BS EN 14307:2015

BSI Standards Publication

Thermal insulation products for building equipment and industrial installations — Factory made extruded polystyrene foam (XPS) products — Specification

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National foreword

This British Standard is the UK implementation of EN 14307:2015. It supersedes BS EN 14307:2009+A1:2013 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/540, Energy performance of materials components and buildings.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Thermal insulation products for building equipment and industrial installations - Factory made extruded polystyrene foam (XPS) products - Specification

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Produits manufacturés en mousse de polystyrène extrudé (XPS) - Spécification

Wärmedämmstoffe für die technische Gebäudeausrüstung und für betriebstechnische Anlagen in der Industrie - Werkmäßig hergestellte Produkte aus extrudiertem Polystyrolschaum (XPS) - Spezifikation

This European Standard was approved by CEN on 24 October 2015.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14307:2015) 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 June 2016, and conflicting national standards shall be withdrawn at the latest by September 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14307:2009+A1:2013.

This document is identifying those clauses of the standard which are needed for the compliance of the European Standard with the Construction Products Regulation (CPR).

The main technical changes that have been made in this new edition of EN 14307 are the following:

a) an addition to the foreword;

b) an addition in 3.2.2;

c) a new 4.3.8;

d) modification of 5.3.2;

e) modification of Clause 7;

f) modification of Clause 8;

g) modification of Annex A;

h) a new Annex ZA.

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 Regulation (EU) No. 305/2011.

For relationship with Regulation (EU) No. 305/2011, see informative Annex ZA, which is an integral part of this document.

Locally responsible authorities and contracting entities, who are bound by EU Directives to specify their requirements using European harmonized product standards, are allowed to demand additional properties outside the provisions of this standard if this is technically necessary because of prevailing operational conditions of the building equipment or the industrial installation projected or because of safety regulations.

This European Standard contains six annexes:

— Annex A (normative), Factory production control;

— Annex B (normative), Determination of the aged values of thermal conductivity;

— Annex C (informative), Additional properties;

— Annex ZA (informative), Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation.

This standard includes a bibliography.

This European Standard is one of a series of standards for insulation products used in building equipment and industrial installations, 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 European package of 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 14303, *Thermal insulation products for building equipment and industrial installations — Factory made mineral wool (MW) products — Specification*

EN 14304, *Thermal insulation products for building equipment and industrial installations — Factory made flexible elastomeric foam (FEF) products — Specification*

EN 14305, *Thermal insulation products for building equipment and industrial installations — Factory made cellular glass (CG) products — Specification*

EN 14306, *Thermal insulation products for building equipment and industrial installations — Factory made calcium silicate (CS) products — Specification*

EN 14307, *Thermal insulation products for building equipment and industrial installations — Factory made extruded polystyrene foam (XPS) products — Specification*

EN 14308, *Thermal insulation products for building equipment and industrial installations — Factory made rigid polyurethane foam (PUR) and polyisocyanurate foam (PIR) products — Specification*

EN 14309, *Thermal insulation products for building equipment and industrial installations — Factory made expanded polystyrene (EPS) products — Specification*

EN 14313, *Thermal insulation products for building equipment and industrial installations — Factory made polyethylene foam (PEF) products — Specification*

EN 14314, *Thermal insulation products for building equipment and industrial installations — Factory made phenolic foam (PF) products — Specification*

EN 15501, *Thermal insulation products for building equipment and industrial installations — Factory made expanded perlite (EP) and exfoliated vermiculite (EV) 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, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the requirements for factory made extruded polystyrene foam products which are used for the thermal insulation of building equipment and industrial installations with an operating temperature in the range of approximately - 180 °C to + 75 °C.

Below an operating temperature of - 50 °C, special tests regarding the suitability of the material in the intended application are advised (e.g. liquefaction of oxygen). Manufacturer's advice should be heeded in all cases.

The products are manufactured in the form of faced or unfaced boards, pipe sections, segments and prefabricated ware.

This European 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 European Standard does not specify the required level of a given property that should be achieved by a product to demonstrate fitness for purpose in a particular application. The levels required for a given application can be found in regulations and invitations to tender.

Products with a declared thermal conductivity greater than 0,060 W/(m·K) at a mean temperature of 10 °C are not covered by this standard.

This European Standard does not cover products intended to be used for the insulation of the building structure nor for acoustical insulation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 1609, *Thermal insulating products for building applications - Determination of short term water absorption by partial immersion*

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

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 13164, *Thermal insulation products for buildings - Factory made extruded polystyrene foam (XPS) products - Specification*

EN 13172:2012, *Thermal insulation products - Evaluation of conformity*

EN 13467, *Thermal insulating products for building equipment and industrial installations - Determination of dimensions, squareness and linearity of preformed pipe insulation*

EN 13468, *Thermal insulating products for building equipment and industrial installations - Determination of trace quantities of water soluble chloride, fluoride, silicate, sodium ions and pH*

EN 13501-1:2007+A1:2009, *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 flooring exposed to the thermal attack by a single burning item*

EN 14706, *Thermal insulating products for building equipment and industrial installations - Determination of maximum service temperature*

EN 15715:2009, *Thermal insulation products - Instructions for mounting and fixing for reaction to fire testing - Factory made products*

EN ISO 8497, *Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes (ISO 8497)*

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

EN ISO 10456, *Building materials and products - Hygrothermal properties -Tabulated design values and procedures for determining declared and design thermal values (ISO 10456)*

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

EN ISO 13787:2003, *Thermal insulation products for building equipment and industrial installations - Determination of declared thermal conductivity (ISO 13787:2003)*

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 plastic insulation material expanded and extruded with or without a skin from polystyrene or one of its co-polymers and that has a closed-cell structure

3.1.1.2
block
(insulation) product generally of rectangular cross-section and with a thickness not significantly smaller than the width

3.1.1.3
board
(insulation) rigid or semi-rigid product of rectangular shape and cross-section in which the thickness is uniform and substantially smaller than the other dimensions

Note 1 to entry: Boards may be supplied in tapered form.

3.1.1.4
lag
segment
rigid or semi-rigid insulation product for application to large diameter cylindrical or spherical equipment

3.1.1.5
pipe section
section
(insulation) product in the shape of a cylindrical annulus that may be split to facilitate application

3.1.1.6
production batch
definite quantity of some commodity manufactured or produced under conditions that are presumed uniform

3.1.2 Additional terms and definitions

3.1.2.1
class
combination of two levels of the same property between which the performance shall fall

3.1.2.2
level
given value which is the upper or lower limit of a requirement

Note 1 to entry: The level is given by the declared value of the characteristic concerned.

