# ENVIRONMENTAL PRODUCT DECLARATION

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

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|---|---|
| Owner of the Declaration | FEICA, EFCC, IVK, DBC |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
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| Valid to | 25.09.2027 |

## Modified mineral mortars, group 1

FEICA - Association of the European Adhesive and Sealant Industry

EFCC - European Federation for Construction Chemicals

IVK - Industrieverband Klebstoffe e.V.

DBC - Deutsche Bauchemie e.V.

Institut Bauen und Umwelt e.V.

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# 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.

Modified mineral mortars, group 1

**Programme holder**
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IVK, Völklingerstr. 4, D-40219 Düsseldorf

**Declaration number**
EPD-DBC-20220217-IBF1-EN

**Declared product / declared unit**
1 kg of modified mineral mortar with a density 800 - 1,700 kg/m³

**This declaration is based on the product category rules:**
Mineral factory-made mortar, 11.2017
(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 FEICA, EFCC, DBC 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**
26.09.2022

**Valid to**
25.09.2027

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**

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|---|
| 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.)

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Matthias Schulz
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# 2. Product

## 2.1 Product description/Product definition

Modified mineral mortars are combinations of one or more inorganic binders, fillers, aqueous dispersions or dispersion powders, water and if necessary additives. They comply with manifold, often specific, functions in the construction, furnishing and refurbishment 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 the 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

Modified mineral mortars are used for the following applications:

**Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures**
**1.1** Products used to restore and/or replace defective concrete
**1.2** Products to protect reinforcement, necessary to extend the service life of a concrete structure exhibiting deterioration

**Module 2: Adhesives based on modified mineral mortars**
**2.1** Products for bonding ceramic tiles as well as natural stone for internal and external installations on walls, floors and ceilings
**2.2** Products for bonding thermal insulation composite panels

**Module 3: Modified mineral mortars as joint fillers**
Products for joint filling of wall and floor coverings made of ceramic tiles as well as natural stone for indoor and outdoor applications

**Module 4: Modified mineral mortars as screed, floor levelling compounds, fillers, flowing screed**
Products for screed/synthetic resin screed for use in floor constructions

**Module 5: Modified mineral mortars as levelling compounds for walls and ceilings**
Products for levelling and repairing rough, uneven walls, for repairing grit spots, closing blowholes and modelling broken corners and edges

**Module 6: Modified mineral mortars as grouts**
Products for grouting on holes, recesses, concrete precast columns, foundations and for anchoring machine components indoors and outdoors

**Module 7: Modified mineral mortars for liquid applied products for waterproofing of buildings**
Products for providing cement-based waterproofing surfaces in structural and civil engineering. For use in new and old buildings as well as beneath tiles
**7.1** Liquid-applied water impermeable products for use beneath ceramic tiling
**7.2** Products for waterproofing with mineral waterproofing slurries or flexible polymer modified thick coatings
**7.3** Products for water proofing in conjunction with ceramic tiles
**7.4** Products for waterproofing with flexible polymer modified mineral thick coatings

**Module 8: Modified mineral mortars for waterproofing floors and/or walls inside buildings**
Products for watertight covering in wet rooms inside buildings

## 2.3 Technical Data

The density of the products is between 0,80 and 1,70 g/cm³, other relevant technical data can be found in the manufacturer's technical documentation.
Construction products with Declaration of Performance in accordance with *CPR* and the manufacturer's technical documentation:

**Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures**
**1.1** Products used to restore and/or replace defective concrete
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 ion content (*EN 1015-17*)
- Adhesive strength by pull-off test (*EN 1542*)

**1.2** Products to protect reinforcement
The requirements on essential characteristics for all intended uses in accordance with *EN 1504-7*, Table 1, must be maintained. This is
- Corrosion protection (*EN 15183*)
Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

