BS EN 14313:2015

BSI Standards Publication

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

bsi.

National foreword

This British Standard is the UK implementation of EN 14313:2015. It supersedes BS EN 14313:2009+A1:2013 which is withdrawn.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.

Published by BSI Standards Limited 2016

ISBN 978 0 580 88437 5

ICS 91.100.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2016.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14313

December 2015

ICS 91.100.60

Supersedes EN 14313:2009+A1:2013

English Version

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

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

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

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword ... 4

1 Scope ... 6

2 Normative references ... 6

3 Terms, definitions, symbols, units and abbreviated terms ... 8
3.1 Terms and definitions ... 8
3.1.1 Terms and definitions as given in EN ISO 9229:2007 ... 8
3.1.2 Additional terms and definitions ... 8
3.2 Symbols, units and abbreviated terms ... 9
3.2.1 Symbols and units used in this standard ... 9
3.2.2 Abbreviated terms used in this standard ... 10

4 Requirements ... 10
4.1 General ... 10
4.2 For all applications ... 11
4.2.1 Thermal conductivity ... 11
4.2.2 Dimensions and tolerances ... 11
4.2.3 Dimensional stability ... 12
4.2.4 Reaction to fire of the product as placed on the market ... 12
4.2.5 Durability characteristics ... 13
4.3 For specific applications ... 13
4.3.1 General ... 13
4.3.2 Maximum service temperature ... 13
4.3.3 Minimum service temperature ... 13
4.3.4 Water absorption ... 14
4.3.5 Water vapour diffusion resistance ... 14
4.3.6 Trace quantities of water-soluble ions and the pH-value ... 14
4.3.7 Structure-borne sound transmission ... 15
4.3.8 Sound absorption ... 15
4.3.9 Release of dangerous substances ... 15
4.3.10 Continuous glowing combustion ... 15

5 Test methods ... 15
5.1 Sampling ... 15
5.2 Conditioning ... 15
5.3 Testing ... 16
5.3.1 General ... 16
5.3.2 Thermal conductivity ... 18
5.3.3 Reaction to fire ... 18

6 Designation code ... 19

7 Assessment and Verification of the Constancy of Performance (AVCP) ... 19
7.1 General ... 19
7.2 Product Type Determination (PTD) ... 20
7.3 Factory Production Control (FPC) ... 20

8 Marking and labelling ... 20

Annex A (normative) Factory production control ... 21

Annex B (normative) Determination of minimum service temperature **23**
B.1 Definitions **23**
B.2 Principle **23**
B.3 Apparatus **23**
B.4 Test specimens **23**
B.5 Procedure **24**
B.6 Calculation and expression of results **24**
B.7 Test report **25**
Annex C (informative) Additional properties **26**
C.1 General **26**
C.2 Water vapour diffusion resistance **26**
C.3 Density **26**
C.4 Compressive strength **26**
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation **28**
ZA.1 Scope and relevant characteristics **28**
ZA.2 Procedures for AVCP of factory made polyethylene foam (PEF) products **30**
ZA.3 CE Marking and labelling **37**
Bibliography **39**

European foreword

This document (EN 14313:2015) 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 14313:2009+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 14313 are the following:

a) an addition to the foreword;

b) an addition in Clause 3;

c) a new 4.3.9;

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 out-side 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 four annexes:

— Annex A (normative), Factory production control;

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

— Annex C (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 be-low 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 flexible polyethylene foam products which are used for the thermal insulation of building equipment and industrial installations with an operating temperature in the range of approximately - 80 °C to + 150 °C.

Tensile stress in the insulation product should be avoided when applying PEF. This is even more important when applying PEF on lines with operating temperatures between - 50 °C and - 80 °C. The tensile stress should be kept at the minimum by applying the foam “under pressure”, i.e. cutting the parts in a generous way. Manufacturer’s advice should be heeded in all cases.

The products are manufactured in the form of tubes, profiles, sheets, rolls and tapes with or without coating and/or self-adhesive backing and/or different closure systems.

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 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 standard does not cover products for the insulation of the building structure.

The normative part of this standard does not cover compressive stress (see C.4).

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

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

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

EN 13172:2012, *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 13472, *Thermal insulating products for building equipment and industrial installations - Determination of short term water absorption by partial immersion 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 14366:2004, *Laboratory measurement of noise from waste water installations*

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 354, *Acoustics - Measurement of sound absorption in a reverberation room (ISO 354)*

EN ISO 3822-1, *Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 1: Method of measurement (ISO 3822-1)*

EN ISO 4589-1, *Plastics - Determination of burning behaviour by oxygen index - Part 1: Guidance (ISO 4589-1)*

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

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

EN ISO 11654, *Acoustics - Sound absorbers for use in buildings - Rating of sound absorption (ISO 11654)*

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 apply.

