Construction Products Group Europe

www.cpg-europe.com

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804

With this declaration, Tremco CPG Europe confirms that the following product(s):

Flowfast 202 SL Binder/Duracon 202 (filled)
Flowfast 203 Hot Binder/Duracon 203 (filled)
Flowfast 205 Standard Binder/Duracon 205 (filled)
Flowfast 208 Cove Mix/Duracon 208 (filled)
Flowfast 215 Flexible Binder/Duracon 215 (filled)
Flowfast 216 Flexible Binder R/Duracon 216 (filled)

are covered by DBC enclosed model EPD, which indicates that the provided LCA data and the other data and information from the attached model EPD are applied and can be used.

As a member of DBC (Deutsche Bauchemie e.V.), Tremco CPG Europe, can use these model EPD's and confirms that the manufacturing technology and the mentioned finished product's chemical composition are covered by the DBC's enclosed model EPD, which is verified by IBU (Institut Bauen und Umwelt e.V.).

Program	In compliance with DBC EPD model
Program Holder	Institut Bauen und Umwelt e.V (IBU)
Publisher	Institut Bauen und Umwelt e.V (IBU)
Declaration Number	EPD-DBC-20190118-IBE1-EN

Warsaw, Poland
01-10-2021

Name: Mikołaj Tokarski
Job title: Category Manager
Tremco CPG Europe

ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	**Deutsche Bauchemie e.V.**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DBC-20190118-IBE1-EN
Issue date	25.03.2020
Valid to	24.03.2025

Methacrylate resin products, highly filled, flow coatings

Deutsche Bauchemie e.V.

Institut Bauen und Umwelt e.V.

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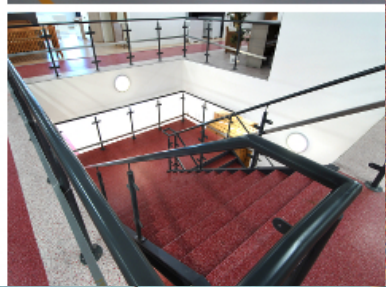
DEUTSCHE BAUCHEMIE



1. General Information

Deutsche Bauchemie e.V.

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-DBC-20190118-IBE1-EN

This declaration is based on the product category rules:
Reaction resin products, 07.2014
(PCR checked and approved by the SVR)

Issue date
25.03.2020

Valid to
24.03.2025

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

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

Methacrylate resin products, highly filled, flow coatings

Owner of the declaration
Deutsche Bauchemie e.V.
Mainzer Landstraße 55
60329 Frankfurt

Declared product / declared unit
1kg/1kg; Density 1,200 to 2,200 kg/m³

Scope:
This declaration is exclusively valid for the specified product groups (methacrylate resin products, highly filled, flow coating) for works in Germany and Belgium for five years after the date of issue.

This is a model EPD based on model declaration EPD-DBC-20130101-IBE1-DE in which the product which exhibits the highest environmental impact in a particular group was selected from the group to calculate the LCA. The members of the association are listed on the association website.

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+A1*. 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 14025:2010*
☐ internally ☒ externally

Matthias Schulz
(Independent verifier appointed by SVR)

2. Product

2.1 Product description/Product definition

The reaction resins are produced as two components by using methacrylate formulations and hardeners.

They fulfil a wide variety of often specialised tasks in the construction, furnishing, repair and waterproofing of buildings. The serviceability of structures can be decisively improved and their service life considerably extended through the use of methacrylate-based reaction resins.

Product in accordance with the CPR based on an hEN;
EU regulation no. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance including

· /EN 1504/, Parts 2, 3, and 6 Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity (**Module 1**). The respective national regulations apply to use.
or
/EN 13813/ Screed material and floor screeds – Screed material – Properties and requirements (**Module 4**). The respective national regulations apply to use.

Product in accordance with the CPR based on an ETA:
EU regulation no. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland).

· The product requires a declaration of performance taking into consideration /ETAG 033 and/or EAD/ Liquid applied Bridge Deck waterproofing Kits and CE marking (**Module 2).** The respective national regulations apply to use.
or

· The product requires a declaration of performance taking into consideration /ETAG 022 and/or EAD 030352-00-0503/ Watertight covering kits for wet room floors and or walls (**Module 3.1**). The respective national regulations apply to use.

