



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for

Keraflex
Keraflex Easy S1
Kerabond Plus



Programme:
**The International
EPD[®] System;**
www.environdec.com

Programme
operator:
EPD International AB

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1. COMPANY DESCRIPTION / GOAL & SCOPE

Founded in 1937 in Milan, Italy, Mapei produces adhesives and complementary products for laying all types of floor, wall and coating materials, and also specializes in other chemical products used in the building industry, such as waterproofing products, specialty mortars, admixtures for concrete, products for underground constructions and for the restoration of concrete and historical buildings.

There are currently 85 subsidiaries in the Mapei Group, with a total of 80 production facilities located around the world in 35 different countries and in 5 different continents. Mapei also has 18 central laboratories. Most locations are ISO 9001 and ISO 14001 or EMAS-certified.

Mapei's strategy of internationalization is based on two main objectives: being closer to local needs and lowering transportation costs. With the declared objective of being close to buyers and clients, Mapei's presence in the five continents enables the company to comply with the requirements of each location, and to use only locally-based managers and qualified personnel, without changing the approach of Mapei.

Mapei invests 12% in its company's total work-force and 5% of its turnover in Research & Development; in particular, 70% of its R&D efforts are directed to develop eco-sustainable and environmentally friendly products, which give important contribution to all major green rating systems for eco-sustainable buildings such as LEED and BREEAM.

Furthermore, Mapei has developed a sales and technical service network with offices all over the world and offers an efficient Technical Assistance Service that is valued by architects, engineers, contractors and owners.

The goal of the study is to provide necessary data and documentation to produce an EPD according to the requirements of PCR Environdec (version 2.3, 2018-11-15) under EN 15804:2014 and to have more comprehension about the environmental impacts related to **Keraflex**, **Keraflex Easy S1** and **Kerabond Plus** manufactured in Mapei S.p.A. located in Robbiano di Mediglia (Italy), Latina (Italy), Sassuolo (Italy) and Fiorano (Italy) including packaging of the finished products.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of **Keraflex**, **Keraflex Easy S1** and **Kerabond Plus**.

This analysis shall not support comparative assertions intended to be disclosed to the public.

2. PRODUCT DESCRIPTION

Keraflex is an improved (2) slip resistant (T) cementitious adhesive (C) with extended open time (E) classified as C2TE.

Keraflex Easy S1 is a high performance, deformable cementitious adhesive with extended open time for ceramic tiles and stone material, with very low emission level of volatile organic compounds. It is especially suitable for the installation of large-size porcelain tiles and natural stone. It's classified as C2ES1 according to EN 12004.

Kerabond Plus is an improved (2) cementitious adhesive (C) with extended open time (E) classified as C2TE according to EN 12004 for interior and exterior bonding of ceramic tiles, porcelain, natural stone and mosaics on floors and walls

All products are compliant with EN 12004 (Adhesives for tiles. Requirements, evaluation of conformity, classification and designation) and ISO 13007-1 (Ceramic tiles -- Grouts and adhesives -- Part 1: Terms, definitions and specifications for adhesives: definitions and characteristics), and are supplied in 25 kg multiply bags.

3. CONTENT DECLARATION

The main components and ancillary materials of **Keraflex** (grey & white), **Keraflex Easy S1** (grey & white) and **Kerabond Plus** (grey & white) are the following:

Table 1: Composition

Materials	Percentage (%)
Binders	25 – 35
Fillers	50 – 70
Recycled content	≤ 3
Additives	< 3
Other	0 – 5

The products contain neither carcinogenic substances nor substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration more than 0,1 % (by unit weight).



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4. DECLARED UNIT AND REFERENCE SERVICE LIFE

The declared unit is 1 kg of packaged finished product.

Packaging materials include:

- Multiply bag (paper/PE/paper)
- Wooden pallet
- LDPE used as wrapping material

The reference service life of the adhesives, if professionally installed and properly used, is estimated to be the same as the building one.

5. SYSTEM BOUNDARIES AND ADDITIONAL TECHNICAL INFORMATION

The approach is “cradle to gate” with options. The following modules have been considered:

- A1, A2, A3 (Product stage): extraction and transport of raw materials and packaging, production process;
- A4 (Construction stage): transport of the finished product to final customers.

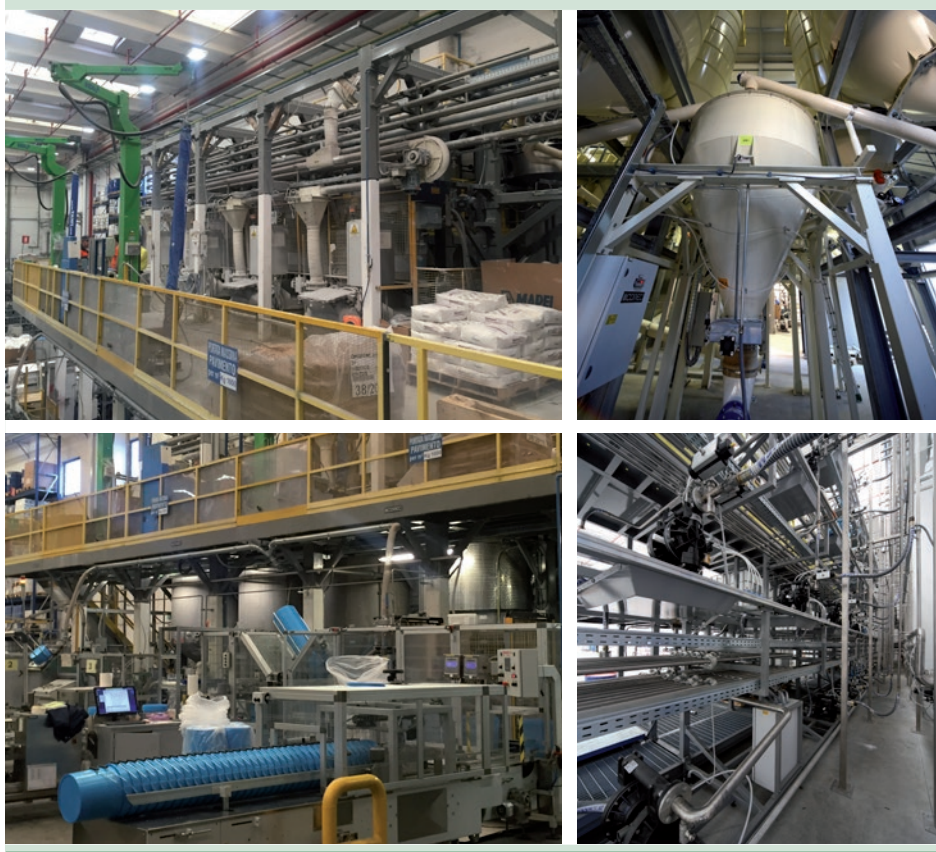
Table 2: System boundaries

System Boundaries														
A1 – A3			A4 – A5		B1 – B7					C1 – C4				D
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END OF LIFE STAGE				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	
Raw Material Supply	Transport	Manufacturing	Transport	Installation Process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction/ Demolition	Transport	Waste Processing	Disposal	Reuse-Recovery- Recycling-potential
					B6	Operational Energy Use								
					B7	Operational Water Use								

included
 excluded

A brief description of the production process, is the following:

Figure 1: Production process detail



The production process starts from raw materials, that are purchased from external and intercompany suppliers and stored in the plant. Bulk raw materials are stored in specific silos and added automatically in the production mixer, according to the formula of the product. Other raw materials, supplied in bags or big bags, are stored in their warehouse and added automatically or manually in the mixer. The production is a discontinuous process, in which all the components are mechanically mixed in batches. The semi-finished product is then packaged in bags, put on wooden pallets, covered by stretched hoods and stored in the Finished Products' warehouse. The quality of final products is controlled before the sale.

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Figure 2: Mediglia Plant



Table 3: Transport to the building site (A4)

Name	Value	Unit
Means of transport: truck euro 3 with 27 tons of payload & Ocean ship with 27500 DWT		
Litres of fuel (truck)	~ 2E-03	l/DU*100km
Litres of fuel (ship)	~ 4E-04	l/DU*100km
Transport distance (weighted average)	~ 400	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	~ 1400	km/m ³
Capacity utilisation volume factor	100	%

DU: declared unit

6. CUT-OFF RULES AND ALLOCATION

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA, information modules and any additional information are intended to support an efficient calculation procedure. They are not applied in order to hide data.

The following procedure is applied for the exclusion of inputs and outputs:

- All inputs and outputs to a unit process, for which data are available, are included in the calculation.
- Cut-off criteria, where applied, are described in Table 4.

Input flows are covered for the whole formula.

Table 4: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%
A3: waste and particle emission	less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%

For the allocation procedure and principles, consider the following table:

Table 5: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1 kg of product • A1: electricity is allocated to the whole plant production
A3	All data are referred to 1 kg of powder packaged product: • A3-wastes: all data are allocated to the whole plant production

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7. ENVIRONMENTAL PERFORMANCE AND INTERPRETATION



GWP₁₀₀

Global Warming Potential refers to the emission/presence of GHGs (greenhouse gases) in the atmosphere (mainly CO₂, N₂O, CH₄) which contribute to the increase in the temperature of the planet.



AP

Acidification Potential refers to the emission of specific acidifying substances (i.e. NO_x, SO_x) in the air. These substances decrease the pH of the rainfall with predictable damages to the ecosystem.



EP

Eutrophication Potential refers to the nutrient enrichment of flowing water, which determines unbalance in aquatic ecosystems and causes the death of the aquatic fauna.



ODP

Ozone Depletion Potential refers to the degradation of the stratospheric layer of the ozone involved in blocking the UV component of sunrays. Depletion is due to particularly reactive components that originate from chlorofluorocarbon (CFC) or chlorofluoromethanes (CFM).



POCP

The Photochemical Ozone Creation Potential is the ozone formation in low atmosphere. This is quite common in the cities where a great amount of pollutants (like VOC and NO_x) are emitted every day (industrial emissions and vehicles). It is mainly diffused during the summertime.



ADP_e (elements)

Abiotic Depletion Potential elements refers to the depletion of the mineral resources.










ADP_f (fossil fuel)

Abiotic Depletion Potential fossil fuel refers to the depletion of the fossil fuel resources.

Following tables show environmental impacts for the products considered according to CML methodology (2001 – Jan.2016). All the results are referred to the declared unit (see chapter § 4).

Keraflex (grey)

Table 6: **Keraflex (grey)** – Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	4,36E-01	2,36E-02
 ADPe (element)	(kg Sb eq.)	1,27E-07	1,95E-09
 ADPp (fossil)	(MJ)	4,50E+00	3,21E-01
 AP	(kg SO ₂ eq.)	3,51E-04	1,41E-04
 EP	(kg (PO ₄) ³ eq.)	1,50E-04	3,59E-05
 ODP	(kg R-11 eq.)	1,74E-08	6,44E-16
 POCP	(kg ethylene eq.)	1,94E-04	-6,23E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPp**: Abiotic Depletion Potential (fossil)

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Table 7: **Keraflex (grey):** Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	5,23E-01	1,77E-02
RPEM	MJ	-	-
TPE	MJ	5,23E-01	1,77E-02
NRPE	MJ	4,59E+00	3,22E-01
NRPM	MJ	-	-
TRPE	MJ	4,59E+00	3,22E-01
SM	kg	2,74E-02	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	5,86E-03	4,03E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water








Table 8: **Keraflex (grey):** Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	7,46E-04	-
HW	kg	4,08E-04	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	4,70E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Keraflex (white)

Table 9: **Keraflex (white)**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	4,72E-01	2,24E-02
 ADPe (element)	(kg Sb eq.)	1,33E-07	1,85E-09
 ADPf (fossil)	(MJ)	3,36E+00	3,04E-01
 AP	(kg SO ₂ eq.)	4,70E-04	1,34E-04
 EP	(kg (PO ₄) ³⁻ eq.)	2,49E-04	3,41E-05
 ODP	(kg R-11 eq.)	8,12E-09	6,11E-16
 POCP	(kg ethylene eq.)	4,51E-05	-5,89E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

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Table 10: **Keraflex (white)**: Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	6,30E-01	1,68E-02
RPEM	MJ	-	-
TPE	MJ	6,30E-01	1,68E-02
NRPE	MJ	3,45E+00	3,05E-01
NRPM	MJ	-	-
TRPE	MJ	3,45E+00	3,05E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	5,68E-03	3,82E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water








Table 11: **Keraflex (white)**: Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	5,66E-04	-
HW	kg	3,23E-04	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	3,91E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

KERAFLEX EASY S1 (grey)

Table 12: **Keraflex Easy S1 (grey)**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	4,01E-01	2,39E-02
 ADPe (element)	(kg Sb eq.)	1,26E-07	1,97E-09
 ADPf (fossil)	(MJ)	4,47E+00	3,25E-01
 AP	(kg SO ₂ eq.)	3,48E-04	1,43E-04
 EP	(kg (PO ₄) ³⁻ eq.)	1,34E-04	3,64E-05
 ODP	(kg R-11 eq.)	1,49E-08	6,52E-16
 POCP	(kg ethylene eq.)	1,76E-04	-6,31E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

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Table 13: **Keraflex Easy S1 (grey)**: Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	6,05E-01	1,79E-02
RPEM	MJ	-	-
TPE	MJ	6,05E-01	1,79E-02
NRPE	MJ	4,57E+00	3,26E-01
NRPM	MJ	-	-
TRPE	MJ	4,57E+00	3,26E-01
SM	kg	2,35E-02	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	2,31E-03	4,08E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water








Table 14: **Keraflex easy S1 (grey)**: Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	8,62E-04	-
HW	kg	4,58E-04	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	5,22E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

KERAFLEX EASY S1 (white)

Table 15: **Keraflex Easy S1 (white)**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	4,29E-01	2,14E-02
 ADPe (element)	(kg Sb eq.)	1,33E-07	1,77E-09
 ADPf (fossil)	(MJ)	3,43E+00	2,90E-01
 AP	(kg SO ₂ eq.)	4,47E-04	1,28E-04
 EP	(kg (PO ₄) ³⁻ eq.)	2,18E-04	3,25E-05
 ODP	(kg R-11 eq.)	6,71E-09	5,83E-16
 POCP	(kg ethylene eq.)	4,77E-05	-5,61E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

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Table 16: **Keraflex Easy S1 (white)**: Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	7,09E-01	1,60E-02
RPEM	MJ	-	-
TPE	MJ	7,09E-01	1,60E-02
NRPE	MJ	3,53E+00	2,92E-01
NRPM	MJ	-	-
TRPE	MJ	3,53E+00	2,92E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	2,15E-03	3,64E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water








Table 17: **Keraflex Easy S1 (white)**: Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	4,16E-04	-
HW	kg	2,21E-04	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	3,12E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

KERABOND PLUS (grey)

Table 18: **Kerabond Plus (grey)**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	3,44E-01	2,07E-02
 ADPe (element)	(kg Sb eq.)	9,36E-08	1,71E-09
 ADPf (fossil)	(MJ)	2,92E+00	2,81E-01
 AP	(kg SO ₂ eq.)	2,46E-04	1,24E-04
 EP	(kg (PO ₄) ³⁻ eq.)	1,25E-04	3,15E-05
 ODP	(kg R-11 eq.)	1,51E-08	5,65E-16
 POCP	(kg ethylene eq.)	1,54E-04	-5,43E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

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Table 19: **Kerabond Plus (grey)**: Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	5,07E-01	1,55E-02
RPEM	MJ	-	-
TPE	MJ	5,07E-01	1,55E-02
NRPE	MJ	2,98E+00	2,82E-01
NRPM	MJ	-	-
TRPE	MJ	2,98E+00	2,82E-01
SM	kg	2,44E-02	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	1,55E-03	3,53E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water








Table 20: **Kerabond Plus (grey)**: Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	2,76E-04	-
HW	kg	1,47E-04	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	2,47E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

KERABOND PLUS (white)

Table 21: **Kerabond Plus (white)**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	3,78E-01	1,99E-02
 ADPe (element)	(kg Sb eq.)	1,03E-07	1,64E-09
 ADPf (fossil)	(MJ)	1,93E+00	2,70E-01
 AP	(kg SO ₂ eq.)	3,53E-04	1,19E-04
 EP	(kg (PO ₄) ³⁻ eq.)	2,13E-04	3,02E-05
 ODP	(kg R-11 eq.)	6,79E-09	5,42E-16
 POCP	(kg ethylene eq.)	2,11E-05	-5,20E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

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Table 22: **Kerabond Plus (white)**: Other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	6,07E-01	1,49E-02
RPEM	MJ	-	-
TPE	MJ	6,07E-01	1,49E-02
NRPE	MJ	1,99E+00	2,71E-01
NRPM	MJ	-	-
TRPE	MJ	1,99E+00	2,71E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	1,41E-03	3,39E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water

Table 23: **Kerabond Plus (white)**: Waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	1,30E-04	-
HW	kg	6,98E-05	-
RW	kg	0,00E+00	-
Components for re-use	kg	-	-
Materials for recycling	kg	1,79E-03	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Tables above show absolute results for every considered environmental impact category. They clearly indicate that module **A1** gives the highest contribution for several of them, up to 98% of the total impact in the whole system boundary.

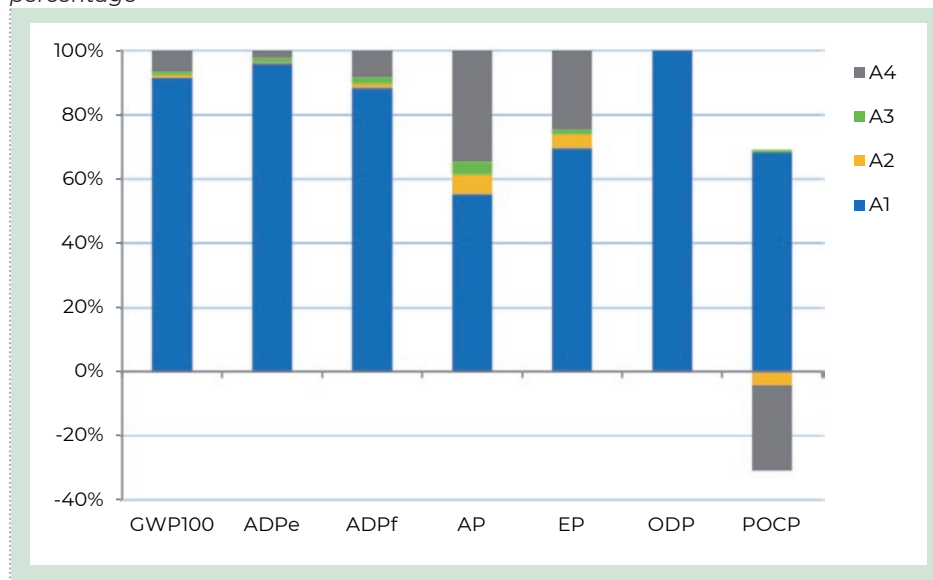
In particular the binders, which are some of the main components in the adhesives formulations, carry a significant impact for all environmental categories.

Electricity consumption during the production process doesn't affect the considered environmental categories.

Modules **A2** and **A4** (transport of raw materials and transport of finished product), give a negative contribution to POCP, due to nitrogen dioxide and monoxide emission factors (for more details, see the methodology used: HBEFA - Handbook Emission Factors for Road Transport).

A specific amount of **recycled material** is contained in the formulations and the values are shown in Table 7, Table 13 and Table 19 as **SM** (Secondary Material) indicator.

