



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for

Keraflex
Keraflex Easy S1
Kerabond Plus



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

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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.

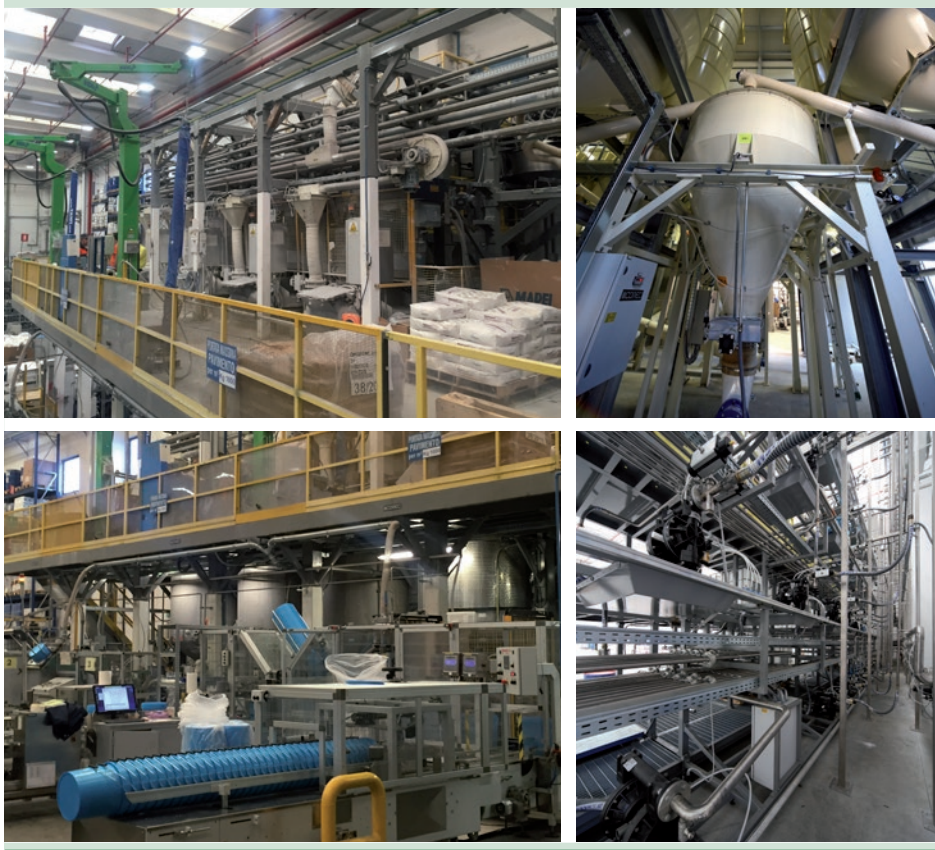
Table 2: System boundaries

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	
					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

