ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**UNILIN, division insulation**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	30.09.2019

UNILIN insulation boards PIR

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Institut Bauen und Umwelt e.V.

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

1. General Information

UNILIN	UNILIN insulation boards PIR
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** UNILIN, division insulation Waregemstraat 112 B - 8792 Desselgem
Declaration number EPD-UNI-20140123-IBA1-EN	**Declared product / Declared unit** The declared product is 1m² of UNILIN insulation board UTHERM with a multi-layer facing, of thickness 100 ±10 mm.
This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 07.2014 (PCR tested and approved by the independent expert committee)	**Scope:** The Declaration refers to a UNILIN insulation board UTHERM with a multi-layer facing. The product, which can be used for thermal insulation in different areas of a building, is available under different product names: UTHERM WALL (or KD), UTHERM FLOOR (or FBO), UTHERM ROOF (or FD), UTHERM SARKING (or SD) and UTHERM AGRI. The declared UNILIN insulation boards are produced in Desselgem, Belgium. 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.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.
Issue date 01.10.2014	
Valid to 30.09.2019	**Verification** The CEN Norm EN 15804 serves as the core PCR Independent verification of the declaration according to ISO 14025 ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Mr Carl-Otto Neven (Independent tester appointed by SVA)

2. Product

2.1 Product description

UTHERM is a factory-made rigid insulation board of polyisocyanurate (PIR) for the use as thermal insulation of buildings, according to /EN 13165/. UTHERM type PIR L, PIR C and PIR K FRA are faced on both sides with a multi-layer facing. The product is available in variable thicknesses from 20mm up to 240mm. This EPD covers the thicknesses of 100 ± 10 mm with an R-value of 4,3 m²K/W ± 10% and a density of 32kg/m³.

2.2 Application

UNILIN insulation boards are used for thermal insulation of residential or commercial buildings, according to /EN 13165/; e.g. UTHERM WALL (or KD) in masonry cavity walls, for interior and exterior insulation of walls and in timber frame construction. UTHERM FLOOR (or FBO) is used in floors, UTHERM ROOF (or FD) on flat roofs, and UTHERM SARKING (or SD) on pitched roofs. UTHERM AGRI is used for industrial applications like livestock buildings, barns or warehouses. PIR insulation boards minimize the required insulation thickness, have good dimensional stability and high compressive strength.

2.3 Technical Data

Constructional data

The product is tested according to the requirements of the European harmonized product standard EN 13165 of which the values are stated below.

Name	Value	Unit
Gross density	32	kg/m³
Compressive strength acc. to EN 826	0.15	N/mm²
Tensile strength acc. to EN 826	0.08	N/mm²
Thermal conductivity EN 12667	0.023	W/(mK)

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA RegulationNo 305/2011 dated from 9th of March applies /CPR/. The products need a Declaration of Performance taking into consideration EN 13165 and the CE-marking.
For the application and use of the products the national provisions apply.

2.5 Delivery status

Delivery status for different applications:
UTHERM WALL (or KD): the products are delivered in standard dimensions 1200 x 600mm in thicknesses varying from 30 to 240mm. Products of 100mm are packed 5 boards per pack and 50 per pallet.
UTHERM ROOF (or FD): the products are delivered in standard dimensions 1200 x 600mm (other dimensions are possible e.g. 600mm x 600mm) in thicknesses varying from 30 to 240mm. Products of 100mm are packed 5 boards per pack and 50 per pallet.
UTHERM SARKING (or SD): the products are delivered in standard dimensions 1200 x 2400mm in thicknesses varying from 30 to 240mm. Products of 100mm are packed 3 boards per pack and 24 per pallet.
UTHERM FLOOR (or FBO): the products are delivered in standard dimensions 1200 x 2500mm (other dimensions are possible 1000mm x 1200mm) in thicknesses varying from 20 to 240mm. Products of 100mm are packed 5 boards per pack and 25 per pallet.
UTHERM AGRI: the products are delivered in standard width 1200mm, lengths 2400mm or longer on order, and in thicknesses varying from 30 to 240mm.

