SLOVENSKI STANDARD
SIST EN 14319-1:2013

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Toplotnoizolacijski proizvodi za opremo stavb in industrijske inštalacije - Proizvodi iz trde poliuretanske pene (PUR) in poliizocianuratne pene (PIR), oblikovani na mestu vgradnje - 1. del: Specifikacija penastega sistema pred vgradnjo

Thermal insulating products for building equipment and industrial installations - In-situ formed dispensed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products - Part 1: Specification for the rigid foam dispensed system before installation

Wärmedämmstoffe für die technische Gebäudeausrüstung und für betriebstechnische Anlagen in der Industrie - An der Verwendungsstelle hergestellte Wärmedämmung aus dispensiertem Polyurethan (PUR)- und Polyisocyanurat (PIR)-Hartschaum - Teil 1: Spezifikation für das Schaumsystem vor dem Einbau

Produits d'isolation thermique destinés aux applications du bâtiment et aux installations industrielles - Produits en mousse rigide de polyuréthanne (PUR) et de polyisocyanurate (PIR) injectée, formés en place - Partie 1: Spécifications relatives aux systèmes d'injection du polyuréthanne et du polyisocyanurate rigide avant mise en œuvre

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ICS:

91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials

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Thermal insulating products for building equipment and industrial installations - In-situ formed dispensed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products - Part 1: Specification for the rigid foam dispensed system before installation

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This European Standard was approved by CEN on 24 November 2012.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Contents

Page

Foreword

This document (EN 14319-1:2013) 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of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

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 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 document.

This European Standard consists of two parts which form a package. The first part is the harmonised part satisfying the mandate and the CPD and is the basis for the CE marking covering the products, which are placed on the market. The second part, which is the non-harmonised part, covers the specification for the installed products. Both parts need to be used for the application of the insulation products in the end-use applications covered by EN 14319.

This European Standard is one of a series for expanded perlite, exfoliated vermiculite and polyurethane/polyisocyanurate in-situ formed insulation products used in building equipment and industrial installations, but this standard may be used in other areas where appropriate.

The reduction in energy used and emissions produced during the installed life of insulation products exceeds by far the energy used and emissions made during the production and disposal processes.

EN 14319-1, *Thermal insulating products for building equipment and industrial installations — In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products* consists of the following parts:

— *Part 1: Specification for the rigid foam spray system before installation* (the present document)

— *Part 2: Specification for the installed insulation products*

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 requirements for in-situ formed dispensed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products for the insulation of building equipment and industrial installations, for example industrial storage vessels, pipes and ducts used for the supply of fuels, oil, other liquids, hot and cold water, air and other gases.

Depending on the type of foam products complying with this standard, they may have service temperature ranges which lie within the limits of ± 200 °C.

This Part 1 of this European Standard is a specification for the rigid foam system before installation.

Part 1 of this European Standard describes the product characteristics and it includes procedures for testing, marking and labelling and the rules for evaluation of conformity.

This European Standard does not specify the required levels of all properties to be achieved by a product to demonstrate fitness for purpose in a particular end-use application. The required levels are to be found in regulations or non-conflicting standards.

This European Standard does not cover factory made rigid polyurethane or polyisocyanurate foam insulation products or in-situ products intended to be used for the insulation of buildings.

This European Standard does not specify performance requirements for direct airborne sound insulation and acoustic absorption applications.

NOTE Foam products are either called flexible or rigid. The flexible products are used in upholstery and mattresses and are characterised by their ability to deflect, support and recover to their original thickness continually during their in-use phase. Those that are not flexible are termed rigid and do not possess these flexible characteristics. They are mostly used for thermal insulation purposes and vary widely in their compression strength values. Once the cell structure is crushed in a rigid foam, it does not recover its thickness fully. Some of these rigid foams are very low in density with very low compression strengths and are sometimes described commercially as “soft foams” or “semi-rigid” foams. This note has been included to clarify that all foams with such descriptions are covered by this standard’s used of the term rigid foam.