**Module 2: Adhesives based on modified mineral mortars**
**2.1** Products for bonding ceramic tiles as well as natural stone for internal and external installations on walls, floors and ceilings
The requirements on essential characteristics according to *EN 12004*, Table 1, must be maintained. These are:
- Tensile adhesion strength after dry storage (*EN 12004-2*)
- Tensile adhesion strength after water immersion (*EN 12004-2*)
- Tensile adhesion strength after heat ageing (*EN 12004-2*)
- Tensile adhesion strength after freeze/thaw cycles (*EN 12004-2*)
- Open time: Tensile strength (*EN 12004-2*)
Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance
**2.2** The minimum requirement of *EAD 040083-00-0404* External Thermal Insulation Composite Systems with Rendering must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.). Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

**Module 3: Modified mineral mortars as joint fillers**
The minimum requirements of *EN 13888* must be maintained.

**Module 4: Modified mineral mortars as screed, floor levelling compounds, fillers, flowing screed**
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 5: Modified mineral mortars as levelling compounds for walls and ceilings**
**Module 5.1:** The minimum requirements of *EN 998-1* apply. These are: - Reaction to fire (*EN 13501-1*) -

Compressive strength - Dry bulk density - Capillary water absorption - Water vapour permeability
Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance
**Module 5.2:** The minimum requirements of *EN 13279* apply. Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

**Module 6: Modified mineral mortars as grouts**
The requirements of *DAfStb Guideline* on 'Production and use of cement-bound flow concrete and grouting mortar' (VeBMR) must be maintained.
The requirements according to *MVV TB* No. C 2.1.4.5 for "Ü-mark" must be maintained.

**Module 7: Modified mineral mortars for liquid applied products for waterproofing of buildings**
**7.1**
The requirements according to *EN 14891* , table 1, must be maintained. These are:
- initial tensile adhesion strength *EN 14891*
- Tensile adhesion strength after water contact *EN 14891*
- Waterproofing *EN 14891*
- Crack bridging ability *EN 14891*

**7.2**
The minimum requirements of the 'Testing principles for granting general building authority approved test certificates for waterproofing with mineral waterproofing slurries and flexible polymer modified thick coatings' (*PG MDS/FPD*) 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 waterproofing with mineral waterproofing slurries and flexible polymer thick coatings.

**7.3**
The minimum requirements of the 'testing principles for granting general building authority approved test certificates for waterproofing in conjunction with ceramic tiles' (*PG AIV*) must be considered.

**7.4**
The minimum requirement of *EAD 030295-00-0605* must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

**Module 8: Modified mineral mortars for waterproofing floors and/or walls inside buildings**
The minimum requirement of *EAD 030352-00-0503* must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

**Constructional data**

| Name | Value | Unit |
|---|---|---|
| Compressive strength | - | N/mm² |
| Adhesive shear strength | - | N/mm² |
| Water absorption | - | mg |
| Water vapor diffusion equivalent air layer thickness | - | m |
| Thermal conductivity | - | W/(mK) |
| Tensile bond strength | - | N/mm² |
| Flexural strength | - | N/mm² |
| Sound absorption coefficient (if relevant) | - | % |

### 2.4 Delivery status
Modified mineral mortars are generally manufactured and supplied as factory-made dry mortars. Factory-made dry mortar is a finished mixture of base materials which merely requires the addition of water and/or a polymer dispersion on the building site. The products can be supplied in 1-5 kg bags, 15-25 kg sacks, big bags (1 t), minitainers (1.2 t) or as silo goods (5-15 t). Paper sacks with polyethylene lining were modelled as packaging (worst-case approach).

### 2.5 Base materials/Ancillary materials
**Typically**, the products covered by this EPD contain the following range of base materials and auxiliaries (% by mass):
Inorganic binder: ~ 2 - 98
Filler materials: ~ 0 - 90
Additives: ~ 0 - 10
Aqueous dispersion and/or dispersion powder: ~ 0 - 35

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 raw materials are stored in silos, big bags or sacks in the manufacturing plant and fed gravimetrically in

accordance with the respective formula and mixed intensively. The mix is then packaged.

