BS EN 14309:2015

BSI Standards Publication

Thermal insulation products for building equipment and industrial installations — Factory made products of expanded polystyrene (EPS) — Specification

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National foreword

This British Standard is the UK implementation of EN 14309:2015. It supersedes BS EN 14309:2009+A1:2013 which is withdrawn.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 products of expanded polystyrene (EPS) - Specification

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Produits manufacturés en polystyrène expansé (PSE) - Spécification

Wärmedämmstoffe für die technische Gebäudeausrüstung und für betriebstechnische Anlagen in der Industrie - Werkmäßig hergestellte Produkte aus expandiertem Polystyrol (EPS) - 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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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14309:2015) 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 14309:2009+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 14309 are the following:

a) an addition to the foreword;

b) an addition in 3.2.2;

c) a new 4.3.15;

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 five annexes:

— Annex A (normative), Factory production control;

— Annex B (normative), Product classification;

— Annex C (normative), Determination of minimum service temperature;

— Annex D (informative), Additional properties;

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

This document 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 can 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 products of expanded polystyrene (EPS) — 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 products of expanded polystyrene which are used for the thermal insulation of building equipment and industrial installations with an operating temperature range of approximately - 180 °C to + 80 °C. Modified expanded polystyrene polymers with a higher temperature resistance are also covered by this standard.

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

The products are manufactured in the form of faced or unfaced boards, rolls, lags, pipe sections or other prefabricated ware.

This 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 insulation systems and composite panels; the performance of systems incorporating these products is not covered.

This standard does not specify the required level or class of a given property that should be achieved by a product to demonstrate fitness for purpose in a particular application. The classes and 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 10 °C are not covered by this standard.

This standard does not cover products for *in situ* insulation (for loose fill or poured insulation) or products for the insulation of the building structure.

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 1602, *Thermal insulating products for building applications - Determination of the apparent density*

EN 1603, *Thermal insulating products for building applications - Determination of dimensional stability under constant normal laboratory conditions (23 °C/ 50 % relative humidity)*

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

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

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

EN 12085, *Thermal insulating products for building applications - Determination of linear dimensions of test specimens*

EN 12086, *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 12431, *Thermal insulating products for building applications - Determination of thickness for floating floor insulating products*

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 13163, *Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) 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 13469, *Thermal insulating products for building equipment and industrial installations - Determination of water vapour transmission properties of preformed pipe insulation*

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

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

EN 14933, *Thermal insulation and light weight fill products for civil engineering applications - Factory made products of expanded polystyrene (EPS) - Specification*

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

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

EN ISO 1182, *Reaction to fire tests for products - Non-combustibility test (ISO 1182:2010)*

EN ISO 1716, *Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716:2010)*

EN ISO 8497, *Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes (ISO 8497:1994)*

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

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2010)*

EN ISO 13787, *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
pipe section
(insulation) product in the shape of a cylindrical annulus which may be split to facilitate application

3.1.1.2
board
slab
(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 are usually thinner than slabs. They may also be delivered in tapered form.

3.1.1.3
roll
(insulation) product supplied in the form of a wound cylinder

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

3.1.2 Additional terms and definitions

3.1.2.1
expanded polystyrene (EPS)
rigid cellular plastics insulation material, manufactured by moulding beads of expandable polystyrene or one of its copolymers and which has a closed cellular structure filled with air

3.1.2.2
expanded polystyrene block
rigid insulation product or material generally of rectangular cross section and with a thickness not significantly smaller than the width. Blocks are supplied trimmed or untrimmed

3.1.2.3
expanded polystyrene board
rigid insulation product (cut, moulded or continuously foamed) of rectangular shape and cross section in which the thickness is significantly smaller than the other dimensions

Note 1 to entry: Boards can be of uniform thickness or tapered. The board edges can be of various sorts (e.g. square, half lapped, tongue and groove).

3.1.2.4
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.

3.1.2.5
class
combination of two levels of the same property between which the performance shall fall

3.1.2.6
production line
assemblage of equipment that produces products using a continuous process

3.1.2.7
production unit
assemblage of equipment that produces products using a discontinuous process

Note 1 to entry: For PTD and FPC, units using the same process in one factory are considered together (as one production line).

3.1.2.8
prefabricated ware
pieces cut, abraded or otherwise formed from a board or block of product e.g. elbows, T-pieces etc

3.1.2.9
product
material, element or component about which information is required. Refers to a construction product, as defined in the Construction Products Regulation, from an individual producer

3.2 Symbols, units and abbreviated terms

3.2.1 Symbols and units used in this standard

α	is the confidence level	—
b	is the width	mm
d	is the thickness	mm
D_i	is the inside diameter	mm
D	is the water vapour permeability	mg/(m·h·Pa)
d_D	is the declared thickness of a product	mm
$\Delta\varepsilon_b$	is the relative change in width	%
$\Delta\varepsilon_l$	is the relative change in length	%
$\Delta\varepsilon_d$	is the relative change in thickness	%
E_{dyn}	is the dynamic elasticity modulus	MN/m^2
k	is a factor related to the number of test results available	—
l	is the length	mm
L	is the deviation from linearity	mm
$\lambda_{90,\,90}$	is the thermal conductivity of 90 % fractile and 90 % confidence level	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 value of the measured thermal conductivity	W/(m·K)
μ	is the water vapour diffusion resistance factor	—
p	is the fractile value (quantile)	—
ρ_a	is the apparent density	kg/m^3
s'	is the dynamic stiffness	MN/m^3
σ_{10}	is the compressive stress at 10 % deformation	kPa
σ_b	is the bending strength	kPa
σ_{mt}	is the tensile strength perpendicular to faces	kPa
S_b	s the deviation from squareness	mm/m
s_λ	is the estimate of the standard deviation of the thermal conductivity	W/(m·K)
S_{max}	is the deviation from flatness	mm
s_R	is the estimate of the standard deviation of the thermal resistance	$(m^2{\cdot}K)/W$
τ	is the shear strength	kPa

v	is the deviation of squareness	mm
W_{dV}	is the water absorption by diffusion	vol.-%
W_{lt}	is the long-term water absorption by total immersion	vol.-%
W_{lp}	is the long-term water absorption by partial immersion	kg/m^2
X_0	is the initial deformation (after 60 s from the beginning of the loading)	mm
X_{ct}	is the absolute compressive creep	mm or %
X_t	is the deformation at time t	mm
Z	is the water vapour resistance	$(m^2 \cdot h \cdot Pa)/mg$
BS	is the symbol of the declared level for bending strength	
$CC(i_1/i_2/y)\sigma_c$	is the symbol of the declared level for compressive creep	
CL	is the symbol of the declared level for water soluble chloride ions	
CS(10)	is the symbol of the declared level for compressive stress at 10 % deformation	
DS(N)	is the symbol of the declared class for dimensional stability under normal laboratory conditions	
DS(T\L)	is the symbol of the declared level for dimensional stability under load and temperature	
F	is the symbol of the declared level of water soluble fluoride ions	
L	is the symbol of the declared class for length tolerances	
MU	is the symbol for the declared water vapour diffusion factor	
NA	is the symbol of the declared level of water soluble sodium ions	
P	is the symbol of the declared class for flatness tolerance	
pH	is the symbol of the declared level for the pH-value	
S	is the symbol of the declared class for squareness tolerance	
SI	is the symbol of the declared level of water soluble silicate ions	
ST(+)	is the symbol of the declared level of maximum service temperature	
ST(-)	is the symbol of the declared level of minimum service temperature	
T	is the symbol of the declared class for thickness tolerance	
TR	is the symbol of the declared level for tensile strength perpendicular to faces	
W	is the symbol of the declared class for width tolerance	
WD(V)	is the symbol of the declared level for water absorption by diffusion	
WL(T)	is the symbol of the declared level for water absorption by total immersion	
WS	is the symbol of the declared level for short-term water absorption	
Z	is the symbol of the declared water vapour resistance value	

3.2.2 Abbreviated terms 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

EPS is **E**xpanded **P**oly**S**tyrene

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

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)

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 D.