Product which is not subject to any EU harmonisation legislation:

The respective national regulations apply to use of the product at the location of use, in Germany for example the /building regulations of the federal states/ and the technical regulations based on these regulations:

· **Modules 3.2, 5, 6 and 7**

2.2 Application

Methacrylate resin products, highly filled, are used for the following applications:

Module 1: *Reaction resins to protect and repair concrete building components*
Products for surface protection of concrete, 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 for structural and non-structural repair used for restoring the original condition of concrete supporting structures and/or replacing faulty concrete and providing reinforcements with protection (Requirements 1.2), as well as products for anchoring of reinforcing steel bars (Requirements 1.3).

Module 2: *Reaction resins for liquid-applied bridge deck waterproofing kits*
Products for liquid-applied waterproofing kits for use on concrete bridge decks (Requirements 2.1 and 2.2) and products for liquid-applied waterproofing kits for use on steel bridge decks (Requirements 2.3).

Module 3: *Reaction resins for watertight covering kits*
Products for waterproofing floors and/or walls in wet rooms (Requirements 3.1) and waterproofing products in accordance with /DIN 18534-3/ and /DIN 18535-3/ (Requirements 3.2).

Module 4: *Screed material and floor screeds*
Products for screed / synthetic resin screed for use in floor constructions.

Module 5: *Liquid-applied products for waterproofing buildings*
Liquid-applied products for waterproofing buildings.

Module 6: *Liquid-applied products for waterproofing joints*
Reaction resins for use as joint sealants

Module 7: *Reaction resins for waterproofing concrete components or masonry and for pre-treating mineral substrates such as screed or concrete floors or for optical design*
To be applied in accordance with the manufacturer's technical documentation / declaration of performance.

2.3 Technical Data

Information on construction product performance in relation to their technical properties is contained in the declaration of performance in accordance with EU Regulation No. 305/2011 (Construction Products Regulation).

Construction products with declaration of performance in accordance with the building products regulations.

Module 1: *Reaction resins for protecting and repairing concrete structures*
The minimum requirements according to /EN 1504/ are to be complied with. They are as follows:

1.1 Surface protection for concrete - requirements regarding essential characteristics for all intended uses in accordance with /EN 1504-2/, Tables 1 and 5:
· CO2 permeability/EN 1062-6/
· Water vapour permeability /ISO 7783-1/ and /ISO 7783-2/
· Capillary absorption and water permeability /EN 1062-3/
· Pull-off test to test adhesive strength /EN 1542/
1.2 Products for structurally relevant and non-relevant repair - requirements regarding essential characteristics for all intended uses in accordance with /EN 1504-3/, Tables 1 and 3:
· Compressive strength /EN 12190/
· Chloride ion content /EN 1015-17/
· Adhesive strength /EN 1542/
1.3 Products for anchoring reinforcing bars – requirements regarding essential characteristics for all intended uses in accordance with /EN 1504-6/, Table 1:
· Pull-out resistance /EN 1881/
· Chloride ion content /EN 1015-17/
· Glass transition temperature /EN 12614/
· Creep behaviour under tensile load /EN 1544/
Further essential characteristics in accordance with the manufacturer's technical documentation//declaration of performance.

Module 2: *Reaction resins for liquid-applied bridge deck waterproofing kits*
2.1 The requirements in accordance with /ZTV ING Part 7, Section 3/ (ZTV BEL-B Part 3) are to be complied with.

2.2 The minimum requirements in accordance with /ETAG 033 and/or EAD/ Liquid-applied bridge deck waterproofing kits are to be complied with. The essential characteristics are to be specified in accordance with the European technical approval/assessment (ETA, specification no.).

2.3 The requirements in accordance with /ZTV ING Part 7, Sections 4 and 5/ are to be complied with. The performance characteristics are to be specified accordingly.

Module 3: *Watertight covering kits*
3.1 The minimum requirements of /ETAG 022 and EAD 030352-00-0503/ Seals for walls and floors in wet rooms must be complied with.
The essential characteristics are to be specified in accordance with the European technical approval/assessment (ETA, specification no.).