Table 24: Environmental Impact of **Keraflex (grey)** and **Keraflex Easy S1 (grey)** as percentage



Keraflex
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Table 25: Environmental Impact of **Keraflex (white)** and **Keraflex Easy S1 (white)** as percentage

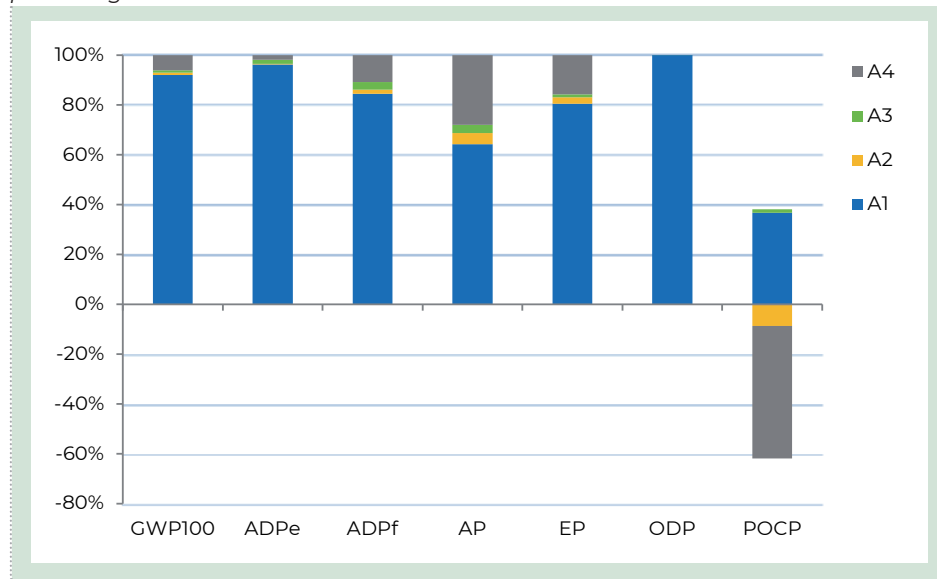


Table 26: Environmental Impact of **Kerabond Plus (grey)** as percentage

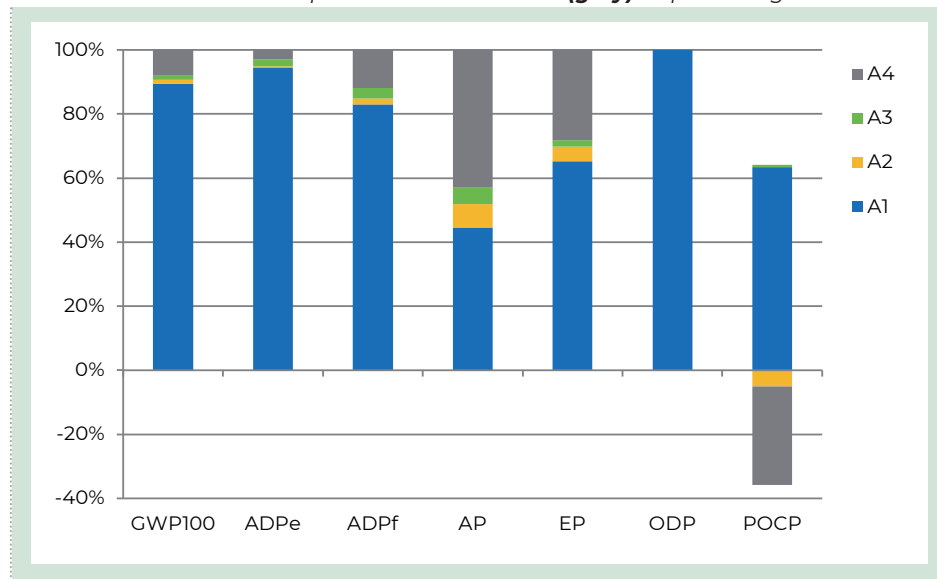


Table 27: Environmental Impact of **Kerabond Plus (white)** as percentage

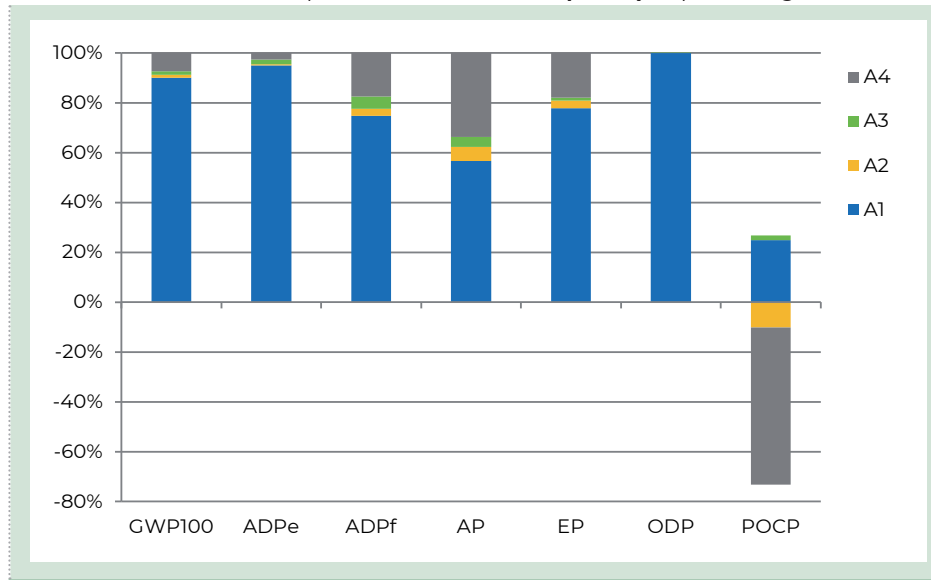
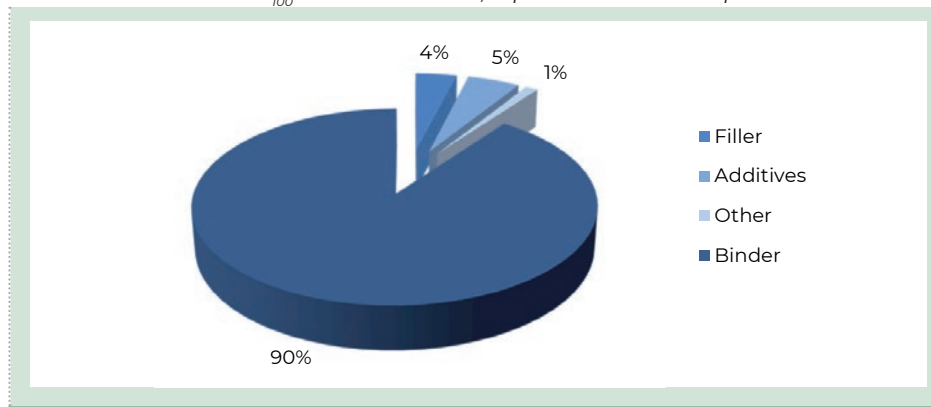


Table 28: Focus on GWP_{100} of the module A1, representative for all products



More details about electrical mix used in this EPD, is shown below:

	Data source	Amount	Unit
Electricity grid mix (IT) – 2014	GaBi database	0,4020	kg CO ₂ -eqv/kWh
Electricity from photovoltaic (IT) – 2014	GaBi database	0,0641	kg CO ₂ -eqv/kWh

Keraflex
Keraflex Easy S1
Kerabond Plus



8. DATA QUALITY

Table 29 Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1-A3		
Grey PTL cement	EPD S-P-00880	2016 – 2018
White PTL cement	EPD-CIS-20150243-CAAI	2015
Fillers (EU)	GaBi Database;	2017
Additives (EU)	GaBi Database	2012 – 2017
Electricity grid mix (IT)	GaBi Database	2014
Electricity from photovoltaic (IT)	GaBi Database	2014
Packaging components (EU)	GaBi Database, PlasticEurope	2005 – 2017
A2; A4		
Truck transport (euro 3, 27t payload – GLO)	GaBi Database	2017
Light Train (Gross Ton Weight 500t - GLO)	GaBi Database	2017
Oceanic ship (27500 DWT - GLO)	GaBi Database	2017
Electricity grid mix (EU)	GaBi Database	2014
Diesel for transport (EU)	GaBi Database	2014
Heavy Fuel Oil (EU)	GaBi Database	2014

All data included in table above refer to a period between 2005 and 2018; the most relevant ones are specific from suppliers, while the others (i.e. transport and minor contribution dataset), come from European and global databases.

All dataset are not more than 10 years old according to EN 15804 § 6.3.7 “Data quality requirements”. The only exception is represented by one raw material used for one packaging component production.

Primary data concern the year 2018 and represent the whole annual production.

9. REQUISITE EVIDENCE

9.1 VOC emissions

Volatile Organic Compounds (VOC) special tests and evidence have been carried out on the two products, according to ISO 16000 parts 3, 6, 9 and 11 and EN 16516.

The tile-adhesives have been evaluated in emission chambers, in order to detect their VOC emissions after 3 and 28 days storage in the ventilated chambers, according to GEV (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V.) test method.

Keraflex, **Keraflex Easy SI** and **Kerabond Plus** meet the requirements for the emission class Emission class Ecode EC1^{PLUS}, as "very low VOC emission", released by GEV.

Next table describes the limits for the Emission class EC1^{PLUS} class.

Table 30: EC1^{PLUS} VOC limits

	3 days µg/m ³	28 days µg/m ³
TVOC (C6-C16)	≤ 750 µg/m ³	≤ 60 µg/m ³
TSVOC (C16-C22)		≤ 40 µg/m ³
C1A-C1B substances	Total ≤ 10 µg/m ³	Single substance ≤ 1 µg/m ³
Formaldehyde/ acetaldehyde	≤ 50 µg/m ³	
Sum of formaldehyde/ acetaldehyde	≤ 50 ppb	
sum of non-assessable VOCs		≤ 40
R value		≤ 1

9.2 Recycled Content

Keraflex contains 2,8% of recycled material in the grey version.

Keraflex Easy SI contains 2,4% of recycled material in the grey version.

Kerabond Plus contains 2,5% of recycled material in the grey version.

Keraflex
Keraflex Easy SI
Kerabond Plus



10 SIGNIFICANT CHANGES FROM THE PREVIOUS VERSION

In this revision new primary data (referred to the reference year 2018) have been adopted. The new version of PCR 2.3 has been considered. Secondary materials have been included in the content declaration and SM indicator has been updated. Due to these updates, environmental categories have changed more than $\pm 10\%$ (POCP and W).

11. VERIFICATION AND REGISTRATION

EPD of construction products may not be comparable if they do not comply with EN 15804.

Environmental product declarations within the same product category from different programs may not be comparable.

CEN standard EN15804 served as the core PCR

PCR:	PCR 2012:01 Construction products and Construction services, Version 2.3, 2018-11-15
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	<input checked="" type="checkbox"/> EPD Process Certification (Internal) <input type="checkbox"/> EPD Verification (external)
Third party verifier:	Certquality S.r.l. Number of accreditations: 003H rev15
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

12. REFERENCES

- EN 12004 “ADHESIVES FOR TILES. REQUIREMENTS, EVALUATION OF CONFORMITY, CLASSIFICATION AND DESIGNATION”
- EN 15804: SUSTAINABILITY OF CONSTRUCTION WORKS - ENVIRONMENTAL PRODUCT DECLARATIONS - CORE RULES FOR THE PRODUCT CATEGORY OF CONSTRUCTION PRODUCTS
- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD® SYSTEM. VERSION 3.0
- HBEFA - HANDBOOK EMISSION FACTORS FOR ROAD TRANSPORT
- ISO 13007-1 CERAMIC TILES - GROUTS AND ADHESIVES - PART 1: TERMS, DEFINITIONS AND SPECIFICATIONS FOR ADHESIVES: DEFINITIONS AND CHARACTERISTICS
- ISO 14025 ENVIRONMENTAL LABELS AND DECLARATIONS - TYPE III ENVIRONMENTAL DECLARATIONS - PRINCIPLES AND PROCEDURES
- ISO 14044 ENVIRONMENTAL MANAGEMENT – LIFE CYCLE ASSESSMENT – REQUIREMENTS AND GUIDELINES
- PCR 2012:01; “PRODUCT GROUP CLASSIFICATION: MULTIPLE UN CPC CODES CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES”; VERSION 2.3

CONTACT INFORMATION

EPD owner:	 ADHESIVES • SEALANTS • CHEMICAL PRODUCTS FOR BUILDING Mapei SpA www.mapei.it
LCA Author:	 ADHESIVES • SEALANTS • CHEMICAL PRODUCTS FOR BUILDING Mapei SpA www.mapei.it ; Environmental Sustainability Office
Programme operator:	 EPD International AB info@environdec.com

Keraflex
Keraflex Easy S1
Kerabond Plus

SEDE

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E-mail: mapei@mapei.it



[/mapeispa](#)





Kerabond Plus



Easily trowellable cementitious adhesive with superior bond strength, low slump and high initial grab suitable for most types of ceramic tiles and stone material



CLASSIFICATION IN COMPLIANCE WITH ISO 13007-1

Kerabond Plus is cementitious adhesive (C) improved (2) slip resistant (T) of Class C2T.

DESCRIPTION

Kerabond Plus is ideal for use in interior and exterior floor and wall applications for most types of tiles and natural stones (not moisture-sensitive) onto rigid surfaces.

Kerabond Plus contains a very low VOC content that can contribute valuable points towards Green Star™ credits in compliance with the Green Building Council of Australia.

WHERE TO USE

Bonding ceramic mosaics on paper or mesh, most types of ceramic tiles (quarry tiles, single fired and klinker tiles) on:

- ordinary concrete slabs or suspended concrete slabs completely cured and stable
- conventional renders or cement mortar walls
- gypsum substrates and anhydrite screeds as long as they are dry and treated with a priming coat of **Primer G**, **Eco Prim T** or **Eco Prim Grip**
- spot bonding of insulating materials such as expanded polystyrene, expanded polyurethane, rock and glass wool, wood-cement and sound-deadening panels

TECHNICAL CHARACTERISTICS

Kerabond Plus is available in a grey or white powder composed of cement, fine-graded sand, synthetic resins and special additives according to a formula developed in the MAPEI research laboratories.

Mixed with water, **Kerabond Plus** becomes an easily trowellable adhesive with good bond strength, low slump and a high initial grab allowing it to be applied vertically without any sagging or letting even heavy tiles slip.

Kerabond Plus hardens without noticeable shrinkage to become extremely resistant, adhering perfectly to all the conventional materials used for bonding.

*Mixing **Kerabond Plus** with **Isolastic 50** or **Isolastic** in lieu of water will improve the characteristics of the adhesive to meet the requirements of Class S1 and S2 (deformable and highly deformable adhesive) respectively according to ISO 13007-1.*

RECOMMENDATIONS

- DO NOT apply over presswood, particle board, chipboard, masonite, gypsum floor patching compounds, metal or similar dimensionally unstable substrates
- DO NOT apply over vinyl, rubber or linoleum surfaces
- For external installation onto concrete slabs and cementitious screeds of large sized tile (up to 400 x 400mm) use **Kerabond Plus** mixed with **Isolastic 50**. If using larger sized tiles use **Kerabond Plus** mixed with **Isolastic**
- For installations over marine-grade plywood (interior dry floor only), gypsum walls, pre-cast panels, fibre-cement sheet and floors and walls subject to movement (through shrinkage or temperature changes) use **Kerabond Plus** mixed with **Isolastic**
- DO NOT use **Kerabond Plus** to install agglomerates, moisture-sensitive stone or stone material subject to staining. Instead install using **Granirapid**, **Keralastic T** or **Kerapoxy**
- When installing light coloured and translucent marble and agglomerates use **Granirapid White** or **Keraquick S1 White**. Please refer to the respective Technical Data Sheets for complete product information

APPLICATION PROCEDURE

Examination

Before work commences examine the areas to be covered and report any deficiency or adverse conditions in writing to the general contractor, owner, developer or architect. DO NOT proceed with work until surfaces and conditions comply with the requirements indicated in the current Australian Standards and manufacturer's instructions

Preparing the substrate

All supporting surfaces shall be structurally sound, solid, stable, dry, completely cured, level, plumb and true to a tolerance as per the current Australian Standards. They shall be clean and free of dust, oil, grease, paint, tar, wax, curing agent, primers, sealers, release agents or any deleterious substance and debris which may prevent or reduce adhesion.

Completely remove all loosely bonded topping, paint, loose particles and construction debris by mechanical means such as shot blasting, scarification or sanding. When preparing surfaces containing silica sand use an approved dust mask. Surfaces containing asbestos must be handled in accordance with current legislation and Code of Practice.

Neutralise any trace of strong acid or alkali from the substrate prior to the application of any product.

In all cases, the structural design of the floor shall not allow a deflection greater than 1/360 of the span under live or dead loads. Fibre cement sheeting shall conform to the current Australian Standards quality requirements. It must be installed according to the fibre cement sheeting manufacturer instructions and in strict accordance with current Australian Standards for interior installation.

Cementitious substrates

Cementitious substrates must not be subject to shrinkage after the installation of the tiles. The surface should be true and level and pitched to drains where required. Remove from the concrete slabs any concrete sealers or curing compounds from the surface such as chlorinated rubber, resin, wax sealers. Steel-trowelled finished concrete should be roughened mechanically to remove laitance and provide a good key for tiling. Dampen with water to cool surfaces which have been heated by exposure to sunlight. Gypsum substrates and anhydrite screeds must be perfectly dry, sound and free from dust.

It's absolutely essential that they are treated with **Primer G** or **Eco Prim T**. Areas subjected to high humidity should be primed with **Primer S**.

PREPARING THE MIX

Kerabond Plus must be mixed with clean water. Pour 4.8 – 5.2 litres of water into a clean mixing container. Using a low speed mixer (300RPM) blend to obtain a homogenous lump-free paste. Let slake for 3 minutes. Remix and the paste is then ready for use. The mix produced in this way is workable for at least 8 hours.

Please Note: Mixing **Kerabond Plus** with **Isolastic 50/Isolastic** in place of water will improve the characteristics of the adhesive to meet the requirements of Class S1 and S2 (deformable and highly deformable adhesive) respectively according to ISO 13007.

Mix 5.3 kg of **Isolastic 50** OR 6.4 kg of **Isolastic** and gradually add the 20 kg of **Kerabond Plus** powder while slowly mixing. Use a low speed mixer (300 RPM).

APPLYING THE MIX

Use the recommended notched trowel with sufficient depth to achieve an 80% minimum adhesive contact to the back of the tiles for all interior applications. For exterior installations, commercial floor and shower applications achieve coverage in accordance with applicable current Australian Standards. Using the flat or straight edge of the trowel, apply a thin pressure-applied coat to the substrate. Follow immediately with additional material then comb the adhesive using the notched side of the trowel to achieve an even setting bed. Do not spread more material than can be covered with tiles within open time.

In hot or dry conditions, take precautions to ensure that the adhesive does not flash set. Cooling a concrete slab with water prior to the installation may be beneficial. Remove all excess water prior to applying the adhesive. Also, using cold water or cooling the latex additive will aid in the installation. Set tiles before skinning occurs. If skinning occurs, scrape off and replace with fresh adhesive. Place tiles firmly in position with a slight twisting motion to ensure good contact with the adhesive. Follow immediately with proper and thorough beat-in to flatten ridges or notches into a continuous bed. Make all alignments and adjustments immediately following beat-in. Do not exceed 30-45 minutes.

Do not walk over tiles for at least 24 hours after installation.

Wash tools and hands with water while material is still fresh.

SPOT BONDING INSULATING MATERIAL

Spot bonding of sound deadening or insulating panels should be applied using a float or trowel. The required number and thickness of the spot bonds is determined by the flatness of the surface and weight of the panels.

