2 % over the range of thicknesses where the calculation is applied.

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 5.3:

— the expanded insulation cork board abbreviated term ICB;

— this International Standard number: ISO 2219;

— thickness tolerances Ti;

— dimensional stability at specified temperature DS(T+);

— dimensional stability under specified temperature and humidity conditions DS(TH);

— compressive stress at 10 % deformation CS(10)i;

— tensile strength perpendicular to faces TRi;

— point load PL(P)i;

— compressive creep CC(i_1/i_2/y) σ_c;

— short-term water absorption WS;

— water-vapour resistance Zi;

— dynamic stiffness SDi;

— compressibility CPi;

— practical sound-absorption coefficient APi;

— weighted sound-absorption coefficient AWi;

— air-flow resistance AF_r.

EXAMPLE The designation code for products of expanded cork is illustrated by the following example:

ICB – ISO 2219 – T2 – DS(T+) – CS(10)100 – TR50 – PL(P)200 – WS – Z1 – SD15

NOTE The characteristics determined in 5.2 are not included in the designation code if a limit value (threshold value) is given for the product.

8 Evaluation of conformity

The manufacturer, or his authorized representative, shall be responsible for the conformity of his product with the requirements of this International Standard. The evaluation of conformity shall be carried out in accordance with EN 13172 and shall be based on initial type testing (ITT), factory-production control (FPC) by the manufacturer, including product assessment and tests on samples taken at the factory.

The compliance of the product with the requirements of this International Standard and with the stated values (including classes) shall be demonstrated by

— initial type testing (ITT), or

— factory-production control by the manufacturer, including product assessment.

If a manufacturer decides to group his products into product groups, this shall be done in accordance with the requirements of EN 13172.

The minimum frequencies of tests in the factory production control shall be in accordance with Annex B. When indirect testing is used, the correlation to direct testing shall be established in accordance with EN 13172.

The manufacturer or his authorized representative shall make available, in response to a request, a certificate or a declaration of conformity, as appropriate.

All characteristics defined in 5.2, and those in 5.3, where required, shall be subject to an initial type testing.

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9 Marking and labelling

Products conforming to this International Standard shall be clearly marked, either on the product or on a label or on the packaging, with the following information:

— product name or other identifying characteristic;

— a reference to this International Standard, i.e. ISO 2219:2010;

— name or identifying mark and address of the manufacturer or his authorized representative;

— shift or time of production and manufacturing plant or traceability code;

— reaction to fire class;

— declared thermal resistance;

— declared thermal conductivity;

— nominal thickness;

— designation code, as given in Clause 7;

— type of facing, if any;

— nominal length, nominal width;

— number of boards and area in the package, as appropriate.

10 Packaging and storage

The packaging shall ensure that the product will be stored, transported and delivered while being protected from rain and atmospheric humidity.

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Annex A
(normative)

Determination of the declared values of thermal resistance and thermal conductivity

A.1 Introduction

It is the responsibility of the manufacturer to determine the declared values of thermal resistance and thermal conductivity. He will have to demonstrate conformity of the product to its declared values. The declared values of thermal resistance and thermal conductivity of a product are the expected values of these properties during an economically reasonable working life under normal conditions, assessed through measured data at reference conditions.

A.2 Input data

In order to calculate the declared values, the manufacturer shall have at least 10 test results for thermal resistance or thermal conductivity, obtained from internal or external direct measurements. These measurements shall be carried out at regular intervals, spread over a period of the last 12 months. If fewer than 10 test results are available, that period may be extended until 10 results are obtained, but in a maximum period of three years, within which the product and production conditions have not changed significantly.

For new products, the 10 thermal resistance or thermal conductivity test results shall be obtained spread over a minimum period of 10 days.

The declared values shall be calculated according to the method given in A.3 and shall be recalculated at intervals not exceeding 3 months of production.

A.3 Declared values

The derivation of the declared values, R_D and λ_D, from the calculated values, $R_{90/90}$ and $\lambda_{90/90}$, shall use the rules given in 5.2.1 which include the rounding conditions.