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

3.1.1.1
polyethylene foam
semi-rigid or flexible cellular plastics insulation material based on polymers derived mainly from ethylene and/or propylene

3.1.1.2
tube
(insulation) product for application on cylindrical objects

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

3.1.1.4
pipe insulation
insulation product designed to fit around pipes

3.1.1.5
thermal insulation
process of reducing heat transfer through a system, or to describe a product, component or system which performs that function

3.1.1.6
test specimen
single item within a sample or part of an item used for a test

3.1.1.7
building equipment
system incorporated in a permanent manner in construction works forming part of the heating, cooling and ventilation installation of those works

3.1.1.8
industrial installation
plant and associated vessels, pipes, ducts etc. used by industry to manufacture or store a product or to transfer a fluid

3.1.2 Additional terms and definitions

3.1.2.1
profile
product for application on cylindrical and other objects shaped for special insulation

3.1.2.2
sheet
flexible insulation product of rectangular shape with or without facing or adhesive backing

3.1.2.3
tape
thin, narrow strip of insulation material with or without adhesive backing supplied in rolls

3.1.2.4
form pieces
prefabricated elbows, T-pieces or else formed from tubes, sheets or rolls, etc

3.1.2.5
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.

3.1.2.6
class
combination of two levels of the same property between which the performance shall fall

3.1.2.7
production line
assemblage of equipment that produces products using a continuous process

3.1.2.8
production unit
assemblage of equipment that produces products using a discontinuous process

3.2 Symbols, units and abbreviated terms

3.2.1 Symbols and units used in this standard

α_p	is the practical sound absorption coefficient	—
α_w	is the weighted sound absorption coefficient	—
b	is the width	mm
D_i	is the inside diameter	mm
$D_{i,D}$	is the declared inside diameter of a tube or profile	mm
d	is the thickness	mm
d_D	is the declared thickness of the product	mm
$\Delta\varepsilon_b$	is the relative change in width	%
$\Delta\varepsilon_d$	is the relative change in thickness	%
$\Delta\varepsilon_l$	is the relative change in length	%
l	is the length	m or mm
$L_{sc,A}$	is the single number descriptor of structure-borne sound	dB (A)
λ	is the thermal conductivity	W/(m·K)

λ_D	is the declared thermal conductivity	W/(m·K)
μ	is the water vapour diffusion resistance factor	—
v	is the deviation from squareness for tubes and profiles	mm
Q	is the waste water volume flow	l/s
S_b	is the deviation from squareness for sheets and rolls on length and width	mm/m
W_p	is the short-term water absorption	kg/m^2
AW	is the symbol of the declared level of weighted sound absorption coefficient	
CL	is the symbol of the declared level of soluble chloride ions	
DS(TH)	is the symbol of the declared value for dimensional stability under specified temperature and relative humidity conditions	
F	is the symbol of the declared level of soluble fluoride ions	
MU	is the symbol of the declared level for water vapour diffusion resistance factor	
NA	is the symbol of the declared level of soluble sodium ions	
pH	is the symbol of the declared level of the pH -value	
SI	is the symbol of the declared level of soluble silicate ions	
ST(+)	is the symbol of the declared level for maximum service temperature	
ST(−)	is the symbol of the declared level for minimum service temperature	
SW	is the symbol of the single number descriptor of structure-borne sound	
WS	is the symbol of the declared level for short-term water absorption	

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
FPC	is **F**actory **P**roduction **C**ontrol
PEF	is **P**oly**E**thylene **F**oam
PTD	is **P**roduct **T**ype **D**etermination (previously named ITT for Initial Type Test)
RtF	is **R**eaction to **F**ire
ThIBEII	is **Th**ermal **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 C.

One test result for a product property is the average of the measured values on the numbers of test specimens given in Table 4.

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 measurement standards above covering the product service temperature range. The following conditions apply:

— the hot side temperature of the measuring device shall not exceed the maximum service temperature;

— the measured value 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 values 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 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 Determination of the declared thermal conductivity of pipe sections, following EN ISO 8497 having joints in the metering area, include 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 sheets, rolls and tapes shall be determined in accordance with EN 822 and EN 823. The length, *l*, thickness, *d*, and inside diameter, D_i, of tubes shall be determined in accordance with EN 13467. The dimensions of profiles and form pieces shall be measured analogously.

No test result shall deviate from the declared values by more than the tolerances given in Table 1 and Table 2.

