

BS EN 14314:2015



BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN 14314:2015. It supersedes BS EN 14314:2009+A1:2013 which is withdrawn.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.

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English Version

Thermal insulation products for building equipment and industrial installations - Factory made phenolic foam (PF) products - Specification

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Produits manufacturés en mousse phénolique (PF) -
Spécification

Wärmedämmstoffe für die technische Gebäudeausrüstung und für betriebstechnische Anlagen in der Industrie - Werkmäßig hergestellte Produkte aus Phenolharzschäum (PF) - 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.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14314:2015) 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of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by September 2017.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 14314:2009+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 14314 are the following:

- a) an addition to the foreword;
- b) modifications in 3.2.2;
- c) a new 4.3.10;
- d) modification of 5.3.2;
- e) replacement 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), Determination of the aged value of thermal conductivity;
- 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 phenolic foam products which are used for the thermal insulation of building equipment and industrial installations with an operating temperature in the range of approximately - 200 °C to + 120 °C.

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

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

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

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

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

Products with a declared thermal conductivity greater than 0,050 W/(m·K) at 10 °C are not covered by this standard.

This European Standard does not cover products for *in situ*-insulation (blowing or pouring) or products for the insulation of the building structure.

This European Standard does not cover the following acoustical aspects: direct airborne sound insulation and impact noise transmission index.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

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

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

EN 1608, *Thermal insulating products for building applications - Determination of tensile strength parallel to faces*

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

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 12429, *Thermal insulating products for building applications - Conditioning to moisture equilibrium under specified temperature and humidity conditions*

EN 12667:2001, *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 13166, *Thermal insulation products for buildings - Factory made phenolic foam (PF) products - Specification*

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

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

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

EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

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

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

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

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

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

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

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

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

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

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

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

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

3.1.1 Terms and definitions as given in EN ISO 9229

3.1.1.1

phenolic foam

rigid cellular insulation foam, the polymer structure of which is made primarily from the polycondensation of phenol, its homologues and/or derivatives, with aldehydes or ketones

3.1.1.2

block

billet

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

Note 1 to entry: In English, some industries define a large block as a billet.

3.1.1.3

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 can also be supplied in tapered form.

3.1.1.4

pipe section

section

(insulation) product in the shape of a cylindrical annulus which may be split to facilitate application

3.1.1.5

lag

segment

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

3.1.2 Additional terms and definitions

3.1.2.1

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.

3.1.2.2

class

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

3.1.2.3

prefabricated ware

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

3.1.2.4

production line

assemblage of equipment that produces products using a continuous process

3.1.2.5

production unit

assemblage of equipment that produces products using a discontinuous process

3.1.2.6

end-use application

real application of a product in relation to all aspects that influence the behaviour of that product under different fire situations

Note 1 to entry: The term covers aspects of the product such as its quantity, its orientation, its position in relation to other adjacent products and its method of fixing.

3.1.2.7

end-use application parameter

aspect of the mounting and fixing arrangement of a product reflecting/simulating its end use application (for example: type of substrate, lining, fixing method, position and type of joints) which may or may not affect the fire performance

3.2 Symbols, units and abbreviated terms

3.2.1 Symbols and units used in this standard

b	is the width	mm
D_i	is the inside diameter of pipe sections	mm
d	is the thickness	mm
d_D	is the declared thickness of the product	mm
$\Delta\epsilon_b$	is the relative change in width	%
$\Delta\epsilon_d$	is the relative change in thickness	%
$\Delta\epsilon_l$	is the relative change in length	%
X_{ct}	is the compressive creep	%
ϵ_t	is the total thickness reduction	%
L	is the deviation from linearity	mm
l	is the length	mm
λ	is the thermal conductivity	W/(m·K)
λ_D	is the declared thermal conductivity	W/(m·K)

is declaration of performance

is factory production control

is homogeneous

is product type determination (previously named ITT for Initial Type Test)”

is reaction to fire

is thermal insulation for building equipment and industrial installations

is verification of constancy of performance (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 for a product property is the average of the measured values on the number of the test specimens given in Table 6.

4.2 For all applications

4.2.1 Thermal conductivity

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

In both cases, the thermal conductivity values shall be determined by the manufacturer and verified in accordance with EN ISO 13787 and Annex B of this product standard. 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 with 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 lowest reference mean test temperature required is - 170 °C.

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 formula, 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 boards 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 value or class by more than the tolerances given in Tables 1 and 2.

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

Table 1 — Dimensional tolerances

Form of delivery	Length	Width	Thickness	Inside diameter
Boards: (length or width) < 1 250 mm 1 250 – 2 000 mm 2 001 – 4 000 mm > 4 000 mm	±5 mm ±7,5 mm ±10 mm ±15 mm	±5 mm ±7,5 mm not applicable not applicable	see Table 2	not relevant
Pipe section	±3 mm	—	±2 mm	– 0 mm + 2 mm ^a – 0 mm + 3 mm ^b
Segments	+ 3 mm	±2 mm	±2 mm	– 0 mm + 4 mm
Prefabricated ware	+ 3 mm	—	±2 mm	—
^a Applies to inside diameter less than 170 mm. ^b Applies to inside diameter of 170 mm and greater.				

Table 2 — Classes for thickness tolerances for boards

Dimensions in millimetres

Nominal thickness	Tolerance	
	T1	T2
< 50	±2,0	±1,5
50 to 100	– 2,0 + 3,0	±1,5
> 100	– 2,0 + 5,0	±1,5

NOTE Smaller tolerances may be declared by the manufacturer.