In these cases too, the open time must be observed, bearing in mind that a few spots of adhesive on heavy panels may require some shoring up, which should only be removed after the **Kerabond Plus** has commenced to set.

GROUTING AND SEALING

Wall joints can be grouted after 4-8 hours and floor joints after 24 hours. Joint grouting with both tight and wide joints should be grouted using MAPEI's range of coloured grouts. **Keracolor SF** (super-fine grout for joints up to 4mm), **Keracolor FF** (for joints up to 6mm), **Keracolor GG** (for joints 4-15mm) or **Ultracolor Plus** (high performance, rapid-setting, water-repellent premium grout for joints from 2-20mm).

If the grout joints require chemical resistance use MAPEI's **Kerapoxy** (a two-component acid resistance epoxy grout) or **Kerapoxy Design** (two-component, decorative acid resistant epoxy grout). All MAPEI grouts are available in vast array of exciting colours. The colour chart can be located on the MAPEI website at www.mapei.com.au or alternatively Freecall 1800 652666 and request a Colour Grout Chart.

PROTECTION

Tiling installed with **Kerabond Plus** must not be washed down or exposed to rain for at least 24 hours and must be protected from frost and strong sunlight for at least 5-7 days.

Keep floors free from general traffic for at least 24 hours after installation. Prohibit heavy traffic for 14 days.

READY FOR USE

Tiled surfaces may be put into service after approximately 14 days

TECHNICAL DATA (typical values)

In compliance with	- ISO 13007 as C2T - ISO 13007 as S1 (if mixed with Isolastic 50) - ISO 13007 as S2 (if mixed with Isolastic)
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PRODUCT IDENTITY

Type:	powder
Colour:	grey or white
Bulk density (kg/m ³):	1300
Dry solid content (%):	100

APPLICATION DATA (at +23°C - 50% R.H.)

Mixing ratio:	100 parts of Kerabond Plus with 24-26 parts by weight of water or 26.5 parts by weight with Isolastic 50 or 32 parts by weight with Isolastic
Consistency of the mix:	very viscous
Density of mix (kg/m ³):	1450
pH of mix:	13
Pot life:	over 8 hours
Application temperature:	from +5°C to +40°C
Open time:	approx 20 minutes
Ready for grouting on walls:	4-8 hours
Ready for grouting on floors:	24 hours
Set to light foot traffic:	24 hours
Ready for use:	14 days

FINAL PERFORMANCES

Bonding strength in accordance with EN 1348 N/mm ² :	Kerabond Plus mixed with water	Kerabond Plus mixed with Isolastic 32%	Kerabond Plus mixed with Isolastic 50 26.5%
Initial bonding after 28 days:	1.6	2.4	2.0
Initial bonding after heat exposure:	1.1	> 2.5	2.5
Bonding after immersion in water:	1.1	1.6	1.4
Bonding after freeze/thaw cycles:	1.2	1.7	1.5
Resistance to alkali:	excellent		
Resistance to oil:	excellent (poor to vegetable oil)		
Resistance to solvents:	excellent		
Temperature when in use:	from -30°C to +90°C		

Kerabond Plus



CLEANING

Tools and hands can be cleaned with water while surfaces should be wiped down with a damp cloth. Water should only be used in moderation and after a few hours of drying.

COVERAGE

A 20kg bag will cover approximately 6 to 7.5m² using a 6 x 6 x 6mm square-notched trowel and 4 to 5m² using a 6 x 10 x 6mm square-notched trowel.

Please Note: Coverages are approximate and are given for estimating purposes only. Actual jobsite coverages may vary according to tile size and thickness, job conditions and setting practices. For coverage values not shown in this table contact MAPEI Technical Services on Freecall 1800 652666.

PACKAGING

Kerabond Plus is available in Grey and White 20kg bags.

STORAGE

12 months when stored in a dry, elevated area in the original unopened packaging.

PROTECT FROM MOISTURE

SAFETY INSTRUCTIONS FOR THE PREPARATION AND INSTALLATION

Kerabond Plus contains cement that when in contact with sweat or other body fluids causes irritant alkaline reactions and allergic reactions to those predisposed. It can cause damage to eyes.

During use wear protective gloves and goggles and take the usual precautions for handling chemicals. If the product comes in contact with the eyes or skin, wash immediately with plenty of water and seek medical attention.

For further and complete information about the safe use of our product please refer to the latest version of our Safety Data Sheet available for download from our website at www.mapei.com.au.

PRODUCT FOR PROFESSIONAL USE.

WARNING

Although the technical details and recommendations contained in this Technical Data Sheet correspond to the best of our knowledge and experience, all the above information must in every case be taken as merely indicative and subject to confirmation after long-term practical application. For this reason anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case the use alone is fully responsible for any consequences deriving from the use of the product.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com.au

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement or replace requirements per the TDS in effect at the time of the MAPEI product installation. For the most up-to-date TDS and warranty information, please visit our website at www.mapei.com.au

ANY ALTERATIONS TO THE WORDING OR REQUIREMENTS CONTAINED IN OR DERIVED FROM THIS TDS SHALL VOID ALL RELATED MAPEI WARRANTIES.

All relevant references for the product are available upon request and from www.mapei.com.au



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Manufactured in Brisbane - Australia



BUILDING THE FUTURE

Ultralite S2

Model EPD

“Modified mineral mortars, group 3”

(Declaration number EPD-FEI-20160043-IBG1-EN)



DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPDS

Mapei is a member of FEICA (Association of the European Adhesive & Sealant Industry), which has developed so-called Model Environmental Product Declarations (Model EPDs), independently verified by IBU (Institut Bauen und Umwelt e.V.).

The Model EPDs represent the current production technology in Europe. The compliance of Mapei products to the Model EPDs is checked on the base of their formulations, by using an IBU-approved guideline procedure.

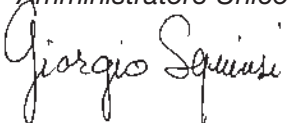
Mapei declares that the product

Ultralite S2

meets the criteria of the attached Model EPD
“Modified mineral mortars, group 3”
(Declaration number EPD-FEI-20160043-IBG1-EN)

The Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used whenever they are required for the evaluation of the sustainability of buildings where ***Ultralite S2*** is applied.

Mapei S.p.A.

Giorgio Squinzi
Amministratore Unico




ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	FEICA - Association of the European Adhesive and Sealant Industry
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20160043-IBG1-EN
ECO EPD Ref. No.	ECO-00000374
Issue date	23/05/2016
Valid to	22/05/2021

Modified mineral mortars, group 3 FEICA - Association of the European Adhesive and Sealant Industry

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



1. General Information

FEICA - Association of the European Adhesive and Sealant Industry

Programme holder

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

Declaration number

EPD-FEI-20160043-IBG1-EN

This Declaration is based on the Product Category Rules:

Mineral factory-made mortar, 07.2014
(PCR tested and approved by the SVR)

Issue date

23/05/2016

Valid to

22/05/2021



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



Dr. Burkhardt Lehmann
(Managing Director IBU)

Modified mineral mortars, group 3

Owner of the Declaration

FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuysse 4
1160 Brussels
Belgium

Declared product / Declared unit

1 kg of modified mineral mortar with a density 800 - 1,700 kg/m³

Scope:

This validated Declaration entitles the holder to bear the symbol of the *Institut Bauen und Umwelt e.V.* It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members 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 FEICA secretariat. The members of FEICA are listed on its 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration according to /ISO 14025/

internally externally



Mr Olivier Muller
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Modified mineral mortars are combinations of one or more inorganic binder, aggregates, water and if necessary additives. They comply with manifold, often specific, tasks 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).

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 for structural and non-structural repair which are used to restore the original condition of concrete structures and/or to replace defective concrete

1.2 Products for reinforcement corrosion protection

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 cementitious screed, floor levelling compounds, filler, flowing screed

Products for manufacturing bonded screed, screeds on separating or insulating layers, for levelling and repairing usual building substrates such as rough, uneven concrete floors, cement, anhydrite and mastic asphalt screed, heated screed and ceramic coverings for indoor and outdoor applications

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 mortar 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 waterproofing slurries

Products for providing cement-based waterproofing surfaces in structural and civil engineering. For use in new and old buildings as well as beneath tiles (mineral or flexible waterproofing slurries)

Module 8: Modified mineral mortars as repair mortar

Products for carrying out repairs (e.g. for repairing minor voids and holes) on horizontal and vertical areas

2.3 Technical Data

Construction products with Declaration of Performance in accordance with /CPR/

Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures

The minimum requirements according to /EN 1504/ apply. These are:

1.1

Products for structural and non-structural repair - Requirements on performance characteristics for all intended uses in accordance with /EN 1504-3/, Table 1:

- Compressive strength (/EN 12190/)
- Chloride ion content (/EN 1015-17/)
- Adhesive strength by pull off test (/EN 1542/)
- Restrained shrinkage/expansion (/EN 12617-4/)

1.2 Reinforcement corrosion protection products –

Requirements on all intended uses in accordance with /EN 1504-7/, Table 1:

- Corrosion protection (/EN 15183/)

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

Module 2: Adhesives based on modified mineral mortar

2.1 The minimum requirements in accordance with /EN 12004/ apply. These are:

- Tensile adhesion strength after dry storage (/EN 1348/)
- Tensile adhesion strength after water immersion (/EN 1348/)
- Tensile adhesion strength after heat ageing (/EN 1348/)
- Tensile adhesion strength after freeze/thaw cycles (/EN 1348/)
- Open time: Tensile strength (/EN 1346/)

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

2.2 Performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance; /ETAG 004/ apply.

Module 3: Modified mineral mortars as joint fillers

The minimum requirements of /EN 13888/ must be maintained.

Module 4: Modified mineral mortars as cementitious screed, floor levelling compounds, filler, flowing screed:

The minimum requirements of /EN 13813/ must be maintained. These are:

- Reaction to fire (/EN 13501-1/)
- Release of corrosive substances
- Compressive strength (/EN 13892-2/)
- Flexural strength (/EN 13892-2/)

Other performance 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

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

Module 5.2: The minimum requirements of /EN 13279/ apply.

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

Module 6: Modified mineral mortars as grouts

Module 7: Modified mineral mortar for waterproofing slurries

The minimum requirements in accordance with /EN 14891/ apply.

Module 8: Modified mineral mortars as repair mortar

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

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 need a Declaration of Performance taking into consideration either the relevant harmonised European standard as cited in chapter 2.3 or the European Technical Assessment and the CE-marking.

For the application and use of the products the respective national provisions apply.

2.5 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 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).

2.6 Base materials / Ancillary materials

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

Cement: ~ 10 - 85%

Filler materials: ~ 10 - 60%

Plaster: ~ 0 - 1%

Additives: ~ 0 - 5%

Dispersion powder: ~ 0 - 30%

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. Mortar for special

applications can also contain fungicides, whereby the functional group of fungicides is dependent on the chemical specification.

2.7 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.

Quality and environmental standards in accordance with /ISO 9001:2008-12/ 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

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 taking consideration of 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.

2.9 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.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty, trickle-free paper containers and clean PE foils can be recycled.

2.11 Condition of use

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.

2.12 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 used in accordance with the designated purpose of the respective products.

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 /AgBB/ test scheme or the /GEV/ (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf) /EMICODE/® marking system typically applied in Germany.

2.13 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.

2.14 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.

Water

No relevant volumes of water-soluble substances hazardous to water are washed out when exposed to water (e.g. flooding). Cement-based mortar is stable in terms of structure and is not subject to any changes in form when exposed to water and drying.

Mechanical destruction

The mechanical destruction of modified mineral mortars does not lead to any decomposition products which are harmful for the environment or health. Dust incurred during de-construction should be avoided by taking the appropriate measures (e.g. humidification).

2.15 Re-use phase

Components manufactured using modified mineral mortars can usually be easily demolished. When removing a building, the materials do not need to be treated as special waste; care should, however, be taken to ensure unmixed residual materials wherever possible. 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 re-using components comprising modified mineral mortar after decommissioning.

2.16 Disposal

The portion of a modified mineral mortar-based product applied at an other construction product is rather low. These low amounts do not play a role when the construction product is disposed. They do not interfere with the disposal/recycling of other components / building materials.

The following European Waste Codes waste (EWC) codes can apply:

Mineral mortar: /EWC 2000/532/EC 170101/ and

/EWC 2000/532/EC 101314/

Mineral filler and levelling compound: /EWC 2000/532/EC 170107/

Calcium sulphate-based filler and levelling compound: /EWC 2000/532/EC 170802/

2.17 Further information

More information is available in 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.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg modified mineral mortar with a density of 800 - 1,700 kg/m³. The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario).

With the information about the consumption per surface area the results can be calculated into a declared unit of kg/m².

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary

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

- A1 Production of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging & installation losses and emissions during installation)
- D Credits from incineration of packaging materials

The declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions

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

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data 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. Transport of packaging materials is also excluded.

3.5 Background data

Data from the /GaBi/ ts database was used as background data. Where no background data was available, it was complemented by manufacturer information and literary research.

3.6 Data quality

Representative products were applied for this EPD and the product in a group displaying the highest environmental impact was selected for calculating the LCA results. The datasets are less than 5 years old. Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

3.7 Period under review

Representative formulations were accepted by FEICA Ltd and collected in 2011.

3.8 Allocation

No allocations were applied for production. A multiinput allocation with a credit for electricity and thermal energy was used for incineration of packaging materials. The credits achieved through packaging disposal are declared 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. In this case, 1 kg modified mineral mortar was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific use per surface area must be taken into consideration.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing 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	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	800 - 1700	kg/m ³
Capacity utilisation volume factor	1	-

Installation into the building (A5)

Name	Value	Unit
Water consumption	0.0003	m ³
Material loss	0.013	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN 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	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg modified mineral mortar, group 3

Parameter	Unit	A1-A3	A4	A5	D/3
Global warming potential	[kg CO ₂ -Eq.]	1.18E+0	4.82E-3	9.97E-2	-3.69E-2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.86E-8	2.21E-14	3.60E-13	-1.21E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	3.01E-3	1.19E-5	1.24E-5	-5.84E-5
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	3.25E-4	2.75E-6	2.44E-6	-5.91E-6
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.80E-4	-3.33E-6	1.13E-6	-6.20E-6
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.91E-6	3.21E-10	1.09E-9	-6.27E-9
Abiotic depletion potential for fossil resources	[MJ]	2.27E+1	6.64E-2	2.20E-2	-5.06E-1

RESULTS OF THE LCA - RESOURCE USE: 1 kg modified mineral mortar, group 3

Parameter	Unit	A1-A3	A4	A5	D/3
Renewable primary energy as energy carrier	[MJ]	2.10E+0	IND	IND	IND
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	IND	IND	IND
Total use of renewable primary energy resources	[MJ]	2.10E+0	3.77E-3	3.16E-3	-8.34E-2
Non-renewable primary energy as energy carrier	[MJ]	2.10E+1	IND	IND	IND
Non-renewable primary energy as material utilization	[MJ]	3.60E+0	IND	IND	IND
Total use of non-renewable primary energy resources	[MJ]	2.46E+1	6.66E-2	2.56E-2	-6.19E-1
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
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]	IND	IND	IND	IND

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 kg modified mineral mortar, group 3

Parameter	Unit	A1-A3	A4	A5	D/3
Hazardous waste disposed	[kg]	IND	IND	IND	IND
Non-hazardous waste disposed	[kg]	IND	IND	IND	IND
Radioactive waste disposed	[kg]	IND	IND	IND	IND
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	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	1.29E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	2.99E-1	0.00E+0

Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories, contribute significantly to the production. The indicators Use of fresh water, Hazardous waste disposed, Non-hazardous waste disposed and Radioactive waste disposed are therefore not declared (decision of IBU advisory board 2013-01-07).

6. LCA: Interpretation

All 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 main driver. The majority of life cycle energy consumption takes place during the production phase (A1-A3). Besides the cement also the dispersion powder influences the results significantly, although this is only used up to 5%. 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. CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO₂ contribute to the largest share.

Transportation to the construction site (A4) and the installation process (A5) make a negligible 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 paper and pallets.

In module A4, transport to construction site, values for Photochemical Ozone Creation Potential (POCP) are negative due to emission profile modelled for the selected transportation process and of the characterisation method used in CML 2001 for the calculation of the POCP. Transportation processes are responsible for the emission of NO_x in the ground layer atmosphere. NO in particular can have an ozone

depleting effect that is reflected in CML 2001 by assigning a negative characterisation factor to this substance. However, although these negative values may appear unusual, it should be considered that POCP is only one of the analysed environmental impact categories. All other potential impacts would increase with greater transportation distances, showing that transportation is a process leading to net environmental burdens. Furthermore, even for POCP, transportation processes needed for supply of materials and product distribution only have limited counterbalance effects on the overall LCA results. Energy credit from incineration of packaging material reported in module D show a negligible influence on the overall results.

7. Requisite evidence

VOC

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for products in question.

Evidence pertaining to VOC emissions shall show

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

(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;

(2) base their test methods on /CEN/TS 16516/ (or /EN 16516/, after the on-going revision of /CEN/TS 16516/);

(3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the

conditions specified in /CEN/TS 16516/; some regulations and programs also have limits after 3 days, on top of the 28 days limits;

(4) express the test results as air concentrations in the European Reference Room, as specified in /CEN/TS 16516/.

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

Relevant test results shall be produced either by an /ISO 17025/ accredited commercial test lab, or by a qualified internal test lab of the manufacturer.

Examples for the applied limits after 28 days of storage in a ventilated test chamber are:

- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):

Table 1 shows an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days of storage in a ventilated test chamber.

Table 2 provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days of storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

	TVOC [µg/m ³]	Sum of carcinogens. C1A,CA2 [µg/m ³]	Formal- dehyde [µg/m ³]	Acet- aldehyde [µg/m ³]	Sum of Form- and Acet- aldehyde
German DIBt/AgBB regulation	10 000	10	-/-	-/-	-/-
draft Lithuanian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 ^{PLUS}	750	10	50	50	50 ppb

	TVOC [µg/m ³]	TSVOC [µg/m ³]	Each carcinogen C1A,CA2 [µg/m ³]	Formaldehyde [µg/m ³]	Acetaldehyde [µg/m ³]	LCI	R value	Specials	Sum non-LCI & non- identified [µg/m ³]
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m ³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	1200	German AgBB list	1	-/-	100
draft Lithuanian regulation	1000	100	1	product type specific	-/-	Lithuanian list	1	-/-	-/-
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 ^{PLUS}	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	-/-	-/-	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m ² h	-/-	5 µg/m ² h	50 µg/m ² h	-/-	-/-	-/-	Ammonia, odour	-/-

Leaching Measurement of leaching performance (eluate analysis) indicating the measurement process.

Leaching is only relevant for specific applications. In this case, information can be provided by the manufacturer.