4.2.2.2 Squareness

Deviations from squareness, S_b, of sheets and rolls shall be determined in accordance with EN 824. Deviations from squareness, *v*, of tubes and profiles shall be determined in accordance with EN 13467. No test result shall exceed the corresponding tolerances given in Table 1.

Table 1 — Dimensional tolerances (length, width, thickness, squareness)

Form of delivery	Length	Width	Thickness [a] mm		Squareness
			Declared	Tolerance	
Tubes Profiles	- 1,5 %; +2,5 %	—	$d_D \leq 6$	±1,0	5,0 mm for $D_{i,D} \leq 60$ mm and 10,0 mm for $60 < D_{i,D} \leq 120$ mm
			$6 < d_D \leq 10$	±1,5	
			$10 < d_D \leq 15$	±2,0	
			$15 < d_D \leq 30$	±2,5	
			$d_D > 30$	±4,0	
Sheets Rolls	±1,5 %	±1,0 %	$d_D \leq 5$	±1,0	10 mm/m (length + width) 2,0 mm (thickness)
			$5 < d_D \leq 10$	±1,5	
			$10 < d_D \leq 15$	±2,0	
			$15 < d_D \leq 30$	±2,5	
			$d_D > 30$	±3,5	
Tapes	±1,5 %	±2,0 mm		±0,5	—

[a] For profiles tolerances are defined only for the section of the profile that is designed for reduction of heat flux.

Table 2 — Dimensional tolerances (inside diameter)

Form of delivery	Inside diameter		
	$D_{i,D} \leq 35$	$35 < D_{i,D} \leq 100$	$D_{i,D} > 100$
Tubes	$D_{i,D}$ +1 to +4	$D_{i,D}$ +2 to +6	$D_{i,D}$ +3 to +8
Profiles	$D_{i,D}$ +1 to +4	$D_{i,D}$ +2 to +6	$D_{i,D}$ +3 to +8

4.2.3 Dimensional stability

Dimensional stability under specified temperature and humidity conditions shall be determined in accordance with EN 1604. The test shall be carried out after storage for 48 h exposure at (23 ± 2) °C and (90 ± 5) % relative humidity. The relative reduction in thickness, $\Delta\varepsilon_d$, shall not exceed 3,0 %. The relative changes in length, $\Delta\varepsilon_l$, and width, $\Delta\varepsilon_b$, shall not exceed 2,0 %.

This test shall not be performed when the more severe test, described in 4.3.2, is used.

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.

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 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 manufacturers 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 PEF products 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 PEF products 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 PEF products does not change with time when subjected to the declared maximum service 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.

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(+), the mean value of relative change in thickness (reduction), $\Delta\varepsilon_{\mathrm{d}}$, shall not exceed 7 %.

The maximum service temperature, ST(+), shall be declared below 100 °C in steps of not less than 5 °C and above 100 °C in steps of not less than 10 °C.

4.3.3 Minimum service temperature

The manufacturer of an insulation material can choose which minimum service temperature he intends to declare for his product.

This minimum service temperature does not represent any specific physical property and cannot be determined by any single standardized test method.

If a minimum service temperature is declared by the manufacturer the following physical properties in line with European test standards have to be declared at the declared minimum service temperature:

a) Thermal conductivity as a function of temperature;

b) Coefficient of thermal expansion as a function of temperature (see Annex B);

c) Tensile strength and/or compressive strength and Young's modulus as a function of temperature as agreed between the parties.

In addition, other physical properties may be agreed upon by the concerned parties.

Using these temperature dependent physical data, the suitability of any specific insulation can be estimated at a given low operational temperature for industrial installations in relation to application related design features.

A low operational temperature cannot be below the minimum service temperature.

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.

4.3.4 Water absorption

Short-term water absorption by partial immersion, W_p, shall be determined in accordance with EN 1609 for flat products or EN 13472 for tubes (method B = drainage). Tests shall be run with specimens of ≥ 15 mm thickness from one sample each being representative for flat products and tubes.

No test result for the water absorption shall exceed the maximum values given in Table 3 for the declared level.

Table 3 — Levels for water absorption

Level	W_p kg/m^2
WS 05	$0,1 < W_p \leq 0,5$
WS 01	$0,05 < W_p \leq 0,1$
WS 005	$W_p \leq 0,05$

4.3.5 Water vapour diffusion resistance

The water vapour transmission properties shall be determined in accordance with EN 12086 for flat products and in accordance with EN 13469 for tubes and declared as the water vapour diffusion resistance factor, μ. The water vapour diffusion resistance factor (μ) shall be declared in levels (MU) with steps of 1 000 up to a value of 15 000. No value shall be less than the declared level. (e.g. MU 1 000 ($\mu \geq 1\,000$), MU 15 000 ($\mu \geq 15\,000$), etc.).

