

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019
for:



Argacem HP, Argatherm, Argatherm Acoustix, Argatherm Ultrafine

From **DIASEN SRL**



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General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): <i>PCR 2019:14 Construction products, Version 1.1</i>
PCR review was conducted by: <i>The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.</i>
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Certiquality S.r.l. Via Gaetano Giardino, 4 20123 - Milan Tel. +39 02 806 9171 www.certiquality.it Accredited by: <i>Accredia (Accreditation Number: n.003H Rev. 15)</i>
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

DIASEN ITALIA, as EPD owner, has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Diasen Srl

Contact: Davide Tomassoni

Description of the organisation:

Diasen is an Italian company operating in the ecological building sector, which oriented its production target towards innovative, low environmental impact, high technological content and quality products. For the purpose, the company provides high performance and green solutions in terms of thermal and acoustic insulating systems, waterproofing systems, coatings and coverings for the public, private and sport building sector.

The respect of the legislation, regulations and prescriptions applicable to the environmental protection, as well as to the reduction and control of environmental impacts, are the basic principles that characterize each single project. Since 2007 Diasen has carried out a certified Environmental Management System in compliance with the standard EN ISO 14001. Moreover, **LEED mapping** for 14 key products has been pursued.

Specific attention is paid to the reduction of waste production through a careful and effective activity of monitoring and control, by favouring, when possible, the production of recoverable waste.

Research and Development activity, is focused on the possibility of using raw materials deriving from manufacturing waste or from recoverable waste. The planning phases is oriented to thermo-insulating products to reduce the energy use and consumption inside the house.

Product-related or management system-related certifications: ISO 9001:2015 - EN ISO 14001:2015;

Name and location of production site(s): DIASEN SRL - Zona Ind. Berbentina, 5 - 60041 Sassoferrato (AN) - Italy

Manufacturing

The manufacturing process starts from raw materials storage as they are received from suppliers. For this purpose, some raw materials arrive in big bags, while others come with no packages, thus are stored inside specific silos. These materials are automatically fed in the production mixer. Other materials arrive in their package and are stored in the warehouse. Afterwards, they are sent to the mixer by mean of an electric forklift or fed to the mixer.

The production is a discontinuous process, in which all the components are mechanically mixed in batches. The product is then packaged in bags, placed on wooden pallets, protected with a hooding polymer film and stored in the Finished Products' warehouse. The quality of final product is checked both during the production phase and before the sale.

This manufacturing process does not involve water, and it is similar to a close-loop process, without scraps and wastes. Most of the residual dust collected in the filter system during production is returned to the production process.

Product information

- Product name: ARGACEM HP
Product identification: see table 1
Product description: High breathability, sponging and powder shaped smoothing plaster, formulated with hydrated lime, natural fillers and calcareous inert minerals. It can be used as a covering for internal and external floors.
UN CPC code: 37410 – Plaster
DIASEN PRODUCT CODE: 1647513;



2. **Product name:** ARGATHERM
Product identification: see table 2
Product description: Lightweight finishing smoother, made out of the finest mineral expanded fillers, with an internal micro-porous structure, which confers an excellent lightness and thermal-insulating properties to the product.
UN CPC code: 37410 - Plaster
DIASEN PRODUCT CODE: 2006033;



Table 1: Argacem HP

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	< 0.200	UNI EN 1745	EN 998-1
Compression Strength (N/mm ²)	CSIII	UNI EN 998-1	
Fire reaction	Class A1	UNI EN 13501-1	
Vapour permeability coefficient - μ	≤ 15	UNI EN 1015-19	
Capillarity water absorption (kg/m ² h ^{0.5})	Category W0	UNI EN 1015-18	
Specific weight (kg/m ³)	1120 $\pm$ 10	UNI EN 1015-15	
CI Content (%)	ND	UNI EN 1015-17	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

