

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	Deutsche Bauchemie e.V.
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Methacrylate resin products, highly-filled, flow coatings Deutsche Bauchemie e.V.

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



Institut Bauen
und Umwelt e.V.

 **DEUTSCHE
BAUCHEMIE**



1. General information

Deutsche Bauchemie e.V.

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
D-10178 Berlin

Declaration number

EPD-DBC-20130101-IBE1-EN

This Declaration is based on the Product Category Rules:

Reactive resin products, 10-2012
(PCR tested and approved by the independent Expert Committee (SVA))

Issue date

31.07.2013

Valid until

31.07.2018



Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)



Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of the Expert Committee (SVA))

Methacrylate resin products, highly-filled, flow coatings

Holder of the Declaration

Deutsche Bauchemie e.V.
Mainzer Landstrasse 55
60329 Frankfurt

Declared product/unit

1 kg / 1 kg; density 800 - 2,000 kg/m³

Area of applicability:

This validated Declaration entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for the product groups referred to for plants in Germany and for a period of five years from the date of issue. The Declaration holder is liable for the details and documentation upon which the evaluation is based. It involves an association EPD based on the sample Declaration [EPD-DBC-number-data base system], for which the product displaying the highest environmental impact in a group was selected for calculating the Life Cycle Assessment. The members of the associations are indicated on the associations' Web sites.

The holder of the Declaration is liable for the information and evidence on which it is based; liability on the part of IBU in terms of manufacturer information, Life Cycle Assessment data and evidence is excluded.

Verification

The DIN EN 15804 CEN standard serves as the core PCR.

Verification of the EPD by an independent third party in accordance with ISO 14025

internally externally



Matthias Schulz,
Independent auditor appointed by the SVA

2. Product

2.1 Product description

Methacrylate resin products, highly-filled for mortar and flow coatings

These two-component reactive resins are manufactured using methacrylate formulations and hardening agents.

They fulfil manifold, often specific, tasks in the construction, furnishing, repair and waterproofing of buildings. Using reactive resins based on methacrylate decisively improves the fitness for use of structures and extends their service lives.

2.2 Application

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

Module 1: *Reactive resins for protecting and repairing concrete structures*

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: *Reactive 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: *Reactive resins for watertight covering kits*

Products for waterproofing floors and/or walls in wet rooms inside buildings (Requirements 3.1);

waterproofing against non-pressuring water at high levels of exposure and against pressuring water from the inside (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 waterproofing for waterproofing buildings

Liquid-applied waterproofing for waterproofing buildings

Module 6: Liquid-applied waterproofing for waterproofing joints

Reactive resins for use as joint sealants

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

Applications in accordance with the manufacturer's technical documentation (Declaration of Performance / Declaration of Conformity)

2.3 Technical data

Construction products with Declaration of Performance in accordance with BPVO

Module 1: Reactive resins for protecting and repairing concrete structures

The minimum requirements according to DIN EN 1504 "Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity" must be maintained. These are:

- 1.1 Surface protection of concrete - Requirements on performance characteristics for all intended uses in accordance with EN 1504-2, Tables 1 and 5:
 - Permeability to CO₂ (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 Products for structural and non-structural repair - Requirements on performance characteristics for all intended uses in accordance with EN 1504-3, Tables 1 and 3:
 - Compressive strength (EN 12190)
 - Chloride content (EN 1015-17)
 - Bond strength (EN 1542)
- 1.3 Products for anchoring of reinforcing steel bars
 - Pull-out resistance (EN 1881)
 - Chloride ion content (EN 1015-17)
 - Glass transition temperature (EN 12614)
 - Creep under tensile load displacement (EN 1544)

Other performance characteristics in accordance with the manufacturer's technical documentation / Declaration of Performance / Declaration of Conformity

Module 2: Reactive resins for liquid-applied bridge deck waterproofing kits

2.1 The requirements of ZTV ING Part 7, section 3 (ZTV BEL-B Part 3) must be maintained.

2.2 The minimum requirements of ETAG 033 "Guideline for the European technical approval for liquid-applied bridge deck waterproofing kits" must be maintained. The performance characteristics must be indicated in accordance with the European Technical Approval (ETA no.).

2.3 The requirements of ZTV ING Part 7, sections 4 and 5 must be maintained. The performance characteristics must be indicated accordingly.

