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BSI Standards Publication

Thermal insulating products for building equipment and industrial installations — In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products

Part 2: Specification for the installed insulation products

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PRI/72, Rigid cellular materials.

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

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Thermal insulating products for building equipment and industrial installations - In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products - Part 2: Specification for the installed insulation products

Produits isolants thermiques destinés aux équipements de bâtiment et aux installations industrielles - Produits en mousse rigide de polyuréthanne (PUR) et de polyisocyanurate (PIR) projetée, formés en place - Partie 2: Spécifications relatives aux produits isolants après mise en œuvre

Wärmedämmstoffe für die technische Gebäudeausrüstung und für betriebstechnische Anlagen in der Industrie - An der Verwendungsstelle hergestellter Wärmedämmstoff aus Polyurethan (PUR)- und Polyisocyanurat (PIR)-Spritzschaum - Teil 2: Spezifikation für die eingebauten Produkte

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

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Foreword

This document (EN 14320-2:2013) 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of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.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 European Standard consists of two parts which form a package. The first part is the harmonised part satisfying the mandate and the CPD and which 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 14320.

Attention is drawn to the need to take into account any complementary member state rules (e.g. installation rules) which together with Part 2 of this European Standard ensures the fitness for purpose of the installed product.

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 14320, *Thermal insulating products for building equipment and industrial installations — In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products* consists of the following parts:

— *Part 1: Specification for the rigid foam dispensed system before installation*

— *Part 2: Specification for the installed insulation products* (the present document)

According to the CEN/CENELEC Internal Regulations, the national standards organisations 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 sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products for the insulation of building equipment industrial installations, for example 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 2 of this European Standard is a specification for the installed insulation product.

This Part 2 of this European Standard describes, when taken together with Part 1 of EN 14320, the product characteristics that are linked to the essential requirements of the EU Construction Products Directive. It also specifies the checks and tests to be used for the declarations made by the installer of the product.

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 (PUR) or polyisocyanurate (PIR) foam products or in-situ products intended to be used for the insulation of buildings.

The products are not intended for use for direct airborne sound insulation or 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 1602, *Thermal insulating products for building applications — Determination of the apparent density*

EN 14320-1, *Thermal insulating products for building equipment and industrial installations — In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate foam (PIR) products — Part 1: Specification for the rigid foam dispensed system before installation*

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

3 Terms, definitions, abbreviations and symbols

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 spray system
kit of constituent components which when sprayed 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 product which is one of the components of the rigid foam spray system

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

3.1.7
machine
equipment used to mix and spray the foam

3.1.8
industrial storage vessels
storage vessels used as building equipment or located in industrial installations

3.1.9
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.

3.1.10
installation
process of spraying the mixture of the components onto the surface to be insulated

Note 1 to entry: The procedure is carried out by the application of successive rigid foam layers until the specified foam thickness is obtained.

3.1.11
declared installed density
representative overall density for the installed product (see 5.3)

3.1.12
declared installed insulation thickness
insulation thickness as installed by the installer (see 5.1)

3.1.13
declared installed aged thermal resistance
time average value of the thermal resistance of the installed insulation over 25 years (see 5.2)

3.2 Symbols and abbreviations

Symbols used in this standard:

d	is the declared installed aged insulation thickness	mm
λ_D	is the declared aged thermal conductivity	W/(m·K)
R_D	is the declared installed aged thermal resistance	m^2K/W

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

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

4 Requirements

4.1 General

The installer shall use a PUR or PIR foam system that complies with EN 14320-1.

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. Although 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 are 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).

4.2 Suitability of the building equipment or industrial installation for the installation of the product

The installer shall inspect the building equipment or industrial installation in accordance with manufacturer's technical information and any national rules, in order to determine whether it is suitable for application of the product (see Annex E).

5 In-situ measurements and calculations

5.1 Declared installed insulation thickness

The declared installed insulation thickness, d, shall be measured in accordance with the procedure given in Annex A. However, the value shall not be less than the minimum installed insulation thickness specified by the client or given in the manufacturer’s technical information.

5.2 Declared installed aged thermal resistance, R_D

The declared installed aged thermal resistance R_D for the installed insulation shall be declared according to the thermal conductivity versus temperature curve given by the manufacturer in accordance with the procedure given in EN 14320-1.

NOTE 1 The correction of the values of thermal conductivity due to the influence of moisture and temperature can be calculated using the procedures given in EN ISO 10456.

NOTE 2 For calculating the thermal resistance of complete building elements involving the use of these products, the procedures given in EN ISO 6946 can be used.

5.3 Declared installed insulation density

The declared installed insulation density shall not be less than the specified minimum when determined by the method given in Annex B.

5.4 Foam quality checks carried out by the installer

The installer shall carry out those on site checks defined by the manufacturer, and check compliance with EN 14320-1 prior to commencing the application of the foam, generate test samples in accordance with either the procedures in Annex G of EN 14320-1:2013 and by any procedures required by the local rules of a Member State.

