EPD-Information

KLB KÖTZTAL

# Erklärung zur Übereinstimmung von Produkten mit Umwelt-produktdeklarationen (EPD)

# *Statement of product compliance with environmental product declaration*

Sehr geehrter Kunde,

der Industrieverband Deutsche Bauchemie, in dem unser Unternehmen Mitglied ist, hat für bauchemische Produkte sogenannte Muster-Umweltproduktdeklarationen (Muster-EPD) entwickelt und durch das unabhängige Institut „Bauen und Umwelt (IBU)“ verifizieren lassen. Die Muster EPD´s wurde dabei an die aktuelle Fassung der EN 15804+A2 angepasst. Diese, durch den europäischen Verband FEICA erstellten und durch das IBU verifizierten Muster-EPDs wurden von der Deutschen Bauchemie und dem Institut Bauen und Umwelt veröffentlicht. Als Mitgliedsunternehmen der Deutschen Bauchemie haben wir exklusiv die Möglichkeit, mittels eines EPD-Leitfadens und anhand unserer Produktrezepturen zu überprüfen, ob unsere Produkte durch die Muster-EPD abgedeckt werden. Mit dieser Erklärung versichern wir Ihnen, dass wir mit dem uns vorliegenden EPD-Leitfaden überprüft und positiv bestätigt haben, dass das unten aufgeführte Produkt von der unten aufgeführten Muster-EPD erfasst wird. Das heißt, dass die Ökobilanzdaten und die sonstigen Inhalte der beigefügten Muster-EPD auf das o.g. Produkt zutreffen und für die Bewertung der Nachhaltigkeit von Gebäuden, in denen das u.g. Produkt verbaut wurde, herangezogen werden können. Für Rückfragen stehen wir Ihnen gerne zur Verfügung.

*To Whom It May Concern,*

*KLB is a member of the industrial association “Deutsche Bauchemie”. The “Deutsche Bauchemie” has developed sample environmental product declarations for building-chemical products. These have been verified by the independent Institute “Bauen und Umwelt” (IBU). The sample EPD’s have been adapted in accordance with the current edition of the EN 15804+A2. The IBU-verified sample environmental product declarations have been developed by the European Federation FEICA and published by the “Deutsche Bauchemie” and the Institute “Bauen und Umwelt”. As a member of the “Deutsche Bauchemie” we have exclusive possibilities to check if our products are covered by the sample-EPD according to the EPD-guidelines and our product recipes. With this declaration we assure that we have tested with the available EPD-guidelines and that below stated products are covered by the sample-EPD. This means that all stated information, e.g. the ecological balance data and other contents of the sample-EPD are relevant for the below stated product and for the evaluation of the sustainability of buildings where the below stated product has been used.*
*Please contact us for further questions.*

| | |
|---|---|
| Produktname / *Product name* | EP 85 Fein |
| Punktezahl nach EPD-Leitfaden / *Amount of points according to EPD-guidelines* | < 4.600 |
| Titel der Muster-EPD / *Title of sample EPD* | Produkte auf Epoxidharzbasis, Gruppe 3, VOC-Gehalt: > 1 %, ≤ 8 %<br><br>*Products based on epoxid-resin, Group 3, VOC content: > 1%, ≤ 8 %* |
| Deklarationsnummer / *Declaration number* | EPD-DBC-20220176-IBF1-EN |

Ichenhausen, 30. August 2022

Artur Kehrle, Geschäftsleitung

**KLB Kötztal**
**Lacke + Beschichtungen GmbH**
Günztalstraße 25
D-89335 Ichenhausen
Phone +49 (0) 8223-9692-0
Fax +49 (0) 8223-9692-100
www.klb-koetztal.com
info@klb-koetztal.com

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# 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) |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Declaration number | EPD-DBC-20220176-IBF1-EN |
| Issue date | 29.08.2022 |
| Valid to | 28.08.2027 |

## Products based on epoxy-resin, group 3

DBC - Deutsche Bauchemie e.V.

