ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	DBC, EFCC, FEICA, IVK
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Issue date	24.02.2023
Valid to	31.05.2027

KEMPEROL 2K-PUR

KEMPER SYSTEM GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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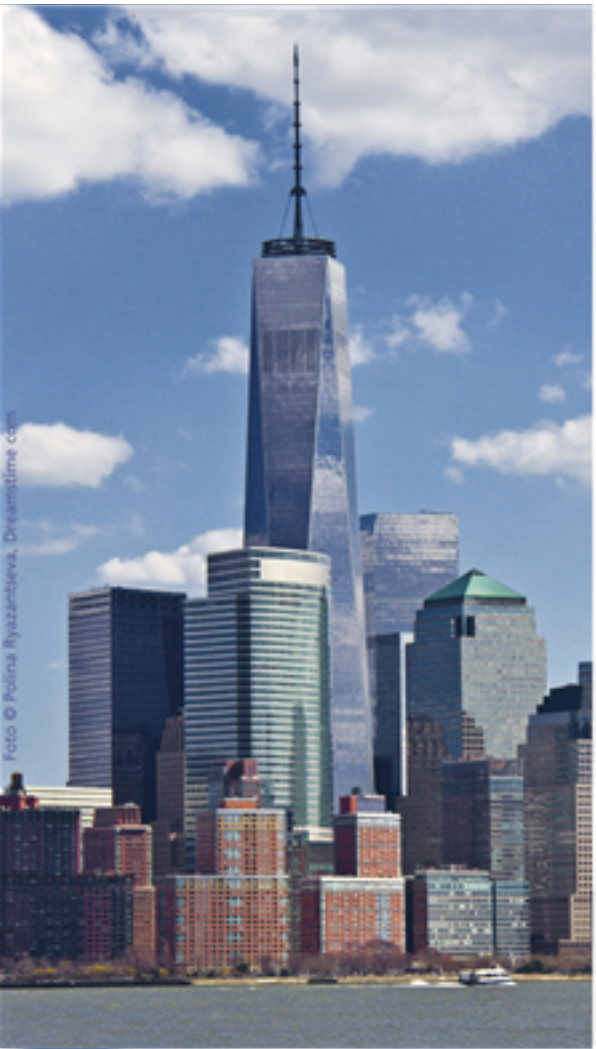

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1. General Information

KEMPER SYSTEM GmbH & Co. KG	KEMPEROL 2K-PUR
Programme holder IBU – Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** KEMPER SYSTEM GmbH & Co. KG Holländische Strasse 32-36 34246 Vellmar Germany
Declaration number EPD-FEI-KEM-20230047-IBG1-EN	**Declared product / declared unit** 1 kg product based on polyurethane; density 1.10 - 1.35 (Komp. A) 1.2275 - 1.24 (Komp. B)
This declaration is based on the product category rules: Reaction resin products, 01.2019 (PCR checked and approved by the SVR)	**Scope:** This Environmental Product Declaration (EPD) is an individualisation of the model EPD 'EPD-FEI-20220110-IBG1-EN' of Deutsche Bauchemie e.V.-(DBC), European Federation for Construction Chemicals (EFCC), Association of the European Adhesive and Sealant Industry (FEICA) and Industrieverband Klebstoffe e.V. (IVK) for which the product of a product group with the highest environmental impacts was selected for the calculation of the LCA. This verified EPD entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for products produced in Europe and for a period of five years from the date of issue. 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 EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
Issue date 24.02.2023	
Valid to 31.05.2027	
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2011* ☐ internally ☒ externally
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Matthias Schulz (Independent verifier)

2. Product

2.1 Product description/Product definition

This EPD comprises reactive products based on polyurethane (PU) with a volatile organic compound (VOC) content >1 % and ≤30 % (VOC definition according to *Decopaint Directive*) and a castor oil/-derivatives content ≥10 %. The one- or two-component reactive PU products are manufactured using polyols and isocyanates. The products fulfil manifold, often specific, functions in the construction, furnishing and repair of buildings.
The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst-case approach).