3.2 The minimum requirements of the Testing principles regarding the issuing of general building supervisory inspection certificates for liquid applied waterproofing materials used in conjunction with tiles and paving Part 1: Liquid applied waterproofing materials (/PG-AIV-F/) must be complied with.
The characteristics are to be specified in accordance with PG-AIV-F.

Module 4: *Screed material and floor screeds*
The minimum requirements of /EN 13813/, Screed material and floor screeds – Screed material – Properties and requirements must be complied with. These are as follows for synthetic resin screeds:
· Tensile adhesive strength (EN 13892-8)
· fire behaviour (EN 13501-1)

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

Module 5: *Liquid-applied waterproofing for waterproofing buildings*
The minimum requirements of the Testing principles regarding the issuing of general building supervisory inspection certificates for liquid applied products for waterproofing of buildings (/PG-FLK/) must be complied with.

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 products for waterproofing buildings.

Module 6: *Liquid-applied products for waterproofing joints*
Reaction resins for use as joint sealants
Essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance.

Module 7: *Reaction resins for waterproofing concrete components or masonry and for pre-treating mineral substrates such as screed or concrete floors or for optical design*

The following requirements must be fulfilled as a minimum:

Name	Value	Unit
Viscosity /ISO 3219/	< 200	Pa·s
Shore hardness A /ISO 7619-1/	> 50	-
Shore hardness D /ISO 7619-1/	> 25	-
Debsity /ISO 2811-1/	1,2 - 2,2	kg/dm³

Note: Specification of tensile shear strength and tensile adhesive strength in accordance with /DIN EN 14239/ are not typical properties of MMA resins.

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

Product in accordance with the CPR based on an hEN:
Performance data of the product in accordance with the declaration of performance in relation to its essential characteristics in accordance with:
· /EN 1504/, Parts 2, 3, 6 Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity (**Module 1**).
or
· /EN 13813/ Screed material and floor screeds – Screed material – Properties and requirements (**Module 4**).

Product in accordance with the CPR based on an ETA:
Performance data of the product in accordance with the declaration of performance in relation to its essential characteristics in accordance with
· /ETAG 033 and/or EAD/ *Liquid-applied bridge deck waterproofing kits* (**Module 2.1**)
or
· /ETAG 022 and/or EAD 03052-00-0503/ *Watertight covering kits for wet room floors and/or wall* (**Module 3.1**)

2.4 Delivery status

2.4.1 Reaction resins: Liquid or past-like in containers made of tin plate
Typical container sizes contain from 30 to 200 kg of material. IBCs (Intermediate Bulk Containers) with up to 1 tonne are used for larger applications. A tin container was modelled for the LCA.

2.4.2 Hardener (Initiator): Generally in powder form in cardboard containers with PE foil lining
The typical container size contains 25 kg. Smaller packages, ready-made to size, are also available.

2.5 Base materials/Ancillary materials

Methacrylate reaction resins, highly filled, consist of a resin and a hardening component. In most cases, the resin component contains methyl methacrylate as a main reactive ingredient and further co-monomers from the methacrylate or acrylate group. Hardening takes place after installation on-site using the hardening component. Radical-forming initiators which are added as a powdery hardener are used for hardening.

The components can contain dissolved polymers and other auxiliaries such as accelerators, wetting agents, foam regulators and viscosity regulators to configure the required application properties.

The mixing ratio for resin and hardener is set according to the specifications depending on the temperature. Product hardening begins directly after the components have been mixed. On average, products covered by this EPD contain the basic and ancillary materials listed within the following margins:

For flow coatings:
Filler: 65 - 80 %
Acrylate: < 35 %
Others: < 5 %

The margins specified are average values and the composition of products which comply with the EPD can deviate from the specified concentration margins in individual cases.

More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).

1) Does the product contain materials from the ECHA list of materials which are especially problematic for approval: Substances of Very High Concern – SVHC) (Date 16/01/2020) above a mass percentage of 0.1: yes.

This is dicyclohexyl phthalate (DHCP). A number of products which are covered by this model EPD still contain DHCP in concentrations above 0.1%. It is to be

anticipated that DHCP will be completely substituted by the beginning of 2021 and no longer used in the products.

Insofar as products contain other REACH candidate list substances (list as per Article 59 Paragraph 1 of the REACH regulation), these are listed as from a concentration of 0.1% together with other ingredients which must be declared in Section 3 of the safety data sheet for the respective product.