3.1.2.3
prefabricated ware
pieces cut, abraded or otherwise formed from a board, a block or a billet of product, e.g. elbows, T-pieces, etc

3.1.2.4
production line
assemblage of equipment that produces products in a continuous process

3.1.2.5
production unit
assemblage of equipment that produces products in a discontinuous process

3.2 Symbols, units and abbreviated terms

3.2.1 Symbols and units used in this standard

b	is the width	mm
D_i	is the inside diameter of pipe shell	mm
d	is the thickness	mm
d_D	is the declared thickness of the product	mm
$\Delta\varepsilon_b$	is the relative change in width	mm
$\Delta\varepsilon_d$	is the relative change in thickness	mm
$\Delta\varepsilon_l$	is the relative change in length	mm
L	is the deviation from linearity for pipe shell	mm/m
l	is the length	mm
λ	is the thermal conductivity	W/(m·K)
λ_D	is the declared thermal conductivity	W/(m·K)
μ	is the water vapour diffusion resistance factor	—
S_b	is the deviation from squareness of the edge (width or length)	mm/m
S_d	is the deviation from squareness of the edge (thickness)	mm/m
S_{max}	is the deviation from flatness	mm
σ_{10}	is the compressive stress at 10 % deformation	kPa
σ_m	is the compressive strength	kPa
v	is the deviation from the squareness for pipe section	mm/m
W_p	is the short-term water absorption by partial immersion	kg/m^2
Z	is the water vapour resistance	$m^2 \cdot h \cdot Pa/mg$
CL	is the symbol of the declared level for soluble chloride ions	
CS(10\Y)	is the symbol of the declared level for compressive stress or strength	
DS(TH)	is the symbol of the declared value for the dimensional stability under specified temperature and humidity conditions	

F	is the symbol of the declared level of soluble fluoride ions
MU	is the symbol of the declared level for water vapour diffusion resistance factor
NA	is the symbol of the declared level of soluble sodium ions
pH	is the symbol of the declared level of the pH value
SI	is the symbol of the declared level of soluble silicate ions
ST(+)	is the symbol of the declared level for maximum service temperature
ST(-)	is the symbol of the declared level for minimum service temperature
T	is the symbol of the declared class for thickness tolerances
WS	is the symbol of the declared level for short-term water absorption by partial immersion
Z	is the symbol of the declared value for water vapour resistance

3.2.2 Abbreviations used in this standard

AVCP	is **A**ssessment and **V**erification of **C**onstancy of **P**erformance (previously named attestation of conformity)
DoP	is **D**eclaration of **P**erformance
FPC	is **F**actory **P**roduction **C**ontrol
PTD	is **P**roduct **T**ype **D**etermination (previously named ITT for Initial Type Test)
RtF	is **R**eaction to **F**ire
SBI	is **S**ingle **B**urning **I**tem
ThIBEII	is **T**hermal **I**nsulation for **B**uilding **E**quipment and **I**ndustrial **I**nstallations
VCP	is **V**erification of **C**onstancy of **P**erformance (previously named evaluation of conformity)
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 C.

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

Apparent density is a useful parameter, among others, for the identification but it should not be used as a basis for the quality assessment of XPS products.

Apparent density of XPS boards and billets, if voluntary declared by the manufacturer will be determined in accordance with EN 1602, *Thermal insulating products for building applications — Determination of the apparent density*.

Apparent density of pipe sections, if voluntary declared by the manufacturer will be determined in accordance with EN 13470, *Thermal insulating products for building equipment and industrial installations — Determination of the apparent density of preformed pipe insulation*.

Products manufactured from XPS can have the same thermal and mechanical properties at different densities. For this reason, product density is not quoted as requirement in this standard.

4.2 For all applications

4.2.1 Thermal conductivity

For flat specimens, the thermal conductivity shall be based upon measurements carried out in accordance with EN 12667 or EN 12939 for thick products. For cylindrical specimens EN ISO 8497 shall be used as specified in 5.3.2.

In both cases, the thermal conductivity values shall be determined by the manufacturer and verified in accordance with EN ISO 13787:2003, 5.3.1, and Annex B of this standard. They shall be declared by the manufacturer at reference mean temperatures covering the product service temperature range. The following conditions apply:

— the measured values shall be expressed with three significant figures;

— the declared conductivity curve shall be given as a limit curve, defined in EN ISO 13787;

— the value of the declared thermal conductivity, λ_D, shall be rounded upwards to the nearest 0,001 W/(m·K);

— the lowest reference mean test temperature required is - 170 °C, where relevant.

The declared equation/limit curve is the “declared reference” with three significant figures, that is to 0,000 1 W/(m·K) for λ values below 0,1 W/(m·K) and in 0,001 W/(m·K) for λ values above 0,1 W/(m·K). This shall be used as a reference for the verification of the declaration.

When thermal conductivity is declared as a table derived from the equation, rounding upwards to the next 0,001 W/(m·K) has to be done for the full range of the thermal conductivity.

NOTE Determinations of the declared thermal conductivity of pipe sections, following EN ISO 8497, having joints in metering area, include the effects of these joints as defined in EN ISO 23993.

4.2.2 Dimensions and tolerances

4.2.2.1 Linear dimensions of boards

The length, *l*, and width, *b*, shall be determined in accordance with EN 822, the squareness, S_b, in accordance with EN 824, and 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 of boards

Length or width mm	**Tolerances**		
	Length or width mm	**Squareness on length and width** S_b mm/m	**Flatness** 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

4.2.2.2 Thickness of boards

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

Table 2 — Classes for thickness tolerances of boards

Class	Tolerances		Thickness mm
T1	– 2	+ 2	< 50
	– 2	+ 3	$50 \le d_D \le 120$
	– 2	+ 8	> 120
T2	– 1,5	+ 1,5	< 50
	– 1,5	+ 1,5	$50 \le d_D \le 120$
	– 1,5	+ 1,5	> 120
T3	– 1	+ 1	< 50
	– 1	+ 1	$50 \le d_D \le 120$
	– 1	+ 1	> 120

4.2.2.3 Dimensions and tolerances of pipe sections and segments

The length, *l*, thickness, *d*, inside diameter, D_i, the deviation from the squareness, *v*, and the deviation from the linearity, *L*, of pipe sections and segments shall be tested in accordance with EN 13467.

Products with a facing or natural skin shall be tested without removing them.

No test result shall deviate from the declared values by more than the tolerances given in Table 3.

Tolerances on prefabricated wares may be agreed between the parties.

Table 3 — Tolerances for pipe sections and segments

Length, *l*	±10 mm
Thickness, *d* [a],	±3 mm or ± 5 % [b]
Inside diameter, D_i	– 0 mm / + 4 mm or + 2 % [b]
Squareness, *v*	±6 mm or ± 2 % [b]
Linearity, *L*	±6 mm

[a] The tolerances only apply to unfaced products. The thickness of any facing exceeding 2 mm shall be indicated in the manufacturer's literature.

[b] The greater value applies.

NOTE Smaller tolerances may be declared by a producer.

4.2.3 Dimensional stability

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 %.

4.2.4 Reaction to fire of the product as placed on the market

Reaction to fire classification of the product as placed on the market shall be determined in accordance with EN 13501-1 and the basic Mounting and Fixing rules given in EN 15715:2009.

NOTE This classification is compulsory and always included in the CE marking label.

EN 13501-1:2007+A1:2009, Table 1, is applicable to products applied to flat surfaces or to curved surfaces with a diameter greater than 300 mm.

If a flat product which has a classification according to EN 13501-1:2007+A1:2009, Table 1, is used in a linear application, it does not require further classification.

EN 13501-1:2007+A1:2009, Table 3, is applicable to products applied on linear objects or with a diameter below or equal 300 mm.

Detailed information about the test conditions and the field of application of the classification as stated in the reaction to fire classification report shall be given in the manufacturer's literature.