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) with the exception of Switzerland) products falling under Regulation (EU) No 305/2011 (*CPR*) need a Declaration of Performance taking into consideration either the relevant harmonised European standard or the European Technical Assessment and the CE marking. For the application and use of the products the respective national provisions apply.

2.2 Application

Products based on polyurethane, are used for the following applications:

Liquid-applied roof waterproofing kits

Reactive products for waterproofing roof constructions which are applied on site

Reactive products for liquid-applied waterproofing
Liquid applied products for waterproofing of buildings

Reactive products for waterproofing and/or for pre-treating mineral substrates
Applications in accordance with the manufacturer's technical documentation

Liquid-applied waterproofing membranes for use beneath ceramic tiles

2.3 Technical Data

The density of the products is between 1.10 - 1.35 (Komp. A) 1.22 - 1.24 (Komp. B), other relevant technical data can be found in the manufacturer's technical documentation.

Liquid-applied roof waterproofing kits
The requirements of *EAD 030350-00-0402* Liquid-applied roof waterproofing kits are achieved. The essential characteristics are to be specified in accordance with the European Technical Assessment (ETA-03/044).

Reactive products for liquid-applied waterproofings
The minimum requirements of the test principles regarding the issuing of general building authority test certificates for liquid-applied products for waterproofing of buildings (*PG-FLK*) are achieved. The characteristics for the proof of usability are to be specified in accordance with the principles for granting general building authority test certificates.

Reactive products for waterproofing and/or for pre-treating mineral substrates

Name	Value	Unit
Shore hardness A acc. to ISO 48-4	>15	
Shore hardness D acc. to ISO 48-4	>5	
Viscosity acc. to ISO 3219-2	<100	Pas

Other performance characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Liquid-applied waterproofing membranes for use beneath ceramic tiling
The minimum requirements on essential characteristics according to *EN 14891* - Liquid applied water-impermeable products for use beneath ceramic tiles
- Definitions, specifications and test methods- must be maintained. These are:
- Initial tensile adhesion strength
- Tensile adhesion strength after water contact
- Tensile adhesion strength after heat ageing
- Tensile adhesion strength after freeze-thaw cycles
- Waterproofing
- Crack bridging ability

2.4 Delivery status

Liquid or pasty in containers made of tinplate or plastic packed in separate or combi-containers for the required mixing ratio. Packages containing one kg of product in different types of containers. Sealants in plastic cartridges and foil packs. Typical container sizes contain 1 to 25 kg of material. For major works, vats containing approx. 200 kg or IBCs (intermediate bulk containers) containing 1 tonne or more are also used. The LCA is based on tinplate, plastic and wood packaging.

2.5 Base materials/Ancillary materials

Products based on polyurethane with a VOC content >1 % and ≤30 % and a castor oil/-derivatives content ≥10 % usually comprise a reactive polymer and a crosslinking system. The polymer component contains polyether and/or polyester polyols. Crosslinking takes place after installation on site. In the case of two-component systems this involves the use of pre-polymers and polymers based on typically methylene diphenyl diisocyanate (MDI) or isophorone diisocyanate (IPDI). The resin mixing ratio is adjusted according to the stoichiometric requirements. Crosslinking starts directly after the components have been mixed. There are also one-component reactive polymer formulations based on PU which crosslink in the presence of moisture. They comprise prepolymers based on e.g. MDI, IPDI. The formulations can contain auxiliary materials such as accelerators, catalysts, wetting agents, foam regulators and viscosity regulators for fine-tuning the product features.
Typically, the products covered by this EPD contain the following ranges of base materials and auxiliaries:
Polyol component: up to approx. 50 %
Crosslinking component: up to approx. 95 %
Plasticiser: ~ 0-25 %
Additives / Pigments: ~ 0-30 %
VOC: >1 % and ≤30 % according to the *Decopaint Directive*
Castor oil and derivatives: ≥10 %

These ranges are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).

1. Substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC)
This product/article/at least one partial article contains substances listed in the ECHA candidate list (date: 28.09.2022) exceeding 0.1 percentage by mass: no
This product/article/at least one partial article contains other cancerogen mutagen reprotoxic (CMR) substances in categories 1A or 1B which are not on the ECHA candidate list, exceeding 0.1 percentage by mass: no
Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture

The components of the formulation are usually mixed batch-wise and packaged for delivery.

2.7 Environment and health during manufacturing

As a general rule, no other environmental protection measures other than those specified by law are necessary.

2.8 Product processing/Installation

Products based on polyurethane, are processed by trowelling/knife-coating or rolling, pouring, spraying or injection.
Precautions for safe handling and storage (e.g. air exchange, exhaust ventilation, personal protective measures, precautions required in the handling of isocyanates, conditions for safe storage) must be observed in accordance with the information on the safety data sheet.

2.9 Packaging

A detailed description of packaging is provided in section 2.4. Empty containers and clean foils can be recycled.

2.10 Condition of use

During the use phase, products based on polyurethane are crosslinked and essentially comprise an inert three-dimensional network. They are long-lasting products which protect our buildings in the form of adhesives, coatings or sealants as well as make an essential contribution in retaining their function and long-term value.

2.11 Environment and health during use

Option 1: Products for applications outside indoor areas with permanent stays by people
During use, the reactive products lose their reactive properties and become inert. No risks are known for water, air and soil if the products are used as designated.
Option 2: Products for applications inside indoor areas with permanent stays by people
When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements (see chapter 7). No further influences by emissions on the environment and health are known.

2.12 Reference service life

Cured products based on polyurethane fullfil specific functions in the construction or refurbishment of building structures. They improve the usability of building structures and extend their service lives. The anticipated reference service life depends on the specific installation situation and the exposure associated with the product. It can be influenced by weathering as well as mechanical or chemical loads.

2.13 Extraordinary effects

Fire
Even without any special fire safety features, cured products based on polyurethane comply with at least the requirements of *EN 13501-1* standard for fire classes E and Efl. In terms of the volumes applied, they have only a marginal influence on the fire performance characteristics (e.g. smoke gas development) of the building structure in which they have been installed.

Fire protection

Name	Value
External fire performance EN 13501-5	class BROOF (t1) class BROOF (t2)
Reaction to fire EN 13501-1	class E

Water
Cured reactive products based on silane-modified polymer are chemically inert and insoluble in water. They are often used to protect building structures from harmful water ingress or the effects of flooding.

Mechanical destruction
Mechanical destruction of cured reactive products based on polyurethane does not lead to any decomposition products which are harmful to the environment or health.

2.14 Re-use phase

According to present knowledge, no environmentally harmful effects are generally anticipated in landfilling, for example, as a result of de-construction and recycling of building materials with adherent crosslinked products. If the crosslinked products can be removed from construction products without large effort, thermal recovery is a practical recycling variant on account of their energy content. Minor adhesion is not taken into consideration during disposal. It does not interfere with the disposal/recycling of the remaining components/building materials.

2.15 Disposal

Residual material which cannot be used or recycled must be combined at a specified ratio and hardened. Hardened product residue is not special waste. Non-hardened product residue is hazardous waste. Empty, dried containers (free of drops and scraped clean) are directed to the recycling process. Residue must be directed to proper waste disposal taking into consideration the local guidelines. The following waste codes according to the European List of Waste (*2000/532/EC*) can apply:
Hardened product residue:
European Waste Catalogue (EWC) 08 04 10

2.16 Further information

More information is available on the manufacturer's product or safety data sheets and on the manufacturer's websites or on request. Valuable technical information is also available on the associations' websites.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg of product based on polyurethane, group 6; applied into the building with a density of 1.10 - 1.35 (Komp. A) 1,2275 - 1,24 (Komp. B) in accordance with the *IBU PCR* part B for reaction resin products.
The results of the Life Cycle Assessment provided in this declaration have been selected from the product

with the highest environmental impact (worst-case scenario).
Depending on the application, a corresponding conversion factor such as the density to convert volumetric use to mass must be taken into consideration.