2.6 Base materials / Ancillary materials

Insulation products made of PIR arise following to a chemical reaction between MDI (approx. 55 - 60%) and polyol (approx. 25 - 30%) and the addition of blowing agents (approx. 5%).
Foam stabilizers (approx. 0,5 -2%) and fire retardants (approx. 2 - 4%) are added as additives.
The multi-layer facing consists of paper (2 - 4%), aluminium (1 - 2%) and polyethylene (1 - 2%).
The PIR insulation boards do not contain substances which are included in the current 'Candidate List of Substances of Very High Concern for Authorisation' (REACH).

2.7 Manufacture

PIR insulation boards with multi-layer facings are manufactured in a continuous process on a double belt conveyor. This manufacturing process involves the reaction mixture flowing from a mixing head to a lower facing made of flexible material where it foams up to, and adheres to a top facing applied from above within the pressure zone of the laminator. The foam boards are cut to the required sizes after passing through the double belt conveyor.

2.8 Environment and health during manufacturing

Air: dust from cutting mother boards and edge finishing is collected by a dust extraction unit and removed according to the national regulations. Emissions are measured periodically. Vapours from polyurethane insertion are collected by an extraction unit and removed according to national regulations.
Water/Soil: contamination of water or soil does not occur. The storage of hazardous products is in compliance with applicable regulations.

2.9 Product processing/Installation

PIR boards can be cut or sawn using standard tools and hand-held equipment used on building sites. Insulations boards can be mechanically fixed or glued, or laid loose for floor application. Open joints between cut insulations panels must be sealed using PU foam. There is no need for noise protection when installing the product.

2.10 Packaging

The insulation boards are placed on EPS (expanded Polystyrene) skids and are then shrink-wrapped in Polyethylene-foil. Packaging material should be collected separately for later recycling.

2.11 Condition of use

The substantial composition during the use phase refers to the composition during the manufacture.

2.12 Environment and health during use

Hazards to water, air or soil will not occur with proper use of the described product. Under normal use conditions no damage to health will occur.
The insulation core has been analyzed according to ISO 16000 series for well-known or suspected pollutants, which could alter the quality of sensitive environments.
The material achieved a class A+ according to the /French decree of 23 March 2011/.

2.13 Reference service life

PIR foam is non-rotting and resistant to most standard chemicals. Its useful life corresponds with the life cycle of the insulated construction components. The useful life of the product is only limited by the lifetime of the building components or the whole building.The reference service life can be estimated more than50 years (comparable to polyurethan products with code no. 335.611, 363.531 and 364.211 of /BNB/).

2.14 Extraordinary effects

Fire

Fire protection

See the producer's literature to select the right product for the required end-use classification. The building material class of the product is Class F according to EN 13501-1.

Name	Value
Building material class EN 13501-1	F

Water

PIR foam panels do not absorb any moisture from the air owing to their closed-cell structure, i.e. they are not capillary-active. In the event of unforeseen exposure to water, e.g. flooding, they do not release substances to the environment.

Mechanical destruction

The material is considered chemically inert and is not expected to present a risk if mechanically destructed.

2.15 Re-use phase

As PIR insulation products are generally installed mechanically or loosely and can be collected separately for a further reuse. Reuse is possible for clean and undamaged PIR insulation boards.

Clean PIR waste can be chemically or mechanically recycled in terms of finished materials or raw materials:
Mechanical recycling: e.g. PIR waste can be used in the manufacture of adhesive pressed boards, whereby PIR cuttings, installation and site waste are shredded before adding binding agents and pressing them into board-shaped materials. These compressed boards can be used e.g. for insulating window frames and thermal bridge insulation. Also, PIR post-consumer waste can be powdered to find application in insulating screeds.
Chemical recycling: e.g. glycolysis involves transforming polyurethane waste at approx. 200 °C into a liquid reclaim (glycolysis polyol) which can in turn be used as a raw material in the manufacture of polyurethane.

2.16 Disposal
The insulation boards can be used as secondary fuel in a cement kiln or can be incinerated in a waste incineration plant. The local requirements for waste disposal and recycling shall always be followed. In the European Waste Catalogue /EWC/ the product has code 17 06 04

2.17 Further information
www.unilininsulation.com.

The declaration refers to the production site in Belgium. The product is also manufactured in France. The product's composition, suppliers and production technology are similar for Belgium and France. Differences from country specific energy and different transport distances will only lead to minor variations of the results.