4.2.5 Durability characteristics

4.2.5.1 General

The appropriate durability characteristics have been considered and are covered in 4.2.5.2, 4.2.5.3 and 4.2.5.4.

4.2.5.2 Durability of reaction to fire against ageing/degradation and high temperature

The reaction to fire performance of XPS products does not change with time within their range of service temperature.

4.2.5.3 Durability of thermal resistance against ageing/degradation

The declared thermal conductivity of XPS products does not change with time. This is covered by 4.2.1 thermal conductivity, Annex B determination of the aged value of thermal conductivity and 4.2.2 dimensions and tolerances.

4.2.5.4 Durability of thermal resistance against high temperature

The thermal conductivity of XPS products does not change with time at a high temperature within their declared operating temperature range. This is covered by 4.3.2 maximum service temperature (dimensional stability).

4.3 For specific applications

4.3.1 General

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

XPS pipe sections and prefabricated ware are sawed or abraded from flat boards. If not specified hereafter, the declarations for the specific characteristics correspond to the flat boards used for their fabrication.

4.3.2 Maximum service temperature

The maximum service temperature, ST(+), shall be determined in accordance with EN 14706. At the maximum service temperature, ST(+), no test result shall have a variation of dimensions exceeding ± 3 %.

The maximum service temperature, ST(+), shall be declared in levels with steps of 5 °C. The rate of increase of temperature shall be 50 °C/h.

XPS pipe sections and prefabricated ware are sawed or abraded from boards. Consequently, the maximum service temperature, ST(+), should be determined only on flat boards, in accordance with EN 14706. In case of need, direct determination of maximum service temperature for prefabricated pipe shells should be carried out in accordance with EN 14707.

4.3.3 Minimum service temperature

Minimum service temperatures within the scope of this standard but above 0 °C, need not be tested. For minimum service temperature within the scope of this standard, but below 0 °C, a test is necessary that shall be agreed upon between the parties.

Where relevant, the minimum service temperature, ST(-), shall be declared in levels with steps of 5 °C, mentioning the test method used.

4.3.4 Compressive stress 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, σ_{10}, or the compressive strength, σ_{m}, whichever is the greatest shall be less than the value given in Table 4, for the declared level.

Table 4 — Levels for compressive stress or compressive strength

Level	**Requirement** kPa
CS(10\Y) 100	≥ 100
CS(10\Y) 150	≥ 150
CS(10\Y) 200	≥ 200
CS(10\Y) 250	≥ 250
CS(10\Y) 300	≥ 300
CS(10\Y) 400	≥ 400
CS(10\Y) 500	≥ 500
CS(10\Y) 600	≥ 600
CS(10\Y) 700	≥ 700
CS(10\Y) 800	≥ 800
CS(10\Y) 1000	≥ 1 000

4.3.5 Water vapour diffusion transmission properties

Water vapour diffusion transmission properties shall be determined in accordance with EN 12086, and declared as the water vapour diffusion resistance factor, μ, for homogeneous products and as the water vapour resistance, Z, for faced or non-homogeneous products. No test result of μ shall be less than the declared level, MU, chosen from the following levels: 50; 80; 100; 150; 200; 250; 300. If Z is declared, no test result of Z shall be less than the declared value.

Alternatively, for the declaration of water vapour transmission properties, the values quoted in EN ISO 10456 may be used.

4.3.6 Short-term water absorption by partial immersion

Short-term water absorption by partial immersion, W_p, shall be determined in accordance with EN 1609. The manufacturer shall declare it in kg/m^3 as levels. No test result shall exceed the declared value.

NOTE A direct measure of the short-term water absorption by partial immersion on preformed pipe insulation may be made in accordance with EN 13472.

4.3.7 Trace quantities of water soluble ions and the pH-value

Trace quantities of water-soluble chloride, fluoride, silicate and sodium ions and the pH-value shall be determined in accordance with EN 13468. The manufacturer shall declare them as levels, respectively as accepted tolerances for pH. No test result shall exceed the declared value or accepted tolerance.

4.3.8 Release of dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: *http://ec.europa.eu/enterprise/construction/cpd-ds/*

4.3.9 Continuous glowing combustion

Where subject to regulation, a manufacturer shall declare the continuous glowing combustion according to national test method, where available.

NOTE A European test method is under development and the standard will be amended when this is available.

5 Test methods

5.1 Sampling

Flat test specimens shall be taken from the same sample with a total area of not less than one board.

Pipe sections, segments and prefabricated ware test specimens shall be taken from a sample consisting of at least three full size sections.

5.2 Conditioning

Conditioning of the test specimens shall be carried out at (23 ± 5) °C and (50 ± 5) % relative humidity for at least 6 h before testing unless otherwise specified in this standard.

5.3 Testing

5.3.1 General

Table 5 gives the dimensions of the test specimens, the minimum number of test specimens required to get one test result and any specific conditions which are necessary.

The test may be performed on the unfaced/uncoated product if the facing/coating is known to have no influence on the property.

For pipe sections, segments and prefabricated wares fabricated from boards, the declared characteristics shall be determined on the boards from which they have been fabricated, except dimensions, squareness, flatness, pipe section linearity, thermal conductivity and reaction to fire.

5.3.2 Thermal conductivity

For flat test specimens, thermal conductivity shall be determined in accordance with EN 12667 or EN 12939 for thick products. For cylindrical test specimens, thermal conductivity shall be determined in accordance with EN ISO 8497.

The tests in accordance with EN ISO 8497 may be replaced by tests in accordance with EN 12667 or EN 12939, provided it has been demonstrated that the results give safe (higher) values.

The thermal conductivity shall be determined for the full temperature range of the product. For factory production control see Annex A.

For XPS products for which ageing procedure applies, this procedure is described in Annex B. The results of ageing procedure performed on boards are also valid for pipe sections, segments and prefabricated wares fabricated from the same boards.

For PTD, measurements of thermal conductivity made on two inside diameters of pipe sections at the greatest and smallest insulation thickness set of diameters are deemed to be representative of the total product range.

For FPC, one dimension only is tested, i.e. one thickness of one diameter.

NOTE Suitable sizes are e.g. 48 mm and 194 mm inside diameter.

The guarded hot plate method EN 12667 or EN 12939 for thick products shall be deemed to be a suitable method for measurement of pipe sections having an inside diameter exceeding 500 mm. Flats products shall be prepared having the same thickness and density as the sections. If the guarded hot plate method is used the fact shall be stated in the test report.

The thermal conductivity shall be determined directly at the measured thickness. If this is not possible it 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 line/unit;

— and it can be demonstrated that the thermal conductivity does not vary more than 2 % over the range of thicknesses where the calculation is applied.

Where a product is manufactured in a range of thicknesses and the manufacturer chooses to characterize the entire range by declaring only one λ, he shall declare the highest λ of the range.

If facings have been removed, this and the reason for the remove shall be stated in the test report.

5.3.3 Reaction to fire

The tests shall be carried out in accordance with EN 13501-1.

Rules for mounting and fixing are given in EN 15715:2009.

Annex A of EN 15715:2009 gives tables for product and installation parameters for flat products and pipe insulation products as placed on the market. Installation parameters for standardized assemblies are only given for flat products.