The Declaration type is according to *EN 15804*: Cradle to gate with options, modules C1–C3, and module D (A1–A3, C, D) and additional modules.

Declared unit

Name	Value	Unit
Declared unit	1	kg
Gross density	0.85 - 1.8	g/cm³
Conversion factor to 1 kg	-	-
Gross density	-	kg/m³

3.2 System boundary

Modules A1, A2 and A3 are taken into consideration in the LCA:
- A1 Production of preliminary products
- A2 Transport to the plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables and waste treatment
- A4 Transport to site
- A5 Installation, product applied into the building during A5 phase operations and packaging disposal. This stage considers VOC emissions during the installation phase. The declared product does not contain substances in the formulation that directly emit (as) VOC, but VOCs are generated by a chemical reaction that are occurring during this phase. The end of life for the packaging material considered is described below:
  -Incineration, for materials like plastic and wood.
  -Landfill, for inert material like metals (where used).

-C1-C2-C3-D
The building deconstruction (demolition process) takes place in the C1 module which considers energy production and consumption in terms of diesel and all the emissions connected with the fuel-burning process to run the machines. After the demolition, the product is transported to the end-of-life processing (C2 module) where all the impacts related to the transport processes are considered. For precautionary principle and as a worst-case scenario, thermal treatment is the only end-of-life scenario considered. This is modelled by the incineration process (module C3) where the product ends its life cycle.

Module D accounts for potential benefits that are beyond the defined system boundaries. Credits are generated during the incineration of wastes and related electricity produced that are occurring in the A5 module.

3.3 Estimates and assumptions

For this EPD formulation and production data defined and collected by FEICA were considered. Production waste was assumed to be disposed of by incineration without credits as a worst-case.
An average of steel and plastic containers, and wooden pallets was considered in the LCA.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data were taken into consideration.
The manufacture of machinery, plant and other infrastructure required for the production of the products under review was not taken into consideration in the LCA.
Transport of packaging materials is excluded.

3.5 Background data

Data from the *GaBi* database SP40 (2020) was used as background data.

3.6 Data quality

Representative products were applied for this EPD and the product in the group displaying the highest environmental impact was selected for calculating the LCA results. The background data sets used are less than 4 years old.
Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.
The data quality of the background data is considered to be good.

3.7 Period under review

Representative formulations are valid for 2021.

3.8 Allocation

Mass allocation has been applied when primary data have been used and implemented into the LCA model.

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.

The *GaBi* database SP40 (2020) was used.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon
The packaging material contains biogenic carbon content which is presented below.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0.224	kg C
Biogenic carbon content in accompanying packaging	0.016	kg C

Transport to the building site (A4)

Name	Value	Unit
Transport distance	1000	km
Gross weight	34 - 40	t
Payload capacity	27	t

Assembly (A5)

Name	Value	Unit
Other resources for packaging material	0.1	kg
Material loss	0.01	kg

Material loss regards the amount of product not used during the application phase into the building. This amount is 1% of the product, impacts related to the production of this part are charged to the A5 module. This percentage is considered as waste to disposal and impacts of its end of life have been considered in the LCA model and declared in A5.

End of life (C1-C3)

Name	Value	Unit
Collected as mixed construction waste	0.75	kg
Incineration	0.75	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	ND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg of product based on polyurethane, group 6