A.3.1 Case where both thermal resistance and thermal conductivity are declared

The declared values, R_D and λ_D, shall be derived from the calculated values, $R_{90/90}$ and $\lambda_{90/90}$, which are determined using Equations (A.1), (A.2) and (A.3).

$$\lambda_{90/90} = \bar{\lambda} + k \times s_\lambda \tag{A.1}$$

$$s_\lambda = \sqrt{\frac{\sum_{i=1}^{n}\left(\lambda_i - \bar{\lambda}\right)^2}{n-1}} \tag{A.2}$$

$$R_{90/90} = d_N/\lambda_{90/90} \tag{A.3}$$

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A.3.2 Case where only thermal resistance is declared

The declared value, R_D, shall be derived from the calculated value, $R_{90/90}$, which is determined using Equations (A.4) and (A.5).

$$R_{90/90} = \overline{R} - k \times s_R \tag{A.4}$$

$$s_R = \sqrt{\frac{\sum_{i=1}^{n}\left(R_i - \overline{R}\right)^2}{n-1}} \tag{A.5}$$

Table A.1 — Values for k for a one-sided 90 % tolerance interval with a confidence level of 90 %

Number of test results	k[a]
10	2,07
11	2,01
12	1,97
13	1,93
14	1,90
15	1,87
16	1,84
17	1,82
18	1,80
19	1,78
20	1,77
22	1,74
24	1,71
25	1,70
30	1,66
35	1,62
40	1,60
45	1,58
50	1,56
100	1,47
300	1,39
500	1,36
2 000	1,32

[a] For other values of test results, use ISO 12491 or linear interpolation.

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Annex B
(normative)

Factory-production control

Table B.1 — Minimum product testing frequencies

Subclause		Minimum testing frequencies [a]		
No.	Title	Direct testing	Indirect testing	
			Test method	Frequency
5.2.1	Thermal resistance and thermal conductivity	1 per 3 months and indirect testing	Apparent density	1 per 2 h
5.2.2	Length and width	1 per 2 h	—	—
5.2.3	Thickness	1 per 2 h	—	—
5.2.4	Squareness	1 per 4 h	—	—
5.2.5	Flatness	1 per 8 h	—	—
5.2.6	Dimensional stability under normal laboratory conditions	1 per 6 months	—	—
	Dimensional stability under specified temperature and humidity conditions	1 per 6 months	—	—
5.2.7	Bending strength	1 per month and indirect testing	Manufacturer's method	1 per 24 h
5.2.8	Reaction to fire	See Table B.2	See Table B.2	See Table B.2
5.2.10	Moisture content	1 per week and indirect testing	Manufacturer's method	1 per 24 h
5.2.11	Apparent density	1 per 2 h	—	—
5.3.2	Dimensional stability at specified temperature	1 per 6 months	—	—
	Dimensional stability under specified temperature and humidity conditions	1 per 6 months	—	—
5.3.3	Deformation under specified compressive load and temperature	ITT [b]	—	—
5.3.4	Compressive stress at 10 % deformation	1 per month and indirect testing	Manufacturer's method	1 per 24 h
5.3.5	Tensile strength perpendicular to faces	1 per 3 months	—	—
5.3.6	Point load	ITT [b]	—	—
5.3.7	Compressive creep	ITT [b]	—	—
5.3.8	Shear strength	ITT [b] + 1 per year	—	—
5.3.9	Water absorption	ITT [b] + 1 per year	—	—
5.3.10	Water-vapour transmission	ITT [b] + 1 per year	—	—
5.3.11	Dynamic stiffness	ITT [b]	—	—

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Table B.1 (*continued*)

Subclause		Minimum testing frequencies [a]		
No.	Title	Direct testing	Indirect testing	
			Test method	Frequency
5.3.12	Thickness, d_L	ITT [b]	—	—
	Thickness, d_B	ITT [b]	—	—
	Long-term thickness reduction	ITT [b]	—	—
5.3.13	Sound absorption	ITT [b]	—	—
5.3.14	Air-flow resistance	ITT [b]	—	—
5.3.15	Release of dangerous substances	[c]	—	—

[a] 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 conformity 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.

[b] ITT: see EN 13172.

[c] Frequencies are not given, as test methods are not available.