Table 2: Argatherm

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	0.128	UNI EN 1745	EN 998-1
Compression Strength (N/mm ²)	CSIII	UNI EN 998-1	
Fire reaction	Class A1	UNI EN 13501-1	
Vapour permeability coefficient - μ	≤ 15	UNI EN 1015-19	
Capillarity water absorption (kg/m ² h ^{0.5})	Category W0	UNI EN 1015-18	
Specific weight (kg/m ³)	1050 $\pm$ 10	UNI EN 1015-15	
CI Content (%)	ND	UNI EN 1015-17	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

Table 3: Argatherm Acoustix

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	< 0.200	UNI EN 1745	EN 998-1
Compression Strength (N/mm ²)	CSIII	UNI EN 998-1	
Fire reaction	Class A1	UNI EN 13501-1	
Vapour permeability coefficient - μ	≤ 15	UNI EN 1015-19	
Capillarity water absorption (kg/m ² h ^{0.5})	Category W0	UNI EN 1015-18	
Specific weight (kg/m ³)	650 $\pm$ 10	UNI EN 1015-15	
CI Content (%)	ND	UNI EN 1015-17	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

3. **Product name:** ARGATHERM ACOUSTIX
Product identification: see table 3
Product description: Finishing lightweight smoothing plaster composed of extremely fine expanded mineral fillers, characterised by extreme lightness and thermal insulation properties. It can be used as a covering for internal and external floors.
UN CPC code: 37410 - Plaster
DIASEN PRODUCT CODE: 20024116;



4. **Product name:** ARGATHERM ULTRAFINE
Product identification: vedi Table 4
Product description: Breathable smoothing compound for perfectly smooth surfaces.
UN CPC code: 37410 – Plaster;
DIASEN PRODUCT CODE: 1704506;



Table 4: Argatherm Ultrafine

Property	Value	Test methodology	Technical specification
Flexural Strength (N/mm ²) after 28 days	≥ 1,00	UNI EN 1015-11	EN 998-1
Compression Strength (N/mm ²) after 28 days	≥ 3,50	UNI EN 1015-11	
Adhesion Strength (N/mm ²) on concrete after 28 days	≥ 0,50	UNI EN 1015-12	
Vapour permeability coefficient - μ	8	UNI EN 1015-19	
Capillarity water absorption (kg/m ² h ^{0.5})	≤ 1,90	UNI EN 1015-18	
Fire reaction	Class A1	UNI EN 13501-1	
Volumetric mass – fresh mortar (kg/m ³)	1640 ± 15	-	
Volumetric mass – hardened mortar (kg/m ³)	1250 ± 15	-	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

Properties summarized in tables from 1 to 4 can be collected from TDS (Technical Data Sheet) related to each product. Characterisation tests have been carried out both in external laboratories and in Diasen's in-house laboratory, all in accordance with Regulation 305/11. The products *Argacem HP* and *Argatherm* and *Argatherm Ultrafine* are supplied in 25kg bags. For the purpose, the bags used are paper and plastic-based (coupled). Argatherm Acoustix is supplied in 15 kg bags.

Content information

Table 5: Content declaration and substances list for the system Argacem HP

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renewable material (%)
Hydraulic Lime	0.10 ÷ 0.14	285-561-1	85117-09-5	0	-
Hydrated Lime	0.06 ÷ 0.10	215-137-3	1305-62-0	0	-
Perlite	0.06 ÷ 0.10	-	130885-09-5	0	-
Carbonates	0.65 ÷ 0.75	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0.01	143-22-6	205-592-53	0	-

Table 6: Content declaration and substances list for the system Argatherm

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renewable material (%)
Hydraulic Lime	0.10 ÷ 0.14	285-561-1	85117-09-5	0	-
Hydrated Lime	0.06 ÷ 0.10	215-137-3	1305-62-0	0	-
Perlite	0.11 ÷ 0.15	-	130885-09-5	0	-
Carbonates	0.60 ÷ 0.70	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0.01	143-22-6	205-592-53	0	-

Table 7: Content declaration and substances list for the system Argatherm Acoustix.