A conditioning period of six weeks applies before testing.

Table 5 — Test methods, test specimens and conditions

Dimensions in millimetres

Clause		Test method		Test specimen dimensions[a]	Minimum number of measurements to get one test result	Specific conditions
No.	Title	Flat / Board	Cylindrical			
4.2.1	Thermal conductivity	EN 12667 or EN 12939	EN 12667 or EN 12939 for $D_i > 500$ EN ISO 8497 for $D_i \leq 500$	See EN 12667, EN 12939 or EN ISO 8497	1	See Annex B
4.2.2.1	Board length and width	EN 822		Full size	1	
	Board squareness	EN 824		Full size	1	Where relevant the method to determine the squareness of the edge of boards with special edge treatment shall be agreed between parties.
	Board flatness	EN 825		Full size	1	
4.2.2.2	Board thickness	EN 823		Full size	1	Load (250 ± 5) Pa
4.2.2.3	Pipe section dimensions and tolerances		EN 13467	Full size	1	
4.2.3	Dimensional stability	EN 1604		200 × 200	2	Condition specimens for 45 days. Test conditions: 23 °C, 90 % RH.
4.2.4	Reaction to fire of the product as placed on the market	See EN 13501–1, EN ISO 11925-2 and EN 13823				See EN 15715:2009
4.3.2	Maximum service temperature	EN 14706		Boards (100 × 100) × d d = 50 or 100	3	Temperature gradient 50 K/h maximum Condition specimen 45 days
4.3.4	Compressive stress or compressive strength	EN 826		100 × 100	5	Condition specimen for 45 days, specimen shall be a cube when > 150 mm × 150 mm
				150 × 150	3	
4.3.5	Water vapour transmission properties	EN 12086		See 6.1 of EN 12086	3	Conditions, Set A
4.3.6	Short-term water absorption by partial immersion	EN 1609		200 × 200	4	Method A
4.3.7	Trace quantities of water soluble ions and the pH-value	EN 13468			3	7,5 g
4.3.8	Release of dangerous substances	[b]				
4.3.9	Continuous glowing combustion	[b]				

[a] Full size product thickness, except for 4.2.3.

[b] Not yet available.

6 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 4.3:

— The extruded polystyrene foam abbreviated term	XPS
— This EN standard number	EN 14307
— Thickness tolerances	Ti
— Maximum service temperature	ST(+)
— Compressive stress or strength	CS(10\Y)i
— Water vapour diffusion resistance factor	MUi
— Short-term water absorption by partial immersion	WSi
— Trace quantities of water soluble chloride ions	Cli
— Level of the pH	pHi

where “i” shall be used to indicate the relevant class or level.

The designation code for an extruded polystyrene foam board is illustrated by the following example:

XPS – EN 14307 – T2 ST(+)(75) – CS(10\Y)300 – MU(110) – WS(0,5) – CL(5)

7 Assessment and Verification of the Constancy of Performance (AVCP)

7.1 General

The manufacturer or his authorized representative shall be responsible for the conformity of his product with the requirements of this European Standard. The Assessment and Verification of Constancy of Performance (AVCP) shall be carried out in accordance with EN 13172 and shall be based on Product Type Determination (PTD), 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 standard and with the stated values (including classes) shall be demonstrated by:

— Product Type Determination (PTD),

— Factory Production Control (FPC) by the manufacturer, including product assessment.

If a manufacturer decides to group his products, it shall be done in accordance with EN 13172.

7.2 Product Type Determination (PTD)

All characteristics defined in 4.2 and those in 4.3 if declared, shall be subject to Product Type Determination (PTD). Product Type Determination (PTD) for the thermal conductivity curve shall be carried out in accordance with EN ISO 13787.

For Product Type Determination (PTD) only one test result is required for the thermal conductivity curve and the maximum and minimum service temperature.

For the relevant characteristics, PTD on products corresponding also to EN 13164 or EN 14934 may be used for the purpose of PTD and Declaration of Performance (DoP) according to this standard.

7.3 Factory Production Control (FPC)

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

For the relevant characteristics, FPC on products corresponding also to EN 13164 or EN 14934 may be used for the purpose of FPC and DoP according to this standard.

8 Marking and labelling

Products conforming with this standard shall be clearly marked, either on the product or on the label or on the packaging, with the following information:

— product name or other identifying characteristic;

— name or identifying mark and address of the manufacturer or his authorized representative in the European Economic Area;

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

— reaction to fire class; specific test conditions shall be indicated with the marking by reference to manufacturer's literature, where relevant;

— the intended use of the insulation material for Thermal Insulation of Building Equipment and Industrial Installations is given by the abbreviation ThIBEII;

— declared thermal conductivity: reference to Declaration of Performance (DoP), showing thermal conductivity as a function of temperature, given as a table, curve and/or equation;

— declared thickness;

— designation code as given in Clause 6;

— type of facing, if any;

— declared length and declared width or inside diameter, as appropriate;

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

NOTE For CE conformity marking, see ZA.3.

Annex A
(normative)

Factory production control

Table A.1 — Minimum product testing frequencies

Subclause		Minimum testing frequency [a]
No.	**Title**	
4.2.1	Thermal conductivity	1 per 2 years and indirect testing: Manufacturer's methods and thermal conductivity of non sliced boards used to cut pipe sections:1 per 24 h where there are being production.
4.2.2.1	Dimensions and tolerances / board:	
	Length and width	1 per 2 h
	Squareness	1 per 4 h
	Flatness	1 per 8 h
4.2.2.2	Thickness / board	1 per 2 h
4.2.2.3	Dimensions and tolerances – pipe sections	1 per batch
4.2.3	Dimensional stability	PTD [b] / 5 years
4.2.4	Reaction to fire of the product as placed to the market	See Table A.2
4.3.2	Maximum service temperature	PTD [b] / 5 years
4.3.4	Compressive stress or compressive strength/ board	1 per 24 h
4.3.5	Water vapour diffusion resistance factor	PTD [b] / 5 years
4.3.6	Short-term water absorption by partial immersion	PTD [b] / 5 years
4.3.7	Trace quantities of water soluble ions and the pH-value	PTD [b] / 5 years
4.3.8	Dangerous substances	c
4.3.9	Continuous glowing combustion	c

[a] The minimum testing frequencies, expressed in test results required per period, shall be understood as the minimum for each production unit/line under stable conditions. In the case of pipe sections, it shall be understood as the minimum for each production batch fabricated under stable conditions. In addition to the testing frequencies given above, 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. For PTD and FPC, units using the same process in one factory are considered together (as one production line).

For mechanical properties, the testing frequencies given are independent of the change of product. In addition the manufacturer shall establish internal rules for process adjustments related to these properties when changing the product.

For initial type testing of long lasting tests, e.g. aged value of thermal resistance or conductivity, mechanical and freeze–thaw properties, test results of similar products produced at different plants or production line will be recognized until testing for a new plant/production line is completed.

[b] PTD, see EN 13172.

[c] Frequencies are not given.