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	D
GWP-total	[kg CO_2-Eq.]	1.80E+0	5.27E-2	1.50E-1	2.09E-4	9.28E-3	2.47E+0	-7.25E-1
GWP-fossil	[kg CO_2-Eq.]	2.67E+0	5.22E-2	7.23E-2	2.00E-4	8.88E-3	1.66E+0	-7.23E-1
GWP-biogenic	[kg CO_2-Eq.]	-8.76E-1	1.52E-4	7.78E-2	9.27E-6	4.07E-4	8.13E-1	-1.70E-3
GWP-luluc	[kg CO_2-Eq.]	4.05E-3	4.22E-4	4.39E-5	4.80E-9	2.09E-7	1.56E-5	-5.08E-4
ODP	[kg CFC11-Eq.]	1.66E-6	6.27E-18	1.66E-8	2.13E-20	9.29E-19	1.96E-16	-7.58E-15
AP	[mol H^+-Eq.]	2.07E-2	1.56E-4	2.34E-4	2.70E-6	2.80E-5	9.81E-4	-1.01E-3
EP-freshwater	[kg P-Eq.]	5.46E-4	1.59E-7	5.47E-6	4.31E-11	1.88E-9	3.30E-8	-9.36E-7
EP-marine	[kg N-Eq.]	7.93E-3	6.96E-5	8.76E-5	1.23E-6	1.29E-5	4.73E-4	-2.62E-4
EP-terrestrial	[mol N-Eq.]	8.08E-2	7.80E-4	9.25E-4	1.34E-5	1.42E-4	5.45E-3	-2.81E-3
POCP	[kg NMVOC-Eq.]	7.69E-3	1.38E-4	1.56E-1	3.68E-6	2.54E-5	1.22E-3	-7.53E-4
ADPE	[kg Sb-Eq.]	7.91E-6	3.74E-9	7.95E-8	6.04E-12	2.64E-10	3.49E-9	-1.19E-7
ADPF	[MJ]	5.58E+1	6.94E-1	6.17E-1	2.86E-3	1.25E-1	4.40E-1	-1.23E+1
WDP	[m^3 world-Eq deprived]	3.61E+1	4.66E-4	3.75E-1	3.95E-7	1.72E-5	1.63E-1	-7.52E-2

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; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg of product based on polyurethane, group 6

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	D
PERE	[MJ]	1.68E+1	3.90E-2	3.75E+0	9.01E-6	3.93E-4	8.68E+0	-2.69E+0
PERM	[MJ]	1.21E+1	0.00E+0	-3.46E+0	0.00E+0	0.00E+0	-8.62E+0	0.00E+0
PERT	[MJ]	2.89E+1	3.90E-2	2.96E-1	9.01E-6	3.93E-4	6.17E-2	-2.69E+0
PENRE	[MJ]	3.81E+1	6.95E-1	5.46E+0	2.86E-3	1.25E-1	1.34E+1	-1.23E+1
PENRM	[MJ]	1.78E+1	0.00E+0	-4.84E+0	0.00E+0	0.00E+0	-1.30E+1	0.00E+0
PENRT	[MJ]	5.58E+1	6.95E-1	6.17E-1	2.86E-3	1.25E-1	4.40E-1	-1.23E+1
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	1.23E+0	4.52E-5	1.26E-2	1.62E-8	7.06E-7	3.84E-3	-3.12E-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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg of product based on polyurethane, group 6

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	D
HWD	[kg]	1.12E-5	3.23E-8	1.12E-7	2.77E-13	1.21E-11	2.51E-10	-4.89E-9
NHWD	[kg]	4.53E-2	1.06E-4	4.63E-2	2.92E-7	1.28E-5	8.31E-3	-5.68E-3
RWD	[kg]	1.10E-3	8.60E-7	1.29E-5	3.07E-9	1.34E-7	1.78E-5	-9.19E-4
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	2.12E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	3.86E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg of product based on polyurethane, group 6

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	D
PM	[Disease Incidence]	ND	ND	ND	ND	ND	ND	ND
IRP	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND	ND
ETP-fw	[CTUe]	ND	ND	ND	ND	ND	ND	ND
HTP-c	[CTUh]	ND	ND	ND	ND	ND	ND	ND
HTP-nc	[CTUh]	ND	ND	ND	ND	ND	ND	ND
SQP	[-]	ND	ND	ND	ND	ND	ND	ND

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Potential Human exposure efficiency relative to U235, Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and (from) some construction materials is also not measured by this indicator.

ADP minerals & metals, ADP fossil, WDP, ETF-fw, HTP-c, HTP-nc, SQP, Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Additional environmental impact indicators (suggested by *EN15804*, table 4) are not declared in the EPD. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high and as there is limited experience with the indicator (see ILCD classification in EN 15804, table 5). For this reason, results based on these indicators are not considered suitable for a decision-making process and are thus not declared in the EPD.