One test result on a product property is the average of the measured values on the number of test specimens given in Table 12.

4.2 For all applications

4.2.1 Thermal conductivity

For flat specimens, 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. They shall be declared by the manufacturer according to the measuring standards mentioned above covering the product service temperature range. The following conditions apply:

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

— the declared thermal 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 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 the 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

The length, *l*, width, *b*, and thickness, *d*, of flat products shall be determined in accordance with EN 822 and EN 823.

The length, *l*, thickness, *d*, and inside diameter, D_i, of pipe sections, segments and prefabricated ware shall be determined in accordance with EN 13467.

No test result shall deviate from the declared values by more than the tolerances given in Table 1 for the labelled class.

Table 1 — Dimensional tolerances

Form of delivery	Length	Width	Thickness	Inside diameter	Squareness
Board	±0,6 % or ± 3 mm [a]	±0,6 % or ± 3 mm [a]	±2 mm		±5 mm/m
Pipe section or segment, prefabricated ware	±0,6 % or ± 3 mm [a]		±2 mm	+ 2 % or +3 mm	±3 mm/m
[a] Whichever gives the greatest numerical tolerance.					

4.2.2.2 Squareness

Deviation of squareness, S_b, of boards shall be determined in accordance with EN 824. Deviation of squareness of pipe sections shall be determined in accordance with EN 13467. No test result shall exceed the corresponding tolerance given in Table 1.

4.2.2.3 Flatness

Flatness shall be determined in accordance with EN 825 for boards. The deviation from flatness, S_{max}, shall not exceed 3 mm.

4.2.2.4 Pipe section linearity

Linearity shall be determined in accordance with EN 13467 for pipe sections and segments. The deviation from linearity, *L*, shall not exceed 3 mm.

4.2.3 Dimensional stability

4.2.3.1 Dimensional stability under normal laboratory conditions

Dimensional stability under normal laboratory conditions (23 °C, 50 % relative humidity) shall be determined in accordance with EN 1603.The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed the values given in Table 2 for the declared class.

Table 2 — Classes of dimensional stability under normal laboratory conditions

Classes	Requirement %
DS(N) 5	±0,5
DS(N) 2	±0,2

4.2.3.2 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 of 48 h at (23 ± 2) °C and (90 ± 5) % relative humidity. The relative changes in length, $\Delta\varepsilon_l$, width, $\Delta\varepsilon_b$ and thickness, $\Delta\varepsilon_d$, shall not exceed 1 %. The test shall not be performed when the more severe test, described in 4.3.2, is used for a product in a specific application.

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 is 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 is used in a linear application it does not require further classification.

EN 13501-1:2007+A1:2009, Table 3, is applicable for 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 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 products made of EPS does not change with time or when subjected to the declared maximum service temperature.

4.2.5.3 Durability of thermal resistance against ageing/degradation

The thermal conductivity of products made of EPS does not change with time. This is covered by 4.2.1 thermal conductivity, 4.2.2 dimensions and tolerances and 4.2.3 dimensional stability or 4.3.2 maximum service temperature (dimensional stability).

4.2.5.4 Durability of thermal resistance against high temperature

The thermal conductivity of products made of EPS does not change with time at a high temperature. 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 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.

NOTE EPS pipe sections and prefabricated ware can be sawn or abraded from blocks. If not specified hereafter, the declarations for the specific characteristics correspond to the flat boards.

4.3.2 Maximum service temperature

The maximum service temperature ST(+) shall be determined in accordance with EN 14706 for flat specimens and EN 14707 for cylindrical specimens.

At the maximum service temperature, ST(+), no test result shall have a variation of dimensions exceeding 5 %.

The maximum service temperature will be declared in levels with steps of 5 °C.

EPS should normally not be used over 80 °C.

4.3.3 Minimum service temperature

The minimum service temperature ST(-) shall be determined in accordance with Annex C.

The minimum service temperature, ST(-), shall be declared in levels with steps of 10 °C.

Minimum service temperature within the scope of this standard, but above 0 °C need not be tested.

At the minimum service temperature, ST(-), no test result shall have a variation of dimensions exceeding 0,3 % for length and width and 0,5 % for thickness.

4.3.4 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 for one of the conditions given in Table 3. The relative changes in length, $\Delta\varepsilon_l$, width, $\Delta\varepsilon_b$ and thickness, $\Delta\varepsilon_d$, for the declared level shall not exceed the values given in Table 3.

Table 3 — Levels of dimensional stability under specified temperature and humidity conditions

Level	Conditions	Requirement %
DS(70, –)1	48 h, 70 °C	1
DS(70, –)2	48 h, 70 °C	2
DS(70, –)3	48 h, 70 °C	3
DS(70, 90)1	48 h, 70 °C, 90 %	1

4.3.5 Compressive stress at 10 % deformation

Compressive stress at 10 % deformation, σ_{10}, shall be determined in accordance with EN 826. No test result shall for the declared level be less than the value given in Table 4.

NOTE 1 The compressive stress at 10 % deformation is not a design value.

NOTE 2 The compressive stress at 10 % deformation can be measured at other temperatures than 20 °C.

Table 4 — Levels for compressive stress at 10 % deformation

Level	Requirement kPa
CS(10)30	≥ 30
CS(10)50	≥ 50
CS(10)60	≥ 60
CS(10)70	≥ 70
CS(10)80	≥ 80
CS(10)90	≥ 90
CS(10)100	≥ 100
CS(10)120	≥ 120
CS(10)150	≥ 150
CS(10)200	≥ 200
CS(10)250	≥ 250
CS(10)300	≥ 300
CS(10)350	≥ 350
CS(10)400	≥ 400
CS(10)500	≥ 500

4.3.6 Tensile strength perpendicular to faces

Tensile strength perpendicular to faces, σ_{mt}, shall be determined in accordance with EN 1607. No test result shall for the declared level be less than the value given in Table 5.

Table 5 — Levels for tensile strength perpendicular to faces

Level	Requirement kPa
TR20	≥ 20
TR50	≥ 50
TR80	≥ 80
TR100	≥ 100
TR150	≥ 150
TR200	≥ 200
TR400	≥ 400

4.3.7 Bending strength

Bending strength, σ_b, shall be determined in accordance with EN 12089. No test result shall for the declared level be less than the value given in Table 6.

