
**Toplotnoizolacijski proizvodi za stavbe - Proizvodi iz ekspaniranega perlita (EPB)
- Specifikacije**

Thermal insulation products for buildings - Factory made products of expanded perlite (EPB) - Specification

Wärmedämmstoffe für Gebäude - Werkmäßig hergestellte Produkte aus Blähperlite (EPB) - Spezifikation

Produits isolants thermiques pour le bâtiment - Produits manufacturés en perlite expansée (EPB) - Spécification

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Ta slovenski standard je istoveten z: EN 13169:2001

ICS:

91.100.60 Thermal and sound insulating materials

SIST EN 13169:2002

en

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ICS 91.100.60

English version

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This European Standard was approved by CEN on 16 April 2001.

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 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 Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 88, «Thermal insulating materials and products», the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by November 2001, and conflicting national standards shall be withdrawn at the latest by March 2003.

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

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

This European Standard contains six annexes:

Annex A (normative)	Determination of the declared values of thermal resistance and thermal conductivity;
Annex B (normative)	Factory production control;
Annex C (normative)	Determination of the thermal conductivity in relation to moisture content;
Annex D (normative)	Composite insulation boards;
Annex E (informative)	Additional properties;
Annex ZA (informative)	Clauses of this European Standard addressing the provisions of the EU Construction Products Directive.

This European Standard is one of a series of standards for insulation products used in buildings, but this standard may be used in other areas where appropriate.

In pursuance of Resolution BT 20/1993 Revised, CEN/TC 88 have proposed defining the standards listed below as a package of European Standards, setting (21 months after availability) as the date of withdrawal (dow) of national standards which conflict with the European standards of this package.

The package of standards comprises the following group of interrelated standards for the specifications of factory made thermal insulation products, all of which come within the scope of CEN/TC 88:

EN 13162, *Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification.*

EN 13163, *Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specification.*

EN 13164, *Thermal insulation products for buildings – Factory made products of extruded polystyrene foam (XPS) – Specification.*

EN 13165, *Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification.*

EN 13166, *Thermal insulation products for buildings – Factory made products of phenolic foam (PF) – Specification.*

EN 13167, *Thermal insulation products for buildings – Factory made cellular glass (CG) products – Specification.*

EN 13168, *Thermal insulation products for buildings – Factory made wood wool (WW) products – Specification.*

EN 13169, *Thermal insulation products for buildings – Factory made products of expanded perlite (EPB) – Specification.*

EN 13170, *Thermal insulation products for buildings – Factory made products of expanded cork (ICB) – Specification.*

EN 13171, *Thermal insulation products for buildings – Factory made wood fibre (WF) products – Specification.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements for factory made products of expanded perlite, with or without facings or coatings, which are used for the thermal insulation of buildings. The products are manufactured in the form of boards or multi-layered insulation.

The standard also covers composite insulation boards (see annex D).

The standard describes product characteristics and includes procedures for testing, evaluation of conformity, marking and labelling.

Products covered by this standard are also used in prefabricated thermal insulating systems and composite panels; the performance of systems incorporating these products is not covered.

This 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 $0,20 \text{ m}^2 \cdot \text{KW}$ or a declared thermal conductivity greater than $0,070 \text{ W}/(\text{m} \cdot \text{K})$ at $10 \text{ }^\circ\text{C}$ are not covered by this standard.

This standard does not cover in situ insulation products and products intended to be used for the insulation of building equipment and industrial installations. This standard does not cover the following acoustical aspects: Acoustic absorption index and direct airborne sound insulation.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 822, *Thermal insulating products for building applications - Determination of length and width.*

EN 823, *Thermal insulating products for building applications - Determination of thickness.*

EN 824, *Thermal insulating products for building applications - Determination of squareness.*

EN 825, *Thermal insulating products for building applications - Determination of flatness.*

EN 826, *Thermal insulating products for building applications - Determination of compression behaviour.*

prEN ISO 1182, *Reaction to fire tests for building products – Non-combustibility test (ISO/DIS 1182:1998).*

EN 1604, *Thermal insulating products for building applications - Determination of dimensional stability under specified temperature and humidity conditions.*