Table B.2 — Minimum product testing frequencies for the reaction to fire characteristics

Subclause		Minimum testing frequency [a]							
No.	Title	Direct testing [b]		Indirect testing [c]					
5.2.8	Reaction to fire			Product		Components [d,e]			
						Substantial		Non-substantial	
	Class	Test method	Frequency	Test method	Frequency	Test method	Frequency	Test method	Frequency
	A1 without testing [f]	—	—	—	—	—	—	—	—
				—	—	—	—	—	—
	A1	ISO 1182 and ISO 1716 (and EN 13823)	1 per 2 years and indirect testing	—	—	Loss on ignition Apparent density	1 per 4 h 1 per h	Loss on ignition or calorific potential and weight per unit area	1 per 4 h 1 per h
	A2	ISO 1182 or ISO 1716 (and EN 13823)	1 per 2 years and indirect testing	—	—	Loss on ignition Apparent density	1 per 4 h 1 per h	Loss on ignition or calorific potential and weight per unit area	1 per 4 h 1 per h

Table B.2 (*continued*)

Subclause		Minimum testing frequency [a]							
No.	Title	Direct testing [b]		Indirect testing [c]					
5.2.8	Reaction to fire			Product		Components [d,e]			
						Substantial		Non-substantial	
	Class	Test method	Frequency	Test method	Frequency	Test method	Frequency	Test method	Frequency
	B C D	EN 13823 and ISO 11925-2	1 per month or 1 per 2 years and indirect testing[g]	—	—	—	—	—	—
				Manufacturer's method	1 per day	Loss on ignition Apparent density	1 per 4 h 1 per h	Loss on ignition or calorific potential and weight per unit area	1 per 4 h 1 per h
			1 per week or 1 per 2 years and indirect testing	—	—	—	—	—	—
				Manufacturer's method	1 per day	—	—	—	—
	E	ISO 11925-2	1 per week or 1 per 2 years and indirect testing	—	—	—	—	—	—
				Manufacturer's method	1 per day	—	—	—	—
	F	—	—	—	—	—	—	—	—

NOTE Not all Euroclasses can apply for the products conforming to this International Standard.

[a] The minimum testing frequencies, expressed in test results, shall be understood as the minimum for a product or product group for each production unit/line under stable conditions. In addition to the testing frequencies given in this table, testing of relevant properties of the product shall be repeated when changes or modifications are made that are likely to affect the conformity of the product.

[b] Direct testing may be conducted either by a third party or by the manufacturer.

[c] Indirect testing may be either on the product or on its components.

[d] Definition as given in the Euroclasses Decision 2000/147/EC[3]:

— Substantial component: A material that constitutes a significant part of a non-homogeneous product. A layer with a mass per unit area $\geqslant$ 1,0 kg/m^2 or a thickness $\geqslant$ 1,0 mm is considered to be a substantial component.

— Non-substantial component: A material that does not constitute a significant part of a non-homogeneous product. A layer with a mass per unit area $<$ 1,0 kg/m^2 and a thickness $<$ 1,0 mm is considered to be a non-substantial component.

[e] In the case of a certified component, the frequency is once per delivery.

[f] European Decision 96/603/EC[4]: Materials to be considered as reacting to fire class A provided for in Decision 94/611/EC without the need for testing (of reaction to fire characteristics).

[g] Indirect testing is only possible in the case of products falling within system 1 for attestation of conformity of reaction to fire or by having a notified body verifying the correlation to direct testing.

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Annex C
(informative)

Examples of the determination of the declared values of thermal resistance and thermal conductivity for a product or product group

C.1 Case where both thermal resistance and thermal conductivity are declared

It is assumed that 14 test results for thermal conductivity are available for a product or a product group, obtained by direct measurements in accordance with 6.3.2 and Table B.1, as exemplified in Table C.1.