6. LCA: Interpretation

Due to the presence of a high content of raw materials with biogenic origin, the production phase (A1-A3) is not the highest among all impact categories. The most significant contribution to the production phase impacts is the upstream production of raw materials. Another substantial contributor in the production phase, in the category of Abiotic depletion potential for non-fossil resources (ADPminerals& metals), is the steel sheet used as a packaging material. Emissions associated with the manufacturing of products also have some influence on the Formation potential of tropospheric ozone (POCP) in the production phase. In all EPDs, CO_2 is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NOx and SO_2 contribute the largest share. In some cases, HCl in water also impacts AP due to the use of TiO_2.as a pigment.
The majority of life cycle energy consumption takes place during the production phase (A1-A3). Significant contributions to Primary Energy Demand – Non-renewable (PENRT) come from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (PERT) impacts comes from the consumption of renewable energy resources required for the generation and supply of electricity. It should be noted that Primary Energy Demand – Renewable (PERT) generally represents a small percentage of the production phase primary energy demand with the bulk of the demand coming from non-renewable energy resources.
Transportation to the construction site (A4) and the installation process (A5) make a low contribution to all impacts.
The installation phase influences mainly the Photochemical ozone formation indicator, due to the emission of VOC during the operations. These emissions are not only directly related to the pre-products in the resins, but they are related to the reaction products between pre-products and air components (water and oxygen).
The end-of-life phases has a significantly influence on climate change indicators, due to the incineration processes occurring in the C3 module, the process used for modelling the thermal treatment process of the resin.

7. Requisite evidence

VOC
Special tests and evidence were carried out or provided as part of the creation of this EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for product in question.

Evidence pertaining to VOC emissions shall show

- either an attestation of compliance with,
- or documentation of test data that are required in any of the existing regulations or in any of the existing voluntary labelling programs for low-emitting products, as far as these

(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;
(2) base their test methods on *EN 16516*;

(3) perform testing and apply the limits after 28 days of storage in a ventilated test chamber, under the conditions specified in *EN 16516*; some regulations and programs also have limits after 3 days, on top of the 28 days limits;
(4) express the test results as air concentrations in the European Reference Room, as specified in *EN 16516*.

Examples of such regulations are the *Belgian Royal Decree C-2014/24239*, or the *German AgBB/* ABG. Examples of such voluntary labelling programs are *EMICODE*, *Blue Angel* or *Indoor Air Comfort*.

	TVOC µg/m³	Sum of carcinogens. C1A,CA2 µg/m³	Formaldehyde µg/m³	Acetaldehyde µg/m³	Sum of Form- and Acetaldehyde
German AgBB/ABG regulation	10 000	10	-/-	-/-	-/-
Belgian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 PLUS	750	10	50	50	50 ppb

	TVOC µg/m³	TSVOC µg/m³	Each carcinogen C1A,CA2 µg/m³	Formalde-hyde µg/m³	Acetalde-hyde µg/m³	LCI	R value	Specials	Sum of non-LCI & non-identified µg/m³
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	300	German AgBB list	1	-/-	100
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 PLUS	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	300	EU LCI list	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m²h	-/-	5 µg/m²h	50 µg/m²h	300	EU LCI list	-/-	Ammonia, odour	-/-

VOC without NIK	11	µg/m³
Carcinogenic Substances kleiner	1	µg/m³

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16) kleiner	1	µg/m³
Sum SVOC (C16 - C22)	19	µg/m³
R (dimensionless)	0.01	-

AgBB overview of results (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16) lowerr	5	µg/m³
Sum SVOC (C16 - C22) lower	5	µg/m³
R (dimensionless)	0.01	-
VOC without NIK lower	5	µg/m³
Carcinogenic Substances lower	1	µg/m³

8. References

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Blue Angel
Environmental label organised by the federal government of Germany www.blauer-engel.de

CPR
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