NOTE 1 The water vapour transmission property and the water vapour diffusion resistance factor, μ, are a function of temperature, see Annex C.

NOTE 2 Alternatively, for the declaration of the water vapour transmission properties, the values quoted in EN ISO 10456 may be used.

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

Trace quantities of water soluble chloride, fluoride, silicate and sodium ions and the pH-value shall be deter-mined in accordance with EN 13468. The manufacturer shall declare one or more as appropriate as levels in mg per kg of product and the pH-value as levels in steps of 0,5. For chloride and fluoride, no test results shall exceed the declared value. For silicate and sodium, no test results shall be below the declared value. For the pH-value, no test result shall deviate from the declared value by more than 1,0.

4.3.7 Structure-borne sound transmission

The structure-borne sound transmission shall be determined in accordance with EN 14366 and/or EN ISO 3822-1. The structure-borne sound transmission (according to EN 14366) shall be declared as the weighted structure-borne sound level $L_{SC,A}$ of the insulated pipe with a diameter of DN 100 at a volume flow Q of 1,0 l/s and 2,0 l/s. For comparison the $L_{SC,A}$ of the uninsulated pipe shall also be declared.

4.3.8 Sound absorption

The sound absorption coefficient shall be determined in accordance with EN ISO 354 but always without a plenum. The sound absorption characteristics shall be calculated in accordance with EN ISO 11654 using the values for the practical sound absorption coefficient, α_p, at the frequencies: 125 Hz, 250 Hz, 500 Hz, 1 000 Hz, 2 000 Hz and 4 000 Hz and the single number value for α_w (weighted sound absorption coefficient).

α_p and α_w shall be rounded to the nearest 0,05 ($\alpha_p > 1$ shall be expressed as $\alpha_p = 1$) and declared in levels with steps of 0,05. No result of α_p and α_w shall be lower than the declared level.

4.3.9 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/*

4.3.10 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 or one full-size sheet 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.

Tube and profile specimens shall be taken from a sample consisting of at least three full-size tubes and/or profiles.

5.2 Conditioning

No special conditioning of the test specimens is needed 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 6 h prior to testing.

5.3 Testing

5.3.1 General

Table 4 gives the dimensions of the test specimens, the minimum number of test specimens required to get one test result and any specific conditions which are necessary.

Self-adhesive products shall be tested without the release liner.

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

Table 4 — Test methods, test specimens and conditions

Dimensions in millimetres

Clause		Test method		Test specimen dimensions [a]	Minimum number of measure-ments to get one test result	Specific conditions
No.	Title	Flat	Cylindrical			
4.2.1	Thermal conductivity	EN 12667 or EN 12939	—	See EN 12667 or EN 12939	1	For profiles thermal conductivity shall be only measured for the section that is designed for reduction of heat flux in a flat shape. For tape the sheet or roll it is made from shall be tested.
		—	EN ISO 8497	Full-size	1	
4.2.2	Dimensions and tolerances:					All measurements on finished products including coating and adhesive backing. Profiles shall be measured analogously as tubes. For testing the thickness and width of rolls and tapes a stripe of approx. 300 mm width (rolls) or length (tapes) can be cut.
	Length and width and/or inside diameter	EN 822	EN 13467	Full-size [b]	1	
	Thickness	EN 823	EN 13467	Full-size [b]	1	Load for flat products = 500 Pa (soft ones = 100 Pa)
	Squareness	EN 824	EN 13467	Full-size [b]	1	
4.2.3	Dimensional stability	EN 1604	—	200 × 200	3	—
4.2.4	Reaction to fire	EN 13501–1 for mounting and fixing see EN 15715				Annex A, Tables A.53 to A.57 of EN 15715:2009
4.3.2	Maximum service temperature	EN 14706	—	100 × 100 × d_{max}	3	Rate of temperature increase = 50 °C/h.
		—	EN 14707	See EN 14707	3	Sheets shall be full service (total area) glued. Instead of profiles and tape sheets shall be measured.