4.2.2.2 Squareness

Deviation from squareness, S_b , of boards and slabs shall be determined in accordance with EN 824. Deviation from squareness, v , of pipe shall be determined in accordance with EN 13467. For boards the deviation from squareness on length and width, S_b , shall not exceed 10 mm/m and the deviation from squareness on thickness, S_d , shall not exceed 2 mm. For pipe sections and segments the deviation from squareness, v , shall not exceed 3 mm.

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

4.2.2.3 Flatness

Deviation from flatness, S_{max} , shall be determined in accordance with EN 825. The deviation from flatness, S_{max} , shall not exceed 10 mm.

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

4.2.2.4 Pipe section linearity

Linearity, L , shall be determined in accordance with EN 13467. The deviation from linearity, L , shall not exceed 6 mm.

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

4.2.3 Dimensional stability

4.2.3.1 Dimensional stability under constant normal laboratory conditions

Dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity) shall be determined in accordance with EN 1603. The relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed $\pm 0,5$ %. The overall change in flatness, $\Delta\epsilon_s$, shall not exceed the values given in Table 3 for the corresponding nominal thicknesses, d_N .

Table 3 — Tolerances for deviation from flatness

Dimensions in millimetres

Nominal thickness	Tolerance
< 50	10,0
50 to 100	7,5
> 100	5

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 for 48 h at (23 ± 2) °C and (90 ± 5) % relative humidity. The relative changes in length, $\Delta\epsilon_l$, and width $\Delta\epsilon_b$, shall not exceed $\pm 0,5$ %. The relative change in thickness, $\Delta\epsilon_d$, shall not exceed $\pm 1,5$ %.

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

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

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

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

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

EN 13501-1:2007+A1:2009, Table 3, is applicable 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 the reaction to fire classification report shall be given in the manufacturer's literature.

4.2.5 Durability characteristics

4.2.5.1 General

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

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

The reaction to fire performance of phenolic foam does not change with time or when subjected to the declared maximum service temperature.

4.2.5.3 Durability of thermal resistance against ageing

The method for the determination of thermal resistance against ageing is described in Annex B.

4.2.5.4 Durability of dimensional stability

The dimensional stability of phenolic foam over time is described in 4.3.4.

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 If PF pipe sections and pre-fabricated ware are cut from boards or slabs, the declarations for the specific characteristics correspond to those for the boards or slabs used for their fabrication unless specified hereafter.

4.3.2 Maximum service temperature

The maximum service temperature, $ST(+)$, for flat products shall be determined in accordance with EN 14706 and for preformed pipe sections in accordance with EN 14707. At the maximum service temperature, $ST(+)$, the relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed $\pm 2\%$ and the relative change in thickness, $\Delta\epsilon_d$, shall not exceed $\pm 2\%$. The maximum service temperature, $ST(+)$, shall be declared in levels with steps of $10\text{ }^{\circ}\text{C}$.

The rate of temperature increase for EN 14706 and EN 14707 testing shall be $50\text{ }^{\circ}\text{C/h}$.

The test specimen shall not exhibit evidence of self heating.

4.3.3 Minimum service temperature

The minimum service temperature, $ST(-)$, shall be declared in levels with steps of $10\text{ }^{\circ}\text{C}$.

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

Minimum service temperature within the scope of this standard, but above $0\text{ }^{\circ}\text{C}$ need not be tested.

At the minimum service temperature, $ST(-)$, the relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed $1,5\%$ and the relative change in thickness, $\Delta\epsilon_d$, shall not exceed $1,3\%$.

The factor ' F ' as defined in C.9 shall be 1,2.

4.3.4 Dimensional stability under specified conditions

4.3.4.1 Dimensional stability at specified temperature

Dimensional stability at specified temperature shall be determined in accordance with EN 1604. Unfaced products shall be tested for 48 h at $(120 \pm 2)\text{ }^{\circ}\text{C}$ and faced products for 48 h at $(70 \pm 2)\text{ }^{\circ}\text{C}$. For unfaced products the relative changes in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed $\pm 3\%$, and the relative change in thickness, $\Delta\epsilon_d$, shall not exceed $\pm 0,5\text{ mm}$. For faced products the relative change in length, $\Delta\epsilon_l$, and width, $\Delta\epsilon_b$, shall not exceed $\pm 1\%$, and the relative change in thickness, $\Delta\epsilon_d$, shall not exceed $\pm 0,5\text{ mm}$.

4.3.4.2 Dimensional stability at - 20 °C

Dimensional stability at - 20 °C, shall be determined in accordance with EN 1604. The test shall be carried out for 48 h at $(- 20 \pm 2)$ °C. The relative change in length, $\Delta\epsilon_l$, width, $\Delta\epsilon_b$, and thickness, $\Delta\epsilon_d$, shall not exceed $\pm 1,5$ %.

4.3.5 Compression resistance properties

4.3.5.1 Compressive stress or compressive strength

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

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

Compression behaviour of phenolic foam is influenced by the direction of foam rise during the manufacturing process. For boards the compressive stress at 10 % deformation, σ_{10} , or compressive strength, σ_m , shall be determined in the direction of foam rise and for pipe insulation in the direction at right angles to the foam rise.

Table 4 — Levels for compressive stress or compressive strength

Level	Requirement kPa
CS(10\Y) 50	≥ 50
CS(10\Y) 70	≥ 70
CS(10\Y) 100	≥ 100
CS(10\Y) 120	≥ 120
CS(10\Y) 150	≥ 150
CS(10\Y) 175	≥ 175
CS(10\Y) 250	≥ 250
CS(10\Y) 400	≥ 400
CS(10\Y) 800	≥ 800
CS(10\Y) 1 600	$\geq 1\,600$

4.3.5.2 Point load

The effects of point loads shall be assessed by means of the determination of compressive stress or compressive strength in accordance with EN 826 (see 4.3.5.1).