### 2.7 Environment and health during manufacturing

The state of the art involves maximum recirculation of dry waste into production. Wherever dust is incurred during production in the plant, it is directed to a filter system considering the limit values applicable for the workplace and using the corresponding extraction plants. Sack discharge stations connected to the extraction plant offer employees additional protection from dust. Most of the dust collected in the filter system and any residue incurred during production is returned to the manufacturing process.
**Powder residues:** Residual product is returned to the production process wherever possible.
**Air:** Process air is dedusted autonomously, whereby the values are far below legal requirements.
**Water:** The production process does not involve water. Very low volumes of water are required for laboratory tests and for sanitary facilities.
**Noise:** Noise level measurements have indicated that all values established within the production facility fall below the hearing protection limit of 85dB(A).
**Waste:** The main types of waste are powder waste, paper (paper bags) and foil. Low volumes of metal scrap (metal containers), waste oil (maintenance), wood (pallets) and commercial waste are incurred. All waste is separated, stored and redirected to the recycling circuit or disposed of.

### 2.8 Product processing/Installation

Modified mineral mortars can be processed both automatically and manually. The mortars are either automatically removed from a silo using a dry conveyor or manually taken from the container, mixed with water and installed. The professional liability association's rules apply as well as the respective safety data sheets pertaining to the construction products. On account of the various hydrate levels of cement, lime and calcium sulphate binding agents in the mineral mortar, the fresh mortar mixed with water is usually strongly alkaline. In the case of more extensive contact, this alkaline state can cause serious damage to eyes and skin. Therefore, any contact with eyes or skin must be avoided by taking personal protective measures, and the information outlined on the safety data sheet must be observed. Uncontrolled dust emissions should be avoided. Modified mineral mortars may not be discharged into the sewage system, surface water or groundwater. Waste incurred on the building site (packaging, pallets, residual mortar) must be collected separately. Suitable waste disposal companies dispose of packaging materials and mortar sacks and return them to the recycling circuit. Dry mortar residue is taken back by the manufacturing plants and used as a raw material. No dry mortar residue in mortar sacks is incurred. Hard mortar residue can be recycled or disposed of as building site rubble.

### 2.9 Packaging

A detailed description of packaging is provided in section 2.4. Empty, trickle-free paper containers and clean PE foils can be recycled.

### 2.10 Condition of use

A modified mineral mortar does not rot and is resistant to ageing when used in accordance with the designated purpose of the respective products. It is a durable product which, when used as adhesive, screed, waterproofing material or repair product, makes an essential contribution towards improving building function and value.

### 2.11 Environment and health during use

Owing to the stable crystalline bond and firm structure achieved after curing, emissions are extremely low and harmless to health when the respective products are used in accordance with the designated purpose. No risks are known for water, air and soil if the products are used as designated. Natural ionising radiation from mineral mortar is extremely low and negligible in terms of health hazards. Options for applications in indoor areas with permanent stays by people: Evidence of the emission performance of construction products in contact with indoor air and depending on the designated use must be submitted for applications in indoor areas with permanent stays by people, e.g. in accordance with the *German AgBB* test scheme or the *GEV* (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf) *EMICODE*® marking system typically applied in Germany.

### 2.12 Reference service life

Modified mineral mortars 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**
In accordance with Commission Decision 94/611EC, modified mineral binding agents comprising finely distributed organic components must always be classified in reaction-to-fire class A1 ‘No contribution to fire’ in accordance with *EN 13501-1*.
Where higher percentages of organic components are involved, it can also be assumed that at least the requirements of *EN 13501-1* are maintained for fire class E and Efl.

**Fire protection**

| Name | Value |
|---|---|
| Building material class | - |
| Burning droplets | - |
| Smoke gas development | - |

**Water**
No relevant volumes of water-soluble substances hazardous to water are washed out when hardened modified mineral mortars are exposed to water (e.g. flooding). Modified mineral mortar is stable in terms of structure and is not subject to any changes in form when exposed to water and drying. If non-hardened modified mineral mortars are exposed to water an increase of the pH will take place.

**Mechanical destruction**
The mechanical destruction of modified mineral mortars does not lead to any decomposition products which are harmful to the environment or health. Dust

incurred during de-construction should be avoided by taking the appropriate measures (e.g. humidification).

### 2.14 Re-use phase

Components manufactured using modified mineral mortars can usually be easily demolished. When a building is removed, the materials do not need to be treated as special waste; care should, however, be taken to ensure unmixed residual materials wherever possible. Modified mineral mortars can usually be redirected to normal building material recycling circuits. Re-use is generally in the form of recycled aggregate in building construction and civil engineering. No practical experience is currently available for reusing components comprising cementitious-based products after decommissioning.