EN 1605, *Thermal insulating products for building applications - Determination of deformation under specified compressive load and temperature conditions.*

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

EN 1607, *Thermal insulating products for building applications - Determination of tensile strength perpendicular to faces.*

EN 1609, *Thermal insulating products for building applications - Determination of short term water absorption by partial immersion.*

prEN ISO 1716, *Reaction to fire tests for building products – Determination of calorific potential value (ISO/DIS 1716:1998).*

prEN ISO 9229, *Thermal insulation - Definition of terms (ISO/DIS 9229:1997).*

prEN ISO 11925-2, *Reaction to fire tests for building products – Part 2: Ignitability when subjected to direct impingement of flame (ISO/DIS 11925-2:1998).*

EN 12086:1997, *Thermal insulating products for building applications - Determination of water vapour transmission properties.*

EN 12089, *Thermal insulating products for building applications - Determination of bending behaviour.*

EN 12430, *Thermal insulating products for building applications - Determination of behaviour under point load.*

EN 12431, *Thermal insulating products for building applications - Determination of thickness for floating floor insulating products.*

prEN 12667, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance.*

EN 12939, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Thick products of high and medium thermal resistance.*

EN 13172:2001, *Thermal insulating products - Evaluation of conformity.*

prEN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire test.*

prEN 13820, *Thermal insulating products for building applications – Determination of organic content.*

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

EN 29052-1, *Acoustics – Determination of dynamic stiffness – Part 1: Materials used under floating floors in dwellings.*

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

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

For the purpose of this standard, the following terms and definitions apply.

3.1.1 Terms and definitions as given in prEN ISO 9229

3.1.1.1

expanded perlite

lightweight granular (insulation) material manufactured from naturally occurring volcanic rock expanded by heat to form a cellular structure

3.1.1.2

multi-layered insulation

combination of two or more layers of a specific insulation material. The thickness of the individual layers may differ

3.1.1.3

composite insulation

combination of layers of at least two different insulation materials. The insulation property of the composite is derived from the insulation properties of the individual materials

3.1.2 Additional terms and definitions

3.1.2.1

expanded perlite board

rigid insulation board manufactured from expanded perlite, reinforcing fibres and binding agents. It may be delivered as a board or as two or more boards bonded together with a suitable adhesive (multi-layered insulation: see 3.1.1.2). Boards may also have a profiled edge

3.1.2.2

level

the given value which is the upper or lower limit of a requirement. The level is given by the declared value of the characteristic concerned

3.1.2.3

class

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

3.2 Symbols units and abbreviated terms

Symbols and units used in this standard:

a	is the coefficient describing the influence of moisture on the thermal conductivity	
b	is the width	mm
c	is the compressibility	mm
d	is the thickness	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 kPa	mm
d_N	is the nominal thickness of the product	mm
Δe_b	is the relative change in width	%
Δe_d	is the relative change in thickness	%
Δe_l	is the relative change in length	%
k	is a factor related to the number of test results available	-
l	is the length	mm
λ_D	is the declared thermal conductivity	W/(m·K)
λ_i	is one test result of thermal conductivity	W/(m·K)
λ_{mean}	is the mean thermal conductivity	W/(m·K)
$\lambda_{10,\text{dry}}$	is the thermal conductivity in the dry state	W/(m·K)
$\lambda_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity	W/(m·K)
m_1	is the mass of the test specimen after 2 h total immersion in water	kg
$m_{23,\text{dry}}$	is the mass of specimen in the dry state	kg
$m_{23,50}$	is the mass of specimen at 23 °C and 50 % relative humidity	kg
μ	is the water vapour diffusion resistance factor	-
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
R_{mean}	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
S_b	is the deviation from squareness on length and width	mm/m
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_b	is the bending strength	kPa

σ_{bc}	is the bending strength at a constant span	kPa
σ_c	is the declared compressive stress	kPa
σ_m	is the compressive strength	kPa
σ_{mt}	is the tensile strength perpendicular to faces	kPa
σ_{10}	is the compressive stress at 10 % deformation	kPa
$u_{23,50}$	is the moisture content by mass at 23 °C and 50 % relative humidity	kg/kg
V	is the volume of the specimen	m ³
W_p	is the short-term water absorption by partial immersion	kg/m ²
W_{st}	is the short-term water absorption by total immersion	kg/dm ³
X_0	is the initial deformation after 60 s from the beginning of loading	mm
X_{ct}	is the compressive creep	mm
X_t	is the deformation at time t (total thickness reduction)	mm
Z	is the water vapour resistance	m ² ·h·Pa/mg