Clause		Test method		Test specimen dimensions [a]	Minimum number of measure-ments to get one test result	Specific conditions
No.	**Title**	**Flat**	**Cylindrical**			
4.3.3	Minimum service temperature	Annex B	—	See Annex B	1	Since there is no defined test method to calculate the minimum service temperature an engineering approach has to be taken in order to determine the minimum service temperature
4.3.4	Water absorption	EN 1609	EN 13472	See standard	4	Method B
4.3.5	Water vapour diffusion resistance	EN 12086	—	Diameter = 100 thinnest and thickest wall	5	Test conditions = Set A. (0/50 % r. h. 23 °C). One dummy [c] shall be added to every set of five specimens.
		—	EN 13469	l = 100 thinnest and thickest wall/ any diameter	—	Instead of profiles tubes shall be measured. For tape the sheet or roll it is made from shall be tested.
4.3.6	Trace quantities of water soluble ions and the pH-value	EN 13468		7,5 g	3	—
4.3.7	Structure-borne sound transmission	— —	EN 14366 EN ISO 3822-1	According to test standards	1	Different from 8.2.3 of EN 14366:2004 the specimen shall not be fixed with clamps because only the sound reduction effect of PEF shall be measured. Test shall be run with a pipe DN 100 at volume flows of 1 l/s and 2 l/s
4.3.8	Sound absorption	EN ISO 354	—	Minimum 10 m^2	1	Test without plenum
4.3.9	Release of dangerous substances	[d]	[d]	—	—	—
4.3.10	Continuous glowing combustion	[d]	[d]	—	—	—

[a] Always full-size product thickness, except 4.2.3.

[b] The specimen can be cut into pieces for convenience reasons, if this does not change the result.

[c] A “dummy” is a specimen without desiccant.

[d] Not yet available.

5.3.2 Thermal conductivity

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

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

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

For PTD, measurements of thermal conductivity made on two inside diameters of tubes 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.

NOTE Suitable sizes are 22 mm and 42 mm inside diameter.

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

— the product is of similar chemical and physical characteristics and produced on the same production line/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.

In the case of tubes, measurements made on two inside diameters of tubes at the greatest and smallest insulation thickness for each of the diameters are deemed to be representative of the total product range.

For products using hydrocarbon gases as blowing agents, tests shall be carried out on a specimen, only when residual cell gases have reached a level below 5 %. Thermal treatment may be used to accelerate the gas-diffusion. Time and temperature shall be agreed with the producer in advance. The gas-content shall be measured by gas-chromatographic methods. A minimum of 3 specimens has to be taken from a representative area of the sample. In order to simplify production control the time of a measurement can rely on historic log-data of duration and temperature of the thermal treatment. Data shall correlate with gas-chromatic measurements.

When measuring the thermal conductivity of PEF sheets or rolls at ambient temperatures and above the distance between the two plates shall be adjusted according to the thickness measured according to EN 823.

When measuring the thermal conductivity of PEF sheets or rolls at temperatures below ambient, it is very important to make sure no air gap can form between the plates of the measuring device and the test specimen during the whole test. Therefore, the distance between the two plates shall be adjusted according to the thick-ness of the specimen calculated at the least test temperature. Small cylindrical distance holders made of plastic may be used for this purpose.

5.3.3 Reaction to fire

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

Rules for mounting and fixing are given in EN 15715.

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.

For products using hydrocarbons as blowing agents, tests shall be carried out on specimens only when residual cell gases have reached a level which has no negative influence on the fire reaction. It is the responsibility of the producer to define this level(s) per dimension in the factory production control (FPC) process and document it properly. When the product is delivered to the customer its gas level shall not be above this level, i.e. the fire-reaction class declared shall be fulfilled. It shall be continuously checked and secured before testing whether the documented gas levels are correct and whether the manufacturer delivers products only once they have reached the appropriate gas level.

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 polyethylene foam abbreviated term	PEF
— This European Standard number	EN 14313
— Maximum service temperature	ST(+)i
— Minimum service temperature	ST(-)i
— Water absorption	WSi
— Water vapour diffusion resistance	MUi
— Trace quantities of water soluble chloride ions	CLi
— Trace quantities of water soluble fluoride ions	Fi
— Trace quantities of water soluble sodium ions	NAi
— Trace quantities of water soluble silicate ions	Sli
— pH value	pHi
— Structure-borne sound transmission	SWi
— Weighted sound absorption coefficient	AWi

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

The designation code for a polyethylene foam product is illustrated by the following example:

PEF – EN 14313 – ST(+) 100 – ST(–) – 50 – MU 5000 – AW 0,3 – CL 0,05

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.

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.

8 Marking and labelling

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

— product name or other identifying characteristic;

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

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

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

— the intended use of the insulation material for Thermal Insulation of Building Equipment and Industrial Installations is given by the abbreviation 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 coating or facing, if any;

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

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

NOTE For CE conformity marking see ZA.3.