4.3.5.3 Compressive creep

Compressive creep, X_{ct} , and total thickness reduction, ϵ_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 result extrapolated 30 times 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 1 % at the declared stress. No test result shall exceed the declared levels at the declared stress.

NOTE Examples for declaration of levels for compressive creep.

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

4.3.6 Water vapour diffusion resistance

Water vapour diffusion resistance properties shall be determined in accordance with EN 12086 and declared as the water vapour diffusion resistance factor, μ , for homogeneous products and the water vapour resistance, Z , for faced or non-homogeneous products. No test result of μ , shall exceed the declared value MU and no test result of Z shall be less than the declared value Z.

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

The manufacturer may declare the water vapour transmission as given in 8.2, 8.3 or 8.5 of EN 12086 instead of the water vapour transmission factor, if needed. In this case, the MU shall be replaced by WVT, WVP or WVPE respectively in the designation code as given in Clause 6.

4.3.7 Water absorption

4.3.7.1 Short-term water absorption

Short-term water absorption by partial immersion, W_p , shall be determined in accordance with EN 1609. No test result shall exceed the value given in Table 5 for the declared level.

Table 5 — Levels of short-term water absorption by partial immersion

Level	Requirement kg/m ²
WS1	1,25
WS2	1,00
WS3	0,75
WS4	0,50
WS5	0,25

4.3.7.2 Long term water absorption by partial immersion

Long term water absorption by partial immersion, W_{lp} , shall be determined in accordance with EN 12087. No test result shall exceed the value given in Table 6 for the declared level.

Table 6 — Levels for long term water absorption by partial immersion

Level	Requirement kg/m ²
WL (P) 1	3,00
WL (P) 2	2,00
WL (P) 3	1,50
WL (P) 4	1,00
WL (P) 5	0,50

4.3.8 Closed cell content

Closed cell content (corrected), ψ_0 , shall be determined in accordance with EN ISO 4590. Surface facings or natural skins shall be removed. For products whose primary function is thermal insulation the minimum (corrected) closed cell content shall be 90 %.

4.3.9 Trace quantities of water soluble chloride and the pH-value

Trace quantities of water soluble chloride ions (CL⁻), and the pH-value shall be determined in accordance with EN 13468. The manufacturer shall declare the test results as levels in mg per kg of product, or, for the pH-value, in steps of 0,5. For chloride no test result shall exceed the declared value. For the pH-value, no test result shall deviate from the declared value by more than 1,0.

4.3.10 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/>

4.3.11 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 not less than 1 m² 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 smaller.

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

5.2 Conditioning

Except for the determination of initial thermal conductivity, maximum service temperature and minimum service temperature, no special conditioning of the test specimens is needed.

The conditioning required for the determination of initial thermal conductivity is given in 5.3.2. The conditioning required for the determination of maximum and minimum service temperatures is given in the test methods indicated in Table 7.

In the case of dispute, the test specimens shall be stored for at least 6 h at (23 ± 2) °C and (50 ± 5) % relative humidity prior to testing.

5.3 Testing

5.3.1 General

Table 7 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.

For all products, the properties shall be determined on faced or unfaced boards. In the case of pipe sections, segments and prefabricated ware fabricated from blocks or boards the properties shall be determined on the blocks or boards from which they are fabricated except for dimensions, squareness, flatness and pipe section linearity which shall be tested on the fabricated pipe section, segment or prefabricated ware, where possible.

Table 7 — Test methods, test specimens and conditions

Dimensions in millimetres

Clause		Test method		Test specimen dimensions ^a	Minimum number of measurements to get one test result	Specific conditions
No.	Title	Flat	Cylindrical			
4.2.1	Thermal conductivity	EN 12667 or EN 12939	EN ISO 8497	See EN 12667 EN 12939 or EN ISO 8497	1	b
4.2.2	Dimensions and tolerances					
	Length and width	EN 822	EN 13467	Full size	1	—
	Thickness	EN 823	EN 13467	Full size	1	—
	Inside diameter		EN 13467	Full size	1	—
4.2.2.1	Squareness	EN 824	EN 13467	Full size	1	—
4.2.2.2	Flatness	EN 825	—	Full size	1	—
4.2.2.3	Pipe section linearity	—	EN 13467	Full size	1	—
4.2.3.1	Dimensional stability under constant normal laboratory conditions	EN 1603	—	Full size	1	—
4.2.3.2	Dimensional stability under specified temperature and humidity conditions	EN 1604	—	200 × 200	3	—
4.2.4	Reaction to fire	See EN 13501-1				EN 15715:2009
4.3.2	Maximum service temperature	EN 14706	EN 14707	100 × 100 × 50 For pipe sections see EN 14707	3	b,c
4.3.3	Minimum service temperature	Annex C and EN 12667	—	See C.4.1	1	b,d
4.3.4.1	Dimensional stability at specified temperature	EN 1604	—	200 × 200 × 25 or product thickness	3	b
4.3.4.2	Dimensional stability at - 20 °C	EN 1604	—	200 × 200 × 25 or product thickness	3	b
4.3.5.1	Compressive stress or compressive strength	EN 826	—	50 × 50 × 50 or product thickness	5	b
			EN 826	50 × 50 × 50 or product thickness	5	e
4.3.5.2	Point load	See 4.3.5.1	—	—	—	—
4.3.5.3	Compressive creep	EN 1606	—	50 × 50 or 100 × 100	3	e
4.3.6	Water vapour transmission	EN 12086	—	EN 12086	2	b
4.3.7.1	Short-term water absorption	EN 1609	—	200 × 200	3	—
4.3.7.2	Long term water absorption	EN 12087	—	200 × 200	3	—