8. References

PCR 2013, Part A: 2013-04

Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for construction products from the range of Environmental Product Declarations from *Institut Bauen und Umwelt e.V.* (IBU) Part A: Calculation rules for the Life Cycle Assessment and requirements on the Background Report www.bau-umwelt.de

PCR 2011, Part B: 2011-06

Product Category Rules for Construction Products, Part B: Requirements on the EPD for mineral trade mortar www.bau-umwelt.de

2000/532/EC: Commission decision of 3 May 2000 replacing decision 94/3/EC on a waste index as per

Article 1 a) of Council Directive 75/442/EEC on waste and Council decision 94/904/EC on an index of hazardous waste according to Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

GaBi ts software

Software and database for comprehensive analysis. LBP, University of Stuttgart and thinkstep AG, 2015

GaBi ts documentation

Documentation of GaBi 6 data sets from the database for comprehensive analysis LBP, University of Stuttgart and thinkstep AG, 2015 <http://documentation.gabi-software>

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

EN 1504-3:2006-03

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 1504-2:2015-03

Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 2: Surface protection systems for concrete

EN 12190:1998-12

Products and systems for the protection and repair of concrete structures – Test methods – Determination of compressive strength of repair mortar

EN 1015-17:2005-01

Methods of test for mortar for masonry – Part 17: Determination of water-soluble chloride content of fresh mortars

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 12617-4:2002-08

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EN 1504-7:2015-09

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 15183:2006-11

Products and systems for the protection and repair of concrete structures – Test methods – Corrosion protection test; German version EN 15183

EN 12004:2014-02

Adhesive for tiles – Requirements, evaluation of conformity, classification and designation

EN 1346:2007-11

Adhesives for tiles – Determining the open time

EN 1348:2007-11

Adhesive for tiles – Determination of tensile adhesion strength for cementitious adhesives

ETAG 004:2001-02-20

Guideline for European technical approval of external thermal insulation composite systems with rendering (ETAG 004)

EN 13888:2009-08

Grout for tiles – Requirements, evaluation of conformity, classification and designation

EN 13813:2003-01

Screed material and floor screeds – Screed materials – Properties and requirements

EN 13501-1:2010-01

Fire classification of construction products and building products – Part 1: Classification using data from reaction to fire tests

EN 13892-2:2003-02

Methods of test for screed materials – Part 2: Determination of flexural and compressive strength

EN 13501-1:2010-01

Fire classification of construction products building elements – Part 1: Classification using data from reaction to fire tests

EN 998-1:2015-11

Specification for mortar for masonry – Part 1: Rendering and plastering mortar

EN 13279-1:2008-11

Gypsum binders and gypsum plasters – Part 1: Definitions and requirements

EN 14891:2015-02

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

EWC 170101: 2000/532/EC

European Waste Catalogue / Ordinance on European List of Wastes Concrete

EWC 101314: 2000/532/EC

European Waste Catalogue / Ordinance on European List of Wastes Waste concrete and concrete sludge

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

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

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.

EN ISO 9001:2008-12

Quality management systems – Requirements

ISO 16000-3:2013-01

Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds by sampling using a pump

ISO 16000-6:2012-11

Indoor air – Part 6: Determination of volatile organic compounds indoors and in test chambers by sampling on TENAX TA®, thermal desorption and gas chromatography using MS or FID

EN ISO 16000-9:2008-04

Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method

EN ISO 16000-11:2006-06

Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens

CEN/TS 16516:2015-07

Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

Royal Decree C-2014/24239

Belgisch Staatsblad 8 MEI 2014, p. 60603.
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AgBB: 2012-06

Committee for Health-related Evaluation of Building Products: health-related evaluation of

emissions of volatile organic compounds (VOC and SVOC) from building products
www.umweltbundesamt.de/produkte/bauprodukte/agb_b.htm

EMICODE

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

Blue Angel

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

Indoor Air Comfort

Product certification by Eurofins, Hamburg, Germany
www.eurofins.com

Institut Bauen und Umwelt

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ISO 14025

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

EN 15804

EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for
Keraquick Maxi S1



Programme: The International EPD[®] System; www.environdec.com	Programme operator: EPD International AB	EPD registration number: S-P-01108	Publication date: 2018-09-14	Valid until: 2023-09-13	Geographical scope: International	Revision: 2019-10-24
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1. COMPANY DESCRIPTION / GOAL & SCOPE

Founded in 1937 in Milan, Italy, Mapei produces adhesives and complementary products for laying all types of floor, wall and coating materials, and also specializes in other chemical products used in the building industry, such as waterproofing products, specialty mortars, admixtures for concrete, products for underground constructions and for the restoration of concrete and historical buildings.

There are currently 85 subsidiaries in the Mapei Group, with a total of 80 production facilities located around the world in 34 different countries and in 5 different continents. Mapei also has 18 central laboratories. Most locations are ISO 9001 and ISO 14001 or EMAS-certified.

Mapei's strategy of internationalization is based on two main objectives: being closer to local needs and lowering transportation costs. With the declared objective of being close to buyers and clients, Mapei's presence in the five continents enables the company to comply with the requirements of each location, and to use only locally-based managers and qualified personnel, without changing the approach of Mapei.

Mapei invests 12% in its company's total work-force and 5% of its turnover in Research & Development; in particular, 70% of its R&D efforts are directed to develop eco-sustainable and environmentally friendly products, which give important contribution to all major green rating systems for eco-sustainable buildings such as LEED and BREEAM.

Furthermore, Mapei has developed a sales and technical service network with offices all over the world and offers an efficient Technical Assistance Service that is valued by architects, engineers, contractors and owners.

The goal of the study is to provide necessary data and documentation to produce an EPD according to the requirements of PCR Environdec (version 2.3, date 2018-11-15) under EN 15804:2014 and to have more comprehension about the environmental impacts related to **Keraquick Maxi S1** in both versions grey and white, manufactured in Mapei S.p.A. located in Robbiano di Mediglia (Italy), including packaging of the finished product.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of **Keraquick Maxi S1**.

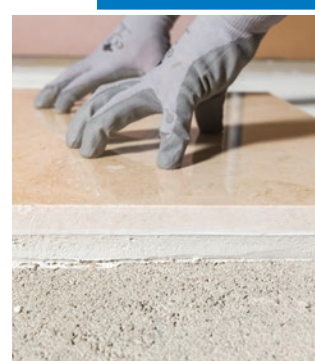
This analysis shall not support comparative assertions intended to be disclosed to the public.

2. PRODUCT DESCRIPTION

Keraquick Maxi S1 is high-performance, deformable, fast setting cementitious adhesive with no vertical slip, for ceramic tiles and stone, including large formats. It has very low emission level of organic volatile compounds.

It is compliant with EN 12004 (Adhesives for tiles. Requirements, evaluation of conformity, classification and designation) and ISO 13007-1 (Ceramic tiles - Grouts and adhesives) as C2FT S1 (or C2F S2 if mixed with Latex Plus).

The product is supplied in 25 kg multiply bags for the grey version and 23 kg multiply bags for the white version.



3. CONTENT DECLARATION

The main components and ancillary materials of **Keraquick Maxi S1** (grey and white) are the following:

Table 1: Composition

Materials	Percentage (%)
Organic binders	< 5
Inorganic binders	< 35
Fillers	< 65
Recycled material	≤ 5
Additives	< 5
Other	< 2

The products contain neither carcinogenic substances nor substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration more than 0,1 % (by unit weight).

Keraquick Maxi S1



4. DECLARED UNIT AND REFERENCE SERVICE LIFE

The declared unit is 1 kg of packaged finish product.

Packaging materials include:

- Multiply bag (paper/PE/paper)
- Wooden pallet
- LDPE used as wrapping material

The reference service life of the adhesives, if professionally installed and properly used, is estimated to be the same as the building one.

5. SYSTEM BOUNDARIES AND ADDITIONAL TECHNICAL INFORMATION

The approach is “cradle to gate”. The following modules have been considered:

- A1-A3 (production stage): extraction and transport of raw materials, packaging included, production process.

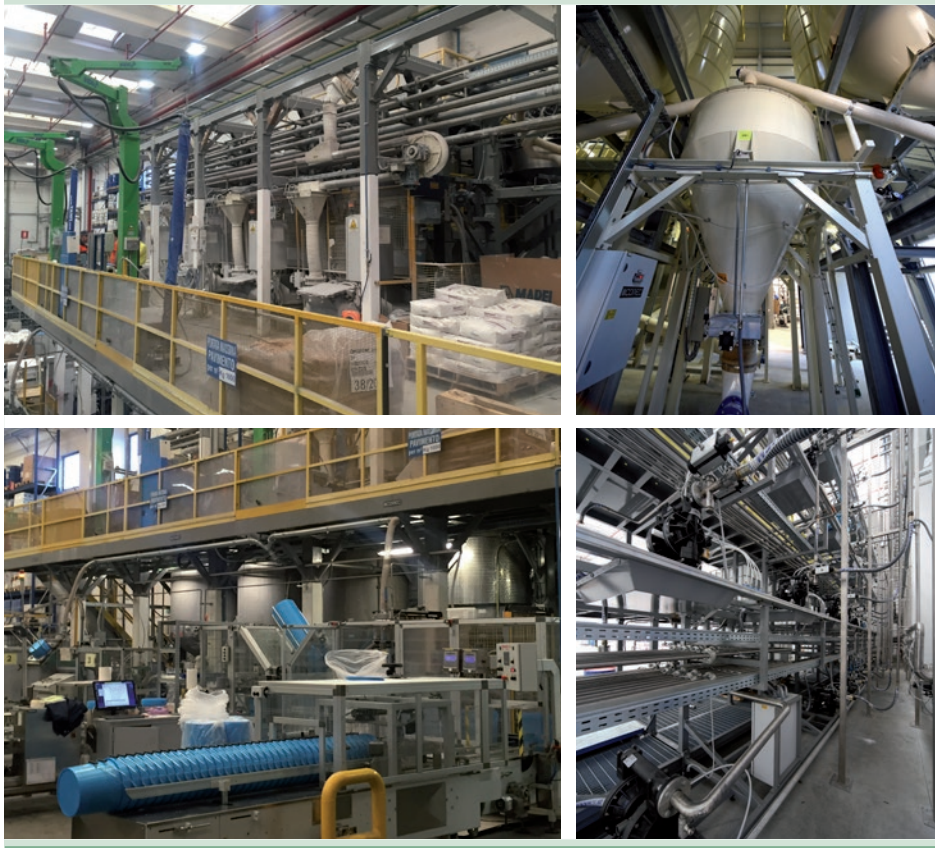
Table 2: System boundaries

System Boundaries														
A1 – A3			A4 – A5		B1 – B7					C1 – C4				D
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END OF LIFE STAGE				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	
Raw Material Supply	Transport	Manufacturing	Transport	Installation Process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction/ Demolition	Transport	Waste Processing	Disposal	
					B6	Operational Energy Use								
					B7	Operational Water Use								

included
 excluded

A brief description of production process, is the following:

Figure 1: Production process detail



The production process starts from raw materials, which are purchased from external and intercompany suppliers and stored in the plant. Bulk raw materials are stored in specific silos and added automatically in the production mixer, according to the formula of the product. Other raw materials, supplied in bags, big bags or tanks, are stored in the warehouse and added automatically or manually in the mixer. The production is a discontinuous process, in which all the components are mechanically mixed in batches. The semi-finished product is then packaged in multiply bags, put on wooden pallets, covered by stretched hoods and stored in the finished products warehouse. The quality of final product is controlled before the sale.



6. CUT-OFF RULES AND ALLOCATION

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA, information modules and any additional information are intended to support an efficient calculation procedure. They are not applied in order to hide data.

The following procedure is followed for the exclusion of inputs and outputs:

- All inputs and outputs to a unit process, for which data are available, are included in the calculation.
- Cut-off criteria, where applied, are described in Table 3

Table 3: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	Less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%
A3: waste and particle emission	Less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%

For the allocation procedure and principles, consider the following table (Table 4):

Table 4: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1 kg of product: <ul style="list-style-type: none"> • A1: electricity is allocated to the whole plant production
A3	All data are referred to 1 kg of packaged product: <ul style="list-style-type: none"> • A3-wastes: all data are allocated to the whole plant production

7. ENVIRONMENTAL PERFORMANCE AND INTERPRETATION



GWP₁₀₀

Global Warming Potential refers to the emission/presence of GHGs (greenhouse gases) in the atmosphere (mainly CO₂, N₂O, CH₄) which contribute to the increase in the temperature of the planet.



AP

Acidification Potential refers to the emission of specific acidifying substances (i.e. NO_x, SO_x) in the air. These substances decrease the pH of the rainfall with predictable damages to the ecosystem.



EP

Eutrophication Potential refers to the nutrient enrichment of flowing water, which determines unbalance in aquatic ecosystems and causes the death of the aquatic fauna.



ODP

Ozone Depletion Potential refers to the degradation of the stratospheric layer of the ozone involved in blocking the UV component of sunrays. Depletion is due to particularly reactive components that originate from chlorofluorocarbon (CFC) or chlorofluoromethanes (CFM).



POCP

The Photochemical Ozone Creation Potential is the ozone formation in low atmosphere. This is quite common in the cities where a great amount of pollutants (like VOC and NO_x) are emitted every day (industrial emissions and vehicles). It is mainly diffused during the summertime.



ADP_e (elements)

Abiotic Depletion Potential elements refers to the depletion of the mineral resources.



ADP_f (fossil fuel)








Abiotic Depletion Potential fossil fuel refers to the depletion of the fossil fuel resources.



Following tables show environmental impacts for the products considered according to CML methodology (2001 – Jan. 2016). All the results are referred to the declared unit (see chapter 4).

Keraquick Maxi S1 (grey)

Table 5: **Keraquick Maxi S1 (grey)**: Environmental categories

Environmental Category	Unit	A1 – A3
 GWP₁₀₀	(kg CO ₂ eq.)	3,22E-01
 ADPe (element)	(kg Sb eq.)	1,64E-06
 ADPf (fossil)	(MJ)	4,03E+00
 AP	(kg SO ₂ eq.)	1,37E-03
 EP	(kg (PO ₄) ³⁻ eq.)	1,03E-04
 ODP	(kg R-11 eq.)	1,11E-09
 POCP	(kg ethylene eq.)	9,07E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 6: **Keraquick Maxi S1 (grey)**: Other environmental indicators

Environmental Indicator	Unit	A1-A3
RPEE	MJ	5,10E-01
RPEM	MJ	-
TPE	MJ	5,10E-01
NRPE	MJ	4,21E+00
NRPM	MJ	-
TRPE	MJ	4,21E+00
SM	kg	4,94E-02
RSF	MJ	-
NRSF	MJ	-
W	m ³	2,55E-03

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water [total freshwater consumption]








Table 7: **Keraquick Maxi S1 (grey)**: Waste production & other output flows

Output Flow	Unit	A1-A3
NHW	kg	1,58E-03
HW	kg	8,62E-04
RW	kg	0,00E+00
Components for re-use	kg	-
Materials for recycling	kg	8,57E-03
Materials for energy recovery	kg	-
Exported energy	MJ	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Keraquick Maxi S1 (white)

Table 8: **Keraquick Maxi S1 (white)**: Environmental categories

Environmental Category	Unit	A1 – A3
 GWP₁₀₀	(kg CO ₂ eq.)	4,62E-01
 ADPe (element)	(kg Sb eq.)	1,33E-06
 ADPf (fossil)	(MJ)	3,07E+00
 AP	(kg SO ₂ eq.)	3,16E-03
 EP	(kg (PO ₄) ³ eq.)	2,15E-04
 ODP	(kg R-11 eq.)	1,10E-07
 POCP	(kg ethylene eq.)	2,75E-04

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 9: **Keraquick Maxi SI (white)**: Other environmental indicators

Environmental Indicator	Unit	A1-A3
RPEE	MJ	3,98E+00
RPEM	MJ	-
TPE	MJ	3,98E+00
NRPE	MJ	3,21E+00
NRPM	MJ	-
TRPE	MJ	3,21E+00
SM	kg	-
RSF	MJ	-
NRSF	MJ	-
W	m ³	2,64E-03

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water [total freshwater consumption]

Table 10: **Keraquick Maxi SI (white)**: Waste production & other output flows

Output Flow	Unit	A1-A3
NHW	kg	1,58E-03
HW	kg	8,62E-04
RW	kg	0,00E+00
Components for re-use	kg	-
Materials for recycling	kg	8,57E-03
Materials for energy recovery	kg	-
Exported energy	MJ	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed



Tables above show absolute results for every considered environmental impact category. They clearly indicate that module **A1** gives the highest contribution for each of them, up to 99% of the total impact in the whole system boundary.

In particular hydraulic binders and organic polymers, which are some of the main components in the adhesive formulation, carry a significant impact for all environmental categories.

Electricity consumption in the production process does not affect the considered environmental categories.

The **module A2** (raw materials transportation) gives a negative contribution to POCP due to the NO and NO₂ emission factors (for more details, see the methodology used: *HBEFA -Handbook Emission Factors for Road Transport*).

A specific amount of recycled material is contained in the grey formulation and the value is shown in Table 6 as SM (secondary material) indicator.

Table 11: Environmental Impact of **Keraquick Maxi S1 (grey)** as percentage

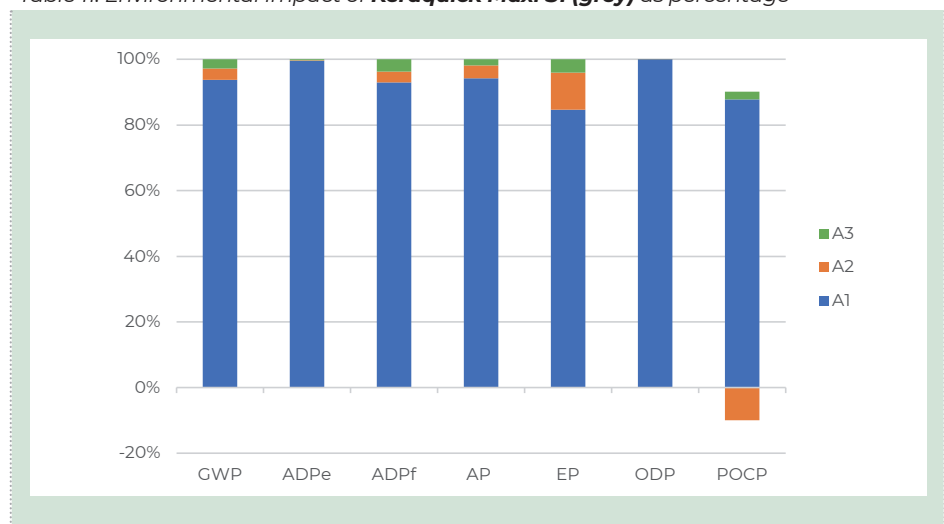


Table 12: Environmental Impact of **Keraquick Maxi S1 (white)** as percentage



More details about electrical mixes used in this EPD are shown below:

	Data source	Amount	Unit
Electricity grid mix (IT) – 2014	GaBi database	0,4020	kg CO ₂ -eqv/kWh
Electricity from photovoltaic (IT) – 2014	GaBi database	0,0641	kg CO ₂ -eqv/kWh

8. DATA QUALITY

Table 13: Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1; A3		
Inorganic Binders (DE)	GaBi Database	2015 – 2017
Organic Binders (DE)	GaBi Database	2012
Fillers (EU)	GaBi Database	2017
Additives (EU)	GaBi Database	2012 – 2017
Recycled Material (DE)	GaBi Database	2017
Electricity grid mix (IT)	GaBi Database	2014
Electricity from photovoltaic (IT)	GaBi Database	2014
Packaging components (EU)	GaBi Database, PlasticEurope	2005 – 2017
A2		
Truck transport (euro 3,27 t payload - GLO)	GaBi Database	2017
Light Train (Gross Ton Weight 500 t - GLO)	GaBi Database	2017
Electricity grid mix (EU)	GaBi Database	2014
Diesel for transport (EU)	GaBi Database	2014

All data included in table above refer to a period between 2005 and 2017; the most relevant ones are specific from supplier, while the others (i.e. transport and minor contribution dataset), come from European and global databases.

All dataset are not more than 10 years old according to EN 15804 § 6.3.7 “Data quality requirements”. The only exception is represented by one raw material used for one packaging component production.