Annex A
(normative)

Factory production control

Table A.1 — Minimum product testing frequencies

Clause		Minimum testing frequency [a]
No.	**Title**	
4.2.1	Thermal conductivity - full temperature range	1 per 2 years and indirect testing 1 per 24 h [b] Examples for indirect testing: density, cell-size or manufacturer's method
4.2.2	Dimensions and tolerances – Length – Width – Thickness – Inside diameter – Squareness	1 per 24h or 1 per 6 months and 1 per 2 h indirect testing Examples for indirect testing: inline measurement, video controlled measurement, laser or manufacturer's method
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 and 1 per 24 h indirect testing Examples for indirect testing: heating furnace or manufacturer's method
4.3.3	Minimum service temperature	1 per 5 years and 1 per 24 h indirect testing
4.3.4	Water absorption	1 per 5 years
4.3.5	Water vapour diffusion resistance	1 per year or 1 per 2 years and 1 per 6 months indirect testing. Example for indirect testing: electrolytic quick or manufacturer's method
4.3.6	Trace quantities of water soluble chloride, fluoride, silicate and sodium ions and the pH-value	1 per 5 years
4.3.7	Structure-borne sound transmission	1 per 5 years
4.3.8	Sound absorption	1 per 5 years
4.3.9	Release of dangerous substances	[c]
4.3.10	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 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. For PTD and FCP, line/units using the same process in one factory are considered together (as one production line).

[b] Once in every 24 h where there has been production.

[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]					
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 C D	EN 13823 and EN ISO 11925-2	1 per 2 years	EN ISO 4589-1 LOI-test or element analysis (as examples)	1 per week	Weight per unit area or manufacturer's method	1 / 24 h	manufacturer's method	1 / 24 h
	E	EN ISO 11925-2	1 per 2 years	EN ISO 4589-1 LOI-test or element analysis (as examples)	1 per week	Weight per unit area or manufacturer's method	1 / 24 h	manufacturer's method	1 / 24 h

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

a The minimum testing frequencies, expressed in number of 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. For PTD and FCP, line/units using the same process in one factory are considered together (as one production line).

b Direct testing may be conducted either by a 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 a certified component, the frequency is once per delivery of the component.

Annex B
(normative)

Determination of minimum service temperature

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

B.2 Principle

The expansion coefficient as a function of temperature within the temperature range 23 °C and minimum service temperature declared by the manufacturer is determined applying EN 1604.

B.3 Apparatus

B.3.1 General

The principal test equipment consists of a temperature controlled test chamber in accordance with EN 1604, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*.

B.3.2 Micrometer

Permitting thickness reading to at least 0,05 mm.

B.3.3 Sliding calliper

Permitting reading to at least 0,1 mm.

B.4 Test specimens

B.4.1 Dimensions of test specimens

The test specimen is a square (200 ± 1) mm x (200 ± 1) mm × thickness.

The thickness to be tested is minimum > 25 mm.

B.4.2 Number of test specimens

The number of test specimens is specified to be 3.

B.4.3 Conditioning of the test specimens

The test specimens 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 as specified in 5.2 of this standard.

B.5 Procedure

B.5.1 Test conditions

The initial conditions for the test shall be (23 ± 1) °C.

A further test condition is the minimum service temperature declared by the manufacturer or (- 165 ± 5) °C for all products declaring cryogenic temperatures as minimum temperature.

B.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 3 of this standard, read to the nearest 0,05 mm.

Install the test specimen vertical within the test chamber.

After the cooling period measure the dimensional changes.

The end point for the cooling period to the specified minimum service temperature is achieved by the time the specified temperature has reached the core of the sample.

Measure the length and width of the test specimen, l_2, b_2, in accordance with EN 12085, read to the nearest 0,1 mm.

Measure the thickness of the test specimen, d_2, in accordance with EN 823 using the load specified in Table 3 of this standard, read to the nearest 0,05 mm.

B.6 Calculation and expression of results

B.6.1 Dimensional changes

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

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

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

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

where

l_1, b_1 and d_1 are respectively the length, width and thickness of the test specimen at (23 ± 1) °C;

l_2, b_2 and d_2 are respectively the length, width and thickness of the test specimen at the declared minimum service temperature or (- 165 ± 5) °C.

Calculate the mean values of dimensional changes, $\overline{\Delta\varepsilon_{\mathrm{l}}}$, $\overline{\Delta\varepsilon_{\mathrm{b}}}$, and $\overline{\Delta\varepsilon_{\mathrm{d}}}$, of the individual results.