Clause		Test method		Test specimen dimensions ^a	Minimum number of measurements to get one test result	Specific conditions
No.	Title	Flat	Cylindrical			
4.3.8	Closed cell content	EN ISO 4590	—	100 × 30 × 30	3	Use Method 2
4.3.9	Trace quantities of water soluble chloride and the pH-value	EN 13468	—	—	3	7,5 g
4.3.10	Release of dangerous substances	f				
4.3.11	Continuous glowing combustion	f				
<p>^a Always full size product thickness unless specified.</p> <p>^b Test with specimen thickness in direction of foam rise.</p> <p>^c If the manufacturer's declared maximum service temperature is lower than that given by the test, the manufacturer's value shall be used.</p> <p>^d If the manufacturer's declared minimum service temperature is higher than that given by the test, the manufacturer's value shall be used.</p> <p>^e Test with specimen thickness in direction of right angles to foam rise.</p> <p>^f Not yet available.</p>						

5.3.2 Thermal conductivity

For flat test specimens, the 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 are 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.

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

The thermal conductivity shall be determined directly at the measured thickness. In the event that this is not possible, it shall be determined by measurements on other thicknesses of the product providing that:

- the product is of similar chemical and physical characteristics and is produced on the same production unit;
- and it can be demonstrated in accordance with EN 12939 that the thermal conductivity, λ , does not vary more than 2 % over the range of thicknesses where the calculation is applied.

For the determination of thermal conductivity from the minimum to the maximum service temperature, the test sample shall be aged and conditioned in accordance with Annex C.

For factory production control purposes, the initial thermal conductivity at a reference temperature of 10 °C shall be derived from the measurement of thermal resistance made one to eight days after manufacture. Samples shall be conditioned for at least 16 h at (23 ± 2) °C and (50 ± 5) % relative humidity prior to cutting the test specimens.

5.3.3 Reaction to Fire

The tests shall be carried out in accordance with EN 13501-1 and EN 15715.

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 phenolic foam abbreviated term	PF
— This European Standard number	EN 14314
— Maximum service temperature	ST(+)i
— Minimum service temperature	ST(-)i
— Dimensional stability at specified temperature	DS(T+)
— Dimensional stability at - 20 °C	DS(T-)
— Compressive stress or compressive strength	CS(10\Y)i
— Compressive creep	CC($i_1/i_2/y$) σ_c
— Water vapour transmission	MU or Z
— Closed cell content	CV
— Water soluble chloride	CLi

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 phenolic foam product is illustrated by the following example:

PF – EN 14314 – ST(+) 120 – DS(T+) – CS(10\Y) 175 – MU – CV – CL35

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 13166 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 13166 may be used for the purpose of FPC and DoP according to this standard.

8 Marking and labelling

Products conforming with this standard shall be clearly marked, either on the product or on the label or 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;
- shift or time of production and manufacturing plant or traceability code;
- reaction to fire class; specific test conditions shall be indicated with the marking by reference to manufacturer's literature, where relevant;
- the intended use of the insulation material for Thermal Insulation of Building Equipment and Industrial Installations is given by the abbreviation 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	
4.2.1	Thermal conductivity ^b – at 10 °C (initial value) – full temperature range (aged value)	1 per 24 h 1 per 2 years
4.2.2	Dimensions and tolerances – boards	
	Length, width and thickness	1 per 24 h
	Dimensions and tolerances – pipe sections	
	Length, thickness and inside diameter	1 per 24 h
	Dimensions and tolerances – segments	
	Length, width, thickness and inside diameter	1 per 24 h
	Dimensions and tolerances – prefabricated ware	
	Length and thickness	1 per 24 h
4.2.2.1	Squareness	1 per 24 h
4.2.2.2	Flatness	1 per 24 h
4.2.2.3	Pipe section linearity	1 per 24 h
4.2.3	Dimensional stability	1 per 5 years
4.2.4	Reaction to fire	See Table A.2
4.3.2	Maximum service temperature	1 per 5 years + indirect 1 per 24 h
4.3.3	Minimum service temperature	1 per 5 years
4.3.4.1	Dimensional stability at specified temperatures	1 per 24 h
4.3.4.2	Dimensional stability at - 20 °C	1 per 24 h
4.3.5.1	Compressive stress or compressive strength	1 per 24 h
4.3.5.2	Point load	See 4.3.5.1
4.3.5.3	Compressive creep	1 per 5 years
4.3.6	Water vapour transmission	1 per year
4.3.7	Water absorption	1 per 5 years
4.3.8	Closed cell content	1 per 180 days
4.3.9	Trace quantities of water soluble chloride and the pH-value	1 per 5 years
4.3.10	Release of dangerous substances	c
4.3.11	Continuous glowing combustion	c
^a The minimum testing frequencies, expressed in number of test results required per period, shall be understood as the minimum for each production batch/unit under stable conditions. In the case of pipe sections, segments and prefabricated ware it is the minimum for each production lot. 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. 1/24h shall be understood to mean once per 24-h period in which any production has taken place. For mechanical properties, the testing frequencies given are independent of the change of product. In addition, the manufacturer shall establish internal rules for process adjustments related to these properties when changing the product. For PTD and FPC, units using the same process in one factory are considered together (as one production line).		
^b For factory production control purposes, the initial thermal conductivity shall be measured at a reference mean temperature of 10 °C or at different mean temperatures following EN ISO 13787, depending on the frequency.		
^c Frequencies not given as test methods are not yet available.		