6 Guidelines for installation

National Practice, National Standards, National Regulations or Local Rules may exist, covering for example the spraying conditions and the mixing ratio. In the absence of national regulations, national standards or any local rules, the manufacturer’s technical information shall be followed together with the procedure given in Annex D.

7 Installer's declaration

The installer shall declare to the customer that the work has been carried out in accordance with the requirements of this Part 2 of this standard using a foam system that complies with EN 14320-1.

The installer shall also state at least the following information:

a) date of the installation;

b) declared installed insulation thickness;

c) declared installed aged thermal resistance according to 5.2;

d) declared installed insulation density;

e) surface area insulated;

f) for the installed product, the trade name, designation code of the foam system (complying with EN 14320-1, from which it has been generated);

g) the number of the EC certificate of conformity.

Annex A
(normative)

Method for the determination of the declared installed insulation thickness

The installed thickness shall be checked with a 2 mm maximum diameter probe calibrated in mm or with non-destructive electronic devices.

For every 100 m^2 of sprayed surface, measurements of thickness shall be taken at ten locations on the sprayed surface. By visual judgement, five measurements shall be taken from the area of the apparent highest thickness and five measurements from the area of apparent lowest thickness with no measurements taken in the area up to 200 mm from either side from any edge or corner. However, if the width of the spray areas is less than 450 mm, the measurement shall not be made in an area less than 100 mm from any edge or corner.

Calculate the average of the ten measurements in each case, and also the average of these averages, as the declared installed insulation thickness.

For installed insulation thicknesses ≥ 100 mm, no individual measurement shall be lower than the insulation thickness by more than 25 mm.

For installed insulation thicknesses < 100 mm, no individual measurement shall be lower than the installed insulation thickness by more than 25 % of the installed insulation thickness.

Annex B
(normative)

Methods for the determination of the declared installed insulation density

B.1 Principle

The declared installed insulation density is obtained from representative samples from the product as installed.

B.2 Procedure

B.2.1 General

Either of the two following procedures shall be used to obtain the test samples from which the declared installed insulation density shall be determined: either the immersion method given in Annex C (only for products with closed cell contents equal to or greater than 90 % (CCC4) or the method given in EN 1602.

B.2.2 Destructive testing

Extract a representative test specimen from the installed product when starting the spray application and at the start of spraying on a new site.

B.2.3 Non-destructive testing

Prepare a representative sample each day before starting the spray application and at the start of spraying on a new site.

The sample shall be prepared using a representative substrate.

A release agent may be applied to the surface to be sprayed of the representative substrate.

Cut the representative test specimen from the sample such that skins are included.

Measure the density by the methods given in B.2.1.

B.3 Test report

The test report includes the following:

— Round the declared installed insulation density to the nearest kg/m^3.

— Date of the test.

— Method used for the determination of the declared installed insulation density.

— Location/site details.

Annex C
(normative)

Immersion method for the determination of the declared installed insulation density

C.1 Scope

When the test specimens are taken from the installed insulation foam and are consequently of an irregular form, the density shall be calculated according to the immersion method.

C.2 Principles

The determination of the density of a body is based on the measurement of the mass and the determination of its volume. When the body is of an irregular form for CCC4 products only, the volume shall be determined according to the immersion method.

C.3 Necessary equipment

C.3.1 Scale, precise to 0,2 g.

C.3.2 Tripod.

C.3.3 Test specimen clip.

C.3.4 Vessel.

C.3.5 Wire.

C.4 Products and reagents

C.4.1 Test specimen, weight not less than 10 g.

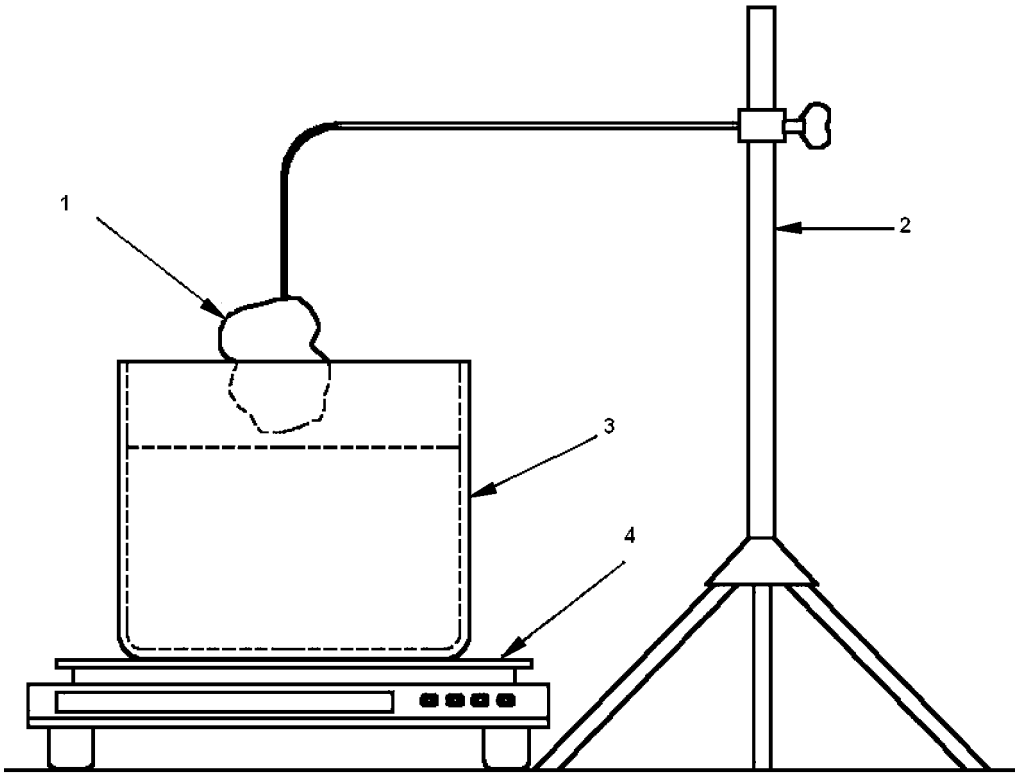
C.4.2 Water.