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

Subclause		Minimum testing frequency [a]							
No.	Title: Reaction to fire class	Direct testing [b]		Indirect testing [c]					
				Product		Components [d]			
						Substantial		Non substantial	
		Test method	Frequency	Test method	Frequency	Test method	Frequency	Test method	Frequency
4.2.4	B C D	EN 13823 [SBI]	1 per month or	—	—	—	—	—	—
		and	1 per 2 years and indirect testing	Manufacturer's method	1 per week	Manufacturer's method	1 per week	Manufacturer's method	1 per week
		EN ISO 11925-2 [Ignitability] Exposure = 30 s	1 per week or	—	—	—	—	—	—
			1 per 2 years and indirect testing	Manufacturer's method	1 per week	Manufacturer's method	1 per week	Manufacturer's method	1 per week
	E	EN ISO 11925-2 [Ignitability] Exposure = 15 s	1 per week or	—	—	—	—	—	—
			1 per 2 years and indirect testing	Manufacturer's method	1 per week	Manufacturer's method	1 per week	Manufacturer's method	1 per week

[a] The minimum testing frequencies, expressed in test results required per period, 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 above, 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, it is only possible in case of product certification.

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

Substantial component: A material that constitutes a significant part of a non-homogeneous product. A layer with a mass per unit area ≥ 1,0 kg/m^2 or a thickness ≥ 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.

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

Annex B
(normative)

Determination of the aged values of thermal conductivity

B.1 Scope

The ageing procedure shall be used for all XPS products with and without diffusion tight laminates. The ageing procedure represents a time average value of about 25 years of use.

B.2 Procedure for XPS foam without diffusion tight laminates

B.2.1 Principle

The procedure involves slicing of the test specimen to increase the rate of gas exchange and thus simulates a long period of use.

B.2.2 Sample preparation

Prepare the test specimen from a product of not less than one day and not more than 90 days old.

Cut each test specimen into slices of (10 ± 1) mm, retaining the surface skins, when present.

The slice package shall include the aged slices over the board thickness and shall contain the outermost 10 mm thick layers on both sides of the test specimen. A remaining central slice with less than 10 mm thickness can be discarded.

Mark the edges of the test sample to ensure correct realignment of the stack of the test specimens (slices) after cutting.

The cutting technique should not significantly damage the surface of the slices. A fine toothed band saw, hot wire cutting or surface grinding may provide suitable methods.

B.2.3 Procedure

Store the individual slices at (23 ± 2) °C, and (50 ± 5) % relative humidity for the following time periods:

(90 + 2/- 2) days for XPS foam thicknesses of 20 mm to 70 mm,

(50 + 2/- 1) days for foam thicknesses of > 70 mm to 120 mm and

(30 + 2/- 0) days for foam thicknesses > 120 mm.

Assemble a test specimen of aged slices including the surface representative of the thickness to be tested. If any part of the cut specimen is discarded, evidence shall be available that the aged thermal conductivity is not adversely affected.

Measure the thermal conductivity of the final entire assembly in accordance, for boards or cylindrical specimen with D_i > 500 mm with EN 12667 and EN 12939 for thick products, in accordance with EN ISO 8497 for cylindrical specimen with $D_i \leq 500$ mm.

The correction of the thermal conductivity due to damaged surface shall be done for XPS products without skin by deducting 0,000 7 W/(m·K) from the measured aged thermal conductivity. For XPS products with skin the correction shall be done by deducting 0,001 W/(m·K) from the measured aged thermal conductivity. This value of 0,001 W/(m·K) includes the correction for the damaged surface and the correction for the elimination of the skin from the ageing process.

B.3 Procedure for XPS foam for use with diffusion tight facings on both sides

B.3.1 Principle

The basis of the declared value of XPS foam which is laminated on both sides of the foam is the thermal value of the foam at the time of lamination with diffusion tight facings.

B.3.2 Ageing procedure

Store the full size board (non-sliced) without the facings at (23 ± 2) °C and (50 ± 5) % relative humidity for a time period of 60 days after production.

Then cut a test specimen with the dimensions of 500 mm × 500 mm and measure the thermal conductivity in accordance with EN 12667 or EN 12939 for thick products and with 5.3.2.

For products which are laminated more than 60 days after production, as an exceptional case, the declaration of thermal conductivity shall be based on measuring the thermal conductivity at the time of lamination.

In order to consider the effect of edges and the degree of diffusion tightness of facings on an increase of the thermal conductivity after lamination, the thermal conductivity as determined according to this clause of the board without the facings shall be increased by 0,001 W/(m·K) when diffusion tight facings like aluminium foils with minimum thickness of 50 µm or facings, that show an equivalent performance are used.

Aluminium foil with thicknesses less than 50 µm and other facings can be considered as diffusion tight, when the thermal conductivity of a faced product with a maximum size of the sample of 800 mm × 800 mm and maximum thickness of 50 mm does not increase more than 0,001 W/(m·K), when stored for (175 ± 5) days at 70 °C.

The panel dimensions of products laminated with diffusion tight facings shall not be less than 600 mm × 800 mm.

NOTE The initial diffusion tight property of a facing can also be proven, if the oxygen diffusion level is less than 4,5 cm^3 per 24 h per m^2 when measured at 20 °C in accordance with ASTM 3985:1995, Standard test method for oxygen gas transmission rate through plastic film and sheeting using a coulometric sensor.

B.4 Blowing agent

The manufacturer shall state the blowing agent used for the product, when requested.

NOTE The blowing agent may be identified by the method of gas chromatography.

Annex C
(informative)

Additional properties

C.1 General

The manufacturer may choose to give information on the following additional properties (see Table C.6).

This information, where appropriate for the product and the application, should be given as limiting values for each test result obtained from the referred test method, sampling and conditions as given in Table C.6.

The properties mentioned are the most commonly requested. Information on other properties may be obtained from other European or international Standards.

C.2 Behaviour under cyclic loading

Behaviour under cyclic loading, CL(i/z)x, (I is the relative deformation, z is the number of cycles and x is the applied compressive stress), should be determined in accordance with EN 13793, *Thermal insulating products for building applications — Determination of behaviour under cyclic loading*. The deformation at e.g. 2×10^6 load cycles and 150 kPa may be given.

C.3 Compressive modulus of elasticity

Modulus of elasticity, *E*, in compression should be determined perpendicular to the faces of the product in accordance with EN 826, *Thermal insulating products for building applications — Determination of compression behaviour*. If the modulus of elasticity in compression is declared, no test result should be lower than the declared value CM.

C.4 Bending strength

Bending strength, σ_b, should be determined in accordance with EN 12089, *Thermal insulating products for building applications — Determination of bending behaviour*.

XPS products may be tested in the extrusion direction or in the cross direction, depending on the application. If the bending strength is declared, no test result should be lower than the declared level, BS, chosen from the following values: 300 kPa; 400 kPa; 500 kPa; 600 kPa; 700 kPa; 800 kPa; 900 kPa; 1 100 kPa; 1 300 kPa; 1 700 kPa; 1 900 kPa; 2 100 kPa; 2 300 kPa; 2 500 kPa; 3 000 kPa; 3 500 kPa; 4 000 kPa.

C.5 Shear strength

Shear strength, τ, should be determined in accordance with EN 12090, *Thermal insulating products for building applications — Determination of shear behaviour*.

XPS products may be tested in the extrusion direction or in the cross direction depending on the application. If the shear strength is declared, no test result should be lower than the declared value, SS.