Module 3: Watertight covering kits

3.1 The minimum requirements of ETAG 022

"Guideline for the European Technical Approval of watertight covering kits for wet room floors and/or walls" must be maintained.

The performance characteristics must be indicated in accordance with the European Technical Approval (ETA no.).

3.2 The minimum requirements of the "Testing principles for granting a general building authority approved test certificate for liquid applied waterproofing materials used in conjunction with tiles and paving. Part 1: Liquid waterproofing materials (PG-AIV-F)" must be maintained.

The characteristics must be indicated 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 materials – Properties and requirements" must be maintained. For synthetic resin screeds, these are:

- Bond strength (EN 13892-8)
- Reaction to fire (EN 13501-1)

Other performance characteristics in accordance with the manufacturer's technical documentation / Declaration of Performance / Declaration of Conformity

Module 5: Liquid-applied waterproofing for waterproofing buildings

The minimum requirements of the "Testing principles for granting a general building authority approved test certificate for waterproofing buildings with liquid plastics" (PG FLK) must be maintained.

The characteristics for the proof of applicability must be indicated in accordance with the "Testing principles for granting a general building authority approved test certificate for waterproofing buildings with liquid applied plastics".

Module 6: Liquid-applied waterproofing for waterproofing joints

Reactive resins for use as joint sealants

Performance characteristics in accordance with the manufacturer's technical documentation / Declaration of Performance / Declaration of Conformity

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

At least the following requirements must be fulfilled:

Characteristic	Standard	Unit	Value
Viscosity	EN ISO 3219	Pa·s	< 200
Shore hardness A	DIN 53505	-	> 50
Shore hardness D	DIN 53505	-	> 25
Density	EN ISO 2811	kg/dm ³	0.8 – 2

Other performance characteristics in accordance with the manufacturer's technical documentation / Declaration of Performance / Declaration of Conformity

2.4 Placing on the market / Application rules

Module 1: *Reactive resins for protecting and repairing concrete structures*

A prerequisite for placing the product on the market and application in Germany is the CE marking of the products. The legal basis for CE marking is represented by Directive (EU) no. 305/2011 of the European Parliament and Council (ABl. I 88/5 dated 4.4.2011). CE marking confirms conformity with the declared performance of the product based on the harmonised DIN EN 1504 specification "Products and systems for the protection and repair of concrete structures". As for the rest, the provisions in Part II of the list of technical building regulations shall apply.

Module 2: *Liquid-applied bridge deck waterproofing kits on concrete and steel*

Modules 2.1 and 2.2: A prerequisite for placing the product on the market and application in Germany is the CE marking of the products. The legal basis for CE marking is represented by Directive (EU) no. 305/2011 of the European Parliament and Council (ABl. I 88/5 dated 4.4.2011). CE marking confirms conformity with the declared performance of the product based on the harmonised ETAG 033 specification "Guideline for the European technical approval for liquid-applied bridge deck waterproofing kits". As for the rest, the provisions in Part II of the list of technical building regulations shall apply.

Special applications can also be regulated in accordance with ZTV ING.

Module 2.3: Applications are regulated in accordance with ZTV ING, Part 7, sections 4 and 5.

Module 3: *Watertight covering kits*

Module 3.1: A prerequisite for placing the product on the market and application in Germany is the CE marking of the products. The legal basis for CE marking is represented by Directive (EU) no. 305/2011 of the European Parliament and Council (ABl. I 88/5 dated 4.4.2011). CE marking confirms conformity with the declared performance of the product based on the harmonised ETAG 033 specification "Guideline for the European technical approval for watertight covering kits for wet room walls and floors". As for the rest, the provisions in Part II of the list of technical building regulations shall apply.

Module 3.2: A prerequisite for application in Germany is marking the products with the mark of conformity (Ü symbol) based on a general building authority test certificate (abP) in accordance with Building Regulation List A, Part 2, consec. no. 2.50.

Module 4: *Screed material and floor screeds*

A prerequisite for placing the product on the market and application in Germany is the CE marking of the products. The legal basis for CE marking is represented by Directive (EU) no. 305/2011 of the European Parliament and Council (ABl. I 88/5 dated 4.4.2011). CE marking confirms conformity with the declared performance of the product based on the harmonised DIN EN 13813 technical specification "Screed material and floor screeds – Properties and requirements". As for the rest, the provisions in Part II of the list of technical building regulations shall apply.