2) Does the product contain further Category 1A or 1B CMR materials which are not on the candidate list at a mass % concentration of above 0.1 in at least one partial product: no.

None of the input materials were classified as category 1A or 1B CMR at the time this model EPD was issued. Substances classified as Category 1A/1B as CMR as from a concentration of 0.1% may be listed next to other ingredients to be declared in Section 3 of the safety data sheet of the respective product.

3) Were biocidal products added to this construction product or was it treated with biocidal products (is this therefore a treated article in terms of the EU Biocide Product Regulation no. 528/2012): no.

2.6 Manufacture

The formulated product components are generally mixed together from the ingredients in a batch process and packed into the supply container. Quality standards in accordance with /ISO 9001/ and the provisions of relevant regulations such as the Industrial Safety Regulation and the Federal Emissions Control Act are complied with.

2.7 Environment and health during manufacturing

Generally, no further environmental protection measures beyond those which are legally prescribed are necessary.

2.8 Product processing/Installation

Methacrylate resin products, highly filled, are applied by trowelling/knife-coating or rolling, pouring or injection. Work safety measures (hand and eye protection and ventilation) are to be taken in accordance with the specifications in the safety data sheet and the conditions on-site and consistently complied with.
Methacrylate resin products, unfilled or low filled, are generally assigned to the RMA 10 or RMA 20 GISCODE/GISBAU product code due to their composition.

Methacrylate resin products, highly filled, react after mixing resin and hardener under heat development (exothermicity). The mixed components should therefore be processed rapidly within the specified pot life. Larger quantities of the mixture remaining in the container can lead to intense heating and decomposition.

2.9 Packaging

Empty containers and clean cardboard boxes with PE foils can be recycled. Reusable wooden pallets are taken back by the building materials trade (reusable pallets against reimbursement within the deposit system), returned by them to building product manufacturers and returned to the production process.

2.10 Condition of use

In the use phase, methacrylate resin products are hardened and consist mainly of an inert three-dimensional network.
They are long-life products which protect buildings as a primer, sealant, coating or waterproofing and make a large contribution to their functionality and value retention.

2.11 Environment and health during use

Option 1: *Products for use outside of commonly used rooms*
During the use phase, methacrylate resin products, highly filled, have lost their reactivity and behave inertly.
No hazards for water, the air/atmosphere and soil are known of if used appropriately.

Option 2: *Products for use in commonly used rooms*
When used in commonly used rooms, evidence must be submitted which confirms that the emission performance complies with at least one of the following regulations or criteria:

- AgBB-VOC concept with additional product-related definitions for chamber loading, test specimen preparation etc.
- Emission classes A+, A, B or C in accordance with the French “Décret n° 2011-321”

No further influences on the environment or health from substances emitted are known of.

2.12 Reference service life

Methacrylate resin products, highly filled, fulfil a wide variety of frequently specialised tasks in the construction or restoration of buildings. The usability of building structures can be improved accordingly and their original service life significantly extended by their use. The anticipated reference service life depends on the specific installation situation and the associated exposure of the product. It can be influenced by weathering and also mechanical or chemical loads.

2.13 Extraordinary effects

Fire
Even without special fire protection equipment, methacrylate resin products, highly filled, fulfil the requirements of /EN 13501-1/ for fire classes E and Ef as a minimum. Cross-linked methacrylate resins do not melt and drip down so that the resins do not contribute in any way to the spread of a fire. In addition to the normal main products of carbon monoxide and carbon dioxide the combustion gases can contain traces of methyl methacrylate, esters, alcohols and hydrocarbons. In addition, due to the quantities in which they are used, they have only a minor influence on the fire properties of the buildings in which they are installed.

Water
Methacrylate resin products, highly filled, are chemically inert and insoluble in water. They are often used to protect buildings against damaging water ingress.

Mechanical destruction

The mechanical destruction of methacrylate-based reaction resins does not produce degradation products which are hazardous to the environmental or health.