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renewable material (%)
Hydraulic Lime	0.10 ÷ 0.14	285-561-1	85117-09-5	0	-
Hydrated Lime	0.06 ÷ 0.10	215-137-3	1305-62-0	0	-
Perlite	0.11 ÷ 0.15	-	130885-09-5	0	-
Carbonates	0.60 ÷ 0.70	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0,01	143-22-6	205-592-53	0	-
Expanded glass	0.13 ÷ 0.18	266-046-0	65997-17-3	100	-

Table 8: Content declaration and substances list for the system Argatherm Ultrafine

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renewable material (%)
Hydraulic Lime	0,10 ÷ 0,14	285-561-1	85117-09-5	0	-
Hydrated Lime	0,06 ÷ 0,10	215-137-3	1305-62-0	0	-
Perlite	0,06 ÷ 0,10	-	130885-09-5	0	-
Carbonates	0,65 ÷ 0,75	207-439-9	471-34-1	0	-
Organic Additives	0,01 ÷ 0,03	-	9004-65-3	0	-
Inorganic Additives	< 0,01	143-22-6	205-592-53	0	-

Table 9: Raw materials used in products of the family Argacem and Argatherm

Material	Hazard Phrase	Function
Hydrated Lime	H315; H318; H335	Natural and antibacterial binder
Hydraulic Lime	H315; H318; H335	Natural binder
Organic Additives	No	Adhesion, working-ability and Flexibility
Inorganic Additives	H228; H315; H318; H335	Aerating and anti-shrinkage
Perlite	No	Light Thermal and Acoustic Insulation
Expanded silica	N.D.	Light Thermal and Acoustic Insulation
Carbonates	H315; H320; H335	Multi-purpose
Expanded Glass	No	Thermal Insulation

The product dealt with in this document are not classified as hazardous or dangerous for the environment in accordance with Directives 67/548/EEC and 1999/45/EC. There are no substances included in the Authorisation List (Attachment XIV) or the Candidate List of Substances of Very High Concern for Authorisation issued by the European Chemicals Agency, nor do they contain such substances. Under normal storage and use conditions, these products can be handled with no particular precautions or special protective equipment.

LCA information

Product environmental performance was assessed using the Life Cycle Assessment (LCA) method, in accordance with the EN ISO 14044:2006 standard, and the Life Cycle Impact assessment (LCIA) method, in accordance with standard UNI EN 15804:2014 + A2:2019. On this regards, Product Category Rules (PCR) – “Construction Products PCR 2019:14 - Version 1.11” was used as reference document. The results of the estimated environmental impacts are only relative statements that do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

The field of application of the different products is quite the same, despite the related properties are different. Any products could perform several functionalities inside a building component (also different performances), thus the definition of a single and specific functionality for each product is quite difficult. For this reason, a declared unit has been taken into account instead of a functional unit, as recommended by the used standardisation. It has to be pointed out that the production of the investigated systems takes place inside the Diasen Manufacturing Plant in Sassoferrato (AN) – Italy. More products can be included in the same EPD if the reference PCRs are the same and if they are made by the same company according to the same production process

Declared unit and Reference service life:

1 kg of product as dry product mix is defined as Declared Unit (DU). The environmental impact of 1 kg of powder product (packaging included) for each products involved is described. According to the system boundary of this EPD, a Reference Service Life has not been provided.

Time representativeness: Data are referred to the production carried out in 2020 and have been provided by Diasen Srl. Also, data regarding the geographic origin of any raw materials, packaging materials etc. have been provided, as well as the transportation media.

Database and LCA software used: Ecoinvent 3.8 used as a database and SimaPrò Version 9.3 as the software.

Description of system boundaries:

Cradle to gate (A1–A3).

