



SLOVENSKI STANDARD

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Toplotnoizolacijski proizvodi za stavbe - Proizvodi iz trde poliuretanske pene (PUR) - Specifikacija

Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification

Wärmedämmstoffe für Gebäude - Werkmäßig hergestellte Produkte aus Polyurethan-Hartschaum (PU) – Spezifikation

Produits isolants thermiques pour le bâtiment - Produits manufacturés en mousse rigide de polyuréthane (PU) - Spécification

Ta slovenski standard je istoveten z: **EN 13165:2012**

ICS:

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| 91.100.60 | Materiali za toplotno in zvočno izolacijo | Thermal and sound insulating materials |
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Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification

Produits isolants thermiques pour le bâtiment - Produits manufacturés en mousse rigide de polyuréthane (PU) - Spécification

Wärmedämmstoffe für Gebäude - Werkmäßig hergestellte Produkte aus Polyurethan-Hartschaum (PU) - Spezifikation

This European Standard was approved by CEN on 6 October 2012.

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.

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EN 13165:2012 (E)**Foreword**

This document (EN 13165:2012) 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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.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 supersedes EN 13165:2008.

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.

Compared with EN 13165:2008, the main changes are:

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- a) better harmonisation between the different standards of the package (EN 13162 to EN 13171) on definitions, requirements, classes and levels;
- b) new normative annex on multi-layered products;
- c) changes on some editorial and technical content and addition of information on some specific items for PU products such as: PU product term, dimensional stability, point load (cancelled), water absorption, water vapour transmission;
- d) addition of links to EN 15715, *Thermal insulation products – Instructions for mounting and fixing for reaction to fire testing – Factory made products*;
- e) changes to the Annex ZA.

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

In pursuance of Resolution BT 20/1993 Revised, CEN/TC 88 has proposed defining the standards listed below as a package of documents.

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 expanded polystyrene (EPS) products — Specification*

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

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

EN 13166, *Thermal insulation products for buildings — Factory made phenolic foam (PF) products — 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 expanded perlite board (EPB) products — 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*

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.

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.

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EN 13165:2012 (E)**1 Scope**

This European Standard specifies the requirements for factory made rigid polyurethane foam (PU) products, with or without facings or coatings, which are used for the thermal insulation of buildings. PU includes both PIR and PUR products. The products are manufactured in the form of boards.

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

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 $0,25 \text{ m}^2 \cdot \text{K/W}$ or a declared thermal conductivity greater than $0,060 \text{ W/(m} \cdot \text{K)}$ at $10 \text{ }^\circ\text{C}$ are not covered by this European Standard.

This standard does not cover in situ insulation products and products intended to be used for the insulation of building equipment and industrial installations (covered by EN 14308).

2 Normative references

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

- EN 822, *Thermal insulating products for building applications — Determination of length and width*
- EN 823, *Thermal insulating products for building applications — Determination of thickness*
- EN 824, *Thermal insulating products for building applications — Determination of squareness*
- EN 825, *Thermal insulating products for building applications — Determination of flatness*
- EN 826, *Thermal insulating products for building applications — Determination of compression behaviour*
- EN 1604, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*
- EN 1605, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature 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 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 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 insulating products — Evaluation of conformity*

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

EN 13820, *Thermal insulating materials for building applications — Determination of organic content*

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

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 1182, *Reaction to fire tests for building 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 4590, *Rigid cellular plastics — Determination of the volume percentage of open cells and closed cells (ISO 4590)*

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

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)*

ISO 16269-6:2005, *Statistical interpretation of data — Part 6: Determination of statistical tolerance intervals*

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229:2007 apply with exception or in addition of the following:

3.1.1

rigid polyurethane foam (PU)

family of rigid cellular thermoset polymeric insulation products with a substantially closed cell structure including both polymer types based on PIR and PUR

3.1.1.1

PIR

rigid cellular thermoset polymeric insulation product with a substantially closed cell structure based on polymers mainly of polyisocyanurate groups

EN 13165:2012 (E)**3.1.1.2****PUR**

rigid cellular thermoset polymeric insulation product with a substantially closed cell structure based on polymers mainly of polyurethane groups

Note 1 to entry: Regarding the properties described in this standard, PIR and PUR types are not distinguished between.

3.1.2**level**

value which is the upper or lower limit of a requirement and given by the declared value of the characteristic concerned

3.1.3**class**

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

3.1.4**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 1 to entry: Boards are usually thinner than slabs. They may also be supplied in tapered form.

