

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	PU Europe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Polyurethane thermal insulation spray foam (closed-cell;
density 40 kg/m³)

PU Europe

www.bau-umwelt.com / <https://epd-online.com>



General Information

<p>PU Europe</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-PUE-20140017-CBE1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 07-2013 (PCR tested and approved by the independent expert committee)</p> <hr/> <p>Issue date 21.03.2014</p> <hr/> <p>Valid to 21.03.2019</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>Polyurethane thermal insulation spray foam (closed-cell; density 40 kg/m³)</p> <hr/> <p>Owner of the Declaration PU Europe Av. E. Van Nieuwenhuysse 6 1160 Brussels (Belgium)</p> <hr/> <p>Declared product / Declared unit 1 m² polyurethane spray insulation foam with a density of 40 kg/m³ and a thickness of 13 cm. The data presented here provide a complete picture of the performance during production, installation and end-of-life.</p> <hr/> <p>Scope: This EPD is a generic association EPD covering polyurethane in-situ insulation foam produced by PU Europe members. These members represent 90 % of this market segment and use similar production techniques across Europe. The EPD therefore represents an average of these producers. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <hr/> <p>Verification</p> <table border="1" style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;">The CEN Norm EN 15804 serves as the core PCR</td> </tr> <tr> <td colspan="2" style="text-align: center;">Independent verification of the declaration according to ISO 14025</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/> internally</td> <td style="text-align: center;"><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p style="text-align: center;"></p> <hr/> <p>Prof. Dr. Birgit Grahl (Independent tester appointed by SVA)</p>	The CEN Norm EN 15804 serves as the core PCR		Independent verification of the declaration according to ISO 14025		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Product

Product description

Polyurethane (PU) is a high performance thermal insulation material offering the lowest thermal conductivity of all insulation products commonly available in the market. It offers excellent compressive strength at low densities. PU includes both PUR (polyurethane) and PIR (polyisocyanurate) products.

The product covered by this EPD is a closed-cell PU spray foam of a density of 40 kg/m³ without facing.

Application

The PU in-situ foam covered by this EPD is applied for the thermal insulation of residential and commercial buildings according to /EN 14315-1/ (e.g. interior and exterior insulation for roofs, floors, ceilings and walls).

Technical Data

In this Life Cycle Assessment, a PU spray insulation foam with the following properties has been regarded:

Constructional data

Name	Value	Unit
Gross density	40	kg/m ³
Thermal conductivity	0.026	W/(mK)

Closed-cell content	> 90	%
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Base materials / Ancillary materials

Core material (100 % of the weight of the declared unit):

Closed-cell polyurethane foam made from MDI (50 %), polyols (31 %), HFC (5 %) and additives (14 %).

The polyurethane spray foam for insulation does not contain substances which are included in the "Candidate List of Substances of Very High Concern for Authorisation".

Default values on packaging (use and waste), production waste, air emission and energy use are arithmetic averages of the inputs and outputs per ton produced over one reference year from different PU Europe producers and applicators. Since the same machinery and similar process conditions are applied across Europe, using the same base chemicals, they can be considered valid.

Reference service life

The reference service life is 50 years.

LCA: Calculation rules

Declared Unit

The declared unit is 1 m² of polyurethane insulation spray foam with the following specifications:

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Gross density	40	kg/m ³
Conversion factor to 1 kg	0.192	m ² /kg
Thickness	13	cm
Thermal conductivity	0.026	W/mK
Weight of declared unit	5.2	kg/m ²

This provides a thermal resistance R = 5 m² K/W.

The LCI (Life Cycle Inventory) data used in this report is the weighted average of the data supplied by individual members of PU Europe. The product is manufactured in accordance with /EN 14315-1/ "Thermal insulation products for buildings – in-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products – Part 1: specification for the rigid foam spray system before installation".

System boundary

This life cycle assessment for the production of polyurethane insulation spray foam considers the life cycle from the supply of raw materials to the

manufacturer's gate (cradle-to-gate with options). It also includes the transport to the construction site, the installation and the end-of-life stage of the used polyurethane insulation spray foam. The life cycle is split into the following individual phases:

- A1 - Raw material formulation (foam materials)
- A2 - Raw material transport
- A3 - Production of the polyurethane insulation spray foam (energy demands, waste, auxiliaries etc.) at construction site
- A4 - Transport system house to warehouse and from warehouse to the construction site
- A5 - Emissions during installation and packaging disposal
- C2 - Transport of the used product from the building site to the waste management site
- C3/C4 - End-of-life: waste management (thermal recovery)
- D - Benefits and loads beyond system boundary

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA: Scenarios and additional technical information

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.00159	l/100km
Transport distance	100	km
Gross density of products transported	40	kg/m ³
Capacity utilization (including empty runs)	85	%

Installation into the building (A5)