EFCC - European Federation for Construction Chemicals

FEICA - Association of the European Adhesive and Sealant Industry

IVK - Industrieverband Klebstoffe e.V.

Institut Bauen und Umwelt e.V.

**www.ibu-epd.com | https://epd-online.com**

ECO PLATFORM EPD VERIFIED



# 1. General Information

DBC - Deutsche Bauchemie e.V.
EFCC - European Federation for Construction Chemicals
FEICA - Association of the European Adhesive and Sealant Industry
IVK - Industrieverband Klebstoffe e.V.

Products based on epoxy-resin, group 3

**Programme holder**
IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

**Owner of the declaration**
DBC, Mainzer Landstr. 55, D-60329 Frankfurt a.M.
EFCC, 172 Boulevard du Triomphe, B-1160 Brussels
FEICA, Rue Belliard 40, B-1040 Brussels
IVK, Völklingerstr. 4, D-40219 Düsseldorf

**Declaration number**
EPD-DBC-20220176-IBF1-EN

**Declared product / declared unit**
1 kg product based on epoxy-resin, group 3; density 1 - 2,5 g/cm³

**This declaration is based on the product category rules:**
Reaction resin products, 01.2019
(PCR checked and approved by the SVR)

**Scope:**
This verified EPD entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies to products produced in Europe and for a period of five years from the date of issue. This EPD may be used by members of DBC, EFCC, FEICA and IVK and their members provided it has been proven that the respective product can be represented by this EPD. For this purpose, a guideline is available at the secretariats of the four associations. The members of the associations are listed on their respective websites.

**Issue date**
29.08.2022

**Valid to**
28.08.2027

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*.

**Verification**

| |
|---|
| The standard *EN 15804* serves as the core PCR |
| Independent verification of the declaration and data according to *ISO 14025:2011* |
| ☐ internally ☒ externally |

Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

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 epoxy (EP) resin and hardening agent; the Volatile Organic Compound (VOC) content is >1 %, ≤8 % (VOC definition according to *Decopaint Directive*). The aqueous systems can be formulated as aqueous dispersions on the resin or hardening agent side. They comply with multiple, often specific functions in the construction, furnishing and repair of structures. 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 epoxy-resins are used for the following applications:

**Module 1: Reactive products for protecting and repairing concrete structures**
Products for increasing the durability of concrete and reinforced concrete structures as well as for new concrete and for maintenance and repair work (requirements 1.1), products used to restore and/or to replace defective concrete and to protect reinforcement, necessary to extend the service life of a concrete structure exhibiting deterioration (requirements 1.2), products for structural bonding of strengthening materials to an existing concrete structure (requirements 1.3) and products for concrete injection for filling cracks, voids and interstices in concrete (requirements 1.4)

**Module 2: Liquid-applied roof waterproofing kits**
Reactive products for waterproofing roof constructions which are applied on site

**Module 3: Reactive products for liquid-applied bridge deck waterproofing kits**
Products for liquid-applied waterproofing for use on concrete bridge decks

**Module 4: Reactive products for watertight covering kits**
Products for waterproofing floors and/or walls in wet rooms inside buildings

**Module 5: Reactive products for liquid-applied waterproofings**
Liquid applied products for waterproofing of buildings

**Module 6: Screed material, floor screeds and decorative floors**
Products for screed/synthetic resin screed and decorative floors for use in floor constructions

**Module 7: Reactive products for waterproofing and/or for pre-treating mineral substrates**
Products to protect mineral substrates from the ingress of water

## 2.3 Technical Data

The density of the products is between 1,0 and 2,5 g/cm³, other relevant technical data can be found in the manufacturer's technical documentation.