Primary data concern the year 2018 and represent the whole annual production.



9. REQUISITE EVIDENCE

9.1 VOC emissions

Volatile Organic Compounds (VOC) special tests and evidence have been carried out on the products, according to ISO 16000 parts 3, 6, 9 and 11 and EN 16516.

The tile-adhesives have been evaluated in emission chambers, in order to detect their VOC emissions after 3- and 28-days storage in the ventilated chambers, according to GEV (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V.) test method.

Keraquick Maxi S1 meets the requirements for the emission class Emission EC1^{PLUS}, as "very low VOC emission", released by GEV.

The next table describes the limits for the Emission EC1^{PLUS} class:

Table 14: EC1^{PLUS} VOC limits

	3 days µg/m ³	28 days µg/m ³
TVOC (C6-C16)	≤ 750 µg/m ³	≤ 60 µg/m ³
TSVOC (C16-C22)		≤ 40 µg/m ³
C1A-C1B substances	Total ≤ 10 µg/m ³	Single substance ≤ 1 µg/m ³
Formaldehyde/ acetaldehyde	≤ 50 µg/m ³	
Sum of formaldehyde/ acetaldehyde	≤ 50 ppb	
Sum of non-assessable VOCs		≤ 40
R value		≤ 1

9.2 Recycled Content

Keraquick Maxi S1 contains 5% of recycled material in the grey version.

10.SIGNIFICANT CHANGES FROM THE PREVIOUS VERSION

In this revision new primary data (referred to the reference year 2018) have been adopted. The new version of PCR 2.3 has been considered. Secondary materials has been included in the content declaration and SM indicator has been updated. Due to these updates, environmental categories have changed more than ±10% (ODP and W).

10.VERIFICATION AND REGISTRATION

EPD of construction products may not be comparable if they do not comply with EN 15804.

Environmental product declarations within the same product category from different programs may not be comparable.

CEN standard EN15804 served as the core PCR

PCR:	PCR 2012:01 Construction products and Construction services, Version 2.3, 2018-11-15
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	<input checked="" type="checkbox"/> EPD Process Certification (Internal) <input type="checkbox"/> EPD Verification (external)
Third party verifier:	Certiquality S.r.l. Number of accreditation: 003H rev15
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

11. REFERENCES

- EN 12004 "ADHESIVES FOR TILES. REQUIREMENTS, EVALUATION OF CONFORMITY, CLASSIFICATION AND DESIGNATION"
- EN 15804: SUSTAINABILITY OF CONSTRUCTION WORKS - ENVIRONMENTAL PRODUCT DECLARATIONS - CORE RULES FOR THE PRODUCT CATEGORY OF CONSTRUCTION PRODUCTS
- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD® SYSTEM. VERSION 3.0
- HBEFA - HANDBOOK EMISSION FACTORS FOR ROAD TRANSPORT
- ISO 13007-1 CERAMIC TILES - GROUTS AND ADHESIVES - PART 1: TERMS, DEFINITIONS AND SPECIFICATIONS FOR ADHESIVES: DEFINITIONS AND CHARACTERISTICS
- ISO 14025 ENVIRONMENTAL LABELS AND DECLARATIONS - TYPE III ENVIRONMENTAL DECLARATIONS - PRINCIPLES AND PROCEDURES
- ISO 14044 ENVIRONMENTAL MANAGEMENT – LIFE CYCLE ASSESSMENT – REQUIREMENTS AND GUIDELINES
- PCR 2012:01; "PRODUCT GROUP CLASSIFICATION: MULTIPLE UN CPC CODES CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES"; VERSION 2.3

12. CONTACT INFORMATION

EPD owner:	 ADHESIVES • SEALANTS • CHEMICAL PRODUCTS FOR BUILDING Mapei SpA www.mapei.it
LCA Author:	 ADHESIVES • SEALANTS • CHEMICAL PRODUCTS FOR BUILDING Mapei SpA www.mapei.it ; Environmental Sustainability Office
Programme operator:	 EPD International AB info@environdec.com

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[/mapeispa](#)



Latex Plus

Model EPD

“Dispersion-based products, solvent-free”

(Declaration number EPD-FEI-20160086-IBG1-EN)



II ADDITIVO ELASTICIZZANTE PER KERADUICK S1, NIVORAPID O PLANPATCH
Applicationes con KERADUICK S1 (per il dosaggio si rimanda alla scheda tecnica) in un recipiente pulito, fino ad ottenere una consistenza omogenea. Applicare l'impasto con spatola dentata idonea per il tipo ed il formato del materiale da incollare. L'impasto è lavorabile per circa 30 minuti.
Applicationes con NIVORAPID o PLANPATCH (per il dosaggio si rimanda alla scheda tecnica) in un recipiente pulito, fino ad ottenere un impasto omogeneo. Applicare l'impasto con spatola smerlatana per ottenere risultato a spessore variabile, rispettivamente da 1 a 20 mm e da 0 a 10 mm. L'impasto è lavorabile per circa 20 minuti.
Immagazzinamenti 24 mesi nelle condizioni originali chiuse. Condizioni: Biscotti: 1,2-benzotriazolone-3(2H)-ione (EC no. 247-500-7) e il 2-metil-2H-benzotriazol-3-one (EC no. 200-238-6 (21)). Può provocare una reazione allergica. Substant data di sicurezza disponibile su richiesta. Per maggiori informazioni consultare la scheda tecnica. **PRODOTTO PER USO PROFESSIONALE. TEME IL GELO.**

Peso netto
Net weight **10 kg e-9,8ℓ**



III LATEX ADMIXTURE IMPARTING ELASTICITY FOR KERADUICK S1, NIVORAPID AND PLANPATCH
Applicationes con KERADUICK S1 (per il dosaggio si rimanda alla scheda tecnica) in un recipiente pulito, fino ad ottenere una consistenza omogenea. Applicare l'impasto con spatola dentata idonea per il tipo ed il formato del materiale da incollare. L'impasto è lavorabile per circa 30 minuti.
Applicationes con NIVORAPID o PLANPATCH (per il dosaggio si rimanda alla scheda tecnica) in un recipiente pulito, fino ad ottenere un impasto omogeneo. Applicare l'impasto con spatola smerlatana per ottenere risultato a spessore variabile, rispettivamente da 1 a 20 mm e da 0 a 10 mm. L'impasto è lavorabile per circa 20 minuti.
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Peso netto
Net weight **10 kg e-9,8ℓ**



DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPDS

Mapei is a member of FEICA (Association of the European Adhesive & Sealant Industry), which has developed so-called Model Environmental Product Declarations (Model EPDs), independently verified by IBU (Institut Bauen und Umwelt e.V.).

The Model EPDs represent the current production technology in Europe. The compliance of Mapei products to the Model EPDs is checked on the base of their formulations, by using an IBU-approved guideline procedure.

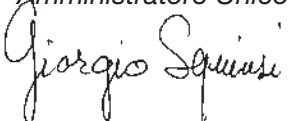
Mapei declares that the product

Latex Plus

meets the criteria of the attached Model EPD
“Dispersion-based products, solvent-free”
(Declaration number EPD-FEI-20160086-IBG1-EN)

The Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used whenever they are required for the evaluation of the sustainability of buildings where ***Latex Plus*** is applied.

Mapei S.p.A.

Giorgio Squinzi
Amministratore Unico




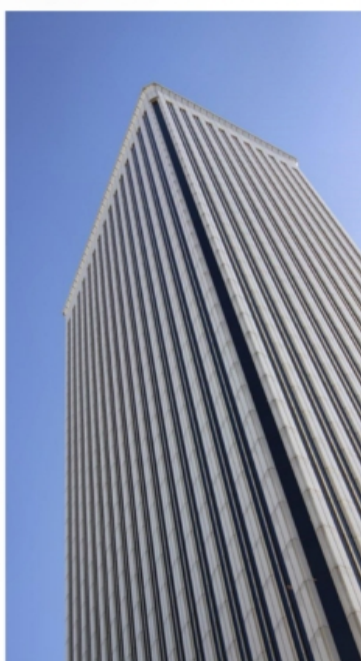
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	FEICA - Association of the European Adhesive and Sealant Industry
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20160086-IBG1-EN
ECO EPD Ref. No.	ECO-00000400
Issue date	29/08/2016
Valid to	28/08/2022

**Dispersion-based products, solvent-free
FEICA - Association of the European
Adhesive and Sealant Industry**

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



1. General Information

FEICA - Association of the European Adhesive and Sealant Industry

Programme holder

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

Declaration number

EPD-FEI-20160086-IBG1-EN

This Declaration is based on the Product Category Rules:

Coatings with organic binders, 07.2014
(PCR tested and approved by the SVR)

Issue date

29/08/2016

Valid to

28/08/2022



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



Dr. Burkhard Lehmann
(Managing Director IBU)

Dispersion-based products, solvent-free

Owner of the Declaration

FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuysse 4
1160 Brussels
Belgium

Declared product / Declared unit

1 kg / 1 kg; density 1,000 - 1,500 kg/m³

Scope:

This validated Declaration entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members 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 FEICA secretariat. The members of FEICA are listed on its 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration according to /ISO 14025/

internally externally



Mr Olivier Muller
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Solvent-free, dispersion-based products comprise organic binding agents based on synthetic and/or natural resins, mineral fillers such as chalk as well as water and smaller volumes of auxiliaries (thickening agents, defoaming agents, surface-active agents, preservatives etc.). They dry physically through evaporation of the water contained therein.

They comply with manifold, often specific, tasks in the construction, furnishing and repair of buildings. Using dispersion-based products decisively improves the fitness for use of structures and extends their life expectancy.

The product displaying the highest environmental impacts within the class of dispersion-based products considered was used as a representative product for calculating the Life Cycle Assessment results (worst case-approach).

2.2 Application

Dispersion-based products are used for the following applications:

Module 1: Dispersion adhesives, fixatives, pre-coatings and primers for floor coverings and parquet

flooring

Adhesives for, e.g.

- tufted carpets with various backing
- woven textile coverings, fibre-bonded and natural-fibre coverings
- resilient coverings (PVC, rubber)
- linoleum
- insulating bases and underlays
- parquet, laminate and wood blocks on surfaces ready for laying. The products are suitable for normal wear in residential and commercial areas, also on heated floor constructions.

Module 2: Dispersion-based tile adhesive

Products for bonding ceramic tiles and paving as well as natural stone for internal and external installations on walls, floors and ceilings

Module 3: Dispersion-based adhesives, coatings and sealants

As structural adhesives, coatings and sealants:

- structural and repair adhesives
- dispersion filler compounds
- joint sealants

Module 4: Dispersion-based products for waterproofing of buildings

Module 5: *Dispersion-based primers and bonding agents for concrete and floor screeds*

Module 6: *Dispersion-based products for surface protection of concrete*

To increase the durability of concrete and reinforced steel structures as well as for new concrete and for maintenance and repair work (for areas without vehicle traffic)

Module 7: *Dispersion-based primers, barrier coatings, varnishes and glazes for coating of buildings, structural elements and components for decorative, functional or protective purposes*

2.3 Technical Data

Module 1: *Dispersion adhesives, fixatives, pre-coatings and primers for floor coverings and parquet flooring*

Dispersion adhesives for floor coverings have to comply with the requirements of the /EN 14259:2003/. Fixatives do not usually comply with these requirements; their strengths are lower in accordance with their specifications. The performance characteristics of pre-coatings and primers are subject to the manufacturer's technical documentation / declaration of performance.

Dispersion adhesives for parquet: The test procedures and requirements of the /EN 14293:2006/ have to be fulfilled.

Module 2: *Dispersion-based tile adhesive*

The minimum requirements in accordance with /EN 12004:2012/ must be maintained. These are:

- Shear adhesion strength after dry storage (/EN 1324:2007/)
- Shear adhesion strength after heat ageing (/EN 1324:2007/)
- Open time: tensile adhesion strength (/EN 1346:2007/)

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

Module 3: *Dispersion-based adhesives, coatings and sealants*

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

Module 4: *Dispersion-based products for waterproofing of buildings*

The minimum requirements of the /ETAG 022:2007/ must be maintained.

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

Module 5: *Dispersion-based primers and bonding agents for concrete and floor screeds*

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

Module 6: *Dispersion-based products for surface protection of concrete*

Dispersion-based products for surface protection systems of concrete comply with the following requirements (characteristics for all intended uses in accordance with /EN 1504-2:2005/, Tables 1 and 5):

- Permeability to CO₂ (/EN 1062-6:2002/)
- Water vapour permeability (/EN ISO 7783-1/-2:2012/)
- Capillary absorption and permeability to water (/EN 1062-3:2008/)
- Measurement of bond strength by pull-off (/EN 1542:1999/)

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

Module 7: *Dispersion-based primers, barrier coatings, varnishes and glazes for coating of buildings, structural elements and components for decorative, functional or protective purposes*

The requirements of the /Decopaint Directive 2004/42/EC/ must be maintained

- for unpigmented primers
 - for pigmented dispersion varnishes and dispersion primers in Decopaint product group d
 - for water-soluble glazes in Decopaint product groups e or f
 - for barrier primers in Decopaint product group g
 - for single-component special varnishes in Decopaint product group i,
- all of which are water-based.

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

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 need a Declaration of Performance taking into consideration either the relevant harmonised European standard or the European Technical Assessment as cited in chapter 2.3 and the CE-marking.

For the application and use of the products the respective national provisions apply.

2.5 Delivery status

Liquid or pasty in containers made of plastic or metal. Typical container sizes contain 1 to 30 kg, usually 10 to 20 kg of product on pallets. For larger applications, vats with approx. volumes of 200 kg (litres) or IBCs (intermediate bulk containers) with a capacity in excess of 1 tonne (m³) are also used.

A plastic container was modelled for the Life Cycle Assessment.

2.6 Base materials / Ancillary materials

Dispersion-based products usually comprise at least one synthetic resin dispersion, natural or synthetic resins dispersed in water, mineral fillers (e.g. chalk) and/or pigments. Auxiliaries such as thickening agents, defoaming agents, surface-active and dispersing agents as well as preservatives are used to fine-tune the product features.

On average, the products covered by this EPD contain the following range of base materials and auxiliaries (% by mass):

- Synthetic resin dispersion (solids portion): 5 - 65
- Natural resins, natural resin derivatives: 0 - 25
- Mineral fillers: 0 - 60
- Pigments: 0 - 35
- Water: 15 - 95
- Auxiliaries: 1 - 5
- Thickening agents: < 3
- Dispersing agents / Emulsifying agents: < 2
- Wetting agent: 2
- Other: 0 - 2

The biocidal products used contain agents which can be marketed in accordance with Biocidal Products Regulation (EU) No 528/2012.

In individual cases, it is possible that substances on the list of particularly harmful substances for inclusion in Annex XIV of the /REACH/ regulation are contained in concentrations of exceeding 0.1%. If this is the case,

this information can be found on the respective safety data sheet.

2.7 Manufacture

Dispersion-based products are usually mixed discontinuously in batch mode, i.e. in individual batches or series of individual batches, and filled into the delivery containers. The quality of the products and safe handling thereof is ensured by the corresponding regulations such as /ISO 9001:2008-12/ and the provisions outlined in the relevant regulations such as the Industrial Safety Regulation and Federal Pollution Control Act.

2.8 Environment and health during manufacturing

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

2.9 Product processing/Installation

Dispersion-based products are processed on site using suitable tools, usually by hand. The products are applied by trowelling/knife-coating, painting, rolling or spraying, 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.

Depending on the application and product specifications, between 50 and 1,500 g/m² are applied.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty containers and clean foils can be recycled.

2.11 Condition of use

During the use phase dispersion-based products are existent as hardened film.

They are long-lasting products which protect our buildings in the form of primers, coatings or sealants as well as making an essential contribution towards their appearance, function and sustainability.

2.12 Environment and health during use *Option 1 – Products for applications outside indoor areas with permanent stays by people*

No risks are known for water, air and soil if the products are used as designated.

Option 2 – Products for applications inside indoor areas with permanent stays by people

When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements. No further influences on the environment and health by emanating substances are known.

2.13 Reference service life

Dispersion-based products fulfil manifold, often specific, tasks in the construction, refurbishment or renovation 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 weather factors as well as by mechanical or chemical loads.

2.14 Extraordinary effects

Fire

In terms of their application volumes, dispersion-bound products usually have no or only a subordinate influence on the fire characteristics of the structure in which they have been used.

Water

Dispersion-based products are only water-resistant to a certain degree and their strength can deteriorate when exposed to water for longer periods of time, detaching from the surface in a worst-case scenario. The primary components of dispersion-based products are not hazardous to water or only slightly hazardous to water. Owing to the overall low volumes of dispersion-based products used on buildings, no relevant contribution towards environmental damage can be anticipated by buildings featuring dispersion-based products in the event of extraordinary exposure to water.

Mechanical destruction

The mechanical destruction of dispersion-bound products 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 known environmentally-hazardous effects in terms of disposal are to be generally anticipated through dismantling and recycling components to which hardened, dispersion-bound products adhere.

2.16 Disposal

The portion of a dispersion-based product applied at an other construction product is rather low. These low amounts do not play any role when the construction product is disposed. They do not interfere with the disposal/recycling of other components / building materials.

Hardened product residue mechanically removed from substrates must be disposed of as commercial / construction waste.

The following waste codes according to the European List of Waste (/2000/532/EC/) can apply: Hardened product residue:

08 01 12 waste paint and varnish other than those mentioned in 08 01 11

08 04 10 waste adhesives and sealants other than those mentioned in 08 04 09

2.17 Further information

More information is available in 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.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg dispersion-based product with a density of 1.000 - 1.500 kg/m³ in the mixing ratio required for processing the components in accordance the PCR part B for Coatings with organic binders.

Consumption per unit area of the products to be applied extensively can range between 50 - 1.500 g/m².

The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario).

Declared unit

Name	Value	Unit
Conversion factor to 1 kg	1	-
Declared unit	1	kg

3.2 System boundary

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

- A1 Production of preliminary products
- A2 Transport to plant
- A3 Production (incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging & installation losses and emissions during installation)
- D Credits from incineration of packaging materials & installation losses

The declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions

Where no specific /GaBi/ processes were available, the individual constituent materials of the formulations were estimated based on information provided by the manufacturer or literature sources.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data 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.

Transport of packaging materials is also excluded.

3.5 Background data

Data from the /GaBi/ 6 database was used as background data. Where no background data was available, data gaps were complemented by manufacturer information and literature research.

3.6 Data quality

Representative products were selected for this EPD. The product displaying the highest environmental impacts in a group was selected for calculating the LCA results. The datasets are less than 5 years old. Data for production and packaging are based on details

provided by the manufacturer. The formulation used for evaluation refers to a specific product.

3.7 Period under review

Representative formulations were accepted by FEICA Ltd and collected in 2011.