C.5 Procedure

Measure the mass of the test specimen, in grams.

The volume of the test specimen is measured with the following procedure:

Prepare a vessel on the scale containing water. With the test specimen installed in the clip, lower the test specimen completely into the water being careful not to touch the walls of the vessel (see Figure C.1). The change in weight is then recorded. This change in weight will be the volume of the test specimen on the basis that 1 g = 1 cm^3.



Key

1 test specimen
2 tripod
3 vessel
4 balance

Figure C.1 — Example of an immersion apparatus

C.6 Results

Determine the declared installed insulation density, using the following Formula (C.1):

Installed declare insulation density

$$(kg/m^3) = (M / V) \times 1000 \qquad (C.1)$$

where

M: mass, in g, of the test specimen;

V: volume, in cm^3, of the test specimen.

Annex D
(normative)

Installation guidelines

D.1 General

The following installation procedure shall be followed for each separate installation or once a day, whichever is the more frequent.

D.2 Substrate preparation

Sprayed foam can be applied to any suitably prepared surface.

Before beginning the installation, the condition of the substrate shall be checked in case any dust or other contaminants need to be removed by washing down. If the substrate is contaminated by grease or oil, it shall be degreased. Where there is an adhesion problem on the substrate, a primer coating shall be applied before spraying to obtain good adhesion, for example metallic, plastic surfaces, or wet surfaces.

In any case and before proceeding to start spray, it is necessary to carry out a small adhesion test on the substrate in order to check that good adhesion will be obtained.

In case of the existence of expansion joints that could cause breaks in the foam due to the movement of the support, these joints shall be covered with a non-adhesive plastic tape.

D.3 Substrate conditions

The substrate to which the foam is to be applied shall have a minimum temperature of +5 ºC.

Porous surfaces shall not have a moisture content greater than 20 %. Non-porous substrates shall be checked to ensure that there is no surface condensation.

D.4 Atmospheric conditions

Spraying shall not be carried out if the wind speed is greater than 30 km/h.

D.5 Spraying machine preparation

D.5.1 General

Set the spraying machine to the output, the mixing ratio and the components delivery lines to the temperatures and pressures specified by the foam system supplier. This data shall be recorded.

D.5.2 Mixing ratio

Check that the mixing ratio is correct by measuring the output separately from the two component delivery lines.

For fixed output spraying machines, monthly confirmation of the mixing ratio shall be carried out; and for variable output spraying, daily confirmation shall be carried out.

The value of the mixing ratio shall not differ by more than 5 % in weight from the value indicated by the foam system supplier.

D.6 Spraying procedure

The spraying procedure shall consist of spraying on to the substrate the mixture of the components by means of the spraying machine, where this mixture expands and hardens forming the foam.

The foam shall be applied in passes such that the total thickness will be built up in discrete layers with average thicknesses according to the manufacturer's technical information.

Annex E
(normative)

Suitability of the building equipment or industrial installation to receive the insulation product

E.1 Building equipment or industrial installation

The installer should ensure that the building equipment and industrial installations are structurally sound and the area suitable to receive the spray rigid PUR or PIR insulation. This assessment should take into account all aspects of the proposed installation.

In particular, the substrates to be sprayed shall be clean, dry and free of extraneous materials. Vapour barriers shall be provided if necessary.

E.2 Site survey

The site survey includes the following:

— Description of the building equipment or industrial installation to be insulated.

— Determination of the limits of the area to be insulated.

— Checking the existence of any dust, water or oils on the substrates likely to interfere with the adhesion of the sprayed foam.

— Checking the general condition of the substrate and its consistency.

— Checking the existence of any expansion joints or ventilation holes.

— Checking that if the substrate is a metal surface, that this has been suitably protected from atmospheric corrosion by a suitable coating.

Bibliography

[1] EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO 6946)*

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

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