In the declared modules the following activities have been considered:

- Phase A1: raw materials together with the related packaging, as in the case of (kraft paper) bags, or with no packages if returned to the producers, as in the case of Clay, Hydrated and Hydraulic lime, Perlite, Pumice, expanded silica, etc. Also, energies of production (cork milling, powder mixing) and related to the company utilities (mainly compressed air) have been included in this module;
- Phase A2: Transports of raw materials (and packages if existing) and packages used to purchase the investigated products. Also produced waste transport to treatment plants has been included;
- Phase A3: emissions (powder collected by scrubbers and abatement systems), wastes related to auxiliary packages the used raw materials are provided with. The latter kinds have been considered being sent to the appropriate collecting systems;

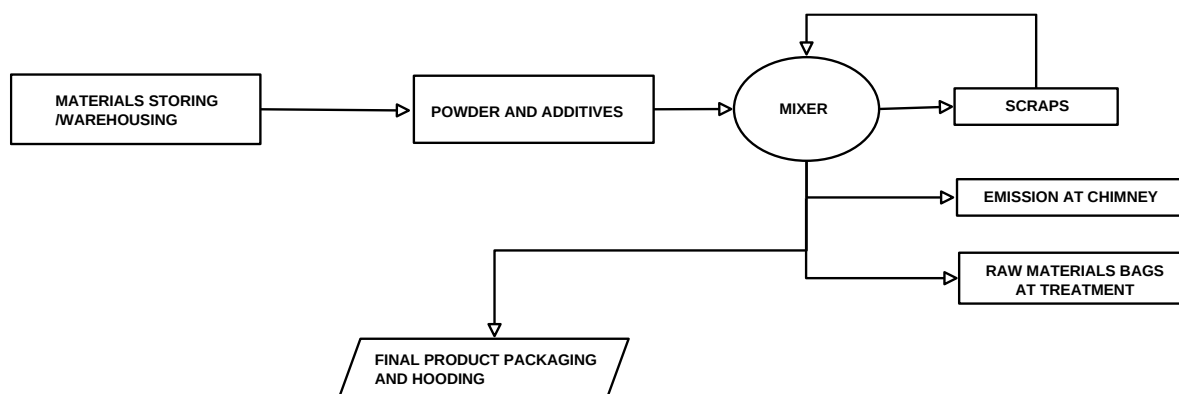


Figure 1: Preliminary scheme of the Argacem and Argatherm family Production phase.

Table 10: Reporting table for Argacem HP and Argatherm products.

	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	IT	IT	IT	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data						-	-	-	-	-	-	-	-	-	-	-	-
Variation - Products						-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites						-	-	-	-	-	-	-	-	-	-	-	-

Modules not accounted in the LCA since they are not assessed are marked as “ND” (Not Declared), as shown in table 10. A low number of emissions is produced, as the main number of scraps (powders) are collected by specific filters and re-processed.

More information:

Name and contact information of the organisation carrying out the underlying LCA study: University of Perugia – Strada di Pentima, 4 – 05100 –Terni (Italy)

Assumption and Estimation:

In accordance with the General Programme Instructions for the International EPD® System (2015) and the reference PCR, secondary materials -such as expanded glass- are contained only in the product Argatherm Acoustix. This constituent has been accounted adopting the following approach:

- Environmental impacts related to the “previous life cycle” have not been considered;
- Secondary materials do not need to be processed before the new use;
- Transports to the factory gate have been considered;

The whole amount of expanded glass is recycled (or it becomes a secondary material), and it comes from the recovering of industrial processing scrap (no end of life but pre-consumer product).

About the used additives, both organic and inorganic counterpart, their composition has been modelled according to the information contained in the related technical and safety data sheet, provided by the specific provider. Transports of both raw materials and packaging, from provider's sites to Diasen Processing plant, have been carried out by mean EURO4 lorries. This data represents the Italian road Transport system average framework. The data regarding energy consumption were accurately calculated on the basis of specific measurement campaigns, on the base of the most recent Italian Residual Mix.

