

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)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-PUE-20190008-CBE1-EN
Issue date	26/02/2019
Valid to	25/02/2024

Polyurethane thermal insulation spray foam (blowing agent HFO; density 40 kg/m³)

PU Europe

www.ibu-epd.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-20190008-CBE1-EN</p> <hr/> <p>This declaration is based on the product category rules: Insulating materials made of foam plastics, 06.2017 (PCR checked and approved by the SVR)</p> <hr/> <p>Issue date 26/02/2019</p> <hr/> <p>Valid to 25/02/2024</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. Alexander Röder (Head of Board IBU)</p>	<p>Polyurethane thermal insulation spray foam (blowing agent HFO; density 40 kg/m³)</p> <hr/> <p>Owner of the declaration PU Europe Rue Belliard 65 1040 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, using a blowing agent from the HFO family. 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.</p> <p>The EPD therefore represents an average of these producers.</p> <p>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">The standard /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to /ISO 14025:2010/</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 verifier appointed by SVR)</p>	The standard /EN 15804/ serves as the core PCR		Independent verification of the declaration and data according to /ISO 14025:2010/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
The standard /EN 15804/ serves as the core PCR							
Independent verification of the declaration and data according to /ISO 14025:2010/							
<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally						

Product

Product description / Product definition

Polyurethane (PU) is a high performance thermal insulation material that offers one of 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, using a blowing agent from the HFO (HydroFluoro-Olefins) family, of a density of 40 kg/m³ without facing.

For the placing on the market of the product in the European Union/European Free Trade Association, EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 Construction Products Regulation (CPR) applies. The product needs a Declaration of Performancetaking into consideration

/hEN 14315-1:2013/ «Thermal insulating 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» and in the CE-marking.

For determining the lambda value of HFO blown in-situ PU foam, the approved guidance NB-CPR/SG19-17/167r2 «Thermal performance of in-situ PU polyurethane products used as thermal insulation for buildings with a new blowing agent» from the Group of Notified Bodies shall be read.

For the application and use of the product, the respective national provisions apply. However, part 2 of /EN14315/ «Specification for the installed insulation products» should be followed together with part 1.

Application

This EPD covers PU in-situ foam for the thermal insulation of residential and commercial buildings according to /hEN 14315-1/ (e.g. interior and exterior insulation for roofs, floors, ceilings and walls). Part 2 of /EN14315/ should be followed together with part 1 during construction works.

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	%

The data set out in the DoP apply.

Base materials / Ancillary materials

Closed-cell polyurethane foam made from MDI (50 %), polyols (31 %), HFO (5 %) and additives (14 %) such as surfactants, catalysts and flame retardants (chlorinated-phosphorus based).

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 performance fulfills the requirements set in /hEN14315-1/ «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» and follows the principles set in /EN14315/ Part 2: «specification for the installed products».

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 in liquid form (energy demands, waste, auxiliaries, etc.) at system house site
- A4 - Transport system house to ware house and from ware house 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

All relevant background data necessary for the production and its treatment were taken from the Gabi 6 database.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.00159	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	85	%
Capacity utilisation volume factor	100	%

Installation into the building (A5)

Name	Value	Unit
Pump energy consumption	17.94	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	MNR	MNR	MNR	MND	MND	MND	X	X	X	X	

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² installed PU insulation spray foam – blowing agent HFO (closed-cell; density 40 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	16.60	0.38	1.08	0.04	0.14	11.50	-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) ³ -Eq.]	5.49E-3	5.66E-4	1.06E-4	5.82E-5	3.47E-5	1.17E-3	-1.30E-3
POCP	[kg ethene-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	1.40E-8	1.28E-8	1.48E-9	1.92E-8	8.01E-8	-5.46E-7
ADPF	[MJ]	377.00	5.22	1.12	0.55	2.45	3.20	-113.00

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 – blowing agent HFO (closed-cell; density 40 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
PERE	[MJ]	19.40	IND	IND	IND	IND	IND	IND
PERM	[MJ]	0.00	IND	IND	IND	IND	IND	IND
PERT	[MJ]	19.40	0.21	0.16	0.02	0.41	0.18	-7.62
PENRE	[MJ]	248.00	IND	IND	IND	IND	IND	IND
PENRM	[MJ]	130.00	IND	IND	IND	IND	IND	IND
PENRT	[MJ]	378.00	5.22	1.12	0.55	2.46	3.20	-113.00
SM	[kg]	IND	IND	IND	IND	IND	IND	IND
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m ³]	IND	IND	IND	IND	IND	IND	IND

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 – blowing agent HFO (closed-cell; density 40 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
HWD	[kg]	IND	IND	IND	IND	IND	IND	IND
NHWD	[kg]	IND	IND	IND	IND	IND	IND	IND
RWD	[kg]	IND	IND	IND	IND	IND	IND	IND
CRU	[kg]	IND	IND	IND	IND	IND	IND	0.00
MFR	[kg]	IND	IND	IND	IND	IND	IND	0.44
MER	[kg]	IND	IND	IND	IND	IND	IND	5.33
EEE	[MJ]	0.00	0.00	2.47	0.00	0.00	16.90	IND
EET	[MJ]	0.00	0.00	6.85	0.00	0.00	46.60	IND

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

References

/Institut Bauen und Umwelt 2011/
 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), 2011-06,
 www.bau-umwelt.de.

/PCR Part A/

Institut Bauen und Umwelt e.V., Berlin (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 (basis of EPD software tool).
<https://epd-online.com>

/hEN 14315-1:2013/

Thermal insulating 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.

/EN 14315-2:2013/

Thermal insulating products for buildings – In-situ formed sprayed rigid polyurethane (PUR) and

polyisocyanurate (PIR) foam products – Specification for the installed insulation products.

/Gabi 6/

GaBi dataset documentation for the software-system and databases, LBP, University of Stuttgart and thinkstep, Leinfelden-Echterdingen,
(<http://documentation.gabi-software.com/>)

/IBU 2016/

IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin.
www.ibu-epd.de

/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+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products



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@ibu-epd.com
Web www.ibu-epd.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@ibu-epd.com
Web www.ibu-epd.com



Author of the Life Cycle Assessment
thinkstep AG
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

Tel +49 711 341817-0
Fax +49 711 341817-25
Mail info@thinkstep.com
Web <http://www.thinkstep.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