**Module 1: Reactive products for protecting and repairing concrete structures**
1.1 The requirements on essential characteristics for all intended uses in accordance with *EN 1504-2*, Tables 1 and 5 must be maintained. These are:
- Permeability to $CO_2$ (*EN 1062-6*)
- Water vapour permeability (*EN ISO 7783-1/-2*)
- Capillary absorption and permeability to water (*EN 1062-3*)
- Adhesive strength by pull-off test (*EN 1542*)

1.2 The requirements on essential characteristics for all intended uses in accordance with *EN 1504-3*, Tables 1 and 3, must be maintained. These are
- Compressive strength (*EN 12190*)
- Chloride content (*EN 1015-17*)
- Adhesive strength by pull-off test (*EN 1542*)

1.3 Essential characteristics for all intended uses in accordance with *EN 1504-4*, Tables 3.1 and 3.2 (manufacturer's declaration of performance)

1.4 Requirements on essential characteristics for all intended uses in accordance with *EN 1504-5*, Table 3:
- Injectability (*EN 1771*)
- Viscosity (*EN ISO 3219)*

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

**Module 2: Liquid-applied roof waterproofing kits**
The minimum requirements of *EAD 030350-00-0402* 'Liquid-applied roof waterproofing kits' must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

**Module 3: Reactive products for liquid-applied bridge deck waterproofing kits**
The minimum requirements of *ETAG 033* 'Liquid-applied bridge deck waterproofing kits' must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

**Module 4: Reactive products for watertight covering kits**
The minimum requirements of *EAD 030352-00-0503* 'Liquid applied watertight covering kits for wet room floors and/or walls' must be maintained. The essential characteristics are to be specified in accordance with the European Technical Assessment (ETA, specification no.).

**Module 5: Reactive products for liquid-applied waterproofings**
The minimum requirements of the 'Test principles regarding the issuing of general building authority inspection test certificates for liquid applied products for waterproofing of buildings' (*PG-FLK*) must be maintained. The characteristics for the proof of usability are to be specified in accordance with the 'Test principles for granting general building authority test certificates for liquid applied polymer products for waterproofing buildings'.

**Module 6: Screed material, floor screeds and decorative floors**
The requirements on essential characteristics according to *EN 13813* 'Screed material and floor screeds – Screed materials – Properties and requirements' must be maintained. For synthetic resin screeds, these are:
- Bond strength (*EN 13892-8*)
- Reaction to fire (*EN 13501-1*)

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

**Module 7: Reactive products for waterproofing and/or for pre-treating mineral substrates**
Essential characteristics in accordance with the manufacturer's technical documentation

## 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 10 to 25 kg of material. For major works, vats containing approx. 200 kg or IBCs containing more than 1 tonne are also used. The LCA is based on a sheet steel container.

### 2.5 Base materials/Ancillary materials

The products based on epoxy-resin, comprise glycidyl components (epoxy resin and/or diluting agents) and a crosslinking agent component. When installed on site hardening occurs with the crosslinking agent component. For this purpose, polyamines, polyamides, polyamine adducts or mixtures of the same are used. Additionally the formulation can contain auxiliaries such as accelerators, catalysts, wetting agents, foam regulators and viscosity regulators for fine adjustment of the product properties. The mixing ratio for the glycidyl components and the crosslinker is adjusted in accordance with the stoichiometric requirements. Product crosslinking starts immediately after mixing the components. **Typically**, the products covered by this EPD contain the following range of base materials and auxiliaries:
Resin component: ~ 0-90 %
Reactive diluting agent: ~ 0-90 %
Crosslinker component: ~ 5-25 %
Filler: ~ 0-70 %
Water: ~ 0-40 %
Other: <4 %
VOC: >1 %, ≤8 % according to *Decopaint Directive* **(mandatory)**

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).
*Note: For companies to declare their products within the scope of this EPD it is not sufficient to simply comply with the product composition shown above. The application of this EPD is only possible for member companies of DBC, EFCC, FEICA, and IVK member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.*
**1. substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC)**
If this product contains substances listed in the *candidate list* (latest version) exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD.
**2. CMR substances in categories 1A and 1B**
If this product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD.
**3. Biocide products added to the construction product**
If this construction product contains biocide products, the active substances, information on the concentration and/or concentration range, the product type together with information on their hazardous properties are listed in the safety data sheet of the respective product.