Table 6 — Levels of bending strength

Level	**Requirement** kPa
BS 50	≥ 50
BS 75	≥ 75
BS 100	≥ 100
BS 115	≥ 115
BS 125	≥ 125
BS 135	≥ 135
BS 150	≥ 150
BS 170	≥ 170
BS 200	≥ 200
BS 250	≥ 250
BS 350	≥ 350
BS 450	≥ 450
BS 525	≥ 525
BS 600	≥ 600
BS 750	≥ 750

4.3.8 Compressive creep

Compressive creep, X_{ct}, and the total thickness reduction, X_t, shall be determined after at least one hundred and 22 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.

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 Examples for declaration of levels for compressive creep.

Level	**Test time** t Days	**Extrapolation time** Years	**Declared stress** σ_c kPa	**Requirement %**
$CC(i_1/i_2/10)\sigma c$	122	10	σ_c	$\varepsilon_t < i_1$ and $\varepsilon_{ct} < i_2$
$CC(i_1/i_2/25)\sigma c$	304	25	σ_c	
$CC(i_1/i_2/50)\sigma c$	608	50	σ_c	

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

4.3.9 Water absorption

4.3.9.1 Long term water absorption by immersion

Long term water absorption by immersion shall be determined in accordance with EN 12087.

No test result of the water absorption by total immersion, W_{lt}, shall exceed the value given in Table 7, for the declared level and no test result of water absorption by partial immersion, W_p, shall exceed 0,5 kg/m^2.

Table 7 — Levels for long time water absorption by total immersion

Level	Requirements vol.-%
WL(T)5	≤ 5,0
WL(T)3	≤ 3,0
WL(T)2	≤ 2,0
WL(T)1	≤ 1,0

4.3.9.2 Long term water absorption by diffusion

Long term water absorption by diffusion, W_{dV}, shall be determined in accordance with EN 12088. No test result shall exceed the value given in Table 8, for the declared level.

Table 8 — Levels for long time water absorption by diffusion

Level	Requirement vol.-%
WD(V)15	≤ 15
WD(V)10	≤ 10
WD(V)5	≤ 5
WD(V)3	≤ 3

NOTE The long term water absorption by diffusion is not used only as an accelerated test but can also be used for classification.

4.3.9.3 Freeze–thaw resistance

Freeze–thaw resistance shall be determined in accordance with EN 12091 using samples prepared by total immersion in accordance with EN 12087. The reduction of compressive stress at 10 % deformation, σ_{10}, shall be less than 10 % after three hundred freeze–thaw cycles.

4.3.10 Water vapour transmission

Water vapour transmission properties shall be determined in accordance with EN 12086 for flat products and EN 13469 for pipe sections and declared as the water vapour diffusion resistance factor, μ, for homogeneous products and as the water vapour resistance, Z, for faced products. All test result of μ and / or all test result of Z shall be within the range declared by the manufacturer.

In the absence of measurements, the water vapour resistance diffusion factor, μ, of EPS products may be chosen from Table D.2.

4.3.11 Apparent density

Apparent density, ρ_a, shall be determined in accordance with EN 1602 for flat products and EN 13470 for pipe sections.

NOTE Apparent density can be useful for indirect testing.

4.3.12 Dynamic stiffness

Dynamic stiffness, *s'*, should be determined in accordance with EN 29052-1. No test result for the declared level should exceed the value given in Table 9.

Table 9 — Levels for dynamic stiffness

Level	Requirement MN/m^3
SD50	≤ 50
SD40	≤ 40
SD30	≤ 30
SD20	≤ 20
SD15	≤ 15
SD10	≤ 10
SD7	≤ 7
SD5	≤ 5

For products in level CP2 (see 4.3.13.3), if the imposed load exceeds 5,0 kPa, the dynamic stiffness, *s'*, should be determined under the imposed load plus the self-weight of the screed.

4.3.13 Compressibility

4.3.13.1 Thickness, d_L

The thickness, d_L, should be determined in accordance with EN 12431 under a load of 250 Pa. No test result for the labelled class should deviate from the declared thickness, d_L, by more than the tolerances given in Table 10 for the labelled class.

Table 10 — Classes for thickness tolerances

Class	Upper tolerance	Lower tolerance
T3	- 5 % or - 1 mm [a]	+ 15 % or + 3 mm [a]
T4	0	+ 10 % or + 2 mm for d_L < 35 mm [a]
		+ 15 % or + 3 mm for d_L ≥ 35 mm [a]
[a] Whichever gives the greatest numerical tolerance.		

The declared value of d_L should preferably be indicated in steps of 5 mm, the smallest value of d_L being 15 mm.

4.3.13.2 Thickness, d_B

The thickness, d_B, should be determined according to EN 12431 with a pause of 300 s before measuring d_B.

4.3.13.3 Compressibility, *c*

Compressibility, *c*, should be determined as the difference between d_L and d_B. No test result for the declared level should exceed the values given in Table 11.

Table 11 — Levels for compressibility

Level	**Imposed load on the screed** kPa	**Requirement** mm	**Tolerance** mm
CP5	≤ 2,0	< 5	≤ 2 for d_L < 35 ≤ 3 for d_L ≥ 35
CP4	≤ 3,0	< 4	
CP3	≤ 4,0	< 3	
CP2	≤ 5,0	< 2	≤ 1 for d_L < 35 ≤ 2 for d_L ≥ 35

NOTE The levels of the imposed load on the screed are taken from EN 1991–1–1.

4.3.13.4 Long term thickness reduction

If the imposed load on the screed exceeds 5 kPa, only products having a declared level of compressibility of CP2 may be used and their long term thickness reduction should be determined.

The total thickness reduction, $X_t = X_0 + X_{ct}$ shall be determined after one hundred and 22 days of testing at the imposed load plus the self-weight on the screed, in accordance with EN 1606 and extrapolated 30 times, corresponding to 10 years. The 10 years value shall not exceed the declared level of compressibility *c* (see 4.3.13.3).

4.3.14 Trace quantities of water soluble ions and pH

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

4.3.15 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/*.

4.3.16 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 1 m^2 and sufficient to cover the needed tests. The shorter side of the sample shall not be less than 300 mm or the full size of the product whichever is the smaller.

Pipe section 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 for at least 6 h at (23 ± 5) °C unless otherwise specified in the test standard. In case of dispute, the test specimens shall be stored at (23 ± 2) °C and (50 ± 5) % relative humidity for at least 14 days prior to testing.

5.3 Testing

5.3.1 General

Table 12 gives the dimensions of the test specimens, the minimum number of measurements 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.

One test result on a product property is the average of the measured values on the number of test specimens given in Table 12.