C.6 Deformation under specified compressive load and temperature conditions

Deformation under specified compressive load and temperature conditions should be determined in accordance with EN 1605, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*. For each 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 values given in Table C.1 for the declared level.

Table C.1 — Levels for deformation under specified compressive load and temperature conditions

Level	Test conditions	Requirement %
DLT(1)5	load: 20 kPa temperature: (80 ± 1) °C time: (48 ± 1) h.	≤ 5
DLT(2)5	load: 40 kPa temperature: (70 ± 1) °C time: (168 ± 1) h.	≤ 5

C.7 Compressive creep

Compressive creep, $\chi\varepsilon_{ct}$, and total thickness reduction, χ_t, should be determined after at least 122 days of testing at a declared compressive stress, σ_c, given in steps of at least 1 kPa, and the results extrapolated 30 times, corresponding to 10 years, to obtain the declared levels in accordance with EN 1606, *Thermal insulating products for building applications — Determination of compressive creep*. Tests shall be done with samples that do not exceed the compressive stress or compressive strength according to the level of Table 4 by more than 10 %. 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 at the declared stress.

NOTE 1 For building applications a total thickness reduction, ε_t, of 2 % and an exploration time of 50 years are generally required.

NOTE 2 Examples for declaration of levels for compressive creep.

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

NOTE 3 Referring to the designation code $CC(i_1/i_2/y)\sigma_c$, according to Clause 6, a declared level CC(2/1.5/50)100, for example, indicates a value not exceeding 1,5 % for compressive creep and 2 % for total thickness reduction after extrapolation at 50 years (i.e. 30 times 608 days of testing) under a declared stress of 100 kPa.

C.8 Tensile strength perpendicular to facings

Tensile strength perpendicular to faces, σ_{mt}, should be determined in accordance with EN 1607, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*. No test result shall be less than the value given in Table C.2 for the declared level.

Table C.2 — Levels for tensile strength, perpendicular to faces

Level	**Requirement** kPa
TR100	≥ 100
TR200	≥ 200
TR400	≥ 400
TR600	≥ 600
TR900	≥ 900

C.9 Long term water absorption by diffusion

Water absorption by diffusion, W_{dV}, should be determined in accordance with EN 12088, *Thermal insulating products for building applications — Determination of long term water absorption by diffusion*. No test result shall be higher than the value given in Table C.3 for the declared level.

Table C.3 — Levels for long term water absorption by diffusion

Level	**Requirement** [a] Volume %		
	d_D = 50 mm	d_D = 100 mm	d_D = 200 mm
WD(V)5	≤ 5	≤ 3	≤ 1,5
WD(V)3	≤ 3	≤ 1,5	≤ 0,5
[a] Values between thicknesses to be interpolated.			

C.10 Long term water absorption by immersion

Water absorption by total immersion, W_{lt}, should be determined in accordance with EN 12087, *Thermal insulating products for building applications — Determination of long term water absorption by immersion method 2A*. No test result shall be higher than the value given in Table C.4, for the declared level.

Table C.4 — Levels for long term water absorption by total immersion

Level	**Requirement** **%**
WL(T)3	≤ 3
WL(T)1.5	≤ 1,5
WL(T)0.7	≤ 0,7

C.11 Freeze–thaw resistance

Freeze–thaw resistance should be determined in accordance with EN 12091, *Thermal insulating products for building applications — Determination of freeze–thaw resistance* using the test specimen from 4.3.6.2 The water absorption, W_V, shall be not higher than the value given in Table C.5 for the declared level.

Table C.5 — Levels for freeze–thaw resistance

Level	Requirement %
FT1	≤ 2
FT2	≤ 1

After the freeze–thaw test the reduction in compressive stress at 10 % deformation, σ_{10}, or the compressive strength, σ_m, of the dry specimen, when tested in accordance with EN 826 shall not exceed 10 % of the initial value.

C.12 Apparent density

Density as such is a characteristic parameter but not a basis for quality assessment of extruded polystyrene foam products.

Apparent density, AD, of XPS board should be determined in accordance with EN 1602.

Apparent density, AD, of XPS pipe shell should be determined in accordance with EN 13470.

C.13 Coefficient of thermal expansion

The coefficient of thermal expansion, TE, should be determined in accordance with EN 13471.

C.14 Closed cell content

Closed cell content of a product should be tested in accordance with EN ISO 4590. If the closed cell content is declared, no test result should be lower than the declared value of closed cells CV.

Table C.6 — Test methods, test specimens and conditioning

Dimensions in millimetres

Clause		Test methods	Test specimens [a]		Factory Production Control [b] Minimum product testing frequencies	Specific conditions
No.	Title	EN	Dimensions	Number of measurements to get one test result		
C.2	Behaviour under cycling load	EN 13793	150 × 150	1	1 per 5 years	Grinding of surfaces is an option, condition specimen for 45 days
C.3	Compressive modulus of elasticity	EN 826	100 × 100	5	1 per 5 years	Condition specimen for 45 days
			150 × 150	3	1 per 5 years	
C.4	Bending strength	EN 12089	Thickness: declared, but max. 100 Length: 5d (≤550) Width: 150	3	1 per 5 years	Method B Condition specimen for 45 days
C.5	Shear strength	EN 12090	250 × 50 × thickness (max. 50 thick)	5	1 per 5 years	Single specimen Condition specimen for 45 days
			200 × 100 × thickness, (max. 50 thick)	3	1 per 5 years	Double specimen Condition specimen for 45 days
C.6	Deformation under specified compressive load and temperature conditions	EN 1605	100 × 100	3	1 per 5 years	Condition specimen for 45 days
C.7	Compressive creep	EN 1606	100 × 100	2	1 per 5 years	Condition specimen for 45 days
			150 × 150	2	1 per 5 years	
C.8	Tensile strength perpendicular to faces	EN 1607	50 × 50	5	1 per 5 years	Condition specimen for 45 days
C.9	Long term water absorption by diffusion	EN 12088	500 × 500	1	1 per 5 years	
C.10	Long term water absorption by immersion	EN 12087	200 × 200	2	1 per 5 years	Method 2A
C.11	Freeze–thaw resistance	EN 12091	500 × 500	1	1 per 5 years	Set A
			100 × 100 or	5	1 per 5 years	Set B1 and B2
			150 × 150	3	1 per 5 years	Set B1 and B2
C.12	Apparent density, board	EN 1602	Full size or specimen size	1	1 per 5 years	
C.13	Coefficient of thermal expansion	EN 13471		3	1 per 5 years	Test specimen dimensions adapted to the chosen equipment. Condition specimen for 45 days.
C.14	Closed cell content	EN ISO 4590	30 × 30 × 50	5	1 per 5 years	Method 2 with corrections. Condition specimen for 45 days

NOTE Density as such is a characteristic parameter but not a property or a basis for the quality assessment of XPS products.

[a] Unless stated otherwise the dimensions include the declared thickness.

[b] Only relevant in the case of declaration of the property.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/103[1)] "Thermal insulation products" given to CEN by the European Commission and the European Free Trade Association.