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

A prerequisite for application in Germany is marking the products with the mark of conformity (Ü symbol) based on a general building authority test certificate

(abP) in accordance with Building Regulation List A, Part 2, consec. no. 2.51.

Module 6: *Liquid-applied waterproofing for waterproofing joints*

A prerequisite for application in Germany is marking the products with the mark of conformity (Ü symbol) based on a general building authority test certificate (abP) in accordance with Building Regulation List A, Part 2, consec. no. 1.4.

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

Special applications in accordance with the manufacturer's technical documentation / Declaration of Performance / Declaration of Conformity

2.5 Delivery status

2.5.1 *Reactive resins: Liquid or pasty in containers made of tinfoil.*

Typical container sizes contain 30 to 200 kg of material.

For more extensive applications, IBCs containing up to 1 tonne are also used.

A tinfoil container was modelled for the Life Cycle Assessment.

2.5.2 *Hardening agents (initiators): usually in powder form in containers made of cardboard lined with PE foil*

Typical container sizes contain 25 kg.

Smaller containers packed correspondingly are also available.

2.6 Base materials / Auxiliaries

Reactive resins based on methacrylate for mortar, coating mortar and flow coatings comprise resin and hardening agent components. In most cases, the resin component contains methyl methacrylate as its main reactive ingredient as well as other co-monomers from the group of methacrylates and acrylates. Hardening takes place after installation on site and using the hardening component. This involves the use of radical-forming initiators which are added as hardeners in powder form.

The components can contain dissolved polymers and other auxiliaries such as accelerators, wetting agents, foam regulators and viscosity regulators for fine-tuning the required product features.

The resin and hardening agent mixing ratio is adjusted according to the specifications depending on temperature. Product hardening commences directly after the components are mixed.

On average, the products covered by this EPD contain the following ranges of base materials and auxiliaries referred to:

For flow coatings

Filler: 65 - 80%

Acrylate: < 35%

Other: < 5%

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).

In individual cases, it is possible that substances on the list of materials of particularly high concern for

inclusion in Annex XIV of the REACH regulation are contained in concentrations exceeding 0.1%. If this is the case, this information can be found on the respective safety data sheet.

2.7 Production

The product components formulated are usually mixed from the ingredients in batch mode and packaged for delivery, whereby quality standards in accordance with DIN EN ISO 9001 and the provisions outlined in the relevant regulations such as the Industrial Safety Regulation and Federal Pollution Control Act are adhered to.

2.8 Environment and health during manufacturing

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

2.9 Product processing / Installation

Methacrylate resin products are processed by trowelling/knife-coating or rolling, pouring or injection, whereby health and safety measures (gloves and goggles, ventilation) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site.

On account of their composition, methacrylate resin products, highly-filled, generally bear the GISCODE/GISBAU product code RMA 10 or RMA 20. Methacrylate resin products, highly-filled, react after mixing resin and hardening agent under heat development (exothermicity). The mixed components must therefore be processed rapidly within the specified pot time. If larger volumes remain in the container, this can lead to a strong heat build-up and decomposition.

2.10 Packaging

Empty containers and clean cardboard boxes with PE foils can be recycled.

Wooden reusable pallets are taken back by the building material trade (reusable pallets remunerated in the German deposit system) which returns them to the building product manufacturer who in turn redirects them into the production process.

2.11 Condition of use

During the use phase, methacrylate resin products, highly-filled, are hardened and essentially comprise an inert three-dimensional network.

They are long-lasting products which protect our buildings in the form of mortar, coating mortar or flow coatings as well as making an essential contribution towards their function and conservation of value.

2.12 Environment and health during use

Option 1 – Products for applications outside indoor areas with permanent stays by people

During use, methacrylate resin products, highly-filled, lose their reactive capacity and are 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 must be submitted confirming that at least one of the following regulations or criteria is complied with:

- AgBB VOC concept with additional product-related specifications on chamber loading, preparation of samples etc.
- Emission classes A+, A, B or C in accordance with the French Directive "Décret n° 2011-321" No further influences by emissions on the environment and health are known.

2.13 Reference Service Life

Methacrylate resin products, highly-filled, fulfil manifold, often specific, tasks 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.