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					
4.2.4	Reaction to fire class			Product		Components ^d			
						Substantial		Non-substantial	
		Test Method	Frequency	Test Method	Frequency	Test Method	Frequency	Test Method	Frequency
	B	EN 13823	1 per 2 years and indirect testing	Manufacturer's method	1 per day	Manufacturer's method	1 per day	—	—
	C	and							
	D	EN ISO 11925-2	1 per 2 years and indirect testing	Manufacturer's method	1 per day	—	—	—	—
	E	EN ISO 11925-2	1 per 2 years and indirect testing	Manufacturer's method	1 per day	—	—	—	—
^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 third party or by the manufacturer.									
^c Indirect testing may be conducted by a third party or by the manufacturer on the product or on its components.									
^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 certified component, the frequency is once per delivery of the component.									

Annex B (normative)

Determination of the aged value of thermal conductivity

B.1 General

This annex covers products of phenolic foam, with or without facings, up to a thickness of 200 mm.

This annex provides two thermal ageing methods for the determination of the aged values of thermal resistance and thermal conductivity. The methods predict the time averaged value over 25 years.

The ageing methods are valid for products of phenolic foam produced using high molecular weight blowing agents which remain substantially in the products for time periods well in excess of those required for a “reasonable economic life”.

The methods are suitable for all products, with or without facings, expanded with hydrofluorocarbons, (e.g. 365mfc, 227ea), iso-propyl chloride, mixtures of pentane and iso-propyl chloride (LBL2) and mixtures of pentanes, with the following characteristics:

- closed cell content $f \geq 90$ % as determined in accordance with 4.3.7;
- a compressive strength 100 kPa as determined in accordance with 4.3.5;
- a cell gas shall be identified by gas chromatography.

This annex does not cover products with a closed cell content < 10 %. The thermal conductivity of these products shall be determined in accordance with 5.3.2.

B.2 Preparation of test sample

B.2.1 Sampling

The test sample shall be taken from the full size product or, in the case of pipe insulation, a slab from the full size block from which the pipe insulation is cut, not less than seven days and not more than 50 days after manufacture.

The sample shall be taken as described in Table 6, except that, at the manufacturer's discretion and admission, an average result from measurements parallel to and perpendicular to the direction of rise may be declared.

B.2.2 Dimensions

Select a test sample such that the area dimensions shall not be less than those specified in Table A.1 of EN 12667:2001 which correspond to the product thickness, or shall be equal to the maximum product dimensions. The maximum size of the test sample shall be (800 × 600) mm.

B.2.3 Conditioning

The test sample shall be conditioned in accordance with EN 12429 at (70 ± 2) °C and then at (23 ± 2) °C and (50 ± 5) % relative humidity for at least 16 h before cutting the test specimen. For unfaced products, the maximum conditioning at (70 ± 2) °C shall not exceed 14 days.

B.3 Determination of the initial value of thermal conductivity

The initial value of the thermal conductivity of the test sample shall be derived from the measurement of the thermal resistance:

- prepare the test sample for thermal resistance measurement in accordance with C.2;
- measure the thermal resistance of the test sample in accordance with 5.3.2;
- report the initial value of thermal conductivity to the nearest 0,000 1 W/(m·K).

B.4 Determination of the aged value of thermal conductivity

B.4.1 Method

B.4.1.1 Test sample

The test sample shall include any facings, skins, etc. and shall be tested at product thickness after preparation in accordance with B.2.

B.4.1.2 Ageing conditions

B.4.1.2.1 Heat ageing of the product may be at either 70 °C or 110 °C

B.4.1.2.1.1 Ageing at 70 °C

The test sample shall be aged for (175 ± 5) days at (70 ± 2) °C and then conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity to constant weight as defined in EN 12429.

B.4.1.2.1.2 Ageing at 110 °C

The test sample shall be conditioned for (7 ± 1) days at (70 ± 2) °C to dry the product. The test sample shall be aged for (14 ± 1) days at (110 ± 2) °C and then conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity to constant weight as defined in EN 12429.

B.4.1.3 Determination of the aged value of thermal conductivity

The aged value of thermal conductivity of the test sample shall be derived from the measurement of thermal resistance measured in accordance with 5.3.2.

The accelerated aged value of thermal conductivity shall be increased by the increments given in Table B.1 to obtain the time-averaged value over 25 years.

Table B.1 — Increments to be added to accelerated aged values of thermal conductivity to obtain the time averaged value over 25 years (W/m·K)

Products expanded with	LBL2/pentane mixtures	All others
Diffusion open facing or no facing	0,001	0,002
Diffusion closed facings	0,001	0,001

The diffusion tight property of the facing can also be proven if the faced product (maximum size of the sample 800 mm × 600 mm and maximum thickness 50 mm), when tested under either of the test conditions permitted by B.4.1.2, does not show a lambda increase for the product greater than 0,001 W/m·K.

NOTE Facings with oxygen diffusion levels less than $4,5 \text{ cm}^2$ per 24 h per m^2 when measured in accordance with ASTM D 3985 at 20°C can be considered diffusion tight.

B.4.1.4 Reporting of the aged value of thermal conductivity

Report the aged value of thermal conductivity to the nearest $0,000 \text{ 1 W/(m}\cdot\text{K)}$. The value aged thermal conductivity, determined as in 4.2 with a mean temperature of 10°C , represents the value for the product aged at ambient temperatures.

B.5 Blowing agent

The manufacturer, in response to a request, shall declare the blowing agent used in the product.

NOTE The blowing agent can be determined by testing in accordance with D.8.