### 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

The products based on epoxy-resin 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 and conditions for safe storage) must be observed in accordance with the information on the safety data sheet.
The products based on epoxy-resin react after mixing resin and crosslinking agent under heat generation (exothermicity). The mixed components must therefore be processed swiftly within the pot life indicated. If larger volumes of the mixture remain in the container, this can lead to overheating and decomposition. In the case of reactively diluted products, exothermicity is particularly strong. Emissions of volatile components may occur.

### 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 epoxy-resin 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 towards 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 reactive epoxy products comply with a variety of, often specific, functions in the construction or refurbishment of building structures. They decisively improve the usability of building structures and significantly extend their original 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 reactive epoxy products comply with at least the requirements of *EN 13501-1* standard for fire classes E and Efl. In terms of the volumes applied, they only have a marginal influence on the fire performance characteristics (e.g. smoke gas development) of the building structure in which they are installed. As crosslinked epoxy products are duroplastic they do not melt or drip and they do not contribute to the spreading of fire, whereas the combustibility of crosslinked epoxy products is larger than that of other duroplastics. Among other substances, formaldehyde and phenol can be formed in the event of a fire.

**Water**
Cured reactive epoxy products 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 epoxy products 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 cross-linked 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 special 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*) code 08 01 12 (Paint and varnish waste with the exception of that covered by *EWC* 08 01 11)
*EWC* code 08 04 10 (Adhesive and sealant compound waste with the exception of that covered by *EWC* 08 04 09)

### 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 epoxy-resin, group 3; applied into the building with a density of 1 - 2.50 g/cm³ 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 (A4-A5)

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | kg |
| Gross density | 1 - 2.50 | g/cm^3 |
| Conversion factor to 1 kg | - | - |

### 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. The emission of VOC (Volatile Organic Compounds) is also considered in this module.
The end of life for the packaging material considered is described below:
  -Incineration, for materials like 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 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 which is presented below.

**Information on describing the biogenic Carbon Content at factory gate**

| Name | Value | Unit |
|---|---|---|
| Biogenic Carbon Content in product | - | kg C |
| Biogenic Carbon Content in accompanying packaging | 0.026 | kg C |

For the preparation of building life cycle assessments, it must be taken into account that in module A5 (installation in the building) the biogenic amount of $CO_2$ (0.026 kg C *3.67 = 0.095 kg $CO_2$-eq.) of the packaging bound in module A1-A3 is mathematically booked out.

**Transport to the building site (A4)**

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

**Installation into the building (A5)**

| Name | Value | Unit |
|---|---|---|
| Other resources for packaging material | 0.117 | 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 A5 module. This percentage is considered as waste to disposal and impacts of its end of life have been considered into the LCA model and declared in the A5.

**End of life (C1-C4)**

| Name | Value | Unit |
|---|---|---|
| Collected as mixed construction waste | 0.92 | kg |
| Incineration | 0.92 | 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 epoxy-resin, group 3

