SLOVENSKI STANDARD
SIST EN 14934:2008

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Toplotnoizolacijski in lahki polnilni/nasipni proizvodi za inženirske objekte - Proizvodi iz ekstrudiranega polistirena (XPS) - Specifikacija

Thermal insulation and light weight fill products for civil engineering applications - Factory made products of extruded polystyrene foam (XPS) - Specification

Wärmedämmung und leichte Füllprodukte für Anwendungen im Tiefbau - Werkmäßig hergestellte Produkte aus extrudiertem Polystyrolschaum (XPS) - Spezifikation

Produits isolants thermiques et de remblayage pour les applications de génie civil - Produits manufacturés en mousse de polystyrene extrudé (XPS) - Spécifications

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Thermal insulation and light weight fill products for civil engineering applications - Factory made products of extruded polystyrene foam (XPS) - Specification

Produits isolants thermiques et de remblayage pour les applications de génie civil - Produits manufacturés en mousse de polystyrène extrudé (XPS) - Spécifications

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Foreword

This document (EN 14934:2007) has been prepared by 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of an identical text or by endorsement, at the latest by March 2008, and conflicting national standards shall be withdrawn at the latest by March 2008.

This document 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 document.

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1 Scope

This European Standard specifies the requirements for factory made products of extruded polystyrene foam which are used for frost insulation of roads, railways, trafficked areas, light weight fill for reduction of horizontal and vertical earth pressure and other civil engineering applications.

The products are manufactured in the form of boards, which are also available with special edge and surface treatment (tongue & grooves, shiplap etc.). The standard also covers multilayered insulation boards.

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

The 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 classes and levels required for a given application are to be found in regulations or non-conflicting standards.

For applications where thermal resistance is required, products with a declared thermal resistance lower than 0,25 m²·K/W or a declared thermal conductivity greater than 0,060 W/(m· K) are not covered by this standard. This standard does not cover in situ insulation products and products intended to be used for insulation of buildings, of building equipment and industrial installations or products intended for acoustic insulation.

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.

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*

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

EN 12087, *Thermal insulating products for building applications — Determination of long term water absorption by immersion*

EN 12088, *Thermal insulating products for building applications — Determination of long term water absorption by diffusion*

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

EN 12091, *Thermal insulating products for building applications — Determination of freeze-thaw resistance*

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

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*

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

EN 13793, *Thermal insulating products for building applications — Determination of behaviour under cyclic loading*

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

EN ISO 1182, *Reaction to fire tests for building products — Non combustibility test (ISO 1182:2002)*

EN ISO 1716, *Reaction to fire tests for building products — Determination of the heat of combustion (ISO 1716:2002)*

EN ISO 9229:2007, *Thermal insulation — Vocabulary (ISO 9229:2007)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2002)*

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 purposes of this document, the following terms and definitions apply.

3.1.1 Terms and definitions as given in EN ISO 9229:2007

3.1.1.1
extruded polystyrene foam
rigid cellular plastics insulation material expanded and extruded with or without a skin, from polystyrene or one of its copolymers and which has a closed cell structure

3.1.1.2
board
rigid or semi-rigid insulation product of rectangular shape and cross section in which the thickness is uniform and substantially smaller than the other dimensions

3.1.2 Additional definitions

3.1.2.1
level
given value which is the upper or lower limit of a requirement. The level is given by the declared value of the characteristic concerned

3.1.2.2
class
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:

b	is the width	mm
d	is the thickness	mm
d_N	is the nominal thickness of the product	mm
d_s	is the thickness of test specimen	mm
D_i	is the relative compression after i number of cycles	%
$\Delta\varepsilon_b$	is the relative change in width	%
$\Delta\varepsilon_d$	is the relative change in thickness	%
$\Delta\varepsilon_l$	is the relative change in length	%
ε_{ct}	is the compressive creep	%
ε_t	is the total relative thickness reduction	%
$\varepsilon_{l,max}$	is the relative maximum deformation	%
ε_1	is the relative deformation after step A	%
ε_2	is the relative deformation after step B	%
k	is a factor related to the number of test results available	—
l	is the length	mm
$\lambda_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity	W/(m·K)
$\lambda_{90/90,\ 60d}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity of foam at 60 days	W/(m·K)
$\lambda_{90/90>60d}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity of foam older than 60 days	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)
λ_{mean}	is the mean thermal conductivity	W/(m·K)
$\lambda_{mean,\ a}$	is the mean thermal conductivity of aged values	W/(m·K)