Table 12 — Test methods, test specimens, 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**	**Cylindrical**			
4.2.1	Thermal conductivity	EN 12667 or EN 12939	EN 12667 or EN 12939 for Di > 500	Depending on measuring equipment	1	—
		—	EN ISO 8497	Full size	—	—
4.2.2	Dimensions and tolerances					
	Length and width	EN 822	EN 13467	Full size	1	—
	Thickness	EN 823	EN 13467	Full size	1	Load of (250 ± 5) Pa
	Inside diameter	—	EN 13467	Full size	—	—
4.2.2.2	Squareness	EN 824	EN 13467	Full size	1	—
4.2.2.3	Flatness	EN 825	—	Full size	1	—
4.2.2.4	Pipe section linearity	—	EN 13467	Full size	1	—
4.2.3.1	Dimensional stability under normal laboratory conditions	EN 1603	EN 1603	Full size	3	—
4.2.3.2	Dimensional stability under specified temperature and humidity conditions	EN 1604	EN 1604	200 × 200	3	Method B
4.2.4	Reaction to fire	See EN 13501–1 For mounting and fixing see EN 15715:2009				Annex B See EN 15715:2009
4.3.2	Maximum service temperature	EN 14706	EN 14707	150 × 150; for pipe sections see EN 14707	—	—
4.3.3	Minimum service temperature	—	—	150 × 150	—	Annex C
4.3.4	Dimensional stability under normal laboratory conditions	EN 1603	EN 1603	Full size	3	—
4.3.5	Compressive stress at 10 % deformation	EN 826	EN 826	[a]	3	Grinding
4.3.6	Tensile strength perpendicular to faces	EN 1607	EN 1607	50 × 50 × 50	3	—
4.3.7	Bending strength	EN 12089	EN 12089	300 × 150 × 50[b] or (5 × d + 50) × 150 × d [c]	3	Method B
4.3.8	Compressive creep	EN 1606	EN 1606	b	2	Grinding
4.3.9.1	Long term water absorption by immersion	EN 12087	EN 12087	200 × 200	3	Total: method 1A and 2A

Clause		Test method		Test specimen dimensions [a]	Minimum number of measurements to get one test result	Specific conditions
No.	Title	Flat	Cylindrical			
4.3.9.2	Long term water absorption by diffusion	EN 12088	EN 12088	500 × 500	—	—
4.3.9.3	Freeze–thaw resistance	EN 12091	EN 12091	200 × 200	6	Preparation by EN 12087
4.3.10	Water vapour transmission	EN 12086	EN 12086	100 × 100	5	Set B
4.3.11	Apparent density	EN 1602	EN 1602	Full size	5	—
4.3.12	Dynamic stiffness	EN 29052–1	—	200 × 200 mm	3	—
4.3.13	Compressibility Thickness, d_L Thickness, d_B	EN 12431	—	200 × 200 mm	3	Measured 300 s after the pre-load has been removed
4.3.14	Trace quantities of water soluble ions and pH	EN 13468	—	—	3	7,5 g
4.3.15	Release of dangerous substances	[d]	[d]	—	—	—
4.3.16	Continuous glowing combustion	[d]	[d]	—	—	—

[a] Full-size product thickness, unless otherwise mentioned.

[b] Sample size used for boards of 50 mm and above.

[c] For boards of thickness $d < 50$ mm.

[d] Not yet available.

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 that 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 PTD. Measurements of thermal conductivity made on two internal diameters of pipe sections at the greatest and smallest insulation thickness for each set of the diameters are deemed to be representative of the total product range.

For FPC, one dimension only is used.

The guarded hot plate method, EN 12667 or EN 12939 shall be deemed to be a suitable method for measurement of pipe insulation having an internal diameter exceeding 500 mm. Flat boards shall be prepared having the same thickness as the sections. If the guarded hot plate method is used, the fact shall be stated in the report.

The thermal conductivity shall be determined directly at measured thickness. If that 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 unit;

— and it can be demonstrated that the thermal conductivity, λ, 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.

5.3.3 Reaction to fire

Test shall be carried out in accordance with the rules given in 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.

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 expanded polystyrene abbreviated term	EPS
— This European Standard number	EN 14309
— Thickness tolerance	Ti
— Length tolerance	Li
— Width tolerance	Wi
— Squareness tolerance	Si
— Flatness tolerance	Pi
— Dimensional stability under specified temperature and humidity	DS(TH)i
— Bending strength	BSi
— Maximum service temperature	ST(+)i
— Minimum service temperature	ST(–)i
— Compressive stress at 10 % deformation	CS(10)i
— Dimensional stability under laboratory condition	DS(N)i
— Deformation under specified load and temperature conditions	DLT(i)5
— Tensile strength perpendicular to faces	Tri
— Water absorption by immersion	WL(T)i
— Water absorption by diffusion	WD(V)i
— Compressive creep	CC(i_1/i_2/y)σ_c
— Water vapour diffusion transmission	MUi or Zi
— Trace quantities of water soluble chloride ions	CLi
— Trace quantities of water soluble fluoride ions	Fi
— Trace quantities of water soluble silicate ions	Sli
— Trace quantities of water soluble sodium ions	NAi
— pH level	pHi

where “i” shall be used to indicate the relevant class or level; “σ_c” shall be used to indicate the compressive stress and “y” to indicate the number of years.

The designation code for a product made of EPS is illustrated by the following example:

EPS – EN 14309 L1 – T1 – W1 – S1 – P1 – ST(+)80 – ST (–) 180 – DS(N)5 – BS 100 — CS10(60) – DLT(1)5 – TR50 –WL(T)5 – WD(V)15

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 13163, EN 13499, EN 14933 and EN 15037-4 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 13163, EN 13499, EN 14933 and EN 15037-4 may be used for the purpose of FPC and DoP according to this standard.

8 Marking and labelling

Products conforming to 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 te 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 ThlBEII;

— 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 marking and labelling see ZA.3.

Annex A
(normative)

Factory production control

Table A.1 — Minimum product testing frequencies

Clause		Minimum testing frequency [a]			
No.	Title	Direct testing		Indirect testing	
		Boards	Pipe sections	Test method	Frequency
4.2.1					
	– at 10 °C	1 per 24 h	1 per 24 h	—	—
		or 1 per 3 months	or 1 per 3 months	and weight per moulded item or density (using a manufacturer correlation)	1 per 2 h
		or 1 per 3 months	or 1 per 3 months	and other test method for thermal conductivity	1 per week
		or 1 per year	or 1 per year	and density (using the correlation given in Figure A.1)	1 per 2 h
	– at full temperature range	1 per 2 years	1 per 2 years	—	—
4.2.2					
	Length and width	1 per 24 h	1 per 24 h	—	—
	Thickness	1 per 24 h	1 per 24 h	—	—
	Inside diameter		1 per 24 h	—	—
4.2.2.2	Squareness	1 per 24 h	1 per 24 h	—	—
4.2.2.3	Flatness	1 per 24 h		—	—
4.2.2.4	Pipe section linearity		1 per 24 h	—	—
4.2.3.1	Dimensional stability under normal laboratory conditions	1 per 5 years	1 per 5 years		
4.2.3.2	Dimensional stability under specified temperature and humidity conditions	1 per 5 years	1 per 5 years	—	—
4.2.4	Reaction to fire	See Table A.2			
4.3.2	Maximum service temperature	1 per 5 years	1 per 5 years	—	
4.3.3	Minimum service temperature	1 per 5 years	1 per 5 years		
4.3.4	Dimensional stability under specified temperature and humidity conditions	1 per 5 years	1 per 5 years	—	