3.1.5**facing**

functional or decorative surface layer with a thickness of less than 3mm, e.g. paper, plastic film, fabric or metal foil, which are not considered as separate thermal insulation layer to be added to the thermal resistance of the product

3.1.6**coating**

functional or decorative surface layer with a thickness of less than 3 mm usually applied by painting, spraying, pouring or trowelling, which is not considered as separate thermal insulation layer to be added to the thermal resistance of the product

3.1.7**composite insulation product**

product which can be faced or coated made from two or more layers bonded together by chemical or physical adhesion consisting of at least one factory made thermal insulation material layer

3.1.8**multi-layered insulation product**

product which can be faced or coated made from two or more layers of a thermal insulation material from the same European Standard, which are bonded together by chemical or physical adhesion

3.2 Symbols, units and abbreviated terms

For the purposes of this document, the following symbols and units apply.

| | | |
|--------------------|---|----|
| α_p | is the practical sound absorption coefficient | — |
| α_w | is the weighted sound absorption coefficient | — |
| b | is the width | mm |
| d | is the thickness | mm |
| d_N | is the nominal thickness of the product | mm |
| d_S | is the thickness of the test specimen | mm |
| $\Delta\epsilon_b$ | is the relative change in width | % |

| | | |
|-----------------------|---|-------------------------|
| $\Delta\varepsilon_d$ | is the relative change in thickness | % |
| $\Delta\varepsilon_l$ | is the relative change in length | % |
| X_{ct} | is the compressive creep | % |
| ε_t | is the total thickness reduction | % |
| k | is a factor related to the number of test results | — |
| k_a | is a factor related to the number of aged test results | — |
| k_i | is a factor related to the number of initial test results | — |
| 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 thermal conductivity of aged values | W/(m·K) |
| $\lambda_{mean,i}$ | is the mean thermal conductivity of initial values | W/(m·K) |
| λ_U | is the design 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) |
| 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 |
| R_U | is the design thermal resistance | m ² ·K/W |
| S_b | is the deviation from squareness on length and width | mm/m |
| 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 the thermal conductivity | W/(m·K) |
| $s_{\lambda,i}$ | is the estimate of the standard deviation of the initial values of the thermal conductivity | W/(m·K) |
| σ_c | is the declared compressive stress | kPa |
| σ_{10} | is the compressive stress at 10 % deformation | kPa |
| σ_m | is the compressive strength | kPa |
| σ_{mt} | is the tensile strength perpendicular to faces | kPa |
| W_{lt} | is the long term water uptake by total immersion | % Vol. |
| W_{sp} | is the short term water uptake by partial immersion | kg/m ² |
| W_{lp} | is the long term water uptake by partial immersion | kg/m ² |
| Z | is the water vapour resistance | m ² ·h·Pa/mg |

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| | |
|------------------------------|--|
| AP | is the symbol of the declared value of practical sound absorption coefficient |
| AW | is the symbol of the declared value of weighted sound absorption coefficient |
| CC($i_1/i_2/y$) σ_c | is the symbol of the declared level for compressive creep |
| CS(10\Y) | is the symbol of the declared level for compressive stress or strength |
| DLT(i)5 | is the symbol of the declared level for deformation under load and temperature at conditions set with a maximum of 5 % deformation |
| DS(23,90)or DS(70,90) | is the symbol of the declared level for dimensional stability under specified temperature and humidity |
| DS(70,-)or DS(20,-) | is the symbol of the declared level for dimensional stability under specified temperature |
| MU | is the symbol of the declared value for the water vapour diffusion resistance factor |
| FW | is the symbol of the declared level for change in deviation from flatness after one-sided wetting |
| T | is the symbol of the declared class for thickness tolerances |
| TR | is the symbol of the declared level for tensile strength perpendicular to faces |
| WL (T) | is the symbol of the declared value for long term water absorption by total immersion |
| WS (P) | is the symbol of the declared value for short term water absorption by partial immersion |
| WL (P) | is the symbol of the declared value for long term water absorption by partial immersion |
| Z | is the symbol of the declared value for water vapour resistance |

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Abbreviated terms used in this standard

| | |
|-----|---|
| PU | is rigid PolyUrethane foam including PIR and PUR |
| ITT | is Initial Type Test |
| FPC | is Factory Production Control |
| MLn | is Multi-Layered product (n for number of layers) |
| RtF | is Reaction to Fire |

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.

One test result for a product property is the average of the measured values on the number of test specimens given in Table 11.

For multi-layered products, additional requirements are given in Annex D.

NOTE Information on additional properties is given in Annex E.