BS	is the symbol of the declared level of bending strength
BS(z)	is the symbol of the declared level of bending strength at a constant span
CC($i_1/i_2/y$) σ_c	is the symbol of the declared level for compressive creep
CP	is the symbol of the declared level for compressibility
CS(10\Y)	is the symbol of the declared level for compressive stress or compressive strength
DLT(i)5	is the symbol of the declared level of deformation under load and temperature
DS(H)	is the symbol of the declared value for dimensional stability under humidity condition
DS(T+/50)	is the symbol of the declared value for dimensional stability under specified temperature and humidity
MU	is the symbol of the declared value for water vapour diffusion resistance factor
PL(2)	is the symbol of the declared level of point load for 2 mm deformation
SD	is the symbol of the declared level of dynamic stiffness
T	is the symbol of the declared class for thickness tolerances
TR	is the symbol of the declared value for tensile strength perpendicular to faces
WS	is the symbol of the declared level for short term water absorption by partial immersion
WS(T)	is the symbol of the declared level of short term water absorption by total immersion
Z	is the symbol of the declared value for water vapour resistance

Abbreviated terms used in this standard:

EPB	is E xpanded P erlite B oard
ITT	is I nitial T ype T est

4 Requirements

4.1 General

Product properties shall be assessed in accordance with clause 5. To comply with this standard, products shall meet the requirements of 4.2, and the requirements of 4.3 as appropriate.

NOTE Information on additional properties is given in annex E.

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

4.2 For all applications

4.2.1 Thermal resistance and thermal conductivity

Thermal resistance and thermal conductivity shall be based upon measurements carried out in accordance with prEN 12667 or EN 12939 for thick products.

The thermal resistance and thermal conductivity shall be determined in accordance with annex A and annex C, 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;
- the thermal resistance, R_D , shall always be declared. The thermal conductivity, λ_D , shall be declared where possible;
- the declared thermal resistance, R_D , and 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 thermal conductivity, $\lambda_{90/90}$, shall be rounded upwards 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 thermal resistance, $R_{90/90}$, when calculated from the nominal thickness, d_N , and the corresponding thermal conductivity, $\lambda_{90/90}$, shall be rounded downwards to the nearest 0,05 m²·K/W, and declared as R_D in levels with steps of 0,05 m²·K/W;
- the value of $R_{90/90}$, for those products for which only thermal resistance is measured directly, shall be rounded downwards to the nearest 0,05 m²·K/W, and declared as R_D in levels with steps of 0,05 m²·K/W.

4.2.2 Length and width

Length, l , and width, b , shall be determined in accordance with EN 822. No test result shall deviate from the nominal values by more than the following:

- ± 3 mm for length and width not exceeding 1200 mm;
- ± 5 mm for length and width exceeding 1200 mm.

In the case of bonded boards, the offset on the edges shall not exceed 3 mm.

4.2.3 Thickness

Thickness, d , shall be determined in accordance with EN 823, using a load equal to 250 Pa. No test result shall deviate from the nominal thickness, d_N , by more than the corresponding tolerances given in Table 1.

Table 1 – Thickness tolerances

Dimensions in millimetres

Nominal thickness	$d_N \leq 35$	$35 < d_N \leq 70$	$70 < d_N \leq 120$	$d_N > 120$
Tolerance	± 1	± 2	± 3	± 4

This test shall not be performed when the tests described in D.2.7 are used.

4.2.4 Squareness

Squareness shall be determined in accordance with EN 824. The deviation from squareness on length and width, S_b , shall not exceed 3 mm/m.

4.2.5 Flatness

Flatness shall be determined in accordance with EN 825. The deviation from flatness, S_{max} , shall not exceed the following:

- 3 mm for length and width not exceeding 1200 mm;

5 mm for length and width exceeding 1200 mm.