B.6 Declaration of thermal resistance and thermal conductivity

B.6.1 General

The statistical variation as required in Annex A for the declaration of thermal resistance and thermal conductivity shall be calculated using either the initial or the aged values of thermal conductivity.

The initial values shall be determined in accordance with B.3 and the aged values in accordance with B.4.1.2.1.1 or B.4.1.2.1.2.

B.6.2 Product grouping

The manufacturer shall declare either

- separate thermal values for each single product and each single thickness and then determine the $\lambda_{90/90}$ value on each thickness for each product;

or

- a thermal value for a product or product group including all the range of thicknesses using the $\lambda_{90/90}$ value of the product or product group for the corresponding thickness range. Separate product groups shall be established for products without facing, diffusion open facing and diffusion tight facing.

The manufacturer shall decide whether to create groups and the size of the groups. The determined thermal values of thin, medium and thick products shall be included in the statistics of a product group which covers a complete or a thickness range.

A minimum of 10 aged values shall be determined for each product group.

Annex C (normative)

Determination of minimum service temperature

C.1 Definitions

For the purposes of this annex, the following definition applies:

minimum service temperature

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

NOTE 1 The required performance can be in the areas of dimensional stability, thermal properties, and mechanical properties.

NOTE 2 In the present test procedure, which is used as a reference, the test specimen is exposed to a temperature difference going from ambient to the minimum service temperature. This may not reflect the actual application conditions when products are exposed to different temperatures on the two main faces, e.g. in multilayer systems.

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.

Additional requirements for assessing the minimum service temperature of specific materials are described in C.9.

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 product.

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

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 calliper, 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.

The length, width and thickness shall be as specified in this standard, complying with the requirements of this annex.

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

At least 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 $(23 \pm 5) ^\circ\text{C}$ or in case of dispute, at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity for the time specified in 5.2.

C.5 Procedure

C.5.1 Test conditions

The initial conditions for the test shall be $(23 \pm 5) ^\circ\text{C}$.

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 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 3, 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:

$$\Delta\varepsilon_l = 100 \times \frac{l_2 - l_1}{l_1} \quad (\text{C.1})$$

$$\Delta\varepsilon_b = 100 \times \frac{b_2 - b_1}{b_1} \quad (\text{C.2})$$

$$\Delta\varepsilon_d = 100 \times \frac{d_2 - d_1}{d_1} \quad (\text{C.3})$$

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 the relevant product standard, the test shall be repeated 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 C.6.2 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;

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:

$$\Delta\varepsilon_l = 100 \times \frac{l_2 - l_1}{l_1} \quad (\text{C.1})$$

$$\Delta\varepsilon_b = 100 \times \frac{b_2 - b_1}{b_1} \quad (\text{C.2})$$

$$\Delta\varepsilon_d = 100 \times \frac{d_2 - d_1}{d_1} \quad (\text{C.3})$$

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 the relevant product standard, the test shall be repeated 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 C.6.2 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;

C.9.2 Test specimens

C.9.2.1 Dimensions of test specimens

The test specimens shall have dimensions, as indicated in Figure C.1.

NOTE 1 They can be prepared by normal moulding procedures wherever possible but the “skin” effect which results cannot be eliminated and will cause a variance in the final result. Another method of preparation of the test specimen, which would not have this objection, is to machine the desired geometry on a small lathe using a cutter.

NOTE 2 The reduced dimensions are needed to control the temperature homogeneity.

C.9.2.2 Number of test specimens

Five test specimens shall be used.

C.9.3 Procedure

Cool down the test specimens to the expected minimum service temperature and stabilize them for at least 3 h.

Measure the tensile strength of the product at the expected minimum service temperature in accordance with EN 1608 choosing a constant speed of crosshead, such that rupture shall occur in from 3 min to 6 min.

Measure the dimensional change in relation to the tensile force at the expected minimum service temperature in accordance with EN 1608.

Use at least five test specimens.

Measure the coefficient of linear contraction from $(23 \pm 2) ^\circ\text{C}$ to the expected minimum service temperature, in the direction in which the tensile strength has been measured, in accordance with EN 13471.

Use at least three test specimens.

C.9.4 Calculation and expression of results

For each test specimen used for the tensile strength test, calculate the modulus of elasticity at the minimum service temperature by dividing the tensile strength by the dimensional change.

Calculate the factor F using the following equation:

$$F = \frac{\sigma(l - \delta)}{\sum \alpha \times \Delta T} \quad (\text{C.4})$$

where

σ is the average tensile strength of the material at the minimum service temperature;

δ is the Poisson's ratio at the minimum service temperature; for phenolic foams, it shall be estimated to be 0,4;

NOTE Other values can be used if substantiated by experimental data.

Σ is the average tensile modulus of elasticity at the minimum service temperature;

α is the average linear contraction coefficient at the minimum service temperature;

ΔT is the temperature difference between the minimum service temperature and $+ 23 ^\circ\text{C}$.

Figure C.1 — Dimensions of test specimens (mm)

Annex D (informative)

Additional properties

D.1 General

The manufacturer can choose to give information on the following additional properties (see Table D.1).

This information, where appropriate for the product and the application, should be given as limiting values for each test result obtained from the referred test method, sampling and conditions as given in Table D.1

D.2 Apparent density

Apparent density, ρ_a , is a useful identification parameter but should not be used as the basis for quality assessment of phenolic foam products.

Apparent density of boards, if voluntarily declared, will be determined in accordance with EN 1602. Apparent density of pipe sections, if voluntarily declared, will be determined in accordance with EN 13470. If the apparent density is declared, the declared value, AD, should be given in kg/m³.