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 EN 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 values shall be expressed with 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 (e.g. for sloped and tapered products) only the thermal conductivity, λ_D , shall be declared;
- the declared thermal resistance, R_D , and the declared 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 statistical 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 $\lambda_{90/90}$, unless measured directly;
- the statistical 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 m²·K/W, and declared as R_D in levels with steps of 0,05 m²·K/W;
- the statistical value of thermal resistance $R_{90/90}$, for those products for which only the thermal resistance is measured directly, shall be rounded downwards to the nearest 0,05 m²·K/W and declared as R_D in levels with steps of 0,05 m²·K/W.

NOTE λ_U and R_U (design values) may be determined with reference to EN ISO 10456.

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.

Table 1 — Tolerances on length and width

| Dimensions mm | Tolerances mm |
|------------------|------------------|
| < 1 000 | ± 5 |
| 1 000 to 2 000 | ± 7,5 |
| 2 001 to 4 000 | ± 10 |
| > 4 000 | ± 15 |

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 tolerances given in Table 2 for the declared class.

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Table 2 — Classes for thickness tolerances

| Class | Nominal thickness mm | | |
|-------|-------------------------|----------|----------|
| | < 50 | 50 to 75 | > 75 |
| | Tolerance mm | | |
| T1 | ± 3 | ± 4 | + 6, – 4 |
| T2 | ± 2 | ± 3 | + 5, – 3 |
| T3 | ± 1,5 | ± 1,5 | ± 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 5 mm/m.

4.2.5 Flatness

Flatness shall be determined in accordance with EN 825. The deviation from flatness, S_{max} , shall not exceed the values given in Table 3.

Table 3 — Deviation from flatness

| Full-size product | | Deviation from flatness |
|-------------------|------------------------|-------------------------|
| Length m | Area m ² | mm |
| ≤ 2,50 | ≤ 0,75 | ≤ 5 |
| | > 0,75 | ≤ 10 |

A specimen of maximum 2,50 m length shall be cut from longer products.

4.2.6 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 mounting and fixing rules given in EN 15715.

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

Detailed information about the test conditions and the field of application of the classification as stated in the reaction to fire classification report shall be given in the manufacturer's literature.

4.2.7 Durability characteristics

4.2.7.1 General

The appropriate durability characteristics have been considered and are covered in 4.2.7.2, 4.2.7.3 and where appropriate in 4.3.6 on compressive creep.

4.2.7.2 Durability of reaction to fire of the product as placed on the market against ageing/degradation

The reaction to fire performance of PU products as declared by 4.2.6 does not change with time.

4.2.7.3 Durability of thermal resistance and thermal conductivity against ageing/degradation

Any change in thermal conductivity of the PU product with time is covered and considered for declaration by 4.2.1 together with Annex C for thermal conductivity and any change in thickness is covered by at least one of the dimensional stability tests in 4.3.2 as relevant, or the deformation test in 4.3.3.

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 the property does not need to be determined and declared by the manufacturer.

4.3.2 Dimensional stability

Dimensional stability under specified temperature or under specified temperature and humidity conditions shall be determined in accordance with EN 1604. The test shall be carried out for the conditions given in Table 4. The relative changes in length, $\Delta\varepsilon_l$, width, $\Delta\varepsilon_b$ and thickness, $\Delta\varepsilon_d$, shall not exceed the values given in Tables 5 and 6 for the declared level.

Table 4 — Test conditions for dimensional stability under specified temperature and humidity conditions

| No. | Designation | Test condition | Test method |
|-----|-------------|------------------------|-------------|
| 1 | DS (70,-) | 48 h, 70 °C | EN 1604 |
| 2 | DS (23,90) | 48 h, 23 °C, 90 % R.H. | EN 1604 |
| 3 | DS (70,90) | 48 h, 70 °C, 90 % R.H. | EN 1604 |
| 4 | DS (-20,-) | 48 h, -20 °C | EN 1604 |

The test DS(70,-) and DS (23,90) need not be performed when the test DS(70,90) is used.

Table 5 — Levels for dimensional stability for test conditions 1, 2, 3

| Test conditions | Relative changes | | Level DS(TH) | | | |
|-----------------|-----------------------|---|--------------|----|----|----|
| | | | 1 | 2 | 3 | 4 |
| No.1, 2, 3 | $\Delta\varepsilon_l$ | % | ≤5 | ≤3 | ≤2 | ≤1 |
| | $\Delta\varepsilon_b$ | | | | | |
| | $\Delta\varepsilon_d$ | % | ≤10 | ≤8 | ≤6 | ≤4 |