| Core Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|
| GWP-total | [kg $CO_2$-Eq.] | 5.20E+0 | 5.35E-2 | 1.95E-1 | 2.56E-4 | 1.14E-2 | 8.69E-1 | -3.53E-1 |
| GWP-fossil | [kg $CO_2$-Eq.] | 5.26E+0 | 5.30E-2 | 6.11E-2 | 2.45E-4 | 1.09E-2 | 3.95E-1 | -3.52E-1 |
| GWP-biogenic | [kg $CO_2$-Eq.] | -6.41E-2 | 1.55E-4 | 1.33E-1 | 1.14E-5 | 4.99E-4 | 4.74E-1 | -7.94E-4 |
| GWP-luluc | [kg $CO_2$-Eq.] | 1.93E-3 | 4.29E-4 | 2.30E-5 | 5.88E-9 | 2.57E-7 | 3.22E-5 | -2.22E-4 |
| ODP | [kg CFC11-Eq.] | 1.88E-14 | 6.36E-18 | 2.12E-16 | 2.61E-20 | 1.14E-18 | 2.78E-16 | -3.29E-15 |
| AP | [mol $H^+$-Eq.] | 8.18E-3 | 1.59E-4 | 1.13E-4 | 3.32E-6 | 3.44E-5 | 4.83E-4 | -4.66E-4 |
| EP-freshwater | [kg P-Eq.] | 1.46E-5 | 1.61E-7 | 1.51E-7 | 5.29E-11 | 2.31E-9 | 9.53E-8 | -4.08E-7 |
| EP-marine | [kg N-Eq.] | 2.54E-3 | 7.07E-5 | 3.52E-5 | 1.50E-6 | 1.58E-5 | 1.85E-4 | -1.23E-4 |
| EP-terrestrial | [mol N-Eq.] | 2.64E-2 | 7.92E-4 | 3.97E-4 | 1.65E-5 | 1.74E-4 | 2.32E-3 | -1.32E-3 |
| POCP | [kg NMVOC-Eq.] | 9.90E-3 | 1.40E-4 | 8.01E-2 | 4.52E-6 | 3.12E-5 | 4.80E-4 | -3.56E-4 |
| ADPE | [kg Sb-Eq.] | 8.45E-6 | 3.80E-9 | 8.50E-8 | 7.41E-12 | 3.24E-10 | 4.25E-9 | -5.36E-8 |
| ADPF | [MJ] | 1.13E+2 | 7.05E-1 | 1.20E+0 | 3.51E-3 | 1.53E-1 | 5.08E-1 | -5.95E+0 |
| WDP | [$m^3$ world-Eq deprived] | 5.75E-1 | 4.73E-4 | 2.08E-2 | 4.84E-7 | 2.11E-5 | 1.44E-1 | -3.27E-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 epoxy-resin, group 3

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|
| PERE | [MJ] | 6.17E+0 | 3.96E-2 | 1.02E+0 | 1.11E-5 | 4.83E-4 | 8.61E-2 | -1.17E+0 |
| PERM | [MJ] | 9.36E-1 | 0.00E+0 | -9.36E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| PERT | [MJ] | 7.11E+0 | 3.96E-2 | 7.95E-2 | 1.11E-5 | 4.83E-4 | 8.61E-2 | -1.17E+0 |
| PENRE | [MJ] | 8.31E+1 | 7.06E-1 | 3.60E+0 | 3.51E-3 | 1.53E-1 | 2.81E+1 | -5.95E+0 |
| PENRM | [MJ] | 3.00E+1 | 0.00E+0 | -2.40E+0 | 0.00E+0 | 0.00E+0 | -2.76E+1 | 0.00E+0 |
| PENRT | [MJ] | 1.13E+2 | 7.06E-1 | 1.20E+0 | 3.51E-3 | 1.53E-1 | 5.08E-1 | -5.95E+0 |
| 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 | [$m^3$] | 1.72E-2 | 4.59E-5 | 5.27E-4 | 1.98E-8 | 8.66E-7 | 3.41E-3 | -1.35E-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 epoxy-resin, group 3