$\lambda_{mean,\ 60d}$	is the mean thermal conductivity of values for 60 days old foam	W/(m·K)
$\lambda_{>\ 60d}$	is the measured value of the thermal conductivity of foam older than 60 days	W/(m·K)
μ	is the water vapour diffusion resistance factor	—
n	is the number of test results	—
$R_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal resistance	m^2·K/W
$R_{90/90,\ 60d}$	is the 90 % fractile with a confidence level of 90 % for the thermal resistance of foam at 60 days	m^2·K/W
$R_{90/90>60d}$	is the 90 % fractile with a confidence level of 90 % for the thermal resistance of foam older than 60 days	m2·K/W
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
S_b	is the deviation from squareness on length and width	mm/m
S_{max}	is the deviation from flatness	mm/m
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)
$s_{\lambda a}$	is the estimate of the standard deviation of the aged thermal conductivity	W/(m·K)
$s_{\lambda i}$	is the estimate of the standard deviation of the initial thermal conductivity within 90 days of production	W/(m·K) W/(m·K)
σ_2	is the compressive stress at 2 % deformation	kPa
σ_5	is the compressive stress at 5 % deformation	kPa
σ_{10}	is the compressive stress at 10 % deformation	kPa
σ_c	is the declared compressive stress	kPa
σ_i	is the compressive stress applied for resistance to cyclic compressive loading	kPa
σ_m	is the compressive strength	kPa
σ_b	is the bending strength	kPa
W_{dV}	is the water absorption by diffusion	% by volume
W_{it}	is the long term water absorption by total immersion	% by volume
W_V	is the water absorption by freeze-thaw after water absorption by diffusion	% by volume
Z	is the water vapour resistance	m^2·h·Pa/mg

BS	is the symbol of the declared level for bending strength
CC(i_1/i_2/y) σ_c	is the symbol of the declared level for compressive creep

CLR(i,z) σ_i is the symbol of the declared level for resistance to cyclic compressive loading with sinus load application

CLRT(i,z) σ_i is the symbol of the declared level for resistance to cyclic compressive loading with square wave load application

CS(10\Y) is the symbol of the declared level for compressive stress at 10 % deformation or compressive strength

CS(5\Y) is the symbol of the declared level for compressive stress at 5 % deformation or compressive strength

CS(2\Y) is the symbol of the declared level for compressive stress at 2 % deformation or compressive strength

DLT(2)5 is the symbol of the declared level of deformation under specified compressive load and temperature at conditions set 2 with a maximum of 5 % deformation

DS(T+) is the symbol of the declared value for dimensional stability at specified temperature

DS(TH) is the symbol of the declared value for dimensional stability under specified temperature and humidity

FTC is the symbol of the declared level for freeze-thaw resistance

MU is the symbol of the declared level for water vapour diffusion resistance factor

T is the symbol of the declared class for thickness tolerances

WD(V) is the symbol of the declared level for water absorption by diffusion

WL(T) is the symbol of the declared level for long term water absorption by total immersion

Z is the symbol of the declared value for water vapour resistance

Abbreviated terms used in this standard:

XPS is e**x**truded **p**oly**s**tyrene foam

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 for a product property is the average of the measured values on the number of test specimens given in Table 10.

4.2 For all applications

4.2.1 Length, width, squareness, flatness

Length, l, and width, b, shall be determined in accordance with EN 822, the squareness on length and width, S_b, in accordance with EN 824, and the flatness, S_{max}, in accordance with EN 825. No test result shall deviate from the declared values by more than the tolerances given in Table 1.

Table 1 — Tolerances of length, width, squareness and flatness

Declared length or width	Tolerances		
	Length or width	Squareness on length and width	Flatness
mm	mm	S_b mm/m	S_{max} mm
less than 1 000	± 8	5	7,0
1 000 to 2 000	± 10	5	14,0
>2 000 to 4 000	± 10	5	28,0
>4 000	± 10	5	35,0

4.2.2 Thickness

Thickness, d, shall be determined in accordance with EN 823. No test result shall deviate from the nominal thickness, d_N, by more than the tolerances given in Table 2 for the labelled class.

Table 2 — Classes for thickness tolerances

Class	Tolerances mm		Thickness mm
T1	– 2	+ 2	<50
	– 2	+ 3	50 ≤ d_N ≤ 120
	– 2	+ 8	>120
T2	– 1,5	+ 1,5	<50
	– 1,5	+ 1,5	50 ≤ d_N ≤ 120
	– 1,5	+ 1,5	>120
T3	– 1	+ 1	<50
	– 1	+ 1	50 ≤ d_N ≤ 120
	– 1	+ 1	>120

4.2.3 Dimensional stability under specified temperature and humidity conditions

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

This test shall not be performed when the more severe test, described in 4.3.2.2 is used.