### 2.15 Disposal

The portion of a modified mineral mortar applied to another construction product is rather low. These low amounts do not play a role when the construction product is disposed of. They do not interfere with the disposal/recycling of other components/building materials.
The following waste codes according to the European List of Waste (*2000/532/EC*) can apply:
Mineral mortar: *EWC 17 01 01* and *EWC 10 13 14*
Mineral filler and levelling compound: *EWC 17 01 07*
Calcium sulphate-based filler and levelling compound: *EWC 17 08 02*

### 2.16 Further information

More information is available on the manufacturer's product or safety data sheets and is available 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 modified mineral mortar, group 1; applied into the building with a density of 800 - 1,700 kg/m³ in accordance with the IBU *PCR part B* for Mineral Factory-Made Mortars.
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–C4, and module D (A1–A3, C, D) and additional modules (A4-A5).

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | kg |
| Gross density | 800 - 1700 | 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. The end of life for the packaging material considered is described below:
  -Incineration, for materials like plastic, wood and paper.

-C1-C2-C4-D
The building deconstruction (demolition process) takes place in the C1 module which considers energy generation and consumption 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, landfilling is the only end-of-life scenario considered. This is modelled by the landfill process (module C4) 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 packaging that is 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 landfilling as a worst case.
An average of paper sacks with polyethylene lining 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 10* 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 datasets 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 10* 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 | - | kg C |
| Biogenic carbon content in accompanying packaging | 0.0194 | 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 $CO_2$ (0.0194 kg C *3.67 = 0.071 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 | 0.055 | kg |
| Material loss | 0.01 | kg |
| Water consumption | 0.0003 | $m^3$ |

Material loss considers the amount of product not used during the application phase into the building. This amount is 1 % of the product and, impacts related to the production of this part are assigned to the 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 A5.

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

| Name | Value | Unit |
|---|---|---|
| Collected as mixed construction waste | 1.121 | kg |
| Landfilling | 1.121 | kg |

The value above 1 kg is due to the use of water during the installation phase where 50 % of water evaporate while 50 % remain in the product.

# 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 | ND | X | X |

## RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg of modified mineral mortar, group 1

| Core Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| GWP-total | [kg $CO_2$-Eq.] | 4.88E-1 | 5.06E-2 | 1.05E-1 | 3.12E-4 | 1.39E-2 | 1.71E-2 | -3.50E-2 |
| GWP-fossil | [kg $CO_2$-Eq.] | 5.58E-1 | 5.00E-2 | 1.36E-2 | 2.98E-4 | 1.33E-2 | 1.70E-2 | -3.49E-2 |
| GWP-biogenic | [kg $CO_2$-Eq.] | -6.95E-2 | 1.46E-4 | 9.10E-2 | 1.38E-5 | 6.08E-4 | 5.38E-5 | -8.21E-5 |
| GWP-luluc | [kg $CO_2$-Eq.] | 4.13E-4 | 4.05E-4 | 5.72E-6 | 7.17E-9 | 3.13E-7 | 4.89E-5 | -2.45E-5 |
| ODP | [kg CFC11-Eq.] | 2.81E-11 | 6.01E-18 | 2.81E-13 | 3.18E-20 | 1.39E-18 | 6.30E-17 | -3.66E-16 |
| AP | [mol $H^+$-Eq.] | 1.80E-3 | 1.50E-4 | 3.50E-5 | 4.04E-6 | 4.19E-5 | 1.22E-4 | -4.90E-5 |
| EP-freshwater | [kg P-Eq.] | 9.16E-7 | 1.52E-7 | 1.49E-8 | 6.45E-11 | 2.81E-9 | 2.92E-8 | -4.52E-8 |
| EP-marine | [kg N-Eq.] | 3.45E-4 | 6.68E-5 | 8.93E-6 | 1.83E-6 | 1.92E-5 | 3.14E-5 | -1.27E-5 |
| EP-terrestrial | [mol N-Eq.] | 3.72E-3 | 7.48E-4 | 1.14E-4 | 2.01E-5 | 2.12E-4 | 3.45E-4 | -1.36E-4 |
| POCP | [kg NMVOC-Eq.] | 1.33E-3 | 1.32E-4 | 2.83E-5 | 5.51E-6 | 3.80E-5 | 9.51E-5 | -3.64E-5 |
| ADPE | [kg Sb-Eq.] | 5.74E-8 | 3.59E-9 | 7.92E-10 | 9.03E-12 | 3.94E-10 | 1.53E-9 | -5.74E-9 |
| ADPF | [MJ] | 9.91E+0 | 6.66E-1 | 1.24E-1 | 4.27E-3 | 1.86E-1 | 2.23E-1 | -5.92E-1 |
| WDP | [$m^3$ world-Eq deprived] | 8.79E-2 | 4.47E-4 | 2.42E-2 | 5.90E-7 | 2.58E-5 | 1.78E-3 | -3.63E-3 |