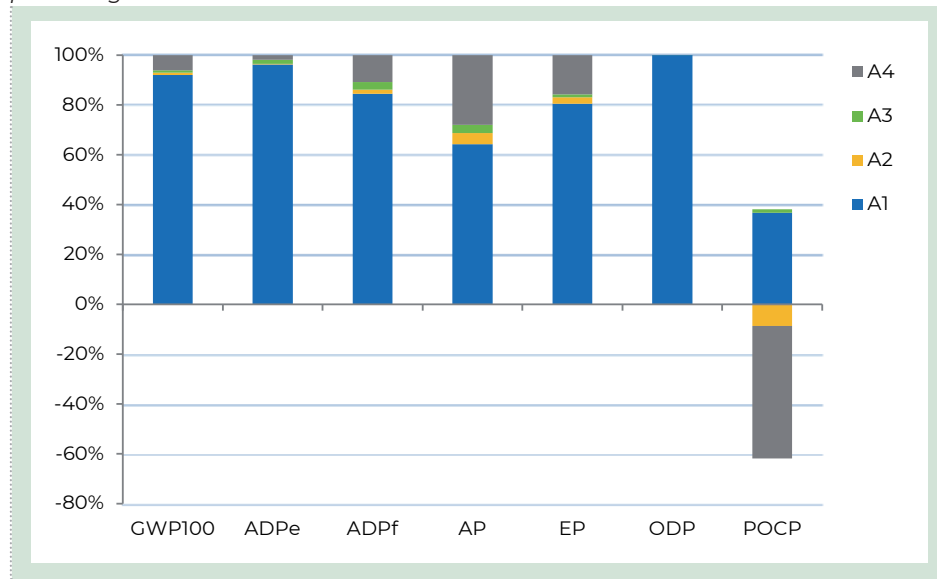


Table 26: Environmental Impact of **Kerabond Plus (grey)** as percentage

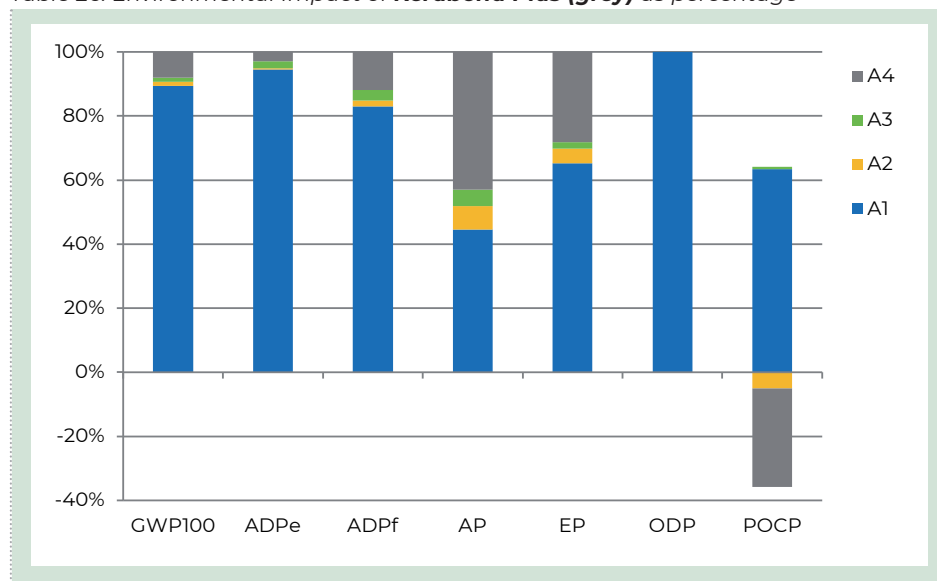


Table 27: Environmental Impact of **Kerabond Plus (white)** as percentage

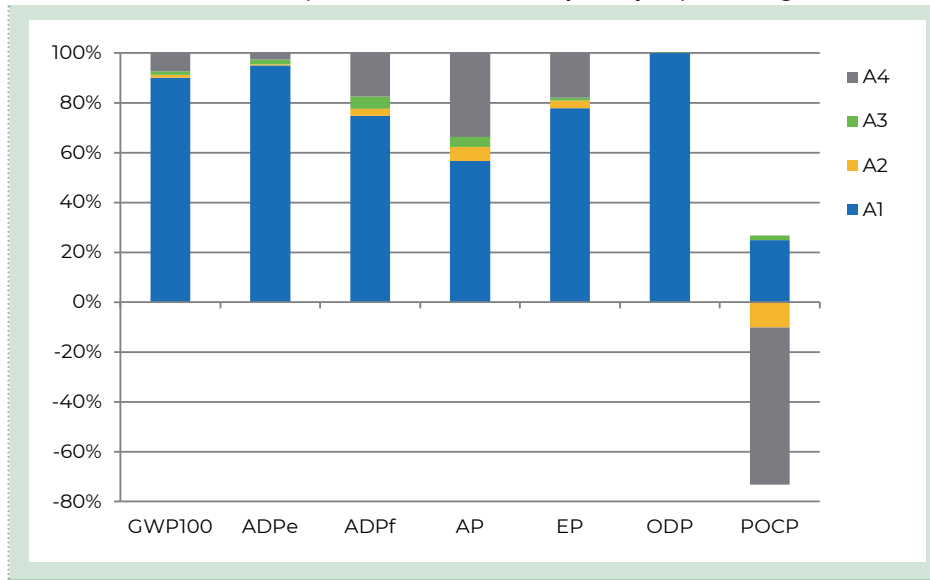
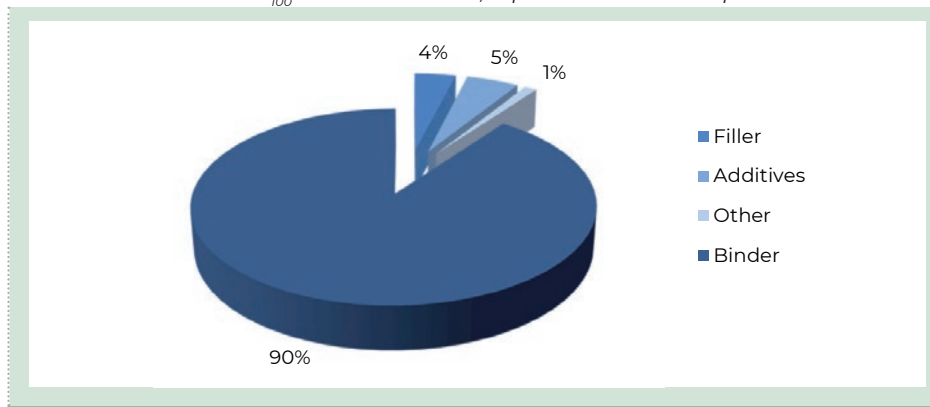


Table 28: Focus on GWP_{100} of the module A1, representative for all products



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 Code EC1^{PLUS}, as "very low VOC emission", released by GEV.

Next table describes the limits for the Emission Code 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

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Keraflex
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