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 312, *Particleboards — Specifications*

EN 508-1, *Roofing products from metal sheet — Specification for self-supporting products of steel, aluminium or stainless steel sheet — Part 1: Steel*

EN 520, *Gypsum plasterboards — Definitions, requirements and test methods*

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

EN 826:1996, *Thermal insulating products for building applications — Determination of compression behaviour*

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

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

EN 12667:2001, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance*

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

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

EN 13238, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

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

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

EN 13823:2010, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 14308:2009, *Thermal insulation products for building equipment and industrial installations — Factory made rigid polyurethane foam (PUR) and polyisocyanurate foam (PIR) products — Specification*

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

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

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

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

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

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

ISO 4590, *Rigid cellular plastics — Determination of the volume percentage of open cells and of closed cells*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229:2007 and the following apply.

3.1.1
polyurethane foam PUR
(in-situ formed products)
rigid cellular plastics insulation material or product with a structure based on polymers mainly of the polyurethane type

3.1.2
polyisocyanurate foam PIR
(in-situ formed products)
rigid cellular plastics insulation material or product with a structure based on polymers mainly of the polyisocyanurate type

3.1.3
polyurethane foam PU
rigid cellular plastics insulation materials or products including both polymer types based mainly on polyurethane (PUR) or mainly on polyisocyanurate (PIR) groups

3.1.4
rigid foam dispensing system
kit of constituent components which when dispensed generates the rigid polyurethane (PUR) or the rigid polyisocyanurate foam (PIR) characterised by the specified properties of the foam generated

3.1.5
isocyanate component
liquid isocyanate material which is one of the components of the rigid foam system

3.1.6
polyol component
liquid polyhydroxyl compound containing an expanding agent, catalysts and other additives which is one of the components of the foam system

3.1.7
cream time
time which has elapsed between the time at which the stirring procedure for the mixed components was started and the moment when the foam is observed as starting to rise (usually measured in seconds)

3.1.8
gel time
time which has elapsed between the time at which the stirring procedure for the mixed components was started and the moment when, by means of a rod (or a match) applied into the surface of the foam, a polymeric string can be drawn from the foam surface (usually measured in seconds)

3.1.9
tack-free time
time which has elapsed between the time at which the stirring procedure for the mixed components was started and the moment when the middle of the top surface of the foam is no longer tacky to the touch

3.1.10
free-rise density
density of the unfaced cut test specimen taken from the reaction profile test sample (see D.5)

3.1.11
mixing ratio
proportions of the components of the rigid foam dispensing system specified by the manufacturer to be dispensed to generate the rigid polyurethane or polyisocyanurate foam

Note 1 to entry: This can be expressed either as a weight or a volume ratio or both.

3.1.12
reference density
density determined by the procedure given in Annex F as typical of the use of the product

3.1.13
industrial storage vessels
storage vessels used as building equipment or located in industrial installations

3.1.14
service temperature range
temperature range between the minimum and maximum service temperatures (see 4.3.2 and 4.3.3)

3.1.15
production batch
amount of a component produced discontinuously in a single period of time of a rigid foam system

3.1.16
level
given value which is the upper or lower limit of a requirement, where the level is given by the declared value of the characteristic concerned

3.1.17
class
combination of two levels of the same property between which the performance falls, where the level is given by the declared value of the characteristic concerned

3.2 Symbols and abbreviations

3.2.1 Symbols used in this standard

d	is the thickness	mm
$\Delta\varepsilon_l$	is the relative change in length	%
$\Delta\varepsilon_b$	is the relative change in width	%
$\Delta\varepsilon_d$	is the relative change in thickness	%
λ_I	is one test result of thermal conductivity	W/(m·K)
$\Delta\lambda_a$	is the ageing increment from measured aged values of thermal conductivity	W/(m·K)
$\Delta\lambda_f$	is the fixed ageing increment	W/(m·K)
λ_D	is the declared thermal conductivity (aged)	W/(m·K)
μ	is the water vapour diffusion resistance factor	-
n	is the number of test results	-
σ_{10}	is the compressive stress at 10 % deformation	kPa
σ_m	is the compressive strength	kPa
w	is the soluble chloride ion content	mg/kg

3.2.2 Designation codes used in this standard

DS (TH) is the symbol for the declared level for dimensional stability under specified temperature and humidity

MU is the symbol for the declared water vapour diffusion resistance factor

CC(i_1,i_2,y)σ_c is the symbol for the declared level for compressive creep with i_1 for the total reduction in thickness level, i_2 for the compressive creep level, y for the corresponding time in years and σ_c for the declared compression extrapolated deformation and y for the corresponding time in years