D.3 Coefficient of thermal expansion

The coefficient of thermal expansion, α_m , if voluntarily declared, will be determined in accordance with EN 13471. If the coefficient of thermal expansion is declared, no test result should be greater than the declared value, TE.

D.4 Water vapour transmission of preformed pipe insulation

Water vapour transmission of preformed pipe sections, if voluntarily declared, will be determined in accordance with EN 13469 and expressed as the water vapour diffusion resistance factor, μ , for homogeneous products or the water vapour resistance, Z , for faced or non homogeneous. If the water vapour transmission of preformed pipe insulation is declared, no test result of the water vapour diffusion resistance, μ , or the water vapour resistance, Z , should be less than the declared value.

D.5 Tensile strength perpendicular to faces

Tensile strength perpendicular to faces, σ_{mt} , if voluntarily declared, will be determined in accordance with EN 1607. If the tensile strength perpendicular to faces is declared, no test result should be less than the declared value, TR.

D.6 Shear strength

Shear strength of boards, τ , if voluntarily declared, will be determined in accordance with EN 12090. If the shear strength is declared, no test result should be less than the declared value, SS.

D.7 Bending strength

Bending strength of boards, σ_b , if voluntarily declared, will be determined in accordance with EN 12089. If the bending strength is declared, no test result should be less than the declared value, BS.

D.8 Cell gas composition

Cell gas composition should be determined with a gas chromatograph.

D.9 Cryogenic application

Because of the dangers of exploding organic substances in the presence of liquid oxygen, it is recommended to consult the manufacturer if PF products are to be used below - 180 °C.

Table D.1 — Test methods, test specimens, conditions and minimum testing frequencies

Dimensions in millimetres

Clause		Test method	Test specimens dimensions ^a	Minimum number of measurements to get one test result	Specific conditions	Factory production control ^b
No.	Title					Minimum product testing frequencies ^b
D.2	Apparent density					
	– boards	EN 1602	Full size	1	—	1 per 24 h
	– preformed pipe insulation	EN 13470	Full size	1	—	PTD ^c + 1/5 years
D.3	Coefficient of thermal expansion	EN 13471	50 × 10 × 10	2	—	PTD ^c + 1/5 years
D.4	Water vapour transmission of preformed pipe insulation	EN 13469	As per test method	2	—	PTD ^c + 1/5 years
D.5	Tensile strength perpendicular to faces	EN 1607	50 × 50	5	—	PTD ^c + 1/5 years
D.6	Shear strength	EN 12090	250 × 50	3	—	PTD ^c +1/5 years
D.7	Bending strength	EN 12089	300 × 150	—	Method B	PTD ^c + 1/5 years
D.8	Cell gas composition	Gas chromatograph ^d	—	—	—	PTD ^c + 1/5 years

^a Full size product thickness, unless otherwise stated.

^b Only relevant in case of declaration of the property.

^c PTD, see EN 13172.

^d Literature reference – S. Lohmeyer, G. Müller “Determination of the cell gas amount and composition in polyurethane foams” Journal of cooling technic and air conditioning (Kältetechnik Klimatisierung, 22nd year, volume 3 (1970), pages 291–295.

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/103¹⁾ “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 phenolic foam 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 phenolic foam and intended use

Product: Factory made phenolic foam products		Intended use: Thermal insulation for building equipment and industrial installations	
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	—	<u>Flat products:</u> Declared thickness d_D <u>Linear products:</u> Inner diameter D_i , thickness d_D
	4.3.8 Closed cells	—	Limit value
Reaction to fire	4.2.4 Reaction to fire	Euroclasses	<u>Flat products:</u> Euroclass for flat products <u>Linear products with outer diameter ≤ 300 mm:</u> Euroclass for linear products <u>Linear products with outer diameter > 300 mm:</u> Euroclass for flat products
Durability of thermal resistance against ageing/degradation and high temperature	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature
	4.2.5 Durability characteristics	—	-
	4.3.8 Closed cell	—	Limit value
Durability of reaction to fire against ageing/degradation and high temperature	4.2.5 Durability characteristics	Euroclasses	^a
Durability of dimensional stability against ageing/degradation and specified conditions	4.2.5 Durability characteristics	—	Level ^b
	4.3.4 Dimensional stability under specified conditions	—	Level ^b
Compressive strength	4.3.5 Compression resistance properties	—	Levels
Water vapour permeability	4.3.6 Water vapour transmission	—	Limit values
	4.3.8 Closed cells	—	Limit value
Water permeability	4.3.7 Water absorption	—	Level
Rate of release of corrosive substances (only when the product is intended to be used in contact with metals)	4.3.9 Trace quantities of water soluble chloride and the pH-value	—	Level
Release of dangerous substances	4.3.10 Release of dangerous substances	—	^c
Continuous glowing combustion	4.3.11 Continuous glowing combustion	—	^c
^a The fire performance of PF does not deteriorate with time. The Euroclass classification of the product is related to the organic content, which cannot increase with time. ^b For thickness only. ^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 phenolic foam

ZA.2.1 Systems of AVCP

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

Table ZA.2 — Systems of AVCP

Product(s)	Intended use(s)	Level(s) or class(es) (reaction to fire)	AVCP system(s)
Thermal insulation products (Factory made products)	For uses subject to regulations on reaction to fire	(A1, A2, B, C) ^a	1
		(A1, A2, B, C) ^b , D, E	3
		(A1 to E) ^c , F	4
	Any	—	3
System 1: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.2 System 3: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.4 System 4: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.5			
^a Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material). ^b Products/materials not covered by footnote (^a). ^c Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of classes A1 according to Commission Decision 96/603/EC, as amended).			