If this European standard is cited in the Official Journal of the European Union (OJEU), the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the factory made extruded polystyrene foam products intended for the use indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1

1) As amended by mandates M126, M130 and M367

Table ZA.1 — Relevant clauses for factory made extruded polystyrene foam products and intended use

Product:	Factory made extruded polystyrene foam (XPS) products		
Intended use:	Thermal insulation for Building Equipment and Industrial Installations (ThIBEII)		
Essential Characteristics	**Clauses in this and other European standard(s) related to essential characteristics**[e]	**Regulatory classes**	**Notes**
Thermal resistance	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature
	4.2.2 Dimensions and tolerances	—	Flat products: Declared thickness d_D and tolerance class Linear products: Inner diameter D_i, thickness d_D and tolerance class
Reaction to fire	4.2.4 Reaction to fire	Euroclasses	—
Durability of thermal resistance against high temperature	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature
	4.3.2 Maximum service temperature	—	Declared ST(+)
Durability of thermal resistance against ageing/degradation	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature [b]
	4.2.3 Dimensional stability or	—	Declared DS
	4.3.2 Maximum service temperature	—	Declared ST(+)
Durability of reaction to fire against high temperature	4.2.5 Durability characteristics	Euroclasses	[c]
Durability of reaction to fire against ageing/degradation	4.2.5 Durability characteristics	Euroclasses	[a]
Compressive strength	4.3.4 Compressive stress or compressive strength for flat products	—	Declared CS
Water permeability	4.3.6 Water absorption	—	Declared WS
Water vapour permeability	4.3.5 Water vapour diffusion resistance	—	Declared MU or Z
Rate of release of corrosive substances	4.3.7 Trace quantities of water-soluble ions and the pH-value	—	Levels of ion content and level of the pH-value
Release of dangerous substances to the indoor environment	4.3.8 Release of dangerous substances	—	[d]
Continuous glowing combustion	4.3.9 Continuous glowing combustion	—	[d]

[a] The fire performance of XPS does not deteriorate with time.

[b] Thermal conductivity change with time of XPS products, if any, is dealt with in Annex B of this standard.

[c] The fire performance of XPS products does not deteriorate within the declared operating temperature range of the product.

[d] European test methods are under development.

[e] Also valid and applicable for multilayers

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential characteristics for the intended use of the product. In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option "No performance determined" (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

ZA.2 Procedures for AVCP of factory made extruded polystyrene foam products

ZA.2.1 Systems of AVCP

The AVCP systems of factory made extruded polystyrene foam products indicated in Table ZA.1, established by EC Decision 95/204/EC of 31.05.95 (OJ L 129) revised by decision 99/91/EC of 25.01.99 (OJ L 29) amended by the decision 01/596/EC of 08.01.01 (OJ L 209) is shown in Table ZA.2 for the indicated intended use and relevant level(s) or class(es) of performance.

Table ZA.2 — Systems of AVCP

Product(s)	Intended use(s)	Level(s) or class(es) (reaction to fire)	AVCP system(s)
Thermal insulation products (Factory made products)	For uses subject to regulations on reaction to fire	(A1, A2, B, C)[a]	1
		(A1, A2, B, C)[b], D, E	3
		(A1 to E)[c], F	4
	Any	—	3
System 1: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.2 System 3: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.4 System 4: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.5			

[a] Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).

[b] Products/materials not covered by footnote ([a]).

[c] Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of classes A1 according to Commission Decision 96/603/EC, as amended).

The AVCP of the factory made extruded polystyrene foam products in Table ZA.1 shall be according to the AVCP procedures indicated in Tables ZA.3.1 to ZA.3.3 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

Table ZA.3.1 — Assignment of AVCP tasks for factory made extruded polystyrene foam products under system 1 for reaction to fire and system 3 (see Table ZA.2)

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared.	Clause 5, Annexes B and C of EN 13172:2012 and 7.3 of this standard
	Further testing of samples taken at factory according to the prescribed test plan	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	Annex A of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory and by the product certification body involved with reaction to fire	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for notified testing laboratory	Determination of the product-type on the basis of type testing (including sampling carried out by the manufacturer), type calculation, tabulated values or descriptive documentation of the product	— Thermal resistance; — Release of dangerous substances [a]; — Compressive strength (for load bearing applications); — Water permeability*;* — Release of corrosive substances *(if relevant).*	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for the notified product certification body	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product [b]	— Reaction to fire	Clause 6 of EN 13172:2012 and 7.2 of this standard
	Initial inspection of manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which are declared, namely reaction to fire. Documentation of the FPC.	Annex B and C of EN 13172:2012 and 7.3 of this standard
	Continuous surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which are declared, namely reaction to fire. Documentation of the FPC.	Annex B and C of EN 13172:2012 and 7.3 of this standard

[a] No test method available yet.

[b] Sampling shall be carried out as defined in 5.1

Table ZA.3.2 — Assignment of AVCP tasks for factory made extruded polystyrene foam products under system 3 (see Table ZA.2)

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	Clause 5, Annexes C and D of EN 13172:2012 and 7.3 of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for a notified testing laboratory	Determination of the product type on the basis of type testing (based on sampling carried out by the manufacturer) or tabulated values	— Reaction to fire; — Thermal resistance; — Release of dangerous substances [a]; — Compressive strength (for load bearing applications); — Water permeability; — Release of corrosive substances *(if relevant).*	Clause 6 of EN 13172:2012 and 7.2 of this standard
[a] No test method available yet.			

Table ZA.3.3 — Assignment of AVCP tasks for factory made extruded polystyrene foam products under combined system 4 for reaction to fire and system 3 (see Table ZA.2)

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which is declared	Clause 5, Annexes C and D of EN 13172:2012 and 7.3 of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for a notified testing laboratory	Determination of the product type on the basis of type testing (based on sampling carried out by the manufacturer) or tabulated values	— Thermal resistance; — Release of dangerous substances [a]; — Compressive strength (for load bearing applications); — Water permeability; — Release of corrosive substances *(if relevant).*	Clause 6 of EN 13172:2012 and 7.2 of this standard
[a] No test method available yet.			

ZA.2.2 Declaration of Performance (DoP)

ZA.2.2.1 General

The manufacturer draws up the DoP and affixes the CE marking on the basis of the different AVCP systems set out in Annex V of the Regulation (EU) No 305/2011:

In case of products under system 1

— the factory production control and further testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and

— the certificate of constancy of performance issued by the notified product certification body on the basis of determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; initial inspection of the manufacturing plant and of factory production control and continuous surveillance, assessment and evaluation of factory production control.

In case of products under system 3

— the factory production control carried out by the manufacturer; and

— the determination of the product-type on the basis of type testing (based on sampling carried out by the manufacturer), type calculation, tabulated values or descriptive documentation of the carried out by the notified testing laboratory.

In case of products under system 4

— the factory production control carried out by the manufacturer; and

— the determination by the manufacturer of the product-type on the basis of type testing, type calculation, tabulated values or descriptive documentation of the product.

ZA.2.2.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011.