| Caption | GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential |
|---|---|

## RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg of modified mineral mortar, group 1

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| PERE | [MJ] | 9.81E-1 | 3.74E-2 | 7.42E-1 | 1.35E-5 | 5.88E-4 | 2.92E-2 | -1.30E-1 |
| PERM | [MJ] | 7.21E-1 | 0.00E+0 | -7.21E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| PERT | [MJ] | 1.70E+0 | 3.74E-2 | 2.15E-2 | 1.35E-5 | 5.88E-4 | 2.92E-2 | -1.30E-1 |
| PENRE | [MJ] | 8.86E+0 | 6.67E-1 | 2.01E-1 | 4.28E-3 | 1.87E-1 | 2.23E-1 | -5.92E-1 |
| PENRM | [MJ] | 1.05E+0 | 0.00E+0 | -8.66E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| PENRT | [MJ] | 9.91E+0 | 6.67E-1 | 1.14E-1 | 4.28E-3 | 1.87E-1 | 2.23E-1 | -5.92E-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 | [$m^3$] | 2.46E-3 | 4.33E-5 | 5.71E-4 | 2.42E-8 | 1.05E-6 | 5.63E-5 | -1.50E-4 |

| 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 modified mineral mortar, group 1

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| HWD | [kg] | 2.60E-5 | 3.10E-8 | 2.60E-7 | 4.15E-13 | 1.81E-11 | 3.40E-9 | -2.36E-10 |
| NHWD | [kg] | 3.12E-2 | 1.02E-4 | 1.44E-2 | 4.37E-7 | 1.91E-5 | 1.12E+0 | -2.74E-4 |
| RWD | [kg] | 2.46E-4 | 8.25E-7 | 3.74E-6 | 4.59E-9 | 2.00E-7 | 2.54E-6 | -4.43E-5 |
| 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 | 1.48E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| EET | [MJ] | 0.00E+0 | 0.00E+0 | 2.66E-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; EET = Exported thermal energy |
|---|---|

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg of modified mineral mortar, group 1**

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C4 | 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

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. Besides the cement also the dispersion powder influences the results significantly, although this is only used for up to 8 % of the total composition. Significant contributions to Primary Energy Demand – Non-renewable (PENRT) derive from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (PERT) is the consumption of renewable energy resources required for the generation and supply of electricity. During manufacturing (A1-A3) some influence also arises due to the wooden pallets and paper used as packaging that need solar energy for photosynthesis. 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.

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.
Transportation to the construction site (A4) and the installation process (A5) make a minor contribution to almost all impacts. The only exception is a relevant influence of carbon dioxide emissions in module A5 to Global Warming Potential (GWP) due to the incineration of the packaging materials plastic, paper and pallets.
In module A4, transport to construction site, values for Eutrophication (freshwater, marine and terrestrial) have an impact due principally to the emission of phosphate. Furthermore, climate change from land use change is 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 end-of-life phases have a negligible influence on all impacts.

## 7. Requisite evidence

Leaching
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 leaching for specific areas of application. This documentation has to be provided separately and is specific to the product in question.