Divide the mean values of dimensional changes by the temperature difference during the test and report the expansion coefficient per °C.

B.6.2 Additional tests and/or observation

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

B.7 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) form in which the product arrived at the laboratory;

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

c) test procedure:

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

   2) conditioning;

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

   4) date of testing;

   5) dimensions and number of test specimens;

   6) general information relating to the test;

   7) 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.

Annex C
(informative)

Additional properties

C.1 General

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

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

C.2 Water vapour diffusion resistance

Although according to new research the water vapour diffusion process is a function of temperature and follows the law of Arrhenius, it is still common practise to measure and declare the water vapour diffusion re-sistance at 23 °C (set A EN 13469). Thus, the above MU levels refer to measurements at 23 °C. The effective diffusion resistance under end-use conditions is a function of the mean temperature and therefore depends on the application temperatures, i.e. line- and ambient temperatures. German VDI 2055 Blatt 1 – 3, September 2008, Part 1, Chapter 5.3.3 et seq. considers the above findings already. As a next step experts plan to revise European standards accordingly. This will regard EN ISO 15758 and EN ISO 23993.

In order to be able to determine water absorption by diffusion data, if required, the water vapour transmission property and/or the water vapour diffusion resistance factor should be determined as a function of temperature.

C.3 Density

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

Polyethylene foam products can have the same thermal and/or other properties at different densities. For this reason product densities are not quoted as requirement in this standard.

Apparent density of sheets, rolls and tapes, if voluntary declared, will be determined in accordance with EN 1602.

Apparent density of tubes and profiles, if voluntary declared, will be determined in accordance with EN 13470.

C.4 Compressive strength

Under normal conditions, polyethylene foam is not subjected to compressive stress.

For special cases, compression behaviour will be determined in accordance with EN 826.

Table C.1 — Test methods, test specimens and conditions

Dimensions in millimetres

Clause		Test methods	Test specimens Dimensions[a]	Minimum number of measurements to get one test result	Specific conditions	Factory production control
						Minimum product testing frequency[b]
No.	Title					Direct testing
C.2	Water vapour diffusion resistance	EN 12086 EN 13469	see EN 12086:2013, 6.1	5	One dummy is added to every set of specimens	PTD [c] + 1/5 years
C.3	Density	EN 1602 EN 13470	see EN 1602 see EN 13470	5 3	– –	1 per h 1 per h
C.4	Compressive strength	EN 826	see EN 826	1	–	PTD [c] + 1/5 years

a Full-size product thickness.

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

c PTD, see EN 13172.

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 polyethylene foam products intended for the use indicated in Table ZA.1 and shows the relevant clauses applicable.

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

1) As amended by mandates M126, M130 and M367

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

Product: Factory made polyethylene foam (PEF) products **Intended use**: Thermal insulation for Building Equipment and Industrial Installations (ThIBEII)			
Essential Characteristics	**Clauses in this and other European standard(s) related to essential characteristics**[e]	**Regulatory classes**	**Notes**
Thermal resistance	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature
	4.2.2 Dimensions and tolerances	—	Flat products: Declared thickness d_D and tolerance class Linear products: Inner diameter D_i, thickness d_D and tolerance class
Reaction to fire	4.2.4 Reaction to fire	Euroclasses	—
Durability of thermal resistance against ageing/degradation	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature[c]
	4.2.2 Dimensions and tolerances	—	—
	4.2.3 Dimensional stability or	—	—
	4.3.2 Maximum service temperature	—	Declared ST(+)
Durability of thermal resistance against high temperature	4.2.1 Thermal conductivity	—	Declared λ_D curve or table vs. temperature
	4.2.3 Dimensional stability	—	—
	4.3.2 Maximum service temperature	—	Declared ST(+)
Durability of reaction to fire against high temperature	4.2.5 Durability characteristics	Euroclasses	[b]
Durability of reaction to fire against ageing/degradation	4.2.5 Durability characteristics	Euroclasses	[b]
Compressive strength	—	—	[a]
Water permeability	4.3.4 Water absorption	—	Declared WS
Water vapour permeability	4.3.5 Water vapour diffusion resistance	—	Declared MU
Rate of release of corrosive substances	4.3.6 Trace quantities of water-soluble ions and the pH-value	—	Declared CL and pH
Acoustic (absorption) index	4.3.7 Structure-borne sound transmission	—	Declared $L_{sc,A}$
	4.3.8 Sound absorption	—	Declared α_p and α_w
Release of dangerous substances to the indoor environment	4.3.9 Release of dangerous substances	—	[d]
Continuous glowing combustion	4.3.10 Continuous glowing combustion	—	[d]

[a] Compressive strength is not applicable for polyethylene foam (PEF) products.