2.14 Extraordinary effects

Fire

Even without any special fire safety features, methacrylate resin products, highly-filled, comply with at least the requirements of the DIN EN 13501-1 standard for fire classes E and E_{fl}. As cross-linked methacrylate resins do not melt or drip, the resins do not contribute towards spreading fire. Apart from the standard main products carbon monoxide and carbon dioxide, fire gases can contain traces of methyl methacrylate, esters, alcohol and hydrocarbons. In terms of their quantities used, they only have a subordinate influence on the fire characteristics of a building structure in which they have been installed.

Water

Methacrylate resin products, highly-filled, are chemically inert and insoluble in water. They are often used to protect building structures from harmful water ingress.

Mechanical destruction

The mechanical destruction of reactive resins based on methacrylate does not lead to any decomposition products which are harmful for the environment or health.

2.15 Re-use phase

According to present knowledge, no environmentally-hazardous effects in terms of landfilling are to be generally anticipated through dismantling and recycling components to which hardened products based on methyl methacrylate adhere.

If methyl methacrylate systems can be removed from the components at no great effort, thermal recovery is a practical recycling variant on account of its energy content.

Low levels of adhesion do not play any role in terms of disposal. They do not impair disposal or recycling of the remaining components/substances.

2.16 Disposal

Individual components which can no longer be 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 consideration of local guidelines.

The following EWC/AVV waste codes can apply:

Non-hardened product residue:

070208 Reactive and distillate residues
080111 Waste from the manufacture, formulation, supply and use (MFSU) and removal of paints and varnishes, paint and varnish waste containing organic solvents or other hazardous substances

2.17 Further information

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

Information on Deutsche Bauchemie is available at www.deutsche-bauchemie.de, for example.

3. LCA: Calculation rules

3.1 Declared unit

The association EPD refers to the declared unit of 1 kg methacrylate resin products, highly-filled, in accordance with the PCR 2013, Part B for reactive resins.

An LCA for highly-filled methacrylate resin products for flow coatings was calculated in this EPD.

The product with the highest environmental impact in the product group was declared. Consumption per unit area of the products to be applied extensively can range between only a few hundred grams and more than 1 kg per square metre. The resin and hardening agent mixing ratio is considered with 2% hardening agent in the LCA. The hardening agent volume is measured according to the processing temperature and can range from 1% at 30 °C to 6% at < 0 °C. Density ranges from 800 to 2,000 kg/m³.

3.2 System boundary

Modules A1/A2/A3, A4, A5 and D are taken into consideration in the LCA:

- A1 Manufacture of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, manufacture of packaging, auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging and emissions during installation)
- D Credits from incineration of packaging materials and recycling the metal container

The Declaration is therefore from the "cradle to plant gate".

3.3 Estimates and assumptions

Where no specific GaBi processes were available, the individual recipe ingredients of formulae were estimated on the basis of information provided by the manufacturer or literary sources.

3.4 Cut-off criteria

No cut-off criteria were applied for calculating the LCA. All raw materials submitted by the associations for the formulae were taken into consideration.

The manufacture of machinery, plants and other infrastructure required for production of the products

under review was not taken into consideration in the LCA.

3.5 Background data

Data from the GaBi 6 data base was used as background data. Where no background data was available, it was supplemented by manufacturer information and literary research.

3.6 Data quality

Representative products were applied for this sample EPD and the product in a group displaying the highest environmental impact was applied for calculating the LCA results. The data sets are no more than 5 years old.

3.7 Period under review

Representative formulations were compiled by Deutsche Bauchemie e.V. in 2011. The production data is based on primary data collation for the year 2011.

3.8 Allocation

No allocations were used for production. Production waste was however directed to a refuse incineration plant. After incineration, credits were calculated for electricity and thermal energy. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of packaging in accordance with the simple credit method. The credits achieved through packaging disposal are offset in Module D.

3.9 Comparability

As a general rule, a comparison or evaluation of EPD data is only possible when all of the data to be compared has been drawn up in accordance with DIN EN 15804 and the building context or product-specific characteristics are taken into consideration. In this case, 1 kg methacrylate resin products, highly-filled, for mortar and flow coatings was selected as the declared unit.

As a general rule, a comparison or evaluation of EPD data is only possible when all of the data to be compared has been drawn up in accordance with DIN EN 15804 and the building context or product-specific characteristics are taken into consideration. EPDs of construction products may not be comparable if they are not based on DIN EN 15804.

4. LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules or can be used for developing

specific scenarios in the context of a building evaluation if modules are not declared (MND).