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|
| HWD | [kg] | -2.21E-6 | 3.28E-8 | -2.19E-8 | 3.40E-13 | 1.49E-11 | 1.63E-9 | -2.37E-9 |
| NHWD | [kg] | 3.91E-2 | 1.08E-4 | 4.82E-2 | 3.59E-7 | 1.57E-5 | 1.26E-1 | -2.61E-3 |
| RWD | [kg] | 1.79E-3 | 8.73E-7 | 2.01E-5 | 3.77E-9 | 1.64E-7 | 2.31E-5 | -3.99E-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 | 2.01E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| EET | [MJ] | 0.00E+0 | 0.00E+0 | 3.66E-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; EEE = Exported thermal energy |
|---|---|

## RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg of product based on epoxy-resin, group 3

| 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 nor 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 International Reference Life Cycle Data System (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

The majority of impacts are associated with the production phase (A1-A3). The most significant contribution to the production phase impacts is the upstream production of raw materials as the main driver. Another relevant 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 (to) the largest share.
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 the overall impacts. Climate change from land use change is the only indicator influenced by transport processes, due to the diesel production used as fuel, because part of this diesel has been produced from bio-based raw materials.
The installation phase mainly influence climate change indicators, due to the impact related to the incineration processes used for packaging waste treatment and residual product treatment (1 % of the total mass).
The end-of-life phases influence climate change indicators, due to the thermal treatment process of the resin occurring in C3 module.

## 7. Requisite evidence

**VOC**
Special tests and evidence have not been carried out or provided within the framework of drawing up this Model 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 to the 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 programmes 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 labeling programs are *EMICODE*, *Blue Angel* or *Indoor Air Comfort*.

Relevant test results shall be produced either by an *ISO 17025* accredited commercial test lab or by a qualified internal test lab of the manufacturer.
Examples of the applied limits after 28 days of storage in a ventilated test chamber are:
- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R-value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):
Table 1 shown below is an overview of the most relevant regulations and specifications as of October 2021, as regards requirements after 3 days of storage in a ventilated test chamber.
Table 2 provides an overview of the most relevant regulations and specifications as of October 2021, as regards requirements after 28 days of storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

| | 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 | -/- |

## 8. References

**ETAG 033**
ETAG 033:2010-09
Liquid applied bridge deck waterproofing

**EN 1015-17**
EN 1015-17:2005-01, Methods of test for mortar for masonry - Part 17: Determination of water-soluble chloride content of fresh mortars

**EN 1062-3**

EN 1062-3:2008-04, Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Part 3: Determination of liquid water permeability

**EN 1062-6**
EN 1062-6:2002-10, Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Part 6: Determination of carbon dioxide permeability

**EN 1504-2**
EN 1504-2:2004-10, Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete

**EN 1504-3**
EN 1504-3:2005-12, Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 3: Structural and non-structural repair

**EN 1504-4**
EN 1504-4:2004-11, Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity- Part 4: Structural bonding

**EN 1504-5**
EN 1504-5:2004-12, Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 5: Concrete injection

**EN 1542**
EN 1542:1999-07, Products and systems for the protection and repair of concrete structures - Test methods - Measurement of bond strength by pull-off

**EN 1771**
EN 1771:2004-11, Products and systems for the protection and repair of concrete structures - Test methods - Determination of injectability and splitting test

**EN ISO 3219**
EN ISO 3219:1994-10, Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate

**EN ISO 7783**
EN ISO 7783-1/-2:2019-02, Paints and varnishes - Determination of water-vapour transmission properties - Cup method

**EN 12190**
EN 12190:1998-12, Products and systems for the protection and repair of concrete structures - Test methods - Determination of compressive strength of repair mortar

**EN 13501-1**
EN 13501-1:2018, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

**EN 13813**
EN 13813:2002-10, Screed material and floor screeds - Screed materials - Properties and requirements

**EN 13892**
EN 13892:2003-02, Methods of test for screed materials - Part 8: Determination of bond strength

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

**EN 15804**
EN 15804+A2+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

**EN 16516**
EN 16516:2017
Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

**EN ISO 17025**
EN ISO 17025:2018-03
General requirements for the competence of testing and calibration laboratories

**EAD 030350-00-0402**
EAD 030350-00-0402:2018-08**,** Liquid Applied Roof Waterproofing Kits

**EAD 030352-00-0503**
EAD 030352-00-0503:2019-01, Watertight covering kits for wet room floors and or walls Part 1: Liquid Applied Coverings with or without wearing surface Part 2: Kits based on flexible sheets Part 3: Kits based on inherently watertight boards