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

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

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared.	Clause 5, Annexes B and C of EN 13172:2012 and 7.3 of this standard
	Further testing of samples taken at factory according to the prescribed test plan	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	Annex A of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory and by the product certification body involved with reaction to fire	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for notified testing laboratory	Determination of the product-type on the basis of type testing (including sampling carried out by the manufacturer), type calculation, tabulated values or descriptive documentation of the product	<ul style="list-style-type: none"> — Thermal resistance; — Release of dangerous substances^a; — Compressive strength (for load bearing applications); — Water permeability; — Release of corrosive substances (<i>if relevant</i>). 	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	<ul style="list-style-type: none"> — 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 phenolic foam products under system 3 (see Table ZA.2)

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	Clause 5, Annexes C and D of EN 13172:2012 and 7.3 of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for a notified testing laboratory	Determination of the product type on the basis of type testing (based on sampling carried out by the manufacturer) or tabulated values	<ul style="list-style-type: none"> — Reaction to fire; — Thermal resistance; — Release of dangerous substances^a; — Compressive strength (for load bearing applications); — Water permeability; — Release of corrosive substances (<i>if relevant</i>). 	Clause 6 of EN 13172:2012 and 7.2 of this standard
^a No test method available yet.			

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.

DECLARATION OF PERFORMANCE

No 0123-DoP-2013/10/07

1. Unique identification code of the product-type:

ABCD Rigid phenolic foam (PF) pipe section

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

see product label

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

Thermal Insulation for Building Equipment and Industrial Installations (ThIBEII)

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

Any Co Ltd, PO Box 21, B-1050

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

not relevant

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

Systems 1 and 3

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

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

8. Declared performance

Essential characteristics		Performance					Harmonized technical specification
Thermal resistance	Thermal conductivity	ϑ_m °C	10	30	60	80	EN 14314:2015
		λ_D W/(m·K)	0,025	0,025	0,029	0,031	
	Dimensions	d_D = 15 mm and above D_i between 17 - 273 mm					
Reaction to fire		Outer diameter \leq 300 mm: B _L -s1, d0					
Durability of thermal resistance against ageing/degradation		Maximum service temperature ST(+)120 (=120 °C)					
Durability of thermal resistance against high temperature		Maximum service temperature ST(+)120 (=120 °C)					
Durability of reaction to fire against ageing/degradation		Durability characteristics B _L -s1, d0					
Durability of reaction to fire against high temperature		Durability characteristics B _L -s1, d0					
Compressive strength		Compressive stress at 10 % deformation or yield CS(10\Y)100 (\geq 100 kPa)					
Water permeability		Water absorption WS5 (\leq 0,25 kg/m ²)					
Water vapour permeability		WVT 0.1 (\leq 0,1g/m ² /d)					
Rate of release of corrosive substances		Trace quantities of water-soluble chloride ions CL10 (\leq 10 ppm)					
Release of dangerous substances		NPD					
Continuous glowing combustion		NPD					
NPD No Performance Determined, ϑ_m Mean Temperature							

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 phenolic foam (PF) product

or

— to a label attached to it.

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

The CE marking shall be followed by:

- the last two digits of the year in which it was first affixed;
- the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;
- the unique identification code of the product-type;
- the reference number of the declaration of performance;
- the level or class of the performance declared;
- the dated reference to the harmonized technical specification applied; the identification number of the notified body [only for products under systems 1 and 3];
- the intended use as laid down in the harmonized technical specification applied.

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

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

<p>4567</p> <p>7456</p>	<p><i>CE marking, consisting of the “CE”-symbol</i></p> <p><i>Identification number of the product certification body</i></p> <p><i>Identification number of the notified test laboratory/ laboratories</i></p>
<p>AnyCo Ltd, PO Box 21, B-1050</p> <p>13</p> <p>0123 – DoP – 2013/10/07</p>	<p><i>name and the registered address of the manufacturer, or identifying mark</i></p> <p><i>Last two digits of the year in which the marking was first affixed</i></p> <p><i>reference number of the DoP</i></p>
<p>EN 14314:2015</p> <p>ABCD</p> <p>Rigid phenolic foam (PF) pipe section</p> <p>ThIBEII</p> <p>λD DoP</p> <p>RtF BL-s1,d0</p> <p>dD 20 mm</p> <p>PF – EN 14314 – ST(+)120 – CS(10\Y)100 – WVT 0.1 – WS5 – CL10</p>	<p><i>No. of European standard applied, as referenced in OJEU</i></p> <p><i>Unique identification code of the product-type</i></p> <p><i>Intended use of the product as laid down in the European standard applied</i></p> <p><i>Declared thermal conductivity</i></p> <p><i>Reaction to fire – Euroclass</i></p> <p><i>DeclaredThickness</i></p> <p><i>Designation code (in accordance with Clause 6 of this standard for the relevant characteristics according to Table ZA.1)</i></p> <p><i>Level or class of the performance declared</i></p>

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

Bibliography

- [1] ASTM D 3985, *Standard test method for oxygen gas transmission rate through plastic film and sheeting using a coulometric sensor*
- [2] EN 1602, *Thermal insulating products for building applications - Determination of the apparent density*
- [3] EN 1607, *Thermal insulating products for building applications - Determination of tensile strength perpendicular to faces*
- [4] EN 12089, *Thermal insulating products for building applications - Determination of bending behaviour*
- [5] EN 12090, *Thermal insulating products for building applications - Determination of shear behaviour*
- [6] EN 13238, *Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates*
- [7] EN 13469, *Thermal insulating products for building equipment and industrial installations - Determination of water vapour transmission properties of preformed pipe insulation*
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- [10] EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications*
- [11] ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*

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