About the packaging, as it is strongly dependant from the product, it is summarized in the following table:

Table 11: Recycled materials used in the production process of Diasen Product.

Material	Weight fraction in Diasen products (%)	Recycled content (%)	Definition
Expanded Glass	0.00 ÷ 15.00	100%	PRE-consumer recycled content is defined as materials that are diverted from the manufacturing waste stream and used to make a new product. Normally, the materials are purchased from companies that collect discarded waste from other manufacturers. To qualify, the materials must be considered a waste product and not normally reused by industry within the original manufacturing process. Paper product scraps that must be re pulped can be considered PRE-consumer content
Product			Recycled (%)
Argatherm Acoustix			15.00

Table 12: Packages for series Argacem HP, Argatherm and Argatherm Acoustix.

Product	Argacem HP	Argatherm	Argatherm Acoustix	Argatherm Ultrafine
Weight (kg/bag)	25.00	25.00	25.00	25.00
N° bag/Pallet	56	56	60	60
Paper bag (kg/kg product)	1.20*10 ⁻³	1.20*10 ⁻³	1.20*10 ⁻³	4.85*10 ⁻³
Film PE (kg/kg product)	2.90*10 ⁻⁴	2.90*10 ⁻⁴	2.90*10 ⁻⁴	2.68*10 ⁻⁴
Euro-pallet (unit/kg product)	7.10*10 ⁻⁴	7.10*10 ⁻⁴	7.10*10 ⁻⁴	6.70*10 ⁻⁴

Cut-off criteria:

The consumption of raw materials and energy related to ordinary and extraordinary maintenance operations was not included, as well as energy consumption associated to illumination and heating of personnel, since it has been experienced that the related environmental impact calculations is not relevant.

Allocation criteria:

About the production phase in the manufacturing plant, energy consumption and emissions have been referred to at any single production stage, in order to avoid any allocation procedure. For data collected from Ecoinvent database, the related allocation has been taken into account.

Data quality:

As introduced, the background data used in this EPD were retrieved from the Ecoinvent 3.8 database. For inventory modelling, SimaPro 9.3 software was used. The geographical reference was Italy, while for raw materials the most relevant data are referred to Europe (specific data from the related producer have been collected. As a spanned time period, the last 5 years has been assumed. About the raw materials, the most relevant data are European or specific from supplier. Finally, the reference time period for the LCA (product composition, transport, production rates, etc.) are referred to 2021. Data collection included the analysis of production and environmental internal data (situ-specific data) regarding the whole range of production processes included in the LCA.

Data comparability:

All the data and results related to Diathonite products were collected and obtained based on the EN 15804 standard, in the context of their final use in the building manufacturing system. Thus, the environmental impacts associated with the Diathonite products are comparable with the environmental impacts of other similar products calculated according to the same UNI EN 15804 standard.

Environmental Information

Environmental profiles of the products covered by this EPD, using the LCA method, have been reported in this section.

As introduced, a “Cradle-to-gate” approach has been carried out, and phases A1-A3 have been included within the system boundaries. Different calculation tools have been used, as recommended by the EPD regulation.