**2000/532/EC**
Commission decision dated 3 May 2000 replacing decision 94/3/EC on a waste directory in accordance with Article 1 a) of Council Directive 75/442/EEC on waste and Council decision 94/904/EC on a directory of hazardous waste in terms of Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

**Belgian Royal Decree C-2014/24239**
Belgisch Staatsblad 8 MEI 2014, p. 60603. — Koninklijk besluit tot vaststelling van de drempelniveaus voor de emissies naar het binnenmilieu van bouwproducten voor bepaalde geoogde gebruiken

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

**Candidate list**
Candidate List of substances of very high concern for Authorisation, published in accordance with Article 59(10) of the REACH Regulation, ECHA, www.echa.europa.eu/candidate-list-table

**CPR**
CPR Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

**Decopaint Directive**
Directive 2004/42/CE of the European Parliament and the council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC

**EMICODE**
EMICODE, GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e. V. (pub.).www.emicode.de

**EWC**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes

**European List of Waste**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes

**GaBi 10 software & documentation**
Data base for Life Cycle Engineering LBP, University of Stuttgart and Sphera, documentation of GaBi 10 data sets http://documentation.gabi-software.com/, 2020

**German AgBB**
Committee for Health-related Evaluation of Building Products: health-related evaluation of emissions of volatile organic compounds (VOC and SVOC) from building products; status: June 2012 www.umweltbundesamt.de/produkte/bauprodukte/agbb.htm

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Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V. EPD programme. Version 2.0. Berlin: Institut Bauen und Umwelt e.V., 2021
www.ibu-epd.com

**Indoor Air Comfort**
Product certification by Eurofins, Hamburg, Germany www.eurofins.com

**PCR Part A**
Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, Version 1.1, Institut Bauen und Umwelt e.V., 2021-01

**PCR Part B**
Product Category Rules for Construction Products, Part B: Reaction resin products, 2019-01

**PG-FLK**
PG-FLK:2019-07
Testing principles regarding the issuing of general building authority inspection certificates for liquid applied products for waterproofing of buildings

**REACH**
Directive (EG) No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 on the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of the Council, Directive (EC) No. 1488/94 of the Commission, Guideline 76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission

**Publisher**
Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 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.
Hegelplatz 1
10117 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Logo

**Author of the Life Cycle Assessment**
Name
Straße, Nr.
PLZ, Ort
Land

Tel Nummer
Fax Nummer
Mail e-mail
Web **Web-Adresse**

**Owner of the Declaration**
FEICA - Association of the European Adhesive and Sealant Industry
Rue Belliard 40 box 10
1040 Brussels
Belgium

Tel +32 (0)267 673 20
Fax +32 (0)267 673 99
Mail info@feica.eu
Web **www.feica.eu**

Industrieverband Klebstoffe e.V
Völklinger Straße 4
40219 Düsseldorf
Germany

Tel +49 (0)211 67931-10
Fax +49 (0)211 67931-33
Mail info@klebstoffe.com
Web **www.klebstoffe.com**

Deutsche Bauchemie e.V.
Mainzer Landstr. 55
60329 Frankfurt
Germany

Tel +49 (0)69 2556-1318
Fax +49 (0)69 2556-1319
Mail info@deutsche-bauchemie.de
Web **www.deutsche-bauchemie.de**

EFCC - European Federation for Construction Chemicals
Boulevard du Triomphe 172
1160 Brussels
Belgium

Tel +32289720-39
Fax +32289720-37
Mail info@efcc.be
Web **www.efcc.eu**