

Thermal insulation products for buildings — Factory made products of phenolic foam (PF) — Specification

The European Standard EN 13166:2001, with the incorporation of amendment A1:2004, has the status of a British Standard

ICS 91.100.60

National foreword

This British Standard is the official English language version of EN 13166:2001, including amendment A1:2004 and Corrigendum December 2005.

The start and finish of text introduced or altered by CEN amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated in the text by **A1** **A1**.

EN 13166 is a “harmonized” European Standard and fully takes into account the requirements of the European Commission mandate M/103, *Thermal insulating materials and products*, given under the EU Construction Products Directive (89/106/EEC), and intended to lead to CE marking. The date of applicability of EN 13166 as a “harmonized” European Standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the *Official Journal of the European Communities*.

EN 13166 is the subject of transitional arrangements agreed under the European Commission mandate. The Member States have agreed a nominal transition period for the co-existence of EN 13166 and their corresponding national standard(s). It is intended that this period will comprise a nominal nine month period during which any required changes to national regulations are to be made, followed by a further nominal 12 month period for the implementation of CE marking. By the end of this co-existence period, any conflicting national standards will be withdrawn or amended to remove conflicts. In the UK, the corresponding national standard is:

— BS 3927:1986, *Specification for rigid phenolic foam (PF) for thermal insulation in the form of slabs and profiled sections*;

and based on this nominal transition period of 21 months, BS 3927:1986 will be withdrawn or amended at the latest by March 2003.

The UK participation in the preparation of EN 13166:2001 was entrusted to Technical Committee PRI/72, Rigid cellular materials, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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15257	15 July 2004	See national foreword
16202 Corrigendum No. 1	28 April 2006	Changes to subclauses 3.2 , 4.2.1 , 4.2.6.2 , Clauses 6 , 8 and Annex ZA, Table ZA.1
16543 Corrigendum No. 2	31 July 2006	Correction to typesetting error

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English version

**Thermal insulation products for buildings — Factory made
products of phenolic foam (PF) — Specification**
(includes amendment A1:2004)

Produits isolants thermiques pour le bâtiment — Produits
manufacturés en mousse phénolique (PF) — Spécification
(inclut l'amendement A1:2004)

Wärmedämmstoffe für Gebäude — Werkmäßig hergestellte
Produkte aus Phenolharzschaum (PF) — Spezifikation
(enthält Änderung A1:2004)

This European Standard was approved by CEN on 16 April 2001, and amendment A1 was approved by CEN on 12 February 2004.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 88, Thermal insulation 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 November 2001, and conflicting national standards shall be withdrawn at the latest by March 2003.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

This European Standard contains five annexes.

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| Annex A (normative) | Determination of the declared values of thermal resistance and thermal conductivity. |
| Annex B (normative) | Factory production control. |
| Annex C (normative) | Determination of the aged value of thermal resistance and thermal conductivity. |
| Annex D (informative) | Additional properties. |
| Annex ZA (informative) | Clauses of this European Standard addressing the provisions of the EU Construction Products Directive. |

This European Standard is one of a series of standards for insulation products used in buildings, but this standard may be used in other areas where appropriate.

In pursuance of Resolution BT20/1993 revised, CEN/TC 88 have proposed defining the standards listed below as a package of European 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 13162, *Thermal insulation products for buildings — Factory made mineral wool (MW) products — Specification.*

EN 13163, *Thermal insulation products for buildings — Factory made products of expanded polystyrene (EPS) — Specification.*

EN 13164, *Thermal insulation products for buildings — Factory made products of extruded polystyrene foam (XPS) — Specification.*

EN 13165, *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PUR) products — Specification.*

EN 13166, *Thermal insulation products for buildings — Factory made products of phenolic foam (PF) — Specification.*

EN 13167, *Thermal insulation products for buildings — Factory made cellular glass (CG) products — Specification.*

EN 13168, *Thermal insulation products for buildings — Factory made wood wool (WW) products — Specification.*

EN 13169, *Thermal insulation products for buildings — Factory made products of expanded perlite (EPB) — Specification.*

EN 13170, *Thermal insulation products for buildings — Factory made products of expanded cork (ICB) — Specification.*

EN 13171, *Thermal insulation products for buildings — Factory made wood fibre (WF) 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document (EN 13166:2001/A1:2004) has been prepared by Technical Committee CEN/TC 88, Thermal insulating materials and products, the Secretariat of which is held by DIN.