Clause		Minimum testing frequency [a]			
No.	Title	Direct testing		Indirect testing	
		Boards	Pipe sections	Test method	Frequency
4.3.5	Compressive stress at 10 % deformation	1 per 24 h or 1 per 3 months or 1 per year	1 per 24 h or 1 per 3 months or 1 per year	— and weight per moulded item or density (using a manufacturer's correlation) and weight per moulded item or density (using the correlation given in Figure A.2)	— 1 per 2 h 1 per 2 h
4.3.6	Tensile strength perpendicular to faces	1 per week or 1 per 3 months	1 per week or 1 per 3 months	— and bending strength	— 1 per day
4.3.7	Bending strength	1 per day or 1 per 3 months	1 per day or 1 per 3 months	— and manufacturer's method	— —
4.3.8	Compressive creep	1 per 5 years	1 per 5 years	—	—
4.3.9.1	Long term water absorption by immersion	1 per 5 years	1 per 5 years		
4.3.9.2	Long term water absorption by diffusion	1 per 5 years	1 per 5 years		
4.3.9.3	Freeze–thaw resistance	1 per 5 years	1 per 5 years		
4.3.10	Water vapour transmission	1 per 5 years	1 per 5 years	—	Tabulated values
4.3.12	Dynamic stiffness	1 per 5 years	1 per 5 years		
4.3.13	Compressibility	1 per 5 years	1 per 5 years		
4.3.14	Trace quantities of water soluble ions and pH	1 per 5 years	1 per 5 years		
4.3.15	Release of dangerous substances	c	c	—	—
4.3.16	Continuous glowing combustion	c	c	—	—

a The minimum testing frequencies, expressed in number of 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/run 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 from the change of product. In addition the manufacturer shall establish internal rules for process adjustments related to these properties when changing the product.

b For factory production control one measurement shall always be one test result.

c Frequencies are not given.

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

Clause		Minimum testing frequency [a]							
No.	Title	Direct testing [b]		Indirect testing [c]					
				Product		Components [d]			
						Substantial		Non-substantial	
4.2.4	Reaction to fire class	Test method	Frequency	Test method	Frequency	Test method	Frequency	Test method	Frequency
	A1	EN ISO 1182 and EN ISO 1716 (and EN 13823)	1 per 2 years and indirect testing	—		Loss on ignition	1 per 4 h	Loss on ignition or caloric potential	1 per 4 h 1 per 4 h
						Apparent density	1 per 1 h	Weight per unit area	1 per 1 h
	A2	EN ISO 1182 or EN ISO 1716 and EN 13823	1 per 2 years and indirect testing	—		Loss on ignition	1 per 4 h	Loss on ignition or caloric potential	1 per 4 h 1 per 4 h
						Apparent density	1 per 1 h	Weight per unit area	1 per 1 h
	B, C, D	EN 13823 and	1 per month or 1 per 2 years and indirect testing	— EN ISO 11925-2	— 1 per week[e]	—	— 1 per week[f]	— Manufacturer's method	— 1 per week
		EN ISO 11925-2	1 per week[e] or 1 per 2 years and indirect testing	— —	— —	— —	— 1 per week[f]	— Manufacturer's method	— 1 per week
	E	EN ISO 11925-2	1 per week[e] or 1 per 2 years and indirect testing	— —	— —	— —	— 1 per week[f]	— Manufacturer's method	— 1 per week

NOTE Not all Euroclasses may apply for the products conforming to this standard.

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.

e Unfaced products, i.e. uncovered insulating board, as in f) below.

f Products from raw materials without a certified reaction to fire classification shall be tested at a frequency of once per day.

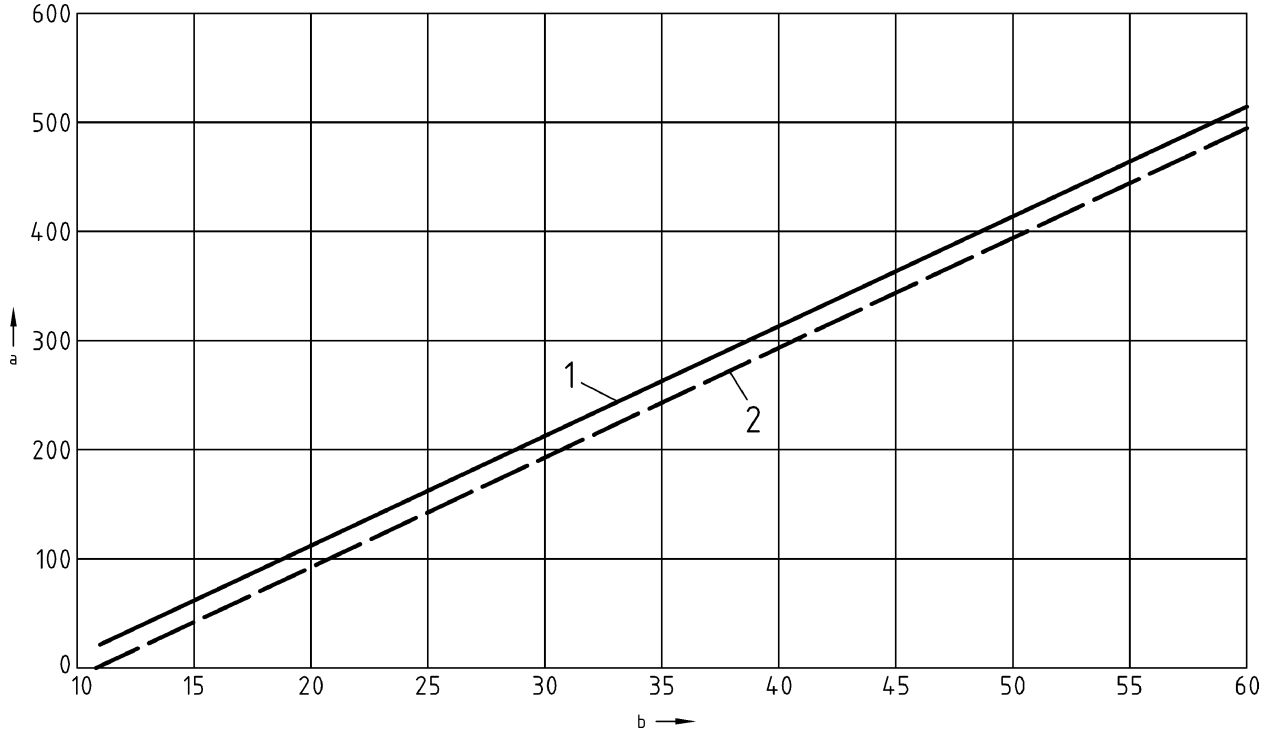
A.1 Indirect testing

A.1.1 General

If indirect testing is used the correlation between the directly tested and the indirect property shall be known and the approach shall be calculated on one sided 90 % prediction interval.

NOTE In this context compressive stress by 10 % deformation and thermal conductivity can be evaluated indirectly using the apparent density and its established mathematical correlation to these properties. For the relationship between compressive stress at 10 % deformation and apparent density and thermal conductivity and apparent density there is a large amount of data collected in Europe. The curves in Figures A.1 and A.2 have been calculated on this European data to which every manufacturer may refer. If a manufacturer wants to use his own data, it is essential that he calculates and records the approach for a prediction interval, 1 – α, of 90 %.