3.8 Allocation

No allocations were applied for production. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of production residues and packaging materials. The credits achieved through packaging disposal are declared 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. In this case, 1 kg dispersion-based product was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing 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	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1000 - 1500	kg/m ³
Capacity utilisation volume factor	1	-

Installation into the building (A5)

Name	Value	Unit
Material loss	0.01	kg
VOC in the air	0.001	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN 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	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: 1 kg dispersion-based product, solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO ₂ -Eq.]	9.92E-1	4.87E-2	1.60E-1	-6.90E-2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.02E-10	2.24E-13	4.99E-13	-2.28E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	2.92E-3	1.20E-4	1.69E-5	-1.10E-4
Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	3.55E-4	2.78E-5	3.47E-6	-1.11E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	6.78E-4	-3.37E-5	3.66E-4	-1.16E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.85E-7	3.25E-9	1.53E-9	-1.18E-8
Abiotic depletion potential for fossil resources	[MJ]	2.65E+1	6.71E-1	2.67E-2	-9.48E-1

RESULTS OF THE LCA - RESOURCE USE: 1 kg dispersion-based product, solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	2.64E+0	IND	IND	IND
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	IND	IND	IND
Total use of renewable primary energy resources	[MJ]	2.64E+0	3.82E-2	3.97E-3	-1.57E-1
Non-renewable primary energy as energy carrier	[MJ]	1.61E+1	IND	IND	IND
Non-renewable primary energy as material utilization	[MJ]	1.24E+1	IND	IND	IND
Total use of non-renewable primary energy resources	[MJ]	2.85E+1	6.74E-1	3.16E-2	-1.16E+0
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
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]	8.33E-3	9.56E-5	3.83E-4	-2.44E-4

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 kg dispersion-based product, solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	2.35E-8	5.09E-8	5.80E-11	-4.48E-10
Non-hazardous waste disposed	[kg]	1.14E-2	5.66E-5	1.45E-3	-4.13E-4
Radioactive waste disposed	[kg]	7.85E-4	9.63E-7	1.96E-6	-8.45E-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	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	2.42E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	5.58E-1	0.00E+0

6. LCA: Interpretation

The majority of life cycle energy consumption takes place during the production phase (A1-A3). 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) relevant influence also arises due to the wooden pallets 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.

Transportation to the construction site (A4) and the installation process (A5) make a minor contribution to almost all impacts. The only exception is the photochemical ozone creation potential (POCP) that is significantly influenced by the installation of the product due to emissions of volatile substances of maximum 0.1%. This leads to a contribution of the installation phase of up to 35% on the overall life cycle of the product. Emissions associated with the manufacturing of products (A3) only have a negligible influence on POCP.

In module A4, transport to construction site, values for POCP are negative due to emission profile modelled for the selected transportation process and of the characterisation method used in /CML 2001/ for the calculation of the POCP. Transportation processes are responsible for the emission of NO_x in the ground layer

atmosphere. NO in particular can have an ozone depleting effect that is reflected in /CML 2001/ by assigning a negative characterisation factor to this substance. However, although these negative values may appear unusual, it should be considered that POCP is only one of the analysed environmental impact categories. All other potential impacts would increase with greater transportation distances, showing that transportation is a process leading to net environmental burdens. Furthermore, even for POCP, transportation processes needed for supply of

materials and product distribution only have limited counterbalance effects on the overall LCA results. Scrap burdens and energy credit from incineration of packaging material reported in module D are of little importance. In general, CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO₂ contribute to the largest share.

7. Requisite evidence

7.1 VOC

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for products in question.

Evidence pertaining to VOC emissions shall show

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

(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;

(2) base their test methods on /CEN/TS 16516/ (or /EN 16516/, after the on-going revision of /CEN/TS 16516/);

(3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the conditions specified in /CEN/TS 16516/; some regulations and programs also have limits after 3 days, on top of the 28 days limits;

(4) express the test results as air concentrations in the European Reference Room, as specified in /CEN/TS 16516/.

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

Relevant test results shall be produced either by an /ISO 17025/ accredited commercial test lab, or by a qualified internal test lab of the manufacturer.

Examples for the applied limits after 28 days storage in a ventilated test chamber are:

- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):

The table shown below is an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days storage in a ventilated test chamber.

	TVOC [µg/m ³]	Sum of carcinogens. C1A,CA2 [µg/m ³]	Formal- dehyde [µg/m ³]	Acet- aldehyde [µg/m ³]	Sum of Form- and Acet- aldehyde
German DIBt/AgBB regulation	10 000	10	-/-	-/-	-/-
draft Lithuanian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 ^{PLUS}	750	10	50	50	50 ppb

	TVOC [µg/m ³]	TSVOC [µg/m ³]	Each carcinogen C1A,CA2 [µg/m ³]	Formaldehyde [µg/m ³]	Acetaldehyde [µg/m ³]	LCI	R value	Specials	Sum non-LCI & non- identified [µg/m ³]
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m ³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	1200	German AgBB list	1	-/-	100
draft Lithuanian regulation	1000	100	1	product type specific	-/-	Lithuanian list	1	-/-	-/-
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 ^{PLUS}	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	-/-	-/-	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m ² h	-/-	5 µg/m ² h	50 µg/m ² h	-/-	-/-	-/-	Ammonia, odour	-/-

The table above provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

7.2 Leaching:

Dispersion-based products in outdoor applications are not used in areas with contact to soil and groundwater. There are currently no European or national

assessment criteria or emission scenarios in place for scenarios involving watered components.

7.3 Fire gas toxicity

The fire gases incurred by organic products contain hazardous substances but no particularly hazardous emissions. Testing toxicity of the fire gases makes sense particularly in the system configuration of the products and is therefore not carried out for individual coatings as the fire gases are essentially influenced by the type of substrate involved.

8. References

PCR 2013, Part A: 2013-04

Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rule for Construction Products from the range of Environmental Product Declarations of Institute Bauen und Umwelt (IBU), Part A: Calculation rules for the Life Cycle Assessment and requirements on the Background Report www.bau-umwelt.de

PCR 2013, Part B: 2013-07

Product Category Rules for Construction Products, Part B: Requirements on the EPD for coatings with organic binding agents

GaBi 6 2014:

Software and data base for comprehensive analysis. LBP, University of Stuttgart and PE International, 2014

GaBi 6 2014b:

Documentation of GaBi 6 data sets from the data base

for comprehensive analysis LBP, University of Stuttgart and PE International, 2014 <http://documentation.gabi-software.com/>

CEN/TS 14472:2003-10

Resilient, textile and laminate floor coverings - Design, preparation and installation – Part 1: General; Part 2: Textile floor coverings; Part 3: Laminate floor coverings; Part 4: Resilient floor coverings

EN 14259:2004-07

Adhesives for floor coverings – Requirements for mechanical and electrical performance

EN 14293:2006-10

Adhesives – Adhesives for bonding parquet to subfloor – Test methods and minimum requirements

EN 12004:2014-02

Adhesives for tiles – Requirements, evaluation of conformity, classification and designation

EN 1324:2014-08

Adhesives for tiles – Determination of shear adhesion strength of dispersion adhesives

EN 1346:2007-11

Adhesives for tiles – Determination of open time

EN ISO 9001:2009-12

Quality management systems – Requirements

EN 923:2015-06

Adhesives – Terms and definitions

EN 1504-2:2015-03

Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 2: Surface protection systems for concrete

EN 1062-6:2002-10

Paints and varnishes – Coating materials and coating systems for exterior masonry and concrete – Part 6: Determination of carbon dioxide permeability

EN ISO 7783:2012-02

Paints and varnishes – Determination of water-vapour transmission properties – Cup method

EN 1062-3:2008-04

Paints and varnishes – Coating materials and coating systems for exterior masonry and concrete – Part 3: Determination of liquid water permeability

EN 1542:1999-07

Products and systems for the protection and repair of concrete structures – Test methods – Measurement of bond strength by pull-off

ETAG 022:2007-07

Guideline for European technical approval of watertight covering kits for wetroom floors and/or walls – Part 1: Liquid-applied coverings with or without wearing surface

GEV/EMICODE:2010-07

Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf; www.emicode.de/

Blue Angel

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

Indoor Air Comfort

Product certification by Eurofins, Hamburg, Germany www.eurofins.com

Decopaint Directive 2004/42/EC:

Directive 2004/42/EC of the European Parliament and of 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 in vehicle refinishing products and amending Directive 1999/13/EC, 2004-04

Harmonised conditions for the marketing of construction products:

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

ISO 16000-3:2013-01

Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds by sampling using a pump

ISO 16000-6:2012-11

Indoor air – Part 6: Determination of volatile organic compounds indoors and in test chambers by sampling on TENAX TA®, thermal desorption and gas chromatography using MS or FID

EN ISO 16000-9:2008-04

Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method

EN ISO 16000-11:2006-06

Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens

CEN/TS 16516:2015-07

Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

Royal Decree C-2014/24239

Belgisch Staatsblad 8 MEI 2014, p. 60603. — Koninklijk besluit tot vaststelling van de drempelniveaus voor de emissies naar het binnenmilieu van bouwproducten voor bepaalde geoogde gebruiken

EN 17025: 2007-05

General requirements for the competence of testing and calibration laboratories

AgBB

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

REACH Regulation:

Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93, Commission Regulation (EC) No. 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, 2006-12

Biocidal Products Regulation:

Regulation (EU) No. 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, 2012-05

CML 2001:

Institute of Environmental Sciences Leiden: CML method 2001, last update of characterization factors in November 2013,
<http://www.cml.leiden.edu/software/data-cmlia.html>

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin(pub.):
Generation of Environmental Product Declarations (EPDs);

General principles

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

ISO 14025

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

EN 15804

EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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Ultracolor Plus

Model EPD

“Modified mineral mortars, group 1”

(Declaration number EPD-FEI-20160017-IBG1-EN)



DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPDS

Mapei is a member of FEICA (Association of the European Adhesive & Sealant Industry), which has developed so-called Model Environmental Product Declarations (Model EPDs), independently verified by IBU (Institut Bauen und Umwelt e.V.).

The Model EPDs represent the current production technology in Europe. The compliance of Mapei products to the Model EPDs is checked on the base of their formulations, by using an IBU-approved guideline procedure.

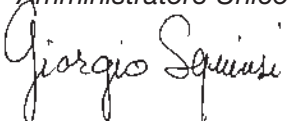
Mapei declares that the product

Ultracolor Plus

meets the criteria of the attached Model EPD
“Modified mineral mortars, group 1”
(Declaration number EPD-FEI-20160017-IBG1-EN)

The Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used whenever they are required for the evaluation of the sustainability of buildings where ***Ultracolor Plus*** is applied.

Mapei S.p.A.

Giorgio Squinzi
Amministratore Unico




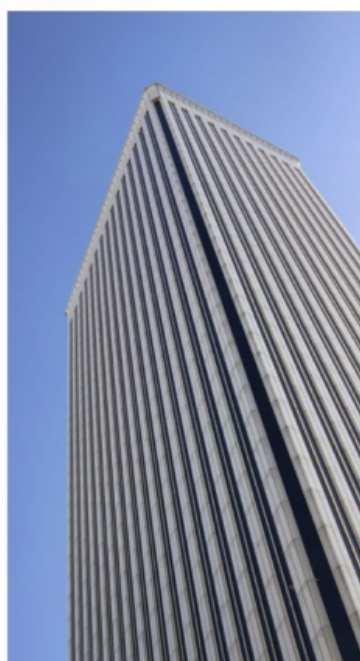
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	FEICA - Association of the European Adhesive and Sealant Industry
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20160017-IBG1-EN
ECO EPD Ref. No.	ECO-00000372
Issue date	23/05/2016
Valid to	22/05/2022

Modified mineral mortars, group 1 FEICA - Association of the European Adhesive and Sealant Industry

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



1. General Information

FEICA - Association of the European Adhesive and Sealant Industry

Programme holder

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

Declaration number

EPD-FEI-20160017-IBG1-EN

This Declaration is based on the Product

Category Rules:

Mineral factory-made mortar, 07.2014
(PCR tested and approved by the SVR)

Issue date

23/05/2016

Valid to

22/05/2022



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



Dr. Burkhardt Lehmann
(Managing Director IBU)

Modified mineral mortars, group 1

Owner of the Declaration

FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuysse 4
1160 Brussels
Belgium

Declared product / Declared unit

1 kg of modified mineral mortar with a density 800 - 1,700 kg/m³

Scope:

This validated Declaration entitles the holder to bear the symbol of the *Institut Bauen und Umwelt e.V.* It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members 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 FEICA secretariat. The members of FEICA are listed on its 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration
according to /ISO 14025/

internally externally



Mr Olivier Muller
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Modified mineral mortars are combinations of one or more inorganic binder, aggregates, water and if necessary additives. They comply with manifold, often specific, tasks 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).

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 for structural and non-structural repair which are used to restore the original condition of concrete structures and/or to replace defective concrete

1.2 Products for reinforcement corrosion protection

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 cementitious screed, floor levelling compounds, filler, flowing screed

Products for manufacturing bonded screed, screeds on separating or insulating layers, for levelling and repairing usual building substrates such as rough, uneven concrete floors, cement, anhydrite and mastic asphalt screed, heated screed and ceramic coverings for indoor and outdoor applications

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 mortar 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 waterproofing slurries

Products for providing cement-based waterproofing surfaces in structural and civil engineering. For use in new and old buildings as well as beneath tiles (mineral or flexible waterproofing slurries)

Module 8: Modified mineral mortars as repair mortar

Products for carrying out repairs (e.g. for repairing minor voids and holes) on horizontal and vertical areas

2.3 Technical Data

Construction products with Declaration of Performance in accordance with /CPR/

Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures

The minimum requirements according to /EN 1504/ apply. These are:

1.1

Products for structural and non-structural repair - Requirements on performance characteristics for all intended uses in accordance with /EN 1504-3/, Table 1:

- Compressive strength (/EN 12190/)
- Chloride ion content (/EN 1015-17/)
- Adhesive strength by pull off test (/EN 1542/)
- Restrained shrinkage/expansion (/EN 12617-4/)

1.2 Reinforcement corrosion protection products –

Requirements on all intended uses in accordance with /EN 1504-7/, Table 1:

- Corrosion protection (/EN 15183/)

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

Module 2: Adhesives based on modified mineral mortar

2.1 The minimum requirements in accordance with /EN 12004/ apply. These are:

- Tensile adhesion strength after dry storage (/EN 1348/)
- Tensile adhesion strength after water immersion (/EN 1348/)
- Tensile adhesion strength after heat ageing (/EN 1348/)
- Tensile adhesion strength after freeze/thaw cycles (/EN 1348/)
- Open time: Tensile strength (/EN 1346/)

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

2.2 Performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance; /ETAG 004/ apply.

Module 3: Modified mineral mortars as joint fillers

The minimum requirements of /EN 13888/ must be maintained.

Module 4: Modified mineral mortars as cementitious screed, floor levelling compounds, filler, flowing screed:

The minimum requirements of /EN 13813/ must be maintained. These are:

- Reaction to fire (/EN 13501-1/)
- Release of corrosive substances
- Compressive strength (/EN 13892-2/)
- Flexural strength (/EN 13892-2/)

Other performance 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

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

Module 5.2: The minimum requirements of /EN 13279/ apply.

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

Module 6: Modified mineral mortars as grouts

Module 7: Modified mineral mortar for waterproofing slurries

The minimum requirements in accordance with /EN 14891/ apply.

Module 8: Modified mineral mortars as repair mortar

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

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 need a Declaration of Performance taking into consideration either the relevant harmonised European standard as cited in chapter 2.3 or the European Technical Assessment and the CE-marking.

For the application and use of the products the respective national provisions apply.

2.5 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 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).

2.6 Base materials / Ancillary materials

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

Cement: ~ 2 - 85%

Filler materials: ~ 10 - 90%

Plaster: ~ 0 - 45%

Additives: ~ 0 - 6%

Dispersion powder: ~ 0 - 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. Mortar for special

applications can also contain fungicides, whereby the functional group of fungicides is dependent on the chemical specification.

2.7 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.

Quality and environmental standards in accordance with /ISO 9001:2008-12/ 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

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 taking consideration of 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.

2.9 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.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty, trickle-free paper containers and clean PE foils can be recycled.

2.11 Condition of use

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.

2.12 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 used in accordance with the designated purpose of the respective products.

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 /AgBB/ test scheme or the /GEV/ (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf) /EMICODE/® marking system typically applied in Germany.

2.13 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.

2.14 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.

Water

No relevant volumes of water-soluble substances hazardous to water are washed out when exposed to water (e.g. flooding). Cement-based mortar is stable in terms of structure and is not subject to any changes in form when exposed to water and drying.

Mechanical destruction

The mechanical destruction of modified mineral mortars does not lead to any decomposition products which are harmful for the environment or health. Dust incurred during de-construction should be avoided by taking the appropriate measures (e.g. humidification).

2.15 Re-use phase

Components manufactured using modified mineral mortars can usually be easily demolished. When removing a building, the materials do not need to be treated as special waste; care should, however, be taken to ensure unmixed residual materials wherever possible. 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 re-using components comprising modified mineral mortar after decommissioning.

2.16 Disposal

The portion of a modified mineral mortar-based product applied at an other construction product is rather low. These low amounts do not play a role when the construction product is disposed. They do not interfere with the disposal/recycling of other components / building materials.

The following European Waste Codes waste (EWC) codes can apply:

Mineral mortar: /EWC 2000/532/EC 170101/ and

/EWC 2000/532/EC 101314/

Mineral filler and levelling compound: /EWC 2000/532/EC 170107/

Calcium sulphate-based filler and levelling compound: /EWC 2000/532/EC 170802/

2.17 Further information

More information is available in 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.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg modified mineral mortar with a density of 800 - 1,700 kg/m³. The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario).

With the information about the consumption per surface area the results can be calculated into a declared unit of kg/m².

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary

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

- A1 Production of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging & installation losses and emissions during installation)
- D Credits from incineration of packaging materials

The declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions

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

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data 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. Transport of packaging materials is also excluded.

3.5 Background data

Data from the /GaBi/ ts database was used as background data. Where no background data was available, it was complemented by manufacturer information and literary research.

3.6 Data quality

Representative products were applied for this EPD and the product in a group displaying the highest environmental impact was selected for calculating the LCA results. The datasets are less than 5 years old. Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

3.7 Period under review

Representative formulations were accepted by FEICA Ltd and collected in 2011.

3.8 Allocation

No allocations were applied for production. A multiinput allocation with a credit for electricity and thermal energy was used for incineration of packaging materials. The credits achieved through packaging disposal are declared 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. In this case, 1 kg modified mineral mortar was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific use per surface area must be taken into consideration.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing 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	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	800 - 1700	kg/m ³
Capacity utilisation volume factor	1	-

Installation into the building (A5)

Name	Value	Unit
Water consumption	0.0003	m ³
Material loss	0.013	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN 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	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: 1 kg modified mineral mortar, group 1

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO ₂ -Eq.]	4.02E-1	4.82E-3	9.97E-2	-3.69E-2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.16E-9	2.21E-14	3.60E-13	-1.21E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.62E-3	1.19E-5	1.24E-5	-5.84E-5
Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	1.38E-4	2.75E-6	2.44E-6	-5.91E-6
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.52E-4	-3.33E-6	1.13E-6	-6.20E-6
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.43E-6	3.21E-10	1.09E-9	-6.27E-9
Abiotic depletion potential for fossil resources	[MJ]	6.29E+0	6.64E-2	2.20E-2	-5.06E-1

RESULTS OF THE LCA - RESOURCE USE: 1 kg modified mineral mortar, group 1

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	1.91E+0	IND	IND	IND
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	IND	IND	IND
Total use of renewable primary energy resources	[MJ]	1.91E+0	3.77E-3	3.16E-3	-8.34E-2
Non-renewable primary energy as energy carrier	[MJ]	6.45E+0	IND	IND	IND
Non-renewable primary energy as material utilization	[MJ]	6.00E-1	IND	IND	IND
Total use of non-renewable primary energy resources	[MJ]	7.05E+0	6.66E-2	2.56E-2	-6.19E-1
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
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]	IND	IND	IND	IND

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 kg modified mineral mortar, group 1

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	IND	IND	IND	IND
Non-hazardous waste disposed	[kg]	IND	IND	IND	IND
Radioactive waste disposed	[kg]	IND	IND	IND	IND
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	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	1.29E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	2.99E-1	0.00E+0

Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories, contribute significantly to the production. The indicators Use of fresh water, Hazardous waste disposed, Non-hazardous waste disposed and Radioactive waste disposed are therefore not declared (decision of IBU advisory board 2013-01-07).