2.14 Re-use phase

According to the current state of knowledge, no environmentally harmful effects are to be expected from dismantling and recycling components to which hardened methyl methacrylate-based products still adhere, for example by placing in landfill.
Due to their energy content, thermal recycling is a viable recycling variant if methyl methacrylate systems can be removed from the building components without appreciable time and effort.
The small amounts which still adhere are not significant for disposal. They do not disrupt the disposal or recycling of the remaining components/building materials.

2.15 Disposal

Individual components which can no longer be recycled must be mixed together at the prescribed ratio and hardened.

Hardened product residues are not hazardous waste. Non-hardened product residues are hazardous waste. Completely empty, dried containers (free of drops and scraped-clean) are recycled. Residual quantities are to be disposed of in accordance with the local regulations.

The following /EWC waste codes/ may be appropriate:

Non-hardened product residues:

- 070208 Reaction and distillation residues.
- 080111 Waste from the manufacture, formulation, sale, use (MFSU) and removal of paints and varnishes (paint and varnish residues which contain organic solvents or other hazardous substances).

2.16 Further information

Further information can be found in the manufacturer's product or safety data sheets and is also available from the manufacturer's website or on enquiry. Valuable technical information is also available from the association's website (www.deutsche-bauchemie.de).

3. LCA: Calculation rules

3.1 Declared Unit

This model EPD is based on the declared unit of 1 kg of methacrylate resin products, highly filled in accordance with /PCR Part B/ for reaction resins. An LCA for highly filled methacrylate products for flow coatings has been calculated in this EPD.
The product which has the highest environmental impact within the product group has been declared.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-
Density	1.200 - 2.200	kg/m³

Consumption per unit of area of products which are applied to flat surfaces can lie between a few hundred grams and more than 1 kg per m2. The mixing ratio of resin and hardener is included in the LCA with 0.66% hardener.
The quantity of hardener is measured according to the processing temperature and can range from 1% at 30°C to 6% at <0°C.
The density ranges from 1,200 to 2,200 kg/m³.

3.2 System boundary

Modules A1-A3, A4, A5 and D are included in the LCA:

- A1 Manufacture of pre-products
- A2 Transport to works
- A3 Production including energy provision, manufacture of packaging and also auxiliary and operating materials and waste treatment
- A5 Transport to the building site
- A5 Installation (burning of packaging materials (wooden pallets) and product residues, emissions during installation)
- D Credits from the burning of the packaging materials and product residues and from recycling the metal containers

This is a cradle to factory gate declaration.

3.3 Estimates and assumptions

If no specific /GaBi 8/ processes were available, the individual component ingredients of the formulations were estimated based on manufacturer specifications or literature.

3.4 Cut-off criteria

No cut-off rules were applied in calculating the LCA. All raw materials which were sent by the association for the formulations were included.
The manufacture of machines, systems and other infrastructure required to produce the products under consideration was not included in the LCA.

3.5 Background data

Data from the /GaBi 8B/ database was used as background data. This was supplemented by information from the manufacturer and research in the relevant literature If background data was not available.

3.6 Data quality

Representative products have been used and the product from the group which has the greatest environmental impact has been used to calculate the LCA results for this model EPD. The primary data is not more than 5 years old.

3.7 Period under review

Representative formulations from Deutsche Bauchemie e.V. From 2018 were compiled for the formulations. The production data relates to a primary data collection from 2017.

3.8 Allocation

No allocations were applied for production. However, production waste was sent to a waste incineration plant for disposal. Potential credits for electrical and thermal energy were calculated after incineration.
A multi-input allocation with a potential credit for electricity and thermal energy is deployed in

accordance with the simple credit method for the burning of the packaging. The potential credits from disposal of the packaging are credited in Module D.

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 used background database has to be mentioned. The /GaBi 8B/ background database was used for modelling.

4. LCA: Scenarios and additional technical information

The following information is the basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment if modules are not declared (MND).