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1 Scope

This European Standard specifies the requirements for factory made products of phenolic foam, with or without facings, which are used for the thermal insulation of buildings. The products are manufactured in the form of boards and laminates.

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 to be achieved by a product to demonstrate fitness for purpose in a particular application. The levels required for a given application are to be found in regulations or non-conflicting standards.

Products with a declared thermal resistance lower than $0,40 \text{ m}^2\cdot\text{K}/\text{W}$ or a declared thermal conductivity greater than $0,050 \text{ W}/(\text{m}\cdot\text{K})$ at 10°C are not covered by this standard.

This standard does not cover *in situ* insulation products, products intended to be used for the insulation of building equipment and industrial installations or products intended for acoustic insulation.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

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

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

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

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

EN 1602, *Thermal insulating products for building applications — Determination of apparent density.*

EN 1603, *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (25°C / 50 % relative humidity).*

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

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

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

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

EN ISO 4590, *Cellular plastics — Determination of volume percentage of open and closed cells of rigid materials* (ISO 4590:1981).

prEN ISO 9229, *Thermal insulation — Definitions of terms* (ISO/DIS 9229:1997).

prEN ISO 11925-2, *Reaction to fire tests for building products — Part 2: Ignitability when subjected to direct impingement of flame* (ISO/DIS 11925-2:1998).

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

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

EN 12089:1997, *Thermal insulating products for building applications — Determination of bending behaviour*.

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

prEN 12667, *Thermal performance for 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 for 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, *Thermal insulating products — Evaluation of conformity*.

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

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*. ^(A1)

ISO 12491, *Statistical methods for quality control of building materials and components*.

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1.1 Terms and definitions as given in prEN ISO 9229

3.1.1.1

phenolic foam

rigid cellular 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

board; slab

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

NOTE Boards are usually thinner than slabs. They may also be supplied in tapered form.

3.1.1.3

laminate

combination of two or more materials that are bonded together during manufacture to produce a single item or product

3.1.2 Additional terms and definitions

3.1.2.1

level

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

The level is given by the declared value of the characteristic concerned.

3.1.2.2

class

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

3.2 Symbols, units and abbreviated terms

Symbols and units used in this standard:

b	is the width	mm
d	is the thickness	mm
d_N	is the nominal thickness of the product	mm
ΔS	is the overall change in flatness	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	%
$\Delta \lambda_a$	is the ageing increment of thermal conductivity	W/(m·K)
$\Delta \lambda_s$	is the ageing increment of thermal conductivity as determined by the slicing method	W/(m·K)
ε_{ct}	is the compressive creep	%
ε_t	is the total thickness reduction	%
k	is a factor related to the number of test results available	—
k_a	is a factor related to the number of test results of aged thermal conductivity	—
k_i	is a factor related to the number of test results of initial thermal conductivity	—
l	is the length	mm
$\lambda_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal conductivity	W/(m·K)
λ_D	is the declared thermal conductivity	W/(m·K)
λ_i	is one test result of thermal conductivity	W/(m·K)
λ_{mean}	is the mean thermal conductivity	W/(m·K)
$\lambda_{mean,a}$	is the mean of the aged values of thermal conductivity	W/(m·K)
$\lambda_{mean,i}$	is the mean of the initial values of thermal conductivity	W/(m·K)
μ	is the water vapour diffusion resistance factor	—
n	is the number of test results	—
$R_{90/90}$	is the 90 % fractile with a confidence level of 90 % for the thermal resistance	m ² ·K/W
R_D	is the declared thermal resistance	m ² ·K/W
R_i	is one test result of thermal resistance	m ² ·K/W
R_{mean}	is the mean thermal resistance	m ² ·K/W
ρ_a	is the apparent density	kg/m ³
S_b	is the deviation from squareness on length and width	mm/mm
S_d	is the deviation from squareness on thickness	mm
S_{max}	is the deviation from flatness	mm
s_R	is the estimate of the standard deviation of the thermal resistance	m ² ·K/W
s_λ	is the estimate of the standard deviation of the thermal conductivity	W/(m·K)
$s_{\lambda,a}$	is the estimate of the standard deviation of the aged values of thermal conductivity	W/(m·K)
$s_{\lambda,i}$	is the estimate of the standard deviation of the initial values of thermal conductivity	W/(m·K)
σ_b	is the bending strength	kPa
σ_c	is the compressive stress	kPa
σ_m	is the compressive strength	kPa
σ_{mt}	is the tensile strength perpendicular to faces	kPa
W_{lp}	is the long term water absorption by partial immersion	kg/m ²
W_p	is the short term water absorption	kg/m ²
ψ_o	is the closed cell content (corrected)	%
Z	is the water vapour resistance	m ² ·h·Pa/mg