4.2.6 Bending strength

Bending strength, σ_b , shall be determined in accordance with EN 12089. For handling purpose, the bending strength of boards shall not be less than 300 kPa.

NOTE The requirement for handling applies to individual boards. In the case of multi-layered boards, it may be assumed that the requirement is satisfied when each of the individual layers fulfills this requirement.

4.2.7 Dimensional stability under specified temperature and humidity conditions

Dimensional stability under specified humidity conditions shall be determined in accordance with EN 1604. The test shall be carried out for 48 h at (23 ± 2) °C and (90 ± 5) % relative humidity. The relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed 0,5 %. The relative changes in thickness, $\Delta\epsilon_d$, shall not exceed 1 %.

4.2.8 Reaction to fire

Reaction to fire classification (Euroclasses) shall be determined in accordance with prEN 13501-1.

4.3 For specific applications

4.3.1 General

If there is no requirement for a property described in 4.3 for a product in use, then the property does not need to be determined and declared by the manufacturer.

4.3.2 Dimensional stability under specified temperature and humidity conditions

Dimensional stability under specified temperature conditions shall be determined in accordance with EN 1604. The test shall be carried out for 48 h exposure at (70 ± 2) °C and (50 ± 5) % relative humidity. The relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed 0,5 %. The relative changes in thickness, $\Delta\epsilon_d$, shall not exceed 1 %.

4.3.3 Compressive stress or compressive strength

Compressive stress at 10 % deformation, σ_{10} , or the compressive strength, σ_m , shall be determined in accordance with EN 826. No test result for either the compressive stress at 10 % deformation, σ_{10} , or the compressive strength, σ_m , whichever is the smaller, shall be less than the value given in Table 2, for the declared level.

Table 2 – Levels for compressive stress or compressive strength

Level	Requirement kPa
CS(10\Y)100	≥ 100
CS(10\Y)125	≥ 125
CS(10\Y)150	≥ 150
CS(10\Y)200	≥ 200
CS(10\Y)300	≥ 300
CS(10\Y)450	≥ 450
CS(10\Y)700	≥ 700
CS(10\Y)800	≥ 800

4.3.4 Deformation under specified load and temperature

Deformation in thickness under specified load and temperature conditions shall be determined in accordance with EN 1605. The relative deformation in thickness, $\Delta\epsilon_d$, shall not exceed the values given in Table 3 for the declared level.

Table 3 – Levels for deformation under specified compressive load and temperature

Level	Requirement %	Test conditions
DLT(1)5	≤ 5	Load : 20 kPa Temperature : $(80 \pm 1) ^\circ\text{C}$ Time : $(48 \pm 1) \text{ h}$
DLT(2)5	≤ 5	Load : 40 kPa Temperature : $(70 \pm 1) ^\circ\text{C}$ Time : $(168 \pm 1) \text{ h}$
DLT(3)5	≤ 5	Load : 80 kPa Temperature : $(60 \pm 1) ^\circ\text{C}$ Time : $(168 \pm 1) \text{ h}$

4.3.5 Tensile strength perpendicular to faces

Tensile strength perpendicular to faces, σ_{mt} , shall be determined in accordance with EN 1607, using the additional provisions of 5.3.3. No test result shall be lower than 20 kPa.

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4.3.6 Water absorption

4.3.6.1 Short-term water absorption by partial immersion

Short-term water absorption by partial immersion, W_p , shall be determined in accordance with EN 1609. No test result shall exceed the declared value.

4.3.6.2 Short-term water absorption by total immersion

Short-term water absorption by total immersion, W_{st} , shall be determined in accordance with 5.3.4. No test result shall exceed the value, given in Table 4, for the declared level.

Table 4 – Levels for water absorption by total immersion

Level	Requirement %
WS(T) 8	$\leq 0,08$
WS(T) 6	$\leq 0,06$
WS(T) 4	$\leq 0,04$
WS(T) 2	$\leq 0,02$

4.3.7 Bending strength at a constant span

Bending strength at a constant span of 250 mm, σ_{bc} , shall be determined in accordance with EN 12089. No test result shall be lower than the value given in Table 5, for the declared level.