6. LCA: Interpretation

All 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 main driver. The majority of life cycle energy consumption takes place during the production phase (A1-A3). Besides the cement also the dispersion powder influences the results significantly, although this is only used up to 5%. 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. CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO₂ contribute to the largest share.

Transportation to the construction site (A4) and the installation process (A5) make a negligible 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 paper and pallets.

In module A4, transport to construction site, values for Photochemical Ozone Creation Potential (POCP) are negative due to emission profile modelled for the selected transportation process and of the characterisation method used in CML 2001 for the calculation of the POCP. Transportation processes are responsible for the emission of NO_x in the ground layer atmosphere. NO in particular can have an ozone

depleting effect that is reflected in CML 2001 by assigning a negative characterisation factor to this substance. However, although these negative values may appear unusual, it should be considered that POCP is only one of the analysed environmental impact categories. All other potential impacts would increase with greater transportation distances, showing that transportation is a process leading to net environmental burdens. Furthermore, even for POCP, transportation processes needed for supply of materials and product distribution only have limited counterbalance effects on the overall LCA results. Energy credit from incineration of packaging material reported in module D show a negligible influence on the overall results.

7. Requisite evidence

VOC

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for products in question.

Evidence pertaining to VOC emissions shall show

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

(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;

(2) base their test methods on /CEN/TS 16516/ (or /EN 16516/, after the on-going revision of /CEN/TS 16516/);

(3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the

conditions specified in /CEN/TS 16516/; some regulations and programs also have limits after 3 days, on top of the 28 days limits;

(4) express the test results as air concentrations in the European Reference Room, as specified in /CEN/TS 16516/.

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

Relevant test results shall be produced either by an /ISO 17025/ accredited commercial test lab, or by a qualified internal test lab of the manufacturer.

Examples for the applied limits after 28 days of storage in a ventilated test chamber are:

- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):

Table 1 shows an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days of storage in a ventilated test chamber.

Table 2 provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days of storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

	TVOC [µg/m ³]	Sum of carcinogens. C1A,CA2 [µg/m ³]	Formal- dehyde [µg/m ³]	Acet- aldehyde [µg/m ³]	Sum of Form- and Acet- aldehyde
German DIBt/AgBB regulation	10 000	10	-/-	-/-	-/-
draft Lithuanian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 ^{PLUS}	750	10	50	50	50 ppb

	TVOC [µg/m ³]	TSVOC [µg/m ³]	Each carcinogen C1A,CA2 [µg/m ³]	Formaldehyde [µg/m ³]	Acetaldehyde [µg/m ³]	LCI	R value	Specials	Sum non-LCI & non- identified [µg/m ³]
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m ³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	1200	German AgBB list	1	-/-	100
draft Lithuanian regulation	1000	100	1	product type specific	-/-	Lithuanian list	1	-/-	-/-
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 ^{PLUS}	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	-/-	-/-	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m ² h	-/-	5 µg/m ² h	50 µg/m ² h	-/-	-/-	-/-	Ammonia, odour	-/-

Leaching Measurement of leaching performance (eluate analysis) indicating the measurement process.

Leaching is only relevant for specific applications. In this case, information can be provided by the manufacturer.

8. References

PCR 2013, Part A: 2013-04

Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for construction products from the range of Environmental Product Declarations from *Institut Bauen und Umwelt e.V.* (IBU) Part A: Calculation rules for the Life Cycle Assessment and requirements on the Background Report www.bau-umwelt.de

PCR 2011, Part B: 2011-06

Product Category Rules for Construction Products, Part B: Requirements on the EPD for mineral trade mortar www.bau-umwelt.de

2000/532/EC: Commission decision of 3 May 2000 replacing decision 94/3/EC on a waste index as per

Article 1 a) of Council Directive 75/442/EEC on waste and Council decision 94/904/EC on an index of hazardous waste according to Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

GaBi ts software

Software and database for comprehensive analysis. LBP, University of Stuttgart and thinkstep AG, 2015

GaBi ts documentation

Documentation of GaBi 6 data sets from the database for comprehensive analysis LBP, University of Stuttgart and thinkstep AG, 2015 <http://documentation.gabi-software>

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

EN 1504-3:2006-03

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 1504-2:2015-03

Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 2: Surface protection systems for concrete

EN 12190:1998-12

Products and systems for the protection and repair of concrete structures – Test methods – Determination of compressive strength of repair mortar

EN 1015-17:2005-01

Methods of test for mortar for masonry – Part 17: Determination of water-soluble chloride content of fresh mortars

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 12617-4:2002-08

Products and systems for the protection and repair of concrete structures – Test methods – Part 4: Determination of shrinkage and expansion

EN 1504-7:2015-09

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 15183:2006-11

Products and systems for the protection and repair of concrete structures – Test methods – Corrosion protection test; German version EN 15183

EN 12004:2014-02

Adhesive for tiles – Requirements, evaluation of conformity, classification and designation

EN 1346:2007-11

Adhesives for tiles – Determining the open time

EN 1348:2007-11

Adhesive for tiles – Determination of tensile adhesion strength for cementitious adhesives

ETAG 004:2001-02-20

Guideline for European technical approval of external thermal insulation composite systems with rendering (ETAG 004)

EN 13888:2009-08

Grout for tiles – Requirements, evaluation of conformity, classification and designation

EN 13813:2003-01

Screed material and floor screeds – Screed materials – Properties and requirements

EN 13501-1:2010-01

Fire classification of construction products and building products – Part 1: Classification using data from reaction to fire tests

EN 13892-2:2003-02

Methods of test for screed materials – Part 2: Determination of flexural and compressive strength

EN 13501-1:2010-01

Fire classification of construction products building elements – Part 1: Classification using data from reaction to fire tests

EN 998-1:2015-11

Specification for mortar for masonry – Part 1: Rendering and plastering mortar

EN 13279-1:2008-11

Gypsum binders and gypsum plasters – Part 1: Definitions and requirements

EN 14891:2015-02

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

EWC 170101: 2000/532/EC

European Waste Catalogue / Ordinance on European List of Wastes Concrete

EWC 101314: 2000/532/EC

European Waste Catalogue / Ordinance on European List of Wastes Waste concrete and concrete sludge

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

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

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.

EN ISO 9001:2008-12

Quality management systems – Requirements

ISO 16000-3:2013-01

Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds by sampling using a pump

ISO 16000-6:2012-11

Indoor air – Part 6: Determination of volatile organic compounds indoors and in test chambers by sampling on TENAX TA®, thermal desorption and gas chromatography using MS or FID

EN ISO 16000-9:2008-04

Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method

EN ISO 16000-11:2006-06

Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens

CEN/TS 16516:2015-07

Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

Royal Decree C-2014/24239

Belgisch Staatsblad 8 MEI 2014, p. 60603.
— Koninklijk besluit tot vaststelling van de drempelniveaus voor de emissies naar het binnenmilieu van bouwproducten voor bepaalde geogde gebruiken

EN 17025: 2007-05

General requirements for the competence of testing and calibration laboratories

AgBB: 2012-06

Committee for Health-related Evaluation of Building Products: health-related evaluation of

emissions of volatile organic compounds (VOC and SVOC) from building products
www.umweltbundesamt.de/produkte/bauprodukte/agb_b.htm

EMICODE

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

Blue Angel

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

Indoor Air Comfort

Product certification by Eurofins, Hamburg, Germany
www.eurofins.com

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin(pub.):
Generation of Environmental Product Declarations (EPDs);

General principles

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

ISO 14025

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

EN 15804

EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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Kerapoxy

Model EPD

“Reactive resins based on epoxy resin,
filled and/or aqueous with high content of filler”

(Declaration number EPD-FEI-20150300-IBG1-EN)



DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPDS

Mapei is a member of FEICA (Association of the European Adhesive & Sealant Industry), which has developed so-called Model Environmental Product Declarations (Model EPDs), independently verified by IBU (Institut Bauen und Umwelt e.V.).

The Model EPDs represent the current production technology in Europe. The compliance of Mapei products to the Model EPDs is checked on the base of their formulations, by using an IBU-approved guideline procedure.

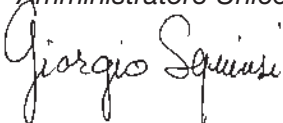
Mapei declares that the product

Kerapoxy

meets the criteria of the attached Model EPD
**“Reactive resins based on epoxy resin,
filled and/or aqueous with high content of filler”**
(Declaration number EPD-FEI-20150300-IBG1-EN)

The Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used whenever they are required for the evaluation of the sustainability of buildings where ***Kerapoxy*** is applied.

Mapei S.p.A.

Giorgio Squinzi
Amministratore Unico




ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	FEICA - Association of the European Adhesive and Sealant Industry
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20150300-IBG1-EN
ECO EPD Ref. No.	ECO-00000347
Issue date	14/12/2015
Valid to	13/12/2021

Reactive resins based on epoxy resin, filled and/or aqueous with high content of filler
FEICA - Association of the European Adhesive and Sealant Industry



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



1. General Information

FEICA - Association of the European Adhesive and Sealant Industry

Programme holder

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

Declaration number

EPD-FEI-20150300-IBG1-EN

This Declaration is based on the Product Category Rules:

Reaction resin products, 07.2014
(PCR tested and approved by the SVR)

Issue date

14/12/2015

Valid to

13/12/2021



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



Dr. Burkhard Lehmann
(Managing Director IBU)

Reactive resins based on epoxy resin, filled and/or aqueous with high content of filler

Owner of the Declaration

FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuysse 4
1160 Brussels
Belgium

Declared product / Declared unit

1 kg reactive resin based on epoxy resin, filled and/or aqueous filled; density 1.1 - 2.5 g/cm³

Scope:

This validated Declaration entitles the holder to bear the symbol of the *Institut Bauen und Umwelt e.V.* It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members 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 FEICA secretariat. The members of FEICA are listed on its 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration according to /ISO 14025/

internally externally



Mr Olivier Muller
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Reactive resins based on epoxy resin, filled and/or aqueous filled

The reactive resins are manufactured in a two-component process using reactively-diluted epoxy resins and polyamines. The aqueous systems can be formulated as aqueous dispersions on the resin or hardening agent side.

They comply with multiple, often specific tasks in the construction, fitting and repair of structures. By using reactive resins based on epoxy resin, filled and/or aqueous filled, the fitness for use of structures is decisively improved and their life time extended. The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst case-approach).

2.2 Application

Reactive resins based on epoxy resin, filled and/or aqueous filled, are used in 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, products for **structural and non-structural repair** used for restoring the original condition of concrete structures and/or replacing faulty concrete and providing reinforcements with protection; products for **structural bonding** of strengthening materials to an existing concrete structure and **products for concrete injection** for filling cracks, voids and interstices in concrete.

Module 2: *Reactive resins for liquid applied roof waterproofing kits*

Reactive resins for waterproofing roof constructions which are applied on the construction site

Module 3: *Reactive resin primer for bridge waterproofing*

Primer for bridge waterproofing for use on bridges made of concrete

Module 4: Reactive resins as adhesive for tiles

Tile adhesives for internal and external tile installations on walls, floors and ceilings.

Module 5: Reactive resins for watertight covering kits

Watertight covering kits for wetroom floors and/or walls inside buildings

Module 6: Reactive resins for liquid applied waterproofings for buildings

Liquid applied products for waterproofing of buildings

Module 7: Screed material and floor screeds

Products for screed / synthetic resin screed for use in floor constructions

Module 8: Reactive resins for waterproofing components made of concrete or brickwork and for pre-treating mineral sub-surfaces such as screed or concrete flooring prior to flooring, parquet and tiling work

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

Module 9: Reactive resins for optical design of concrete components

Products for usually coloured design of concrete accompanied by less-specified surface protection and improved durability of concrete and reinforced concrete surfaces. The same applies for other mineral sub-surfaces such as plaster, stone and brickwork.

On account of the susceptibility of epoxy resin layers to weathering factors (yellowing, whitening after extensive weathering), a final polyurethane-based coating is usually applied to epoxy layers in outdoor applications.

2.3 Technical Data

Module 1: Reactive resins for protecting and repairing concrete structures

The minimum requirements of /EN 1504/ apply. These are:

1.1 Surface protection systems for concrete –

Requirements on performance characteristics for all intended uses in accordance with /EN 1504-2:2005-01/, Tables 1 and 5:

- Permeability to CO₂ (/EN 1062-6:2002-10/)
- Water vapour permeability (/EN ISO 7783-1-2:2012-02/)
- Capillary absorption and permeability to water (/EN 1062-3:2008-04/)
- Adhesive strength by pull off test (/EN 1542:1999-07/)

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/)
- Adhesive strength by pull off test (/EN 1542:1999-07/)

1.3 Products for structural bonding – Performance characteristics for all intended uses in accordance with Tables 3.1 and 3.2 (manufacturer's declaration of performance)-

1.4 Products for concrete injection for filling cracks, voids and interstices in concrete– Requirements on performance characteristics for all intended uses in accordance with /EN 1504-5:2005-03/, Table 3:

- Injectability (/EN 1771:2004-11/)
- Viscosity (/EN ISO 3219:1994-10/)

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

Module 2: Reactive resins for liquid applied roof waterproofing kits

The minimum requirements of /ETAG 005/ apply.

The performance requirements must be indicated in accordance with the European Technical Assessment (ETA, no.).

Module 3: Reactive resins for liquid-applied bridge deck waterproofing kits

The minimum requirements of /ETAG 033/ apply. The performance characteristics must be indicated in accordance with the European Technical Assessment (ETA, no.).

Module 4: Reactive resins as adhesive for tiles

The minimum requirements in accordance with /EN 12004:2012-09/ apply. These are:

- Initial shear adhesion strength (/EN 12003:2009-01/)
- Shear adhesion strength after water immersion (/EN 12003:2009-01/)
- Open time: tensile adhesion strength (/EN 1346:2007-11[H1] /)[IM2]

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

Module 5: Reactive resins for watertight covering kits

The minimum requirements of the /ETAG 022/ apply. The performance characteristics must be indicated in accordance with the European Technical Assessment (ETA, no.).

Module 6: Reactive resins for liquid applied waterproofings for buildings

Module 7: Screed material and floor screeds

The minimum requirements of /EN 13813:2003-01/ apply. For synthetic resin screeds, these are:

- Bond strength (/EN 13892-8:2003-02/)
- Reaction to fire (/EN 13501-1:2010-01/)

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

Module 8: Reactive resins for waterproofing components made of concrete or brickwork and for pre-treating sub-surfaces such as screed or concrete flooring prior to flooring, parquet and tiling work

At least the following requirements must be fulfilled:

Name	Value	Unit
Shore hardness A /ISO 7619-1,2/	> 50	
Shore hardness D /ISO 7619-1,2/	> 25	
Density /EN ISO 2811: 2011-06/	0,9 - 2	kg/dm ³
Viscosity /EN ISO 3219: 1994-10/	< 200	Pa s

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

Module 9: Reactive resins for optical design of concrete components

Physical data on the coating material and/or coating must be indicated in accordance with the respective product standards; these can include, for example:

- Viscosity (/EN ISO 3219:1994-10/)
- Density (/EN ISO 2811:2011-06/)
- Pendulum damping (/ISO 1522:2007-04/)
- Reaction to fire (/EN 13501-1:2010-01/)
- Tensile strength (/EN 13892-8:2003-02/)

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

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 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.

2.5 Delivery status

Liquid or pasty in containers made of tinfoil or plastic appropriately prepared in separate or combi-containers for the practical mixing ratio. One kg of product in individual containers. Sealants in plastic cartridges and poly-tube bags made of foil compound materials. Typical container sizes contain 10 to 25 kg of material. For more extensive applications, vats containing approx. 200 kg or IBCs containing more than 1 tonne are also used.

A sheet steel container was modelled for the Life Cycle Assessment.

2.6 Base materials / Ancillary materials

Reactive resins based on epoxy resin, filled and/or aqueous filled, comprise resin and crosslinking agent components. Aqueous, filled systems can be formulated as aqueous dispersions on the resin or crosslinking agent side.

The resin component contains low-molecular epoxy resins based on Bisphenol-A and Bisphenol-F Diglycidether. Reactive diluting agents (Glycidether) based on aliphatic alcohol are used for viscosity adjustment. Crosslinking occurs when installed on site with the amine component. Polyamines and polyamine adducts based on IPDA, MXDA, TMDA and TEPA are used for this purpose. The components can contain accelerators, catalysts, wetting agents, foam regulators, inert diluting agents (no solvents) for fine adjustment of the product properties as auxiliaries (restrictions governing application or placing on the market must be observed).

The mixing ratio for resin and crosslinker is adjusted in accordance with the stoichiometric requirements.

Product crosslinking starts immediately after mixing the components.

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

Resin component: ~ 5-50%

Crosslinker component: ~ 5-15%

Reactive diluting agent: ~ 0-20%

Filler material: 20-70%

Water: 0-10%

Other: ~ <4%

The ranges referred to above are average values and the composition of products complying with the EPD can deviate from the concentration volumes referred to in individual cases. Deviations are possible. More detailed information is provided by the respective manufacturer (e.g. product data sheets).

In individual cases, it is possible that substances on the list of particularly harmful substances for inclusion in Annex XIV of the /REACH/ Ordinance are included in concentrations of more than 0.1%. If this is the case, this information can be found in the respective safety data sheet.

2.7 Manufacture

The product components formulated are usually mixed from the ingredients in batch mode and packaged for delivery, whereby quality and environmental standards in accordance with /ISO 9001:2008-12/ 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

Reactive resins based on epoxy resin (filled and/or water-filled) are processed by trowelling/knife-coating or rolling, pouring, spraying or injection, whereby health and safety measures (hand and eye protection, ventilation, respiratory equipment) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site. VOC-emissions may occur.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty containers and clean foils can be recycled.

2.11 Condition of use

During the use phase, reactive resins based on epoxy, unfilled/solvent-free, are crosslinked and essentially comprise an inert, three-dimensional network.

They are long-lasting products which protect our buildings in the form of primer, coatings or sealings and make a significant contribution towards retaining their function and long-term value

2.12 Environment and health during use

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

During use, reactive resins based on epoxy, filled and/or aqueous filled, lose their reactivity and react inert.

No risks are known for water, air and soil if the products are used as designated.

Option 2 – Products for applications inside indoor areas with permanent stays by people

When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements. No further influences on the environment and health by emanating substances are known.

2.13 Reference service life

Reactive resins based on epoxy resin, aqueous (unfilled), comply with various, often specific tasks associated with the construction or refurbishment of building structures. Use thereof decisively improves the usability of building structures and significantly extends their Reference Service Life.

The anticipated Reference Service Life depends on the specific installation situation and associated product exposure. It can be influenced by weather factors as well as by mechanical or chemical loads.

2.14 Extraordinary effects

Fire

Even without any special fire safety fittings, the reactive resins based on epoxy, unfilled/solvent-free, comply with the minimum requirements of /EN 13501-1/ for fire class E and Efl. In terms of the volumes used, they only have a subordinate effect on the fire characteristics (e.g. smoke gas development) of a

building in which they are installed. As cross-linked epoxy resins involve a duroplastic material, it does not melt or drip with the result that the resins do not contribute to fire spread, whereas the combustibility of cross-linked epoxy resins is greater than that of other duroplastics. Among other substances, formaldehyde and phenol can be formed in the event of a fire.