A.1.2 Compressive stress at 10 % deformation



Key

a compressive stress σ_{10} in kPa

b apparent density ρ_a in kg/m^3

1 compressive stress

2 predicted compressive stress

Figure A.1 — Relationship between compressive stress at 10 % deformation and apparent density for indirect testing; 1 – α = 90; n = 495

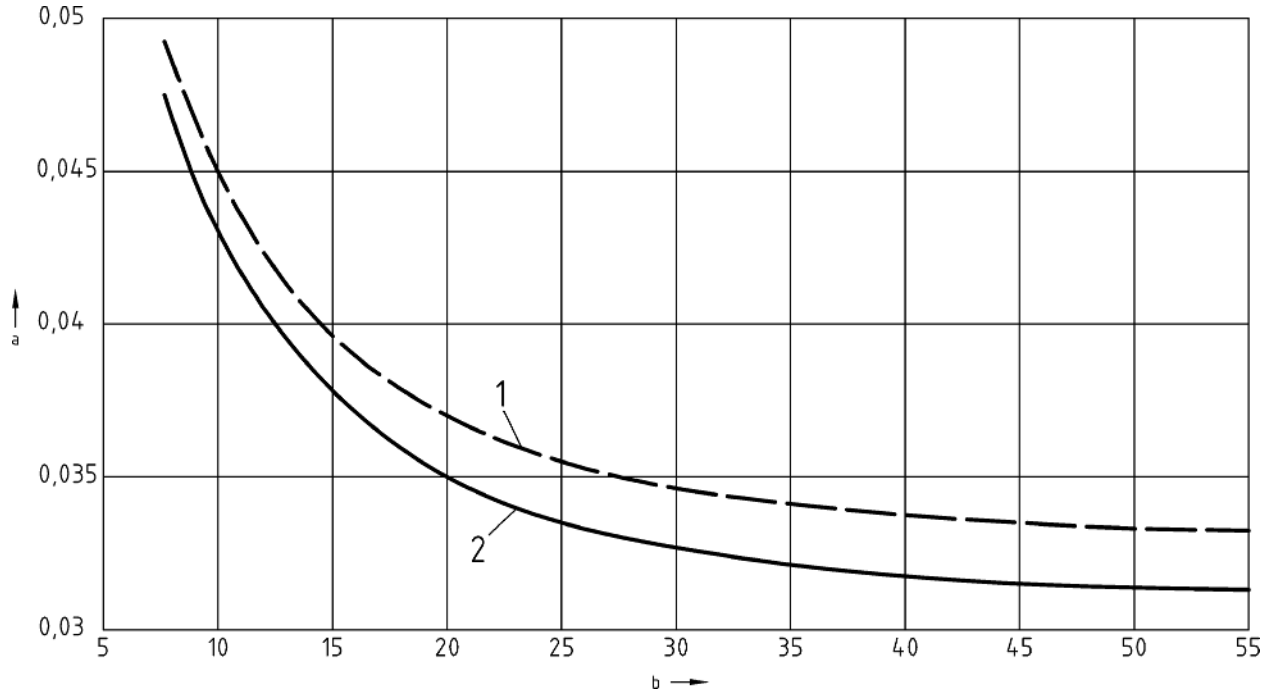
Regression for $\rho_a \geq 11$ kg/m^3:

$$\sigma_{10,mean} = 10{,}0\ \text{kPa} \cdot \text{m}^3/\text{kg} \times \rho_a - 81{,}0\ \text{kPa in kPa} \quad \text{(A.1)},$$

$$\sigma_{10,pred} = 10{,}0\ \text{kPa} \cdot \text{m}^3/\text{kg} \times \rho_a - 109{,}1\ \text{kPa in kPa} \quad \text{(A.2)}$$

A.1.3 Thermal conductivity

A.1.3.1 General



Key

a thermal conductivity λ in W/m·K

b apparent density ρ_a in kg/m^3

1 predicted thermal conductivity

2 mean thermal conductivity

Figure A.2 — Relationship between declared thermal conductivity (at 50 mm reference thickness and 10 °C mean temperature) and apparent density for indirect testing; 1 – α = 90; n = 3 873

Regression for 8 kg/m$^3 \leq \rho_a \leq$ 55 kg/m^3:

$$\lambda_{mean} = 0{,}025\ 314\ \text{W/(m·K)} + 5{,}174\ 3 \cdot 10^{-5}\ \text{Wm}^2/(\text{kgK}) \times \rho_a + 0{,}173\ 606\ \text{Wkg/(m}^4\text{K)}/\rho_a \text{ in W/(m·K)} \quad \text{(A.3)}$$

λ_{pred} approximately

$$0{,}027\ 174\ \text{W/(m·K)} + 5{,}174\ 3 \cdot 10^{-5}\ \text{Wm}^2/(\text{kgK}) \times \rho_a + 0{,}173\ 606\ \text{Wkg/(m}^4\text{K)}/\rho_a \text{ in W/(m·K)} \quad \text{(A.4)}$$

A.1.3.2 Thickness effect

For boards of a thickness of 50 mm with a declared thermal conductivity equal or less than 0,038 W/(m·K) the thickness effect is negligible.

To assess the relevance of the thickness effect, a conversion of the determined thermal conductivity, λ'_i, or the thermal resistance, R'_i, into the values λ_i or R_i has to be carried out according to the following formulas:

$$\lambda_i = \lambda'_i / L \quad \text{(A.5)}$$

$$R_i = R'_i \times L \quad \text{(A.6)}$$

Table A.3 — Thickness effect parameter, *L*, for the determination of the declared thermal conductivity, λ_D

Declared thermal conductivity λ_D At reference thickness of 50 mm W/(m·K)	**Thickness of the specimen** *d* mm	**Thickness effect parameter** *L* 1
0,046	20	0,90
	30	0,92
	40	0,93
	50	0,95
	100	0,98
	200	1,00
0,043	20	0,91
	30	0,93
	40	0,94
	50	0,97
	100	1,00
0,040	20	0,92
	30	0,95
	40	0,96
	50	0,97
	100	1,00
0,038	20	0,93
	30	0,96
	40	0,97
	50	0,99
	100	1,00
0,035	20	0,94
	30	0,97
	40	0,98
	50	1,00
	100	1,00
0,032	20	0,96
	30	0,97
	40	0,98
	50	1,00
	100	1,00
Interim values shall be obtained from linear interpolation(s) for intermediate values of thermal conductivity and/or thickness.		

NOTE The values in Table A.3 are taken from measured values from Forschungsinstitut für Wärmeschutz e. V. (FIW), Munich and Laboratoire Nationale d'Essais (LNE), Paris.

Annex B
(normative)

Product classification

EPS products are divided into types as shown in Table B.1 and Table B.2. Type EPS T has specific impact sound insulation properties. Each type, except EPS S, which is not used in load bearing applications, shall satisfy two different conditions at the same time in order to ensure adequate product performance.