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit is 1 m², 100mm ± 10 mm thickness.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Gross density	32	kg/m^3
Conversion factor to 1 kg	0.29	-

3.2 System boundary
Type of EPD: cradle-to-grave with options.

1a) Declaration of a specific product from a manufacturer's plant.

Modules A1-A3 include processes that provide materials and energy input for the system, manufacturing and transport processes up to the factory gate, as well as waste processing.

Module C: In this EPD two different end-of-life scenarios are declared for the post-consumer insulation board:
- 100% incineration in a waste incineration plant
- 100% use as secondary fuel in a cement kiln.

The environmental burdens of the WIP (R1<0.6) process are assigned to C4/2. The effort for shredding the board as pre-treatment for the cement kiln is assigned to C3/1.

Module D includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste state. The results for D are declared for the 2 scenarios separately. D1 declares the loads and benefits from substitution of primary fuels in a cement kiln. Benefits of the net energy generated from a WIP (R1<0.6) are declared in module D2

3.3 Estimates and assumptions
In this EPD the two end-of-life scenarios are declared as 100%.

Post-consumer insulation boards can be used within the cement industry as secondary fuel. No emissions and burdens for the cement kiln are considered.

3.4 Cut-off criteria
In this assessment all data for the production process is considered. This includes input flows with a contribution of less than 1% of mass or energy. The transport expenditure for all raw materials are considered. Impacts relating to the production of machines and facilities required during production are outside the scope of this assessment.

3.5 Background data
For life cycle modelling of the considered products, the GaBi Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, has been used. All relevant background datasets are taken from the /GaBi 6/ software database. The datasets from the GaBi database are documented in the online documentation /GaBi 6 2012/.

3.6 Data quality
The data quality can be described as good. The primary data collection has been done thoroughly, all flows are considered. Technological, geographical and temporal representativeness is given. Primary data refers to the year 2013. Background datasets are taken from the /Gabi 6/ software database. The last revision of the used background data has taken place no longer than 10 years ago.

3.7 Period under review
The period under review is the year 2013.

3.8 Allocation
The manufacturing line for the declared product is also used for the production of other product types. The allocation of material and energy to manufacture the declared product was determined during the data collection process based on yearly production amounts.

In the EOL scenario cement kiln post-consumer waste is assumed to be sent to a cement kiln in order to substitute primary fuel within the cement production process. The breakdown of credits to module D for the cement kiln is based on the calorific value of the insulation board.

Specific information on allocation within the background data is given in the GaBi dataset documentation.

(http://www.gabi-software.com/databases/).

3.9 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.

4. LCA: Scenarios and additional technical information

End of life (C1-C4)

In this EPD the two end-of-life scenarios are declared as 100%.

Name	Value	Unit
Collected separately	3.4	kg
Energy recovery for 2 scenarios: scenario WIP and scenario cement kiln	3.4	kg

5. 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 BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m² UNILIN insulation board UTHERM

Parameter	Unit	A1 - A3	C3/1	C4/2	D/1	D/2
Global warming potential	[kg CO_2-Eq.]	12.162	0.020	6.868	-0.527	-3.435
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.525E-5	1.380E-11	6.850E-10	-7.490E-12	-9.499E-10
Acidification potential of land and water	[kg SO_2-Eq.]	2.655E-2	9.510E-5	2.830E-3	-2.750E-3	-8.100E-3
Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	4.050E-3	5.360E-6	6.980E-4	-2.250E-4	-5.720E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	6.076E-3	5.650E-6	1.890E-4	-2.870E-4	-6.900E-4
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	1.823E-5	2.790E-9	-1.060E-8	-2.830E-8	-2.620E-7
Abiotic depletion potential for fossil resources	[MJ]	239.414	0.229	1.733	-81.312	-49.112