CCC is the symbol for the declared closed cell content

CT is the symbol for the declared cream time

GT is the symbol for the declared gel time

RK is the symbol for the declared reference density

TFT is the symbol for the declared tack-free time

WC is the symbol for the declared soluble chloride content

TL is the symbol for the declared minimum service temperature

TU is the symbol for the declared maximum service temperature

FRB is the symbol for the declared beaker free-rise density

FRC is the symbol for the declared core free-rise density

MU is the symbol for the declared value for water vapour resistance factor

3.2.3 Abbreviations used in this standard

PUR is **R**igid **P**oly**U**rethane Foam

PU is Rigid **P**oly**U**rethane foam including PUR and PIR types

ITT is **I**nitial **T**ype **T**est

PIR is **R**igid **P**oly**I**socyanurate foam

4 Requirements

4.1 General

The foam properties shall be assessed in accordance with Clause 5. To conform with this standard, foam systems shall meet the requirements of 4.2 and 4.3 as appropriate.

NOTE The range of properties exhibited by PUR products is very wide. The same is true for PIR products and these two ranges often overlap. Though not in every case, generally PIR products have a higher upper service temperature and can perform better in reaction to fire tests. In all cases, for both PIR and PUR products, their individual performance claimed by the manufacturer is described by the levels of properties obtained. Accordingly, therefore, all the declaration clauses will be completed using the term PU to include both PUR and PIR products (see 3.1.3).

One test result for a product property is the average of the measured values on the number of test specimens given in Table 6.

4.2 For all applications

4.2.1 Thickness measurements

Unless otherwise specified by the test method, in all the other test methods involving the measurement of thickness, this shall be carried out using the method given in EN 823.

4.2.2 Thermal conductivity

The thermal conductivity shall be based upon measurements carried out in accordance with EN 12667 or EN 12939 for thick products.

The thermal conductivity values shall be determined by the manufacturer and verified in accordance with EN ISO 13787 and Annex C of this product standard. They shall be declared by the manufacturer according to measuring standards mentioned above, covering the product service temperature range. The following conditions apply:

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

— the declared thermal conductivity curve shall be given as a limit curve, defined in EN ISO 13787 and measured using the details given in 5.3.2;

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

— the lowest reference test temperature required is -170 °C.

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

When thermal conductivity is declared as a table derived from the curve, it shall be rounded upwards to the next 0,001 W/(m·K) for the full range of the thermal conductivities.

NOTE In EN 14319-2, the declaration of the declared installed aged thermal resistance of an installed dispensed rigid PU foam is made by the installer.

4.2.3 Reaction to fire of the products

4.2.3.1 General

The reaction to fire classification of the products not taking into account the end-use application shall be determined in accordance with EN 13501-1 and using data obtained from tests carried out according to procedures EN ISO 11925-2 and EN 13823 and utilising test specimens conforming to 4.2.3.2 and mounting and fixing procedures in accordance with 4.2.3.3.

The PUR or PIR product may be qualified as one for which the Reaction to Fire classification is not susceptible to change during production of the system, provided that it can be demonstrated (for example with a production control system) that the characteristics responsible for change are within a range where no change of the declared classification for the product occurs.

4.2.3.2 Test specimens

4.2.3.2.1 EN ISO 11925-2

Cut six test specimens 250^{0}_{-1} mm long and 90^{0}_{-1} mm wide and using the product thickness up to a maximum of 60^{0}_{-1} mm thick including the internal facing in accordance with 5.2 of EN ISO 11925-2:2010 from a sample prepared in accordance with Annex G of this standard and complying with the requirements of I.3.1.1.

4.2.3.2.2 EN 13823

Prepare five specimens in accordance with I.3.2.1.

4.2.3.3 Mounting and fixing procedures

4.2.3.3.1 EN ISO 11925-2

Test specimens prepared in accordance with 4.2.3.2.1 shall be mounted in the EN ISO 11925-2 test apparatus as specified in I.3.1.

4.2.3.3.2 EN 13823

Test specimens prepared in accordance with 4.2.3.2.2 shall be mounted so that the inner face of the test specimen which is typical of the end use application is in contact with the flame source. In all other respects, the products shall be mounted as specified in I.3.2.