AD	is the symbol of the declared value of apparent density
CC($i_1/i_2/y$) σ_c	is the symbol of the declared level of compressive creep
CS(Y)	is the symbol of the declared level of compressive strength
CV	is the symbol of the declared value of closed cell content
DS(T+)	is the symbol of the declared value of dimensional stability at specified temperature
DS(T-)	is the symbol of the declared value of dimensional stability at -20 °C
DS(TH)	is the symbol of the declared value of dimensional stability under specified temperature and humidity conditions
MU	is the symbol of the declared value of water vapour diffusion resistance factor
T	is the symbol of the declared class for thickness tolerance
TR	is the symbol of the declared level for tensile strength perpendicular to faces
WL(P)	is the symbol of the declared level for long term water absorption by partial immersion
WS	is the symbol of the declared level for short term water absorption
Z	is the symbol of the declared value for the water vapour resistance

Abbreviated terms used in this standard:

PF	is phenolic foam;
ITT	is initial type test.

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 test specimens given in Table 7.

4.2 For all applications

4.2.1 Thermal resistance and thermal conductivity

Thermal resistance and thermal conductivity shall be based upon measurements carried out in accordance with prEN 12667, or EN 12939 for thick products.

The thermal resistance and thermal conductivity shall be determined in accordance with annex A and annex C and declared by the manufacturer according to the following:

- the reference mean temperature shall be 10 °C;
- the measured value shall be expressed to three significant figures;
- for products of uniform thickness, the thermal resistance, R_D , shall always be declared. The thermal conductivity, λ_D , shall be declared where possible. Where appropriate, for products of non-uniform thickness (i.e. for sloped and tapered products) only the thermal conductivity, λ_D , shall be declared;
- the declared thermal resistance, R_D , and thermal conductivity, λ_D , shall be given as limit values representing at least 90 % of the production, determined with a confidence level of 90 %;
- the value of thermal conductivity, $\lambda_{90/90}$, shall be rounded upwards to the nearest 0,001 W/(m·K) and declared as λ_D in levels with steps of 0,001 W/(m·K);
- the declared thermal resistance, R_D , shall be calculated from the nominal thickness, d_N , and the corresponding thermal conductivity, $\lambda_{90/90}$;

- the value of thermal resistance, $R_{90/90}$, when calculated from the nominal thickness, d_N , and the corresponding thermal conductivity, $\lambda_{90/90}$, shall be rounded downwards to the nearest $0,05 \text{ m}^2 \cdot \text{K/W}$ and declared as R_D in levels with steps of $0,05 \text{ m}^2 \cdot \text{K/W}$;
- the value of $R_{90/90}$, for those products for which only the thermal resistance is measured directly, shall be rounded downwards to the nearest $0,05 \text{ m}^2 \cdot \text{K/W}$ and declared as R_D in levels with steps of $0,05 \text{ m}^2 \cdot \text{K/W}$.

4.2.2 Length and width

Length, l , and width, b , shall be determined in accordance with EN 822. No test result shall deviate from the nominal values by more than the tolerances given in Table 1 for the corresponding dimensions.

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

Table 1 — Tolerances for length and width

Dimensions in millimetres		
Dimensions	Length	Width
< 1 250	$\pm 5,0$	$\pm 3,0$
1 250 to 2 000	$\pm 7,5$	$\pm 7,5$
2 001 to 4 000	$\pm 10,0$	not applicable
> 4 000	$\pm 15,0$	not applicable

4.2.3 Thickness

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

Table 2 — Classes for thickness tolerances

Dimensions in millimetres		
Nominal thickness	Tolerance	
	T1	T2
< 50	$\pm 2,0$	$\pm 1,5$
50 to 100	$-2,0$ $+3,0$	$\pm 1,5$
> 100	$-2,0$ $+5,0$	$\pm 1,5$

4.2.4 Squareness

Squareness shall be determined in accordance with EN 824. The deviation from squareness on length and width, S_b , shall not exceed 10 mm/m. The deviation from squareness on thickness, S_d , shall not exceed 2 mm.