Table B.1 — Classification of EPS products

Type	**Compressive stress at 10 % deformation** kPa	**Bending strength** kPa
EPS S	—	50
EPS 30	30	50
EPS 50	50	75
EPS 60	60	100
EPS 70	70	115
EPS 80	80	125
EPS 90	90	135
EPS 100	100	150
EPS 120	120	170
EPS 150	150	200
EPS 200	200	250
EPS 250	250	350
EPS 300	300	450
EPS 350	350	525
EPS 400	400	600
EPS 500	500	750

NOTE Only if the classification requirements given in Table B.1 are fulfilled, the properties in D.2 and D.3 apply.

Table B.2 — Classification of load bearing EPS products with acoustical properties

Type	Compressibility	Dynamic stiffness
EPS T	Level taken from Table 11	Level taken from Table 9

Annex C
(normative)

Determination of minimum service temperature

C.1 Definitions

For the purpose of this Annex, the following definition applies:

minimum service temperature

lowest temperature to which EPS may be exposed at a given thickness and at which it will continue to function within specified limits of performance

NOTE The required performance can be in the areas of dimensional stability, thermal properties, and mechanical properties.

C.2 Principle

Determine the dimensional variation of the test specimen in contact with the coldest plate for the determination of the thermal conductivity by the guarded hot plate by measuring its length, width and thickness before the cooling down and after the apparatus has been brought back to ambient temperature. Record the lowest temperature of the coldest plate during the measurement.

NOTE The procedure can be an iterative process.

C.3 Apparatus

C.3.1 Guarded hot plate apparatus, to measure the thermal conductivity.

The apparatus shall be capable of functioning with a coldest plate as cold as the expected minimum service temperature of the test specimen.

The test specimen dimensions shall correspond to the requirements of this Annex.

C.3.2 Square pressure plate, with the same dimensions as the test specimen exerting the requested load on the test specimen.

C.3.3 Micrometer, permitting thickness reading to at least 0,05 mm.

C.3.4 Sliding caliper, permitting reading to at least 0,1 mm.

C.4 Test specimens

C.4.1 Dimensions of test specimens

The test specimens shall be square cut with dimensions corresponding to those foreseen for the used guarded hot plate apparatus.

They shall not be less than 200 mm × 200 mm × 25 mm or exceed 500 mm × 500 mm × 50 mm.

NOTE Testing can be performed on one layer of a multilayer system with the corresponding difference of temperature between the two main faces to simulate the conditions existing in the application.

C.4.2 Number of test specimens

Two test specimens shall be used.

C.4.3 Conditioning of the test specimens

The test specimens shall be stored in the conditions foreseen for the thermal conductivity measurement. In the absence of such conditions, they shall be stored for at least 6 h at (23 ± 5) °C or in case of dispute, at (23 ± 2) °C and (50 ± 5) % relative humidity for 14 days.

C.5 Procedure

C.5.1 Test conditions

The initial conditions for the test shall be (23 ± 5) °C.

C.5.2 Test procedure

Measure the length and width of the test specimen, l_1, b_1, in accordance with EN 12085, read to the nearest 0,1 mm.

Measure the thickness of the test specimen, d_1, in accordance with EN 823 using the load specified in Table 12, read to the nearest 0,05 mm.

Install the test specimen in the guarded hot plate apparatus, one plate of which shall be cooled down to the minimum service temperature during the thermal conductivity measurement.

Carry out the thermal conductivity measurement recording the lowest temperature of the coldest plate and the temperature of the less cold plate at the same time.

After the measurement – usually consisting of several points – let the apparatus and the test specimen heat up progressively to ambient temperature.

Take the test specimen from the apparatus and remeasure its length l_2, and its width, b_2, in accordance with EN 12085, to the nearest 0,1 mm.

Remeasure the thickness of the test specimen, d_2, in accordance with EN 823 using the load specified in Table 12, read to the nearest 0,05 mm.

C.6 Calculation and expression of results

C.6.1 Dimensional changes

Calculate the dimensional changes of length, width and thickness, in percentage, using the following formulas:

$$\Delta\varepsilon_{\mathrm{l}} = 100 \times \frac{l_2 - l_1}{l_1} \tag{C.1}$$

$$\Delta\varepsilon_{\mathrm{b}} = 100 \times \frac{b_2 - b_1}{b_1} \tag{C.2}$$

$$\Delta\varepsilon_{\mathrm{d}} = 100 \times \frac{d_2 - d_1}{d_1} \tag{C.3}$$

where

l_1, b_1 and d_1 are respectively the length, width and thickness of the test specimen before the measurement of the thermal conductivity;

l_2, b_2 and d_2 are respectively the length, width and thickness of the test specimen after the measurement of the thermal conductivity.

Calculate the mean values of dimensional changes $\overline{\Delta\varepsilon_l}$, $\overline{\Delta\varepsilon_b}$, and $\overline{\Delta\varepsilon_d}$ as a percentage rounded to the nearest 0,5 % of the individual results.

If the change in the mean value for any of the dimensions exceeds the value specified in this product standard, the test shall be repeated at least at a less cold temperature of the coldest plate until the dimensional changes are smaller than or equal to the specified value. This temperature is then considered as the minimum service temperature, providing that the requirements given in 4.3.3 are also fulfilled.

C.6.2 Additional tests and/or observation

The result of the visual examination of the test specimen shall be noted.

If the relevant clause of this Annex and/or the main body of this standard specify additional requirements the calculations and/or observations shall be noted accordingly.

C.7 Accuracy of measurements

NOTE It has not been possible to include a statement on the accuracy of the method in this edition of the standard, but it is intended to include such a statement when the standard is next revised.

C.8 Test report

The test report shall include the following information:

a) reference to this European Standard;

b) product identification:

   1) product name, factory, manufacturer or supplier;

   2) production code number;

   3) type of product;

   4) packaging;

   5) the form in which the product arrived at the laboratory;

   6) other information as appropriate, e.g. declared dimensions, declared density;

c) test procedure:

   1) pre-test history and sampling, e.g. who sampled and where;

   2) conditioning;

   3) if any deviation from C.4 and C.5;

4) date of testing;

5) dimensions and number of test specimens;

6) the chosen temperature increase rate;

7) general information relating to the test;

8) events which may have affected the results;

Information about the apparatus and identity of the technician should be available in the laboratory but it need not be recorded in the report.

d) results.

All individual deformation and temperature. All individual values and the mean values of the dimensional changes. Note if dimensional changes are shrinkage or expansion. All individual values and the mean value of the minimum service temperature. Note the visual evaluation. Additional results as specified in the relevant clauses of this Annex or the main body of this standard or any other European technical specification.

Annex D
(informative)

Additional properties

D.1 General

In addition to the product characteristics given in Clause 4, designers and users of materials can also require additional information of relevance to their proposed application.

The design thermal conductivity, λ_U, should be calculated from the declared thermal conductivity, λ_D, using EN ISO 10456 and EN ISO 13787.

The following information and product requirements can be useful in providing standardised assessment procedures.

D.2 Long-term compressive behaviour

EPS products meeting the requirements of Table B.1 are expected to have a compressive creep deformation of 2 % or less after 50 years, when subjected to a permanent stress of 0,30 σ_{10}.

NOTE See literature Struik, L.C.E., Physical aging in amorphous polymers and other materials, Elsevier Scientific Publishing Company, 1978.