If of relevance for the application (usually if the products are used outside of buildings) the leaching behaviour has to be measured e.g. according to *DIN EN 12457/1--4* or *DIN EN 14405* combined with the Council decision *2003/33/EC*.

## 8. References

**EN 998-1**

EN 998-1:2016, Specification for mortar for masonry – Part 1: Rendering and plastering mortar

**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 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 1504-7**
EN 1504-7:2006-08, Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 7: Reinforcement corrosion protection

**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 12004**
EN 12004:2012, Adhesives for tiles – Requirements, evaluation of conformity, classification and designation

**EN 12004-2**
EN 12004-2:2017, Adhesives for ceramic tiles - Part 2: Test methods

**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

**DIN EN 12457-1**
DIN EN 12457-1:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular and sludges - Part 1: One stage batch test at a liquid to solid ration of 2 l/kg with particle size below 4 mm (without or with size reduction)

**DIN EN 12457-2**
DIN EN 12457-2:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular and sludges - Part 2: One stage batch test at a liquid to solid ratio of 10 l/kg with particle size below 4 mm (without or with size reduction)

**DIN EN 12457-3**
DIN EN 12457-3:2021-03, Characterization of waste - Leaching - Compliance test for leaching of granular waste materials and sludges - Part 3: Two stage batch test at a liquid to solid ratio of 2 l/kg and 8 l/kg for materials with high solid content with particle size below 4 mm (without or with size reduction)

**DIN EN 12457-4**
DIN EN 12457-4:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular waste materials and sludges - Part 4: One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 10 mm (without or with limited size reduction)

**EN 13279**
EN 13279-1:2008, Gypsum binders and gypsum plasters – Part 1: Definitions and requirements

**EN 13501-1**
EN 13501-1:2018, Fire classification of construction products and building products – 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 13888**
EN 13888:2009, Grout for tiles – Requirements, evaluation of conformity, classification and designation

**EN 13892-8**
EN 13892-8:2003-02, 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

**DIN EN 14405**
DIN EN 14405:2017-05, Characterization of waste - Leaching behaviour test - Up-flow percolation test (under specified conditions)

**EN 14891**
EN 14891:2012-04, Liquid-applied water impermeable products for use beneath ceramic tiling bonded with adhesives – Requirements, test methods, evaluation of conformity, classification and designation

**EN 15183**
EN 15183:2006-11, Products and systems for the protection and repair of concrete structures – Test methods – Corrosion protection test

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

**EAD 030295-00-0605**
EAD 030295-00-0605, Flexible polymer modified mineral thick coating

**EAD 030352-00-0503**
EAD 030352-00-0503:2019:01, Liquid applied watertight covering kits for wet room floors and/or walls

**EAD 040083-00-0404**
EAD 040083-00-0404:2013, External Thermal Insulation Composite Systems with Rendering

**96/603/EC**
Commission decision of 4 October 1996 for specifying a directory of products to be classified as category A "No contribution to fire" in accordance with decision 94/611/EC on construction products for implementing Article 20 of Directive 89/106/EEC

**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

**2003/33/EC:**
Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC

**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

**DAfStb Guideline**
DAfStb Guideline on 'Production and use of cement-bound flow concrete and grouting mortar' (VeBMR), 2019-07

**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

**EWC 101314**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Waste concrete and concrete sludge

**EWC 170101**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Concrete

**EWC 170107**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Mixtures of concrete, bricks, tiles and ceramics

**EWC 170802**
2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Gypsum based construction metals e.g. for plasterboard

**GaBi 10**
GaBi 10: Software and database for comprehensive analysis. LBP, University of Stuttgart and Sphera, 2020

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

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**MVV TB**
Ü-mark in accordance with 'Model Administrative Order laying down Technical Building Regulations' (MVV TB) no. C 2.1.4.5

**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: Mineral Factory-Made Mortars, 2017-11

**PG AIV**
Testing principles regarding the issuing of general building authority test certificates for waterproofing with waterproofing in conjunction with ceramic tiles (PG-AIV:2018-03)

**PG MDS/FPD**
Testing principles regarding the issuing of general building authority test certificates for waterproofing with mineral waterproofing slurries and flexible polymer thick coatings (PG-MDS/FPD:2016-11)

**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.

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