Table C.1 — λ test results

Test number	λ W/(m·K)
1	0,036 6
2	0,039 0
3	0,038 2
4	0,037 8
5	0,041 0
6	0,041 2
7	0,039 7
8	0,041 7
9	0,041 5
10	0,040 2
11	0,041 7
12	0,040 6
13	0,040 8
14	0,042 1

The mean thermal conductivity is the arithmetical average of the 14 test results.

$$\bar{\lambda} = 0{,}040\,1\ \mathrm{W/(m \cdot K)}$$

The estimate of the standard deviation of the thermal conductivity, s_λ, determined using Equation (A.2).

$$S_\lambda = \sqrt{\frac{\sum_{i=1}^{14}(\lambda_i - 0{,}040\,1)^2}{14-1}} = 0{,}001\,66$$

The calculated thermal conductivity, $\lambda_{90/90}$, is determined by means of Equation (A.1), where the factor $k = 1{,}90$.

$$\lambda_{90/90} = 0{,}040\,1 + 1{,}90 \times 0{,}001\,66 = 0{,}043\,3\ \mathrm{W/(m \cdot K)}$$

After rounding up to the nearest 0,001 W/(m·K) following the rounding rules in 5.2.1, the resulting declared thermal conductivity is 0,044 W(m·K), using the step 0,001 W(m·K); a higher value may be declared.

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For a product in a product group having a nominal thickness of 80 mm, the calculated thermal resistance, $R_{90/90}$, is determined using Equation (A.3).

$$R_{90/90} = 0{,}080/0{,}044 = 1{,}848\ \text{m}^2 \cdot \text{K/W}$$

After rounding down to the nearest 0,05 m^2·K/W following the rounding rules given in 5.2.1, the resulting declared thermal resistance is 1,80 m^2·K/W using the step 0,05 m^2·K/W; a lower value may be declared.

C.2 Case where only the thermal resistance is declared

It is assumed that 14 test results of the thermal resistance are available for a given product with a given thickness, obtained by direct measurements in accordance with 6.3.2 and Table B.1, as exemplified in Table C.2.

Table C.2 — R test results

Test number	R m^2·K/W
1	2,19
2	2,05
3	2,10
4	2,12
5	1,95
6	1,94
7	2,01
8	1,92
9	1,93
10	1,99
11	1,92
12	1,97
13	1,86
14	1,90

The mean thermal resistance is the arithmetical average of the 14 test results.

$$\overline{R} = 1{,}99\ \text{m}^2 \cdot \text{K/W}$$

The estimate of the standard deviation of the thermal resistance, s_R, is determined using Equation (A.5).

$$s_R = \sqrt{\frac{\sum_{n=1}^{14}(R_i - 1{,}99)^2}{14 - 1}} = 0{,}094\ 4$$

The calculated thermal resistance, $R_{90/90}$, is determined using Equation (A.4), where the factor $k = 1{,}90$.

$R_{90/90} = 1{,}99 - (1{,}90 \times 0{,}094\ 4) = 1{,}81\ \text{m}^2$·K/W.

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After rounding down to the nearest 0,05 $m^2 \cdot K/W$ following the rounding rules given in 5.2.1, the resulting declared thermal resistance is 1,80 $m^2 \cdot K/W$, using the step 0,05 $m^2 \cdot K/W$; a lower value may be declared.

Annex D
(informative)

List of European Standards equivalent to the International Standards referred to in Clause 2

International Standard	European Standard
ISO 2066	EN 12105
ISO 2191	EN 826
ISO 8301	EN 12939
ISO 8302	EN 12667
ISO 9052-1	EN 29052-1
ISO 9053	EN 29053
ISO 29465	EN 822
ISO 29466	EN 823
ISO 29467	EN 824
ISO 29468	EN 825
ISO 29470	EN 1602
ISO 29471	EN 1603
ISO 29472	EN 1604
ISO 29764	EN 1605
ISO 29765	EN 1607
ISO 29767	EN 1609
ISO 29769	EN 12430
ISO 29770	EN 12431

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[1] EN 13170, *Thermal insulation products for buildings — Factory made products of expanded cork (ICB) — Specification*

[2] ENV 1991-2-1, *Actions on structures — Part 2-1: General actions — Actions on structures exposed to fire*

[3] Commission decision 2000/147/EC of 8 February 2000 implementing Council Directive 89/106/EEC as regards the classification of the reaction to fire performance of construction products, *Official Journal of the European Communities*, No. L 50 of 23/02/2000, pp. 0014 0018

[4] Commission Decision 96/603/EC of 4 October 1996 establishing the list of products belonging to Classes A “No contribution to fire” provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products, *Official Journal* L 267, 19/10/1996 pp. 0023 - 0026

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