4.2.4 Compressive stress at 10 % deformation or compressive strength

The 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 greatest, shall be lower than the values given in Table 3 for the declared level.

Table 3 — Levels for compressive stress at 10 % deformation or compressive strength

Level	Requirement kPa
CS(10\Y) 100	>100
CS(10\Y) 200	≥ 200
CS(10\Y) 250	≥ 250
CS(10\Y) 300	≥ 300
CS(10\Y) 350	≥ 350
CS(10\Y) 400	≥ 400
CS(10Y) 450	≥ 450
CS(10\Y) 500	≥ 500
CS(10\Y) 600	≥ 600
CS(10\Y) 650	≥ 650
CS(10\Y) 700	≥ 700
CS(10\Y) 800	≥ 800
CS(10\Y) 900	≥ 900
CS(10\Y) 1000	≥ 1000

4.2.5 Reaction to fire

4.2.5.1 Reaction to fire classification

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

4.2.5.2 Continuous glowing combustion

Where subject to regulation, the continuous glowing combustion shall be declared. In the absence of a European test method which is under development, the existing relevant national test method applies.

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 conditions

4.3.2.1 Dimensional stability at specified temperature

Dimensional stability at specified temperature shall be determined in accordance with EN 1604. The test shall be carried out after storage for 48 h at (70 ± 2) °C. The relative changes in length, $\Delta\varepsilon_l$, in width, $\Delta\varepsilon_b$, and in thickness, $\Delta\varepsilon_d$, shall not exceed 5 %.

4.3.2.2 Dimensional stability under specified temperature and humidity conditions

Dimensional stability under specified temperature and humidity conditions shall be determined in accordance with EN 1604. The test shall be carried out after storage for 48 h at (70 ± 2) °C and (90 ± 5) % relative humidity. The relative changes in length, $\Delta\varepsilon_l$, in width, $\Delta\varepsilon_b$, and in thickness, $\Delta\varepsilon_d$, shall not exceed 5 %.

4.3.2.3 Deformation under specified compressive load and temperature conditions

Deformation under specified compressive load and temperature conditions shall be determined in accordance with EN 1605. For the test condition the difference between the relevant deformation, ε_1, after step A and, ε_2, after step B as described in EN 1605 shall not exceed the value in percent given in Table 4 for the declared level.

Table 4 — Levels for deformation under specified compressive load and temperature conditions

Level	Test conditions	Requirement %
DLT(2) 5	load: 40 kPa temperature: (70 ± 1) °C time: (168 ± 1) h	≤5

4.3.3 Compressive stress at 2 % and 5 % deformation or compressive strength

The compressive stress at 2 % and/ or 5 % deformation, σ_2, and/or, σ_5, or the compressive strength, σ_m, shall be determined in accordance with EN 826. No test result for either the compressive stress at 2 % and/or 5 % deformation, σ_2, and/ or, σ_5, or the compressive strength, σ_m, whichever is the greatest, shall be lower than the values given in Table 5 and Table 6 for the declared level.

NOTE Although EN 826 does not specify the calculation of the compressive stress at 2 % and 5 % deformation, the calculation should be done in the same way.

Table 5 — Levels for compressive stress at 2 % deformation or compressive strength

Level	Requirement kPa
CS(2\Y) 100	>100
CS(2\Y) 200	≥200
CS(2\Y) 250	≥250
CS(2\Y) 300	≥300
CS(2\Y) 350	≥350
CS(2\Y) 400	≥400
CS(2\Y) 450	≥450
CS(2\Y) 500	≥500
CS(2\Y) 600	≥600
CS(2\Y) 650	≥650
CS(2\Y) 700	≥700
CS(2\Y) 800	≥800
CS(2\Y) 900	≥900
CS(2\Y) 1 000	≥1.000

Table 6 — Levels for compressive stress at 5 % deformation or compressive strength

Level	Requirement kPa
CS(5\Y) 100	>100
CS(5\Y) 200	≥200
CS(5\Y) 250	≥250
CS(5\Y) 300	≥300
CS(5\Y) 350	≥350
CS(5\Y) 400	≥400
CS(5\Y) 450	≥450
CS(5\Y) 500	≥500
CS(5\Y) 600	≥600
CS(5\Y) 650	≥650
CS(5\Y) 700	≥700
CS(5\Y) 800	≥800
CS(5\Y) 900	≥900
CS(5\Y) 1 000	≥ 1.000