4.2.3.4 Procedures

4.2.3.4.1 EN ISO 11925-2

Apply the test flame to the natural skin of the test specimen as specified in I.3.1.1).

4.2.3.4.2 EN 13823

Expose the internal surface of the test specimen to the test flame (see I.3.2.1 and I.3.2.2).

4.2.4 Reaction profile and free-rise density

The appropriate values for the foam system shall be stated having been determined in accordance with the procedures given in Annex D.

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, 4.2.5.4, 4.2.5.5, 4.2.5.6 and 4.2.5.7.

4.2.5.2 Durability of reaction to fire against ageing/degradation

The reaction to fire performance of PUR and PIR products does not decrease with time in the applications covered by this standard.

4.2.5.3 Durability of reaction to fire against high temperature

The reaction to fire performance of PUR/PIR products does not decrease with time for temperatures within the claimed service temperature range.

4.2.5.4 Durability of reaction to fire against biological agents

The reaction to fire performance of PUR/PIR products are not subject to change due to biological agents.

4.2.5.5 Durability of thermal resistance against ageing/degradation

This is covered by 4.2.1, 5.3.2 and Annex C which contains an ageing procedure used to determine the values of the declared aged thermal resistance.

4.2.5.6 Durability of thermal resistance against high temperature

This is covered by 4.2.1, 5.3.2 and Annex C.

4.2.5.7 Durability of thermal resistance against biological agents

The thermal performance of PUR/PIR products is not subject to change due to biological agents.

4.2.6 Closed cell content

The closed cell content shall be determined using the ISO 4590 method and classified as shown in Table 1.

Table 1 — Classes for closed cell content

Class	Closed cell content
CCC1	< 20 %
CCC2	20 % to 80 %
CCC3	> 80 % to 89 %
CCC4	≥ 90 %

4.3 For specific applications

4.3.1 General

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

4.3.2 Minimum service temperature

The minimum service temperature, TL, in °C, shall be taken as either the value determined using the method given in 4.3.3 of EN 14308:2009 or the value declared by the manufacturer, whichever is the higher.

4.3.3 Maximum service temperature

The maximum service temperature, TU, in °C, shall be taken as either the value determined using the method given in EN 14706 or the value declared by the manufacturer, whichever is the lower.

4.3.4 Compressive creep

Compressive creep, ε_{ct}, and total thickness reduction, ε_t, shall be determined after at least 122 days of testing at a declared compressive stress, σ_c, given in steps of at least 1 kPa and the results extrapolated 30 times, corresponding to ten years, to obtain the declared levels in accordance with EN 1606. Compressive creep shall be declared in levels, i2, and the total thickness reduction shall be declared in levels i1, with steps of 0,5 % at the declared stress. No test result shall exceed the declared levels at the declared stress. Examples for declaration levels for compressive creep are given in Table 2.

Table 2 — Examples for declaration of levels for compressive creep

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

NOTE Referring to the designation code CC(i_1/i_2/y) σ_c, according to Clause 6, a declared level CC(3/2/25)40, for example, indicates a value not exceeding 2 % for compressive creep and 3 % for total thickness reduction after extrapolation at 25 years (i.e. 30 times 304 days of testing) under a declared stress of 40 kPa.

4.3.5 Reference density

The reference density, RK, shall be determined in accordance with the method given in Annex F. The levels of reference density shall be as given in Table 3.

Table 3 — Levels for reference

Level	RK35	RK40	RK45	RK50	RK55	RK 60	RK 65
Requirement, kg/m^3	≥ 35	≥ 40	≥ 45	≥ 50	≥ 55	≥ 60	≥ 65

4.3.6 Rate of release of corrosive substances

The amount of water soluble chloride shall be determined in accordance with EN 13468 (leaching time of 0,5 h at (100 ± 1) °C), with the chlorine content, w, given as the value in mg/kg of chlorine ion.

4.3.7 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 web site on EUROPA accessed through: *http://ec.europa.eu/enterprise/construction/cpd-ds/*

4.3.8 Water vapour transmission

Water vapour transmission properties shall be determined in accordance with EN 12086, Method B (23 °C, 85 % R.H.). The water vapour resistance shall be declared as the water vapour resistance factor, μ, under the symbol MU. No test result shall be lower than the declared value.

4.3.9 Compressive stress or compressive strength

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