Transport to site (A4)

Description	Value	Unit
Litres of fuel	0.0016	l/100 km
Transport distance	500	km
Capacity (incl. empty runs)	85	%
Gross density of products transported	800 - 2000	kg/m ³
Volume capacity factor	100	-

Construction installation process (A5)

Description	Value	Unit
Auxiliary	0	kg
Water consumption	0	m ³
Other resources	0	kg
Power consumption	0.0033	kWh
Other energy carriers	0	MJ
Material loss	0.01	kg
Output materials as a result of waste treatment on site	-	kg
Dust emissions	-	kg
VOC emissions	0.002 - 0.0045	kg

5. LCA: Results

SYSTEM BOUNDARIES (X = INCLUDED IN THE LCA; MND = MODULE NOT DECLARED)

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacture	Transport from manufacturer to site	Assembly	Use / Application	Maintenance	Repairs	Replacement	Renewal	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Landfilling	Re-use, recovery or 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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

LCA RESULTS – ENVIRONMENTAL IMPACT: 1 kg methacrylate resin products, highly-filled, flow coatings

Parameter	Unit	A1 - A3	A4	A5	D
Global Warming Potential	[kg CO ₂ equiv.]	1.92E+0	2.74E-2	1.75E-1	-2.67E-1
Ozone Depletion Potential	[kg CFC11 equiv.]	3.03E-10	5.72E-13	2.47E-12	-3.09E-11
Acidification Potential of soil and water	[kg SO ₂ equiv.]	6.84E-3	1.8E-4	2.42E-5	-8.01E-4
Eutrophication Potential	[kg (PO ₄) ³ equiv.]	4.68E-4	4.48E-5	4.59E-6	-7.1E-5
Photochemical Ozone Creation Potential	[kg ethene equiv.]	1.38E-3	-7.56E-5	1.65E-3	-1.06E-4
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	1.95E-5	1.26E-9	2.83E-9	-1.65E-5
Abiotic Depletion Potential Fossil Resources	[MJ]	4.3E+1	3.74E-1	5.77E-2	-3.16E+0

LCA RESULTS – USE OF RESOURCES: 1 kg methacrylate resin products, highly-filled, flow coatings

Parameter	Unit	A1 - A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	2.19E+0	-	-	-
Renewable primary energy as material utilisation	[MJ]	0.0E+0	-	-	-
Total use of renewable primary energy sources	[MJ]	2.19E+0	2.22E-2	9.42E-3	-2.04E-1
Non-renewable primary energy as energy carrier	[MJ]	3.58E+1	-	-	-
Non-renewable primary energy as material utilisation	[MJ]	9.25E+0	-	-	-
Total use of non-renewable primary energy sources	[MJ]	4.5E+1	3.76E-1	7.14E-2	-3.4E+0
Use of secondary materials	[kg]	-	-	-	-
Renewable secondary fuels	[MJ]	7.56E-4	2.79E-6	1.19E-6	0.0E+0
Non-renewable secondary fuels	[MJ]	7.78E-3	2.92E-5	1.24E-5	0.0E+0
Net use of fresh water	[m ³]	9.59E-3	2.14E-5	4.39E-4	-1.08E-3

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg methacrylate resin products, highly-filled, flow coatings

Parameter	Unit	A1 - A3	A4	A5	D
Hazardous waste for disposal	[kg]	2.61E-3	0.0E+0	8.55E-4	-9.26E-5
Disposed of, non-hazardous waste	[kg]	6.82E-2	7.43E-5	3.8E-5	-2.94E-3
Disposed of, radioactive waste	[kg]	8.41E-4	5.39E-7	5.65E-6	-9.44E-5
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	2.12E-1	-
Exported thermal energy	[MJ]	-	-	5.15E-1	-

6. LCA: Interpretation

Non-renewable primary energy requirements are dominated by manufacture of the preliminary products (> 95%). This is explained by the fact that they almost exclusively involve preliminary products from fossil raw materials which are usually energy-intensive during production. The primary energy carriers used are therefore natural gas and crude oil. Owing to the high impact by preliminary products, they are given subject to closer scrutiny: Fillers are the main components of the formulations. But as they are less energy-intensive during manufacturing, they make a low contribution to primary energy requirements in relation to their mass percentage. The resin components play a greater role as a result.