Water

The reactive resins based on epoxy, unfilled/solvent-free, are chemically inert and water-insoluble. They are often used for protecting building structures from harmful water ingress / the effects of flooding.

Mechanical destruction

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

2.15 Re-use phase

According to present knowledge, no environmentally-harmful effects are generally anticipated in landfilling, for example, as a result of de-construction and recycling of building materials to which crosslinked epoxy resin products are adherent. If epoxy systems can be removed from construction products without any noticeable effort, thermal utilisation is a practical recycling variant on account of their energy content.

Minor adhesion is not taken into consideration during disposal. It does not interfere with disposal/recycling of the remaining components / building materials.

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 European Waste Codes waste (EWC) codes can apply:

Hardened product residue:

/EWC 2000/532/EC 080112/ with the exception of those covered by /EWC 2000/532/EC08 01 11/
/EWC 2000/532/EC 080410/ with the exception of those covered by /EWC 2000/532/EC 08 04 09/

2.17 Further information

More information is available in 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.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg reactive resin based on epoxy resin, filled and/or aqueous filled of density 1.1 - 2.5 g/cm³ in the mixing ratio required for processing both components in accordance with the PCR Part B for Reactive resin products. 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. In the case of products, which are injected, the application volume depends on the component to be injected. The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario).

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary

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

- A1 Production of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging & installation losses and emissions during installation)

- D Credits from incineration of packaging materials & installation losses and recycling the metal container

The declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions

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

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data 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.

Transport of packaging materials is also excluded.

3.5 Background data

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

3.6 Data quality

Representative products were applied for this EPD and the product in a group displaying the highest environmental impact was selected for calculating the LCA results. The datasets are less than 5 years old. Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

3.7 Period under review

Representative formulations were accepted by FEICA Ltd and collected in 2011.

3.8 Allocation

No allocations were applied for production. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of production residues and packaging materials. The credits achieved through packaging disposal are declared 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. In this case, 1 kg reactive resin was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific unit area must be taken into consideration.

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 the building site (A4)

Name	Value	Unit
Litres of fuel	0.0016	l/100km
Transport distance	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1100 - 2500	kg/m ³
Capacity utilisation volume factor	1	-

Installation into the building (A5)

Name	Value	Unit
Material loss	0.01	kg
VOC in the air (NMVOC)	0.02	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN 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	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: 1 kg reactive resin based on epoxy resin, filled and/or aqueous filled

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO ₂ -Eq.]	2.63E+0	4.91E-2	9.15E-2	-1.50E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.50E-10	2.02E-13	3.84E-13	-1.01E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	6.51E-3	1.26E-4	1.39E-5	-5.43E-4
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	6.92E-4	3.11E-5	2.58E-6	-4.40E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.42E-3	-3.41E-5	7.22E-3	-7.46E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.46E-5	1.93E-9	1.10E-9	-4.53E-9
Abiotic depletion potential for fossil resources	[MJ]	6.72E+1	6.76E-1	2.01E-2	-1.55E+0

RESULTS OF THE LCA - RESOURCE USE: 1 kg reactive resin based on epoxy resin, filled and/or aqueous filled

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	3.34E+0	IND	IND	IND
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	IND	IND	IND
Total use of renewable primary energy resources	[MJ]	3.34E+0	3.79E-2	2.25E-3	-2.27E-2
Non-renewable primary energy as energy carrier	[MJ]	4.09E+1	IND	IND	IND
Non-renewable primary energy as material utilization	[MJ]	2.88E+1	IND	IND	IND
Total use of non-renewable primary energy resources	[MJ]	6.97E+1	6.79E-1	2.38E-2	-1.60E+0
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
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]	2.07E-2	6.65E-5	2.35E-4	-1.91E-4

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 kg reactive resin based on epoxy resin, filled and/or aqueous filled

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	1.09E-4	3.22E-7	6.99E-9	-6.38E-9
Non-hazardous waste disposed	[kg]	3.11E-2	9.66E-5	1.38E-3	1.76E-3
Radioactive waste disposed	[kg]	9.81E-4	9.27E-7	1.47E-6	-1.80E-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	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	1.14E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	2.67E-1	0.00E+0

6. LCA: Interpretation

All 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 main driver. Another significant contributor in the production phase, in the category of Abiotic Depletion Potential Elements (**ADPE**), is the steel sheet used as a packaging material. The majority of life cycle energy consumption takes place during the production phase (A1-A3). 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 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. Transportation to the construction site (A4) and the installation process (A5) make a negligible contribution to almost all impacts. The only exception is the photochemical ozone creation potential (**POCP**) that is significantly influenced by the installation of the product due to emissions of benzyl alcohol of maximum 2%. This leads to a contribution of the installation phase of

up to 80% on the overall life cycle of the product. Emissions associated with the manufacturing of products (A3) only have a minor influence on POCP. In module A4, transport to construction site, values for POCP are negative due to emission profile modelled for the selected transportation process and of the characterisation method used in CML 2001 for the calculation of the POCP.

Scrap burdens and energy credit from incineration of packaging material reported in module D are not important (contribution <2.5% for most results). CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO₂ contribute to the largest share.

7. Requisite evidence

VOC

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for products in question.

Evidence pertaining to VOC emissions shall show

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

(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;

(2) base their test methods on /CEN/TS 16516/ (or /EN 16516/, after the on-going revision of /CEN/TS 16516/);

(3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the conditions specified in /CEN/TS 16516/; some regulations and programs also have limits after 3 days, on top of the 28 days limits;

(4) express the test results as air concentrations in the European Reference Room, as specified in /CEN/TS 16516/.

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

Relevant test results shall be produced either by an /ISO 17025/ accredited commercial test lab, or by a qualified internal test lab of the manufacturer.

Examples for the applied limits after 28 days storage in a ventilated test chamber are:

- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):

The table shown below is an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days storage in a ventilated test chamber.

	TVOC [µg/m ³]	Sum of carcinogens. C1A,CA2 [µg/m ³]	Formal- dehyde [µg/m ³]	Acet- aldehyde [µg/m ³]	Sum of Form- and Acet- aldehyde
German DIBt/AgBB regulation	10 000	10	-/-	-/-	-/-
draft Lithuanian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 ^{PLUS}	750	10	50	50	50 ppb

The table above provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days storage in a ventilated test chamber. Some details may be

missing in the table due to lack of space. Values given represent maximum values/limits.

	TVOC [µg/m ³]	TSVOC [µg/m ³]	Each carcinogen C1A,CA2 [µg/m ³]	Formaldehyde [µg/m ³]	Acetaldehyde [µg/m ³]	LCI	R value	Specials	Sum non-LCI & non- identified [µg/m ³]
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m ³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	1200	German AgBB list	1	-/-	100
draft Lithuanian regulation	1000	100	1	product type specific	-/-	Lithuanian list	1	-/-	-/-
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 ^{PLUS}	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	-/-	-/-	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m ² h	-/-	5 µg/m ² h	50 µg/m ² h	-/-	-/-	-/-	Ammonia, odour	-/-

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Paint and varnish waste

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Waste paints and varnishes containing solvents or other dangerous substances

EWC 080410: 2000/532/EC

Adhesive and sealant compound waste

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Mapesil AC

**Pure, mould-resistant,
acetic, silicone sealant
available in 34 colours
and transparent**

WHERE TO USE

Mapesil AC is an acetic-crosslinking silicone sealant suitable for sealing glass, ceramic and anodised aluminium. After first having used a bonding enhancer, **Primer FD** can also be used on concrete, wood, metal, painted surfaces, plastic and rubber.

Mapesil AC is used for:

- Sealing expansion joints of $\pm 25\%$ expansion of the initial size.
- Forming a perfectly elastic gasket between different elements in building, mechanical engineering, ship-building, automobile, manufacturing, etc.

Some application examples

- Sealing joints in wall and floor coverings of ceramic and cement, provided they are not subject to heavy abrasion.
- Sealing joints between sinks or sanitary ware and ceramic tiles in kitchens, bathrooms and showers with colours coordinated with the grouts.
- Sealing expansion joints in swimming pools.
- Assembling compositions of glass tiles and artistic stained glass windows.
- Sealing glazing of door and window frames.
- Sealing air ducts, water pipes.
- Sealing portholes, windows, glazed frames.
- Sealing tanks, service pipes and boilers.
- Sealing materials of different thermal exposure coefficient.
- Adhesive and sealant for general use.

TECHNICAL CHARACTERISTICS

Mapesil AC is a one-component, acetic crosslinking, solvent-free silicone sealant, available coloured or transparent. It is a thixotropic paste which is easily trowellable both horizontally and vertically. It crosslinks following exposure to atmospheric humidity at ambient temperatures, and forms an elastic product with following properties:



Mapesil AC

- excellent durability. Seals remain unchanged even after many years exposure to climatic extremes, industrial pollution, sudden temperature changes and immersion in water;
- high elasticity;
- excellent bonding to glass, ceramic and anodised aluminium;
- mildew resistant;
- waterproof and permeable to vapour;
- resistant to chemical agents;
- flexible down to -40°C and resistant to temperatures at $+180^{\circ}\text{C}$;
- easily workable;
- in compliance with ISO 11600 norm, it is classified as F-25-LM.
- in compliance with numerous international standards.
- in compliance with EN 15651-1, EN 15651-2, EN 15651-3 and CE-marking.

RECOMMENDATIONS

- Do not use **Mapesil AC** for joints in exterior between ceramic tiles and light-coloured natural stone because dirt could accumulate by the joints. Use **Mapesil LM**.
- For sealing surfaces sensitive to acids such as lime stone, use a neutral silicone sealant (e.g. **Mapesil LM**).
- The use of **Mapesil AC** is not recommended on highly plasticised material or on bituminous surfaces because of the release of substances that reduce bonding and penetrate into the sealant, altering the colour and resistance.
- The resistance of **Mapesil AC** to chemical agents is generally excellent; however, due to the numerous products and working conditions to which **Mapesil AC** can be applied, it is always advisable to do a sample test in cases of doubt.
- Do not use **Mapesil AC** to seal aquariums.
- For sealing floor joints subject to heavy traffic, use a polyurethane (e.g. **Mapeflex PU 45 FT**) or epoxy-polyurethane (e.g. **Mapeflex PU20**) sealant.

APPLICATION PROCEDURE

Preparing and calculating joints size

All the surfaces to receive the sealant must be dry, solid and free from dust and loose particles, oils, grease, wax, old paint and rust.

In order that the seal can carry out its function, provision must be made for it to elongate and compress freely.

During application it is therefore necessary that:

- it adheres only to the side of the walls of the joint and not to the base of the joint;
- the joint is sized so that the estimated maximum extension is not greater than 25% of the initial width (calculated at $+20^{\circ}\text{C}$);
- when the width of the joint is 10 mm, the thickness must be equal to the width; for widths between 11 and 20 mm the thickness must always be equal to 10 mm; for widths greater than the thickness must be equal to half the width.

To control the depth of the joint and to prevent **Mapesil AC** from adhering to the base, the bottom of the joint should be filled with a sized **Mapefoam**, a polyethylene cord.

Application of Primer FD

Where the use of **Primer FD** is necessary, it must be applied with a small brush onto the appropriate areas of the joints and left to dry for several minutes to allow the solvent to evaporate. Then apply **Mapesil AC**.

Application of Mapesil AC

Mapesil AC is packed in cartridges of 310 ml; to use, cut the cartridge above the end of the thread and screw on the nozzle, which should be cut at 45° to produce a hole corresponding to the size of the joint. Insert the cartridge into the gun and extrude the sealant.

The surface of **Mapesil AC** must be finished

off with a damp tool, preferably moistened with soapy water, before a superficial film has formed.

Crosslinking

When exposed to air and humidity, **Mapesil AC** crosslinks and becomes elastic. The speed at which **Mapesil AC** crosslinks depends only slightly on temperature, but is fundamentally linked to humidity in the atmosphere.

The graph shows the cross linking at $+23^{\circ}\text{C}$ and 50% humidity in the atmosphere.

Cleaning

To clean partially cross-linked **Mapesil AC** from tools and contaminated surfaces, common solvents may be used (e.g. ethyl acetate, petrol, toluene). Once cross-linking is complete, silicone rubber can only be cleaned mechanically.

COVERAGE

Mapesil AC:

Coverage of **Mapesil AC** varies depending on the width of the joints. Some examples of coverage for end joints and triangular joints are shown in the chart.

Primer FD:

100 g/m².

PACKAGING

Mapesil AC: 310 ml cartridges.

Primer FD:

0.9 kg and 0.2 kg bottles.

COLOURS

Mapesil AC is available in 34 colours from the "MAPEI COLOURED GROUTS" range plus transparent.

STORAGE

Mapesil AC can be stored 24 months in a dry cool place in original cartridges.

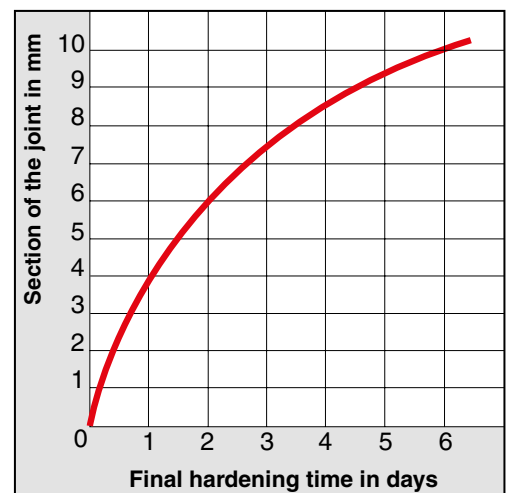
Primer FD, when stored in a cool and dry place (at a temperature not higher than $+25^{\circ}\text{C}$) has a storage life of 6 months.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Mapesil AC is not considered dangerous according to current norms regarding the classification of mixtures. During use, wear protective gloves and goggles and take the usual precautions for handling chemicals.

For further and complete information about the safe use of our product please refer to the latest version of our Material Safety Data Sheet.

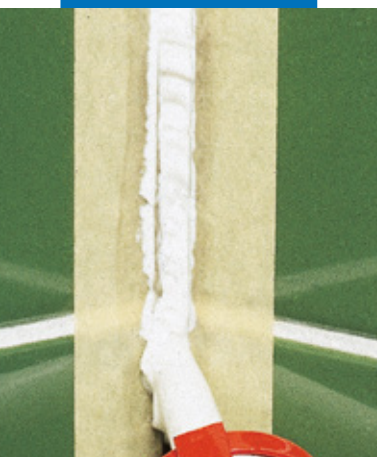
PRODUCT FOR PROFESSIONAL USE.



Cutting the nozzle according to the size of the joints



Application of Primer FD



Application of Mapesil AC

MAPESIL AC - TECHNICAL DATA (typical values)

In compliance with: EN 15651-1
EN 15651-2
EN 15651-3

PRODUCT IDENTITY

Type:	thixotropic paste
Colour:	transparent + 34 colours
Density (g/cm ³):	1.03 (transparent colour)
Dry solids content (%):	100
EMICODE:	EC1 Plus - very low emission

APPLICATION DATA (at +23°C and 50% R.H.)

Application temperature range:	from +5°C to +50°C
Extrusion speed from a 3.5 mm nozzle at a pressure of 0.5 N/mm ² (g/minute):	120
Time for formation of skin (minutes):	10
Shrinkage during vulcanisation (%):	3.5
Speed of vulcanisation (mm):	4 in 1 day - 10 in 7 days

FINAL PERFORMANCES

EN 15651-1: sealant for façade joints in interior and exterior, even with cold temperature:	F-EXT-INT-CC
Class:	25 LM
EN 15651-2: sealant for glazing, even with cold temperature:	G-CC
Class:	G 25 LM
EN 15651-3: sealant for sanitary fittings:	S
Class:	XS 1
Tensile strength – according to ISO 37 (N/mm ²):	1.6
Elongation at breaking point – according to ISO 37 (%):	800
Tear strength (ISO 34-1, Die C) (N/mm):	4
Shore-A-Hardness (ISO 868):	20
Density at +25°C (ISO 1183-1 A) (g/cm ³):	1.02
Modulus of elongation measured according to ISO 8339 METHOD A (N/mm ²):	
– at 25% elongation:	0.20
– at 50% elongation:	0.27
– at 100% elongation:	0.35
Maximum movement allowed (%):	25
Resistance to water:	excellent
Resistance to ageing:	excellent
Resistance to atmospheric agents:	excellent
Resistance to chemical agents, acids and dilute alkali:	good
Resistance to soap and detergents:	excellent
Resistance to solvents:	limited
Resistance to temperature:	from –40°C to +180°C

PRIMER FD - TECHNICAL DATA (typical values)

PRODUCT IDENTITY

Consistency:	transparent liquid
Color:	yellowish
Density (g/cm ³):	0.92
Brookfield viscosity (mPa·s):	1-2 (rotor 1 - rpm 100)



Smoothing the joint with soapy water and a small brush



Sealing ceramic tile floor with Mapesil AC



Sealing sanitary ware

Mapesil AC



COVERAGE TABLE (linear metres per cartridge)	
END JOINT	
Joint size in mm (a x b)	Linear metres per cartridge
5x5	12
10x5	6
10x10	3
15x10	2
20x10	1.5
25x10	1.25
30x15	0.7
40x20	0.4

TRIANGULAR JOINT	
Joint size in mm (l ₁ x l ₂)	Linear metres per cartridge
5x5	25
10x10	6
10x15	3
10x20	1.5

Primer FD is easily inflammable. It is recommended storing it away from naked flames and sparks, to avoid smoking, to prevent the build up of electrostatic energy and to work in well ventilated areas.

Furthermore, it is irritant for the eyes and skin, it may cause drowsiness and dizziness, it is harmful if swallowed or inhaled, and it may cause irreversible damage if used for lengthy periods.

During use, wear protective gloves to prevent dry, chapped skin, and protective gloves, and take the usual precautions for handling chemicals.

If the product comes in contact with the eyes or skin, wash immediately with plenty of clean water and seek medical attention. Wear

a suitable device to protect the respiratory system. Do not use in presence of pregnant women. For further and complete information about the safe use of our product please refer to the latest version of our Material Safety Data Sheet.

PRODUCT FOR PROFESSIONAL USE.

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement or replace requirements per the TDS in force at the time of the MAPEI product installation. The most up-to-date TDS can be downloaded from our website www.mapei.com. ANY ALTERATION TO THE WORDING OR REQUIREMENTS CONTAINED OR DERIVED FROM THIS TDS EXCLUDES THE RESPONSIBILITY OF MAPEI.



All relevant references for the product are available upon request and from www.mapei.com

Sealing U-profile glass

Sealing aluminium window frame with Mapesil AC

	100	WHITE
	103	MOON WHITE
	110	MANHATTAN 2000
	111	SILVER GREY
	112	MEDIUM GREY
	113	CEMENT GREY
	115	RIVER GREY
	116	MISK GREY
	119	LONDON GREY
	114	ANTHRACITE
	120	BLACK
	137	CARIBBEAN
	130	JASMINE
	131	VANILLA
	138	ALMOND
	132	BEIGE 2000
	133	SAND
	134	SILK
	139	PINK POWDER
	135	GOLDEN DUST
	152	LOLORICE
	136	MUD
	141	CARAMEL
	142	BROWN
	143	TERRACOTTA
	144	CHOCOLATE
	145	TERRA DI SIEBIA
	149	VOLCANO SAND
	150	YELLOW
	162	VIOLET
	170	CROCUS BLUE
	171	TURQUOISE
	172	SPACE BLUE
	174	TORNADO
	999	TRANSPARENT

N.B.: Due to the printing processes involved, the colours should be taken as merely indicative of the shades of the actual product