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0016	l/100km
Transport distance	500	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1200 - 2200	kg/m^3
Capacity utilisation volume factor	100	-

Installation in the building (A5)

Name	Value	Unit
Auxiliary	0	kg
Water consumption	0	m^3
Other resources	0	kg
Electricity consumption	0.0033	kWh
Other energy carriers	0	MJ
Material loss (product remains in packaging)	0.01	kg
Output substances following waste treatment on site	-	kg
Dust in the air	-	kg
VOC in the air	0.004	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE 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	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 kg Methacrylate resin products, highly filled, flow coatings

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO_2-Eq.]	1.82E+0	2.77E-2	1.76E-1	-2.78E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.75E-14	9.43E-18	1.34E-16	-1.84E-15
Acidification potential of land and water	[kg SO_2-Eq.]	5.56E-3	5.73E-5	2.64E-5	-5.47E-4
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	4.42E-4	1.43E-5	5.60E-6	-5.84E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	5.88E-4	-1.97E-5	6.84E-4	-6.54E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.84E-5	2.61E-9	3.53E-9	-1.53E-5
Abiotic depletion potential for fossil resources	[MJ]	4.07E+1	3.69E-1	5.88E-2	-2.81E+0

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 kg Methacrylate resin products, highly filled, flow coatings

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	3.12E+0	2.25E-2	1.19E+0	-3.79E-1
Renewable primary energy resources as material utilization	[MJ]	1.16E+0	0.00E+0	-1.16E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	4.29E+0	2.25E-2	2.22E-2	-3.79E-1
Non-renewable primary energy as energy carrier	[MJ]	3.25E+1	3.70E-1	6.86E-2	-2.99E+0
Non-renewable primary energy as material utilization	[MJ]	9.55E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	4.21E+1	3.70E-1	6.86E-2	-2.99E+0
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	8.63E-2
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	7.93E-3	2.58E-5	4.40E-4	-3.60E-4

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 kg Methacrylate resin products, highly filled, flow coatings

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	3.33E-8	2.11E-8	7.94E-11	-1.84E-9
Non-hazardous waste disposed	[kg]	7.48E-2	2.49E-5	1.67E-3	-3.48E-3
Radioactive waste disposed	[kg]	5.40E-4	4.40E-7	3.87E-6	-7.12E-5
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	8.63E-2	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	1.00E-1	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	2.11E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	4.95E-1	0.00E+0

6. LCA: Interpretation

Overall, the results are dominated by the environmental impacts of the pre-products (Module A1) in all important impact categories. The methyl methacrylate (MMA) used plays a particularly large role here. Acrylic copolymer is the second significant pre-product, followed by 2-ethylhexyl acrylate and also quartz and the inorganic pigment.

Global warming potential (GWP), **eutrophication potential** (EP) and **photochemical ozone creation potential** (PCP) are dominated approximately equally by MMA (35 - 40 %), followed by 2-ethylhexyl acrylate (approx. 25 %) and acrylic copolymer (approx. 20 %).

Acidification potential (AP) is dominated to approximately 35 % by MMA, followed by inorganic pigment (approx. 30 %) and acrylic copolymer (approx. 20 %).

Only **photochemical ozone creation potential** (POCP) is not dominated by the manufacture of pre-products: These contribute just approximately 30% to POCP. The main share (approximately 45%) results from the installation of the MMA product through emissions from non-polymerised MMA. The characterisation factor for NMVOC was used since no specific characterisation factor was available for methyl

methacrylate. At approximately 10%, the manufacture of the product also shows a significant influence.

7. Requisite evidence

7.1 VOC evidence

No special tests and verifications have been done or provided as part of compiling this model EPD. Verification should be sought from the manufacturer insofar as products are deployed in any application area (e.g. common room) in which the verification/detection of VOC emissions in the common rooms are demanded.

Measurement procedure: GEV test method to determine emissions of volatile organic compounds from building products in accordance with /ISO 16000/ Part 3, Part 6, Part 9 and Part 11 in a test chamber. Test for CMR substances and also TVOC/TSVOC after 3 and 28 days.

The corresponding test certificate serves as **verification**. The results may be given in the form of an emissions class.

The following threshold values apply for products which are used in common rooms

Name	Value	Unit
TVOC (C6 - C16) after 3 / 28 d	10.000 / 1.000	µg/m³
Sum SVOC (C16 - C22) after 28 d	100	µg/m³
C1, C2 substances after 3 and 28 d	10 / 1 **	µg/m³
Total formaldehyde / acetaldehyde after 3 d	- / -	ppb
VOC without NIK after 28 d	-	µg/m³
R (dimensionless) after 28 d	1	-

* Total after 3 days
** per individual substance after 28 days

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