RESULTS OF THE LCA - RESOURCE USE: 1m² UNILIN insulation board UTHERM

Parameter	Unit	A1 - A3	C3/1	C4/2	D/1	D/2
Renewable primary energy as energy carrier	[MJ]	9.500	-	-	-	-
Renewable primary energy resources as material utilization	[MJ]	1.200	-	-	-	-
Total use of renewable primary energy resources	[MJ]	10.700	0.066	0.112	-0.222	-4.520
Non renewable primary energy as energy carrier	[MJ]	164.000	-	-	-	-
Non renewable primary energy as material utilization	[MJ]	90.600	-	-	-	-
Total use of non renewable primary energy resources	[MJ]	255.000	0.359	1.976	-81.659	-58.045
Use of secondary material	[kg]	0.000	0.000	0.000	0.000	0.000
Use of renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000	0.000
Use of non renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000	0.000
Use of net fresh water	[m³]	0.055	0.000	0.016	-0.007	-0.011

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1m² UNILIN insulation board UTHERM

Parameter	Unit	A1 - A3	C3/1	C4/2	D/1	D/2
Hazardous waste disposed	[kg]	4.800E-3	4.970E-5	1.040E-4	-1.580E-4	-3.420E-3
Non hazardous waste disposed	[kg]	1.510E-1	1.160E-4	6.800E-3	-5.720E-4	-1.170E-2
Radioactive waste disposed	[kg]	6.140E-3	5.170E-5	9.400E-5	-1.370E-4	-3.560E-3
Components for re-use	[kg]	-	-	-	-	-
Materials for recycling	[kg]	-	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-	-
Exported electrical energy	[MJ]	-	-	10.100	-	-
Exported thermal energy	[MJ]	-	-	27.900	-	-

Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories, do not contribute significantly to the production. The indicators can be displayed; the uncertainty of these values is increased (decision of IBU advisory board 2013-01-07).

6. LCA: Interpretation

The environmental impact within the production stage is mainly determined by the pre-chains (extraction and processing) of the raw materials (mainly Methylene diphenyl diisocyanate (MDI) and the polyol).The share of transport and energy consumption within A1-A3 is negligible. The negative values in module D show the benefits beyond the system boundary by energy substitution in a waste incineration plant (WIP) R1<0.6 (D2) or primary fuel substitution in the cement kiln (D1) by the post-consumer waste.
The PIR foam has a contribution of more than 90% to the impact categories. Thus a linear correlation can be assumed for other thicknesses.

7. Requisite evidence

7.1 VOC emissions

- Test institute: Laboratoire Excell - Parc Innolin - 10 rue du Golf, F-33700 Mérignac, The

rapport number for the VOC test of PU/PUR is N° 2012-07-138-02

- Test institute: Laboratoire Excell - Parc Innolin -10 rue du Golf, F-33700 Mérignac, Class A+ according to the French decree of 23 March 2011
- Décret du 23 mars 2011 et Arrête du 19 avril 2011.

8. References

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

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

PCR 2013, Part B
Institut Bauen und Umwelt e. V.: Requirements on the EPD for Insulating materials made of foam plastics, 2013

EN 13165
EN 13165:2012 Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification

EN 826
EN 826:2013 Thermal insulating products for building applications - Determination of compression behaviour

EN 12667
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

ISO 16000
ISO 16000-3:2011 - Indoor air - part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air - Active sampling method.
ISO 16000-6:2011 - Indoor air - part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax A sorbent, thermal desorption and gas chromatography using MS or MS-FID
ISO 16000-9:2006 - Indoor air - part 9: Determination of the emissions of volatile organic compounds from building products and furnishing - Emission test chamber method.
ISO 16000-11:2006 - Indoor air - part 11: Determination of the emissions of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens.

EN 13501-1+A1:2010
Fire classification of construction products and building elements - Part 1 : Classification using test data from reaction to fire tests

EWC
EWC 2002: Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste

BNB
Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit: Nutzungsdauer von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB), 2013
http://www.nachhaltigesbauen.de/baustoff-und-gebaeudedaten/nutzungsdauern-von-bauteilen.html

CPR
EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down hamonised condition for the marketing of construction products

GaBi
GaBi 2012: GaBi Software Databases, see www.gabisoftware.com/databases/

REACH
Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Décret français n° 2011 - 321 du 23 mars 2011:
http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000023759679&dateTexte=&categorieLien=id

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