Name	Value	Unit
Pump energy consumption	17.9	kWh
Emissions to air of blowing agents	10	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² installed PU insulation spray foam – thickness of 13.0 cm (closed-cell; density 40 kg/m³)

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	16.6	0.377	38.2	0.04	0.139	11.5	-7.05
ODP	[kg CFC11-Eq.]	2.11E-5	6.58E-12	1.32E-10	6.96E-13	1.25E-10	1.15E-10	-2.31E-9
AP	[kg SO ₂ -Eq.]	4.32E-2	2.36E-3	6.12E-4	2.43E-4	6.59E-4	4.74E-3	-1.85E-2
EP	[kg (PO ₄) ⁻ -Eq.]	5.49E-3	5.66E-4	1.06E-4	5.82E-5	3.47E-5	1.17E-3	-1.3E-3
POCP	[kg Ethen Eq.]	6.68E-3	-9.54E-4	3.83E-5	-9.76E-5	3.88E-5	3.16E-4	-1.62E-3
ADPE	[kg Sb Eq.]	3.97E-5	1.4E-8	1.28E-8	1.48E-9	1.92E-8	8.01E-8	-5.46E-7
ADPF	[MJ]	354	5.2	0.784	0.55	1.58	2.84	-97.3

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 m² installed PU insulation spray foam – thickness of 13.0 cm (closed-cell; density 40 kg/m³)

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
PERE	[MJ]	19.4	-	-	-	-	-	-
PERM	[MJ]	0	-	-	-	-	-	-
PERT	[MJ]	19.4	0.205	0.157	0.022	0.409	0.178	-7.62
PENRE	[MJ]	248	-	-	-	-	-	-
PENRM	[MJ]	130	-	-	-	-	-	-
PENRT	[MJ]	378	5.22	1.12	0.552	2.46	3.2	-113
SM	[kg]	-	-	-	-	-	-	-
RSF	[MJ]	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0
FW	[m ³]	-	-	-	-	-	-	-

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m² installed PU insulation spray foam – thickness of 13.0 cm (closed-cell; density 40 kg/m³)

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
HWD	[kg]	-	-	-	-	-	-	-
NHWD	[kg]	-	-	-	-	-	-	-
RWD	[kg]	-	-	-	-	-	-	-
CRU	[kg]	-	-	-	-	-	-	0
MFR	[kg]	-	-	-	-	-	-	0.443
MER	[kg]	-	-	-	-	-	-	5.33
EEE	[MJ]	0	0	2.47	0	0	16.9	-
EET	[MJ]	0	0	6.85	0	0	46.6	-

Caption: HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

Results of the LCA - output flows and waste categories: LCI data of raw materials not adapted because of recent change in methodology.

References

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin (pub.):
Generation of Environmental Product Declarations
(EPDs);

General principles

for the EPD range of Institut Bauen und Umwelt e.V.
(IBU), 2013-04
www.bau-umwelt.de

PCR Part A

Institut Bauen und Umwelt e.V., Königswinter (pub.):
Product Category Rules for Construction Products
from the range of Environmental Product Declarations
of Institut Bauen und Umwelt (IBU), Part A: Calculation
Rules for the Life Cycle Assessment and
Requirements on the Background Report. April 2013
www.bau-umwelt.de

PCR Part B

PCR Guidance-Texts for Building-Related Products
and Services; Part B: Requirements on the EPD for
Insulating materials made of foam plastics; Institute
Construction and Environment e.V. (IBU). Version 1.4,
7th July 2013
<https://epd-online.com>

ISO 14025

DIN EN ISO 14025:2011-10: Environmental labels and
declarations — Type III environmental declarations —
Principles and procedures

EN 15804

EN 15804:2012-04: Sustainability of construction
works — Environmental Product Declarations — Core
rules for the product category of construction products

EN 14315-1

EN 14315-1: Thermal insulation products for buildings
– in-situ formed sprayed rigid polyurethane (PUR) and
polyisocyanurate (PIR) foam products – Part 1:
Specification for the rigid foam spray system before
installation

GaBi 6 2013

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GaBi 6 2013B

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<http://documentation.gabi-software.com/>

**Publisher**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@bau-umwelt.com
Web www.bau-umwelt.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@bau-umwelt.com
Web www.bau-umwelt.com

**Author of the Life Cycle Assessment**

PE INTERNATIONAL AG
Hauptstraße 111 -113
70771 Leinfelden-Echterdingen
Germany

Tel +49 711 34 18 17 - 0
Fax + 49 711 34 18 17-25
Mail info@pe-international.com
Web www.pe-international.com

**Owner of the Declaration**

PU Europe
Av. E. Van Nieuwenhuysse 6
1160 Brussels
Belgium

Tel +32 2 676 72 71
Fax +32 2 676 74 79
Mail secretariat@pu-europe.eu
Web www.pu-europe.eu