According to this Regulation, the DoP shall contain, in particular, the following information:

— the reference of the product-type for which the declaration of performance has been drawn up;

— the AVCP system or systems of the construction product, as set out in Annex V of the CPR;

— the reference number and date of issue of the harmonized standard which has been used for the assessment of each essential characteristic;

— where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

a) the intended use or uses for the construction product, in accordance with the applicable harmonized technical specification;

b) the list of essential characteristics, as determined in the harmonized technical specification for the declared intended use or uses;

c) the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;

d) where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared;

e) the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market;

f) for the listed essential characteristics for which no performance is declared, the letters “NPD” (No Performance Determined).

Regarding the supply of the DoP, article 7 of the Regulation (EU) No 305/2011 applies.

The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No 1907/2006, (REACH) shall be provided together with the DOP.

ZA.2.2.3 Example of DoP

The following gives an example of a filled-in DoP for factory made extruded polystyrene foam product for EN 14307

DECLARATION OF PERFORMANCE

No 0123-DoP-2013/10/07

1. Unique identification code of the product-type:

ABCD Chilled Board

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of the CPR:

see product label

3. Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:

Thermal Insulation for Building Equipment and Industrial Installations (ThIBEII)

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5):

Any Co Ltd, PO Box 21, B-1050

5. Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2):

not relevant

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V:

Systems 1 and 3

7. In case of the declaration of performance concerning a construction product covered by a harmonized standard:

Notified certification body No. 4567 performed, carried out the determination of the product type, the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control and issued the certificate of constancy of performance for reaction to fire. Notified testing laboratory No. 7456 performed the test reports for the other relevant declared characteristics

8. Declared performance

<table>
<tr><th colspan="2">Essential characteristics</th><th colspan="6">Performance</th><th>Harmonized technical specification</th></tr>
<tr><td rowspan="3">Thermal resistance</td><td rowspan="2">Thermal conductivity</td><td>ϑ °C</td><td>−50</td><td>−20</td><td>+10</td><td>+40</td><td>+75</td><td rowspan="14">EN 14307:2015</td></tr>
<tr><td>λ_D W/(m·K)</td><td>0,025</td><td>0,028</td><td>0,033</td><td>0,038</td><td>0,045</td></tr>
<tr><td>Thickness</td><td colspan="6">d_D = 200 mm, Tolerance class T3</td></tr>
<tr><td colspan="2">Reaction to fire</td><td colspan="6">E</td></tr>
<tr><td colspan="2">Durability of thermal resistance against ageing/degradation</td><td colspan="6">Dimensional stability DS(70,90)</td></tr>
<tr><td colspan="2">Durability of thermal resistance against high temperature</td><td colspan="6">Maximum service temperature ST(+)75 (= +75°C)</td></tr>
<tr><td colspan="2">Durability of reaction to fire against ageing/degradation</td><td colspan="6">Durability characteristics E</td></tr>
<tr><td colspan="2">Durability of reaction to fire against high temperature</td><td colspan="6">Durability characteristics E</td></tr>
<tr><td colspan="2">Compressive strength</td><td colspan="6">Compressive stress or strength CS(10\Y)200 (≥200 kPa)</td></tr>
<tr><td colspan="2">Water permeability</td><td colspan="6">Water absorption WS0,5 (≤0,5 kg/m^3)</td></tr>
<tr><td colspan="2">Water vapour permeability</td><td colspan="6">Water vapour diffusion transmission MU50</td></tr>
<tr><td colspan="2">Rate of release of corrosive substances</td><td colspan="6">Trace quantities of water-soluble ions: CL8 (≤8 ppm); F7; SI7; NA18
pH-value: pH6</td></tr>
<tr><td colspan="2">Release of dangerous substances</td><td colspan="6">NPD</td></tr>
<tr><td colspan="2">Continuous glowing combustion</td><td colspan="6">NPD</td></tr>
<tr><td colspan="9">NPD No Performance Determined</td></tr>
</table>

9. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

……

(Name and function)

…….…….. ……..……..

(Place and date of issue) (Signature)

NOTE For characteristics where e.g. the declaration is different for different thickness a Table is needed instead of a single value in the Table above

ZA.3 CE Marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly:

— to the factory made extruded polystyrene foam (XPS) product

or

— to a label attached to it.

Where this is not possible or not warranted on account of the nature of the product, it shall be affixed to the packaging or to the accompanying documents.

The CE marking shall be followed by:

— the last two digits of the year in which it was first affixed;

— the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;

— the unique identification code of the product-type;

— the reference number of the declaration of performance;

— the level or class of the performance declared;

— the dated reference to the harmonized technical specification applied;

— the identification number of the notified body [only for products under systems 1 and 3];

— the intended use as laid down in the harmonized technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

Figure ZA.1 gives an example of the information related to products subject to AVCP systems 1 and 3 to be given on the product or to a label attached to it.

CE	*CE marking, consisting of the "CE"-symbol*
4567	*Identification number of the product certification body*
7456	*Identification number of the notified test laboratory/ laboratories*
AnyCo Ltd, PO Box 21, B-1050	*name and the registered address of the manufacturer, or identifying mark*
13	*Last two digits of the year in which the marking was first affixed*
0123 – DoP – 2013/10/07	*reference number of the DoP*
EN 14307:2015	*No. of European standard applied, as referenced in OJEU*
ABCD Chilled Board	*Unique identification code of the product-type*
ThIBEII	*Intended use of the product as laid down in the European standard applied*
λ_D DoP	*Declared thermal conductivity*
RtF E	*Reaction to fire – Euroclass*
d_D 200 mm	*Declared Thickness*
XPS – EN 14307 – T3 ST(+)75 – DS(70,90) – CS(10)200 – WS0,5 – MU50 – CL10 – F7 – SI7 – NA18 – pH9.5	*Designation code (in accordance with Clause 6 of this standard for the relevant characteristics according to Table ZA.1)* *Level or class of the performance declared*

Figure ZA.1 — Example CE marking information of products under AVCP system 1 and system 3

Bibliography

[1] EN 1602, *Thermal insulating products for building applications - Determination of the apparent density*

[2] EN 1606, *Thermal insulating products for building applications - Determination of compressive creep*

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

[4] EN ISO 4590, *Rigid cellular plastics - Determination of the volume percentage of open cells and of closed cells (ISO 4590)*

[5] EN 12087, *Thermal insulating products for building applications - Determination of long term water absorption by immersion*

[6] EN 12088, *Thermal insulating products for building applications - Determination of long term water absorption by diffusion*

[7] EN 12089, *Thermal insulating products for building applications - Determination of bending behaviour*

[8] EN 12090, *Thermal insulating products for building applications - Determination of shear behaviour*

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

[10] EN 13238, *Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates*

[11] EN 13470, *Thermal insulating products for building equipment and industrial installations - Determination of the apparent density of preformed pipe insulation*

[12] EN 13471, *Thermal insulating products for building equipment and industrial installations - Determination of the coefficient of thermal expansion*

[13] EN 13472, *Thermal insulating products for building equipment and industrial installations - Determination of short term water absorption by partial immersion of preformed pipe insulation*

[14] EN 13793, *Thermal insulating products for building applications - Determination of behaviour under cyclic loading*

[15] EN 14707, *Thermal insulating products for building equipment and industrial installations - Determination of maximum service temperature for preformed pipe insulation*

[16] EN ISO 1182, *Reaction to fire tests for products - Non-combustibility test (ISO 1182)*

[17] EN ISO 1716, *Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716)*

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