D.3 Shear behaviour

A correlation between bending strength and the shear strength, τ, is given in Table D.1. To measure the shear strength it should be determined according to EN 12090.

Table D.1 — Correlation between bending strength and shear strength

Bending strength σ_B Requirement kPa	**Shear strength τ correlation** kPa
50	25
75	35
100	50
115	55
125	60
135	65
150	75
170	85
200	100
250	125
350	170
450	225
525	260
600	300
750	375

D.4 Water vapour diffusion resistance factor

Instead of testing the water vapour diffusion resistance factor, μ, according to EN 12086, tabulated values according to Table D.2 can be used.

Table D.2 — Tabulated values of water vapour diffusion resistance index and water vapour permeability

Type	Water vapour diffusion resistance factor μ 1	Water vapour permeability mg/(Pa·h·m)
EPS 30	20 to 40	0,018 to 0,036
EPS 50	20 to 40	0,018 to 0,036
EPS 60	20 to 40	0,018 to 0,036
EPS 70	20 to 40	0,018 to 0,036
EPS 80	20 to 40	0,018 to 0,036
EPS 90	30 to 70	0,010 to 0,024
EPS 100	30 to 70	0,010 to 0,024
EPS 120	30 to 70	0,010 to 0,024
EPS 150	30 to 70	0,010 to 0,024
EPS 200	40 to 100	0,007 to 0,018
EPS 250	40 to 100	0,007 to 0,018
EPS 300	40 to 100	0,007 to 0,018
EPS 350	40 to 100	0,007 to 0,018
EPS 400	40 to 100	0,007 to 0,018
EPS 500	40 to 100	0,007 to 0,018
EPS T	20 to 40	0,018 to 0,036

D.5 Coefficient of thermal expansion

The thermal expansion should be measured according to EN 13471. Also the value of $5 - 7 \cdot 10^{-5}$ $m/(m \cdot K^{-1})$ can be used.

D.6 Behaviour under cyclic loading

Dynamic load resistance should be determined in accordance with EN 13793. The deformation in percent, the number of load cycles and the stress, in kPa, should be declared.

D.7 Test methods

Table D.3 — Test methods

Clause		Test methods	Test specimen Dimensions[a]	Minimum number of measurements to get one test result	Factory production control
No.	Title				Minimum product testing frequencies [b]
					Direct testing
D.3	Shear strength	EN 12090	100 mm × 200 mm × *d* [a]	3	1/month
D.5	Coefficient of thermal expansion	EN 13471	50 mm × 50 mm × 10 mm	1	1/5 years
D.6	Dynamic load resistance	EN 13793	150 mm × 150 mm	1	1/5 years

[a] If *d* is greater than 100 mm it is essential that the sample is cut to dimensions of 100 mm × 100 mm × 100 mm.

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

D.8 Additional information

EPS and any laminates containing it should not come into contact with any materials in the application which reacts with the EPS causing it to dissolve or swell as can be the case with some adhesives, wood preservatives and other substances.

EPS is non-toxic and inert, and contains no chlorofluorocarbons (CFC), hydroclorofluorocarbons (HCFC) or formaldehyde.

When installing EPS products, no special precautions need to be taken by the operatives as they are non irritant and non toxic.

EPS products can easily be trimmed on site using normal cutting tools.

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 products of expanded polystyrene (EPS) 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 products of expanded polystyrene (EPS) and intended use

Product:	factory made products of expanded polystyrene (EPS)		
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**[d]	**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	—	—
	4.3.2 Maximum service temperature	—	Declared ST(+)
Durability of reaction to fire against high temperature	4.2.5 Durability characteristics	Euroclasses	[a]
Durability of reaction to fire against ageing/degradation	4.2.5 Durability characteristics	Euroclasses	[a]
Compressive strength	4.3.5 Compressive stress at 10 % deformation	—	Declared CS
Water permeability	4.3.9 Water absorption	—	Declared WL(T) or WD(V)
Water vapour permeability	4.3.10 Water vapour transmission	—	Declared Z
Rate of release of corrosive substances	4.3.14 Trace quantities of water-soluble ions and pH	—	Levels of ion content and level of the pH-value
Release of dangerous substances to the indoor environment	4.3.15 Release of dangerous substances	—	[c]
Continuous glowing combustion	4.3.16 Continuous glowing combustion	—	[c]

[a] No change in reaction to fire properties for EPS products. EPS does not deteriorate with time or temperature.

[b] The thermal conductivity of EPS products does not change.

[c] European test methods are under development.

[d] 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 products of expanded polystyrene (EPS)

ZA.2.1 Systems of AVCP

The AVCP systems of factory made products of expanded polystyrene (EPS) 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 L29) 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 products of expanded polystyrene (EPS) 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 products of expanded polystyrene (EPS) 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 products of expanded polystyrene (EPS) 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 products of expanded polystyrene (EPS) 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 Clause 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 products of expanded polystyrene (EPS) for EN 14309.

DECLARATION OF PERFORMANCE

No 0123-DoP-2013/10/07

1. Unique identification code of the product-type:

ABCD Low Temperature 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 3

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

Notified testing laboratory No. 7456 performed the test reports for the relevant declared characteristics

8. Declared performance

Essential characteristics		**Performance**						**Harmonized technical specification**
Thermal resistance	Thermal conductivity	ϑ °C	−200	−150	−100	−50	0	EN 14309:2015
		λ_D W/(m·K)	0,012	0,016	0,020	0,026	0,034	
	Thickness	d_D = 90 mm, tolerance ± 2 mm						
Reaction to fire		D						
Durability of thermal resistance against ageing/degradation		Durability characteristics						
Durability of thermal resistance against high temperature		NPD						
Durability of reaction to fire against ageing/degradation		Durability characteristics, D						
Durability of reaction to fire against high temperature		Durability characteristics, D						
Compressive strength		CS(10)100 (≥100 kPa)						
Water permeability		Water absorption WS1 (≤1 kg/m^2)						
Water vapour permeability		NPD						
Rate of release of corrosive substances		NPD						
Release of dangerous substances		NPD						
Continuous glowing combustion		NPD						
NPD No Performance Determined								

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 product of expanded polystyrene (EPS)

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 system 3 to be given on the product or to a label attached to it.

CE 7456	*CE marking, consisting of the "CE"-symbol* *Identification number of the notified test laboratory/ laboratories*
AnyCo Ltd, PO Box 21, B-1050 13 0123 – DoP – 2013/10/07	*name and the registered address of the manufacturer, or identifying mark* *Last two digits of the year in which the marking was first affixed* *reference number of the DoP*
EN 14309:2015 ABCD Low Temperature Board ThIBEII λ_D DoP RtF D d_D 90 mm EPS – EN 14309 – CS(10)100 – WS1	*No. of European standard applied, as referenced in OJEU* *Unique identification code of the product-type* *Intended use of the product as laid down in the European standard applied* *Declared thermal conductivity* *Reaction to fire – Euroclass* *Declared Thickness* *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 3

Bibliography

[1] EN 1991-1-1, *Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

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

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

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

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

[6] EN ISO 10456, *Building materials and products - Hygrothermal properties -Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)*

[7] ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*

[8] ISO 9705, *Fire tests — Full-scale room test for surface products*

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