[b] The fire performance of polyethylene foam (PEF) products does not change with time.

[c] The thermal conductivity of polyethylene foam (PEF) products does not change with time.

[d] European test methods are under development.

[e] Also valid and applicable for multilayers

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

ZA.2 Procedures for AVCP of factory made polyethylene foam (PEF) products

ZA.2.1 Systems of AVCP

The AVCP systems of factory made polyethylene foam (PEF) 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 polyethylene foam (PEF) 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 polyethylene foam (PEF) products under system 1 for reaction to fire and system 3 (see Table ZA.2)

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

a No test method available yet.

b Sampling shall be carried out as defined in 5.1.

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

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory Production Control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	Clause 5, Annexes C and D of EN 13172:2012 and 7.3 of this standard
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared and not tested by the notified testing laboratory	Clause 6 of EN 13172:2012 and 7.2 of this standard
Tasks for a notified testing laboratory	Determination of the product type on the basis of type testing (based on sampling carried out by the manufacturer) or tabulated values	— Reaction to fire; — Thermal resistance; — Release of dangerous substances[a]; — Compressive strength (for load bearing applications); — Water permeability; — Release of corrosive substances *(if relevant).*	Clause 6 of EN 13172:2012 and 7.2 of this standard

[a] No test method available yet.

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

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

ZA.2.2 Declaration of Performance (DoP)

ZA.2.2.1 General

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

In case of products under system 1

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

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

In case of products under system 3

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

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

In case of products under system 4

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

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

ZA.2.2.2 Content

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

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

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

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

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

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

The DoP shall in addition contain:

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

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

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

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

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

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

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

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

ZA.2.2.3 Example of DoP

The following gives an example of a filled-in DoP for factory polyethylene foam (PEF) products for EN 14313

DECLARATION OF PERFORMANCE

No 0123-DoP-2013/10/07

1. Unique identification code of the product-type:

ABCD Polyethylene Foam, Intended To Be Used As Thermal Insulation Product For Building Equipment And Industrial Installations

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	$\lambda_{40°C} \leq 0{,}040$ W/(m·K), $\lambda(\vartheta_m) = (36 + 0{,}1 \cdot \vartheta_m + 0{,}0008 \cdot (\vartheta_m - 40)^2) / 1000$	EN 14313:2015
	Thickness	d_D = 13 mm	
Reaction to fire		C-s3,d0	
Durability of thermal resistance against ageing/degradation		Maximum service temperature ST(+)100 (=100 °C)	
Durability of thermal resistance against high temperature		Maximum service temperature ST(+)100 (=100 °C)	
Durability of reaction to fire against ageing/degradation		Durability characteristics C-s3,d0	
Durability of reaction to fire against high temperature		Durability characteristics C-s3,d0	
Compressive strength		NPD	
Water permeability		Water absorption WS01 ($0{,}05 < W_p \leq 0{,}1$ kg/m^2)	
Water vapour permeability		Water vapour diffusion resistance MU 5000 ($\mu \geq 5000$)	
Rate of release of corrosive substances		Trace quantities of water-soluble chloride ions CL1 (≤1 ppm)	
Acoustic absorption index		Sound absorption AW0,3 (≥0,3)	
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 polyethylene foam (PEF) products

or

— to a label attached to it.

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

The CE marking shall be followed by:

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

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

— the unique identification code of the product-type;

— the reference number of the declaration of performance;

— the level or class of the performance declared;

— the dated reference to the harmonized technical specification applied;

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

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

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

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

CE 4567 7456	*CE marking, consisting of the "CE"-symbol* *Identification number of the product certification body* *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 14313:2015 ABCD Polyethylene Foam, intended to be used as thermal insulation product for building equipment and industrial installations ThIBEII λ_D DoP RtF C-s3,d0 d_D 13 mm PEF – EN 14313 – ST(+)100 – ST(-)-50 – MU5000 – AW0,3 – CL1	*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 1 and system 3

Bibliography

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

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

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

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

[5] EN ISO 15758, *Hygrothermal performance of building equipment and industrial installations - Calculation of water vapour diffusion - Cold pipe insulation systems (ISO 15758)*

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

[7] EN ISO 23993, *Thermal insulation products for building equipment and industrial installations - Determination of design thermal conductivity (ISO 23993)*

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

[9] VDI 2055, *Blatt 1 – 3, Thermal insulation of heated and refrigerated operational installations in the industry and the building services*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email subscriptions@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services
Tel: +44 345 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 345 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.