At approx. 5%, the share of total primary energy required by **renewable primary energy** is relatively

low. Among preliminary products, this is particularly attributable to the renewable percentage of the power mix, whereby the use of pallets has the greatest effect in production. Wood growth requires solar energy for photosynthesis which therefore appears here as a renewable source of primary energy.

At approx. 70%, the **Global Warming Potential (GWP)** is dominated by production of preliminary products, whereby the three resin components play the greatest role. During production, which accounts for < 10% of the GWP, manufacturing of the steel containers has a particular impact. In A5, GWP is dominated by incineration of wooden pallets (7%). The credits from thermal utilisation of waste reduce the GWP by approx. 11%. As the primary ingredient of the recipe is quartz sand which only displays minor environmental impact,

the other modules play a greater role, especially Production, A5 and D. Nevertheless, the GWP is also dominated by carbon dioxide emissions here (> 95%). In the case of the **Ozone Depletion Potential (ODP)**, it is apparent that the influences are largely necessitated by the preliminary products (> 80%) and production (< 10%) which in turn are primarily accounted for by halogenated organic emissions from the power mix used. The credits from waste incineration reduce the ODP by approx. 10%.

Approx. 60% of the **Acidification Potential (AP)** is attributable to sulphur dioxide which is emitted during manufacture of the resin components in particular. Preliminary products have a total impact of approx. 75%. Production accounts for approx. 10% of the AP, whereby the greatest impact is attributable to the steel containers. The nitric oxide emissions incurred during the transport processes are practically negligible. The credits from waste incineration reduce the AP by approx. 10%.

Approx. 80% of the **Eutrophication Potential (EP)** is attributable to emissions into the air and approx. 20%

by emissions into water (incl. ammonium & nitrates). Nitric oxide emissions are responsible for approx. 55% of emissions into air followed by nitrous oxide and nitrogen monoxide emissions (each accounting for 10%). Approx. 65% of the EP is caused by manufacture of preliminary products, whereby the resin components make the greatest contribution to the EP. Production accounts for approx. 15% of the EP which is attributable to the manufacture of steel containers. Only the **Photochemical Ozone Creation Potential (POCP)** is not dominated by production of preliminary products: preliminary products only account for approx. 30% of the POCP. The greatest share (approx. 50%) is incurred during installation of the MMA product in the form of emissions of non-polymerised MMA. As a characterisation factor for CML was not available for methyl methacrylate, the NMVOC characterisation factor was applied. At approx. 10%, manufacturing the product indicates a significant influence.

7. Requisite evidence

7.1 VOC evidence

Special tests and evidence have not been carried out or provided within the framework of drawing up this sample Environmental Product Declaration. Where the products are used in an area of application (e.g. recreation area) demanding testing/provision of VOC emissions in the recreation area, such evidence should always be submitted in the individual EPDs.

The following limit values apply for products used in recreation areas (maximum values in [$\mu\text{g}/\text{m}^3$]):

Classification / EMICODE	AgBB
TVOC (C ₆ -C ₁₆) after 3 / 28 d	10000 / 1000
TSVOC (C ₁₆ -C ₂₂) after 28 days	100
C1, C2 substances after 3 and 28 days * Total after 3 days ** For each material after 28 days	10 / 1**
Total formaldehyde / acetaldehyde [ppb] after 3 days	- / -
Total VOC without NIK and non- identified substances after 28 days	100
R value (28d)	1

Measuring process: GEV test method for determining the emissions of volatile organic compounds from building products in accordance with DIN EN ISO 16000 Parts 3, 6, 9 and 11 in a test chamber. Testing for CMR substances and TVOC/TSVOC after 3 and 28 days

The corresponding test certificate shall apply as **evidence**. If necessary, the results are to be provided in the form of the emission class.

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Institut Bauen
und Umwelt e.V.

Publisher

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748-0
Fax +49 (0)30 3087748-29
E-mail info@bau-umwelt.com
Web www.bau-umwelt.com



Institut Bauen
und Umwelt e.V.

Programme holder

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748-0
Fax +49 (0)30 3087748-29
E-mail info@bau-umwelt.com
Web www.bau-umwelt.com



Author of the Life Cycle Assessment

PE INTERNATIONAL AG
Hauptstrasse 111
70771 Leinfelden-Echterdingen
Germany

Tel. +49 (0)711 341817-0
Fax +49 (0)711 341817-25
E-mail info@pe-international.com
Web www.pe-international.com



Holder of the Declaration

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

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