Potential environmental impact – mandatory indicators according to EN 15804

- **Global Warming Potential (GWP):** It is directly linked to Climate Change, as a measure of greenhouse gas emissions, such as carbon dioxide and methane. These emissions increase absorption of radiation emitted by the earth, intensifying the natural greenhouse effect;
- **Abiotic Depletion Potential (ADP):** It directly regards the consumption of resources in relation to the corresponding source current availability. The exploitation of non-renewable resources leads to a decrease in the future availability of the related performed functions. This impact category can be shared in depletion of mineral resource elements (ADPE) and non-renewable fossil energy resources (ADPF). In the report these are reported separately;
- **Ozone Depletion Potential (ODP):** This indicator directly regards the increase in the tropospheric zone hole. It is another measure of the emissions of greenhouses gasses, as they increase the absorption of radiation emitted by the earth, which increases also the natural greenhouse effect;
- **Photochemical Ozone Creation Potential (POCP):** Photochemical Smog. It is a measure of precursors emissions contributing to ground level smog formation (mainly ozone O₃), produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides under the influence of UV light. Ground level ozone can be harmful for human and ecosystem health and may also damage agriculture;
- **Acidification Potential (AP):** It is related to the Acid Rains. It is a measure of emissions leading to acidifying effects on the environment. From a technical base point, the involved indicator is a measure of the capacity of a given molecule or chemical species to increase the hydrogen ion (H⁺) concentration in the water (lakes, rivers, etc.), thus decreasing the related pH value. Moreover, potential effects include forest and building materials deterioration;
- **Eutrophication Potential (EP):** It regards the Algal Blooms. It is a measure of nutrient enrichment that can lead to an undesirable shift in species composition and elevated biomass production in terrestrial and aquatic ecosystems. It includes potential impacts of excessively high levels of nitrogen and phosphorus macronutrients;

Table 13: Impact indicators for the system Argacem HP.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1,65	1,59*10 ⁻²	2,71*10 ⁻²	1,69
GWP-fossil	kg CO ₂ eq.	1,58	1,58*10 ⁻²	1,34*10 ⁻²	1,61
GWP-biogenic	kg CO ₂ eq.	6,84*10 ⁻²	1,17*10 ⁻⁴	1,36*10 ⁻²	8,21*10 ⁻²
GWP-luluc	kg CO ₂ eq.	3,84*10 ⁻⁴	6,31*10 ⁻⁶	4,42*10 ⁻⁵	4,35*10 ⁻⁴
ODP	kg CFC 11 eq.	1,66*10 ⁻⁷	2,94*10 ⁻⁹	1,01*10 ⁻⁹	1,70*10 ⁻⁷
AP	mol H ⁺ eq.	4,11*10 ⁻³	8,05*10 ⁻⁵	7,85*10 ⁻⁵	4,27*10 ⁻³
	kgSO ₂ _eq.	3,48*10 ⁻³	7,14*10 ⁻⁵	6,73*10 ⁻⁵	3,62*10 ⁻³
Eutroph. Aq. Freshwater	kg_P_eq.	2,13*10 ⁻⁴	1,03*10 ⁻⁶	9,05*10 ⁻⁶	2,23*10 ⁻⁴
	kg PO ₄ ³ eq.	6,55*10 ⁻⁴	3,17*10 ⁻⁵	2,78*10 ⁻⁵	6,86*10 ⁻⁴
Eutroph. Aq. Marine	kg_N_eq.	2,62*10 ⁻⁵	9,53*10 ⁻⁸	1,27*10 ⁻⁶	2,76*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	7,52*10 ⁻³	3,03*10 ⁻⁴	2,23*10 ⁻⁴	8,05*10 ⁻³
POCP	kg NMVOC eq.	2,20*10 ⁻³	8,50*10 ⁻⁵	7,86*10 ⁻⁵	2,37*10 ⁻³
ADP-minerals& metals*	kg Sb eq.	1,39*10 ⁻⁵	5,57*10 ⁻⁸	8,77*10 ⁻⁷	1,41*10 ⁻⁵
ADP-fossil*	MJ	11,10	0,237	0,272	11,60
Water Use*	m ³ _world eq. depr	2,12*10 ⁻¹	7,12*10 ⁻⁴	9,07*10 ⁻³	0,221
GWP - GHG	kg CO ₂ eq.	1,58	7,12*10 ⁻⁴	1,35*10 ⁻²	1,59

Table 14: Impact indicators for the system Argatherm.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1,64	2,07*10 ⁻²	2,71*10 ⁻²	1,69
GWP-fossil	kg CO ₂ eq.	1,56	2,05*10 ⁻²	1,34*10 ⁻²	1,60
GWP-biogenic	kg CO ₂ eq.	7,69*10 ⁻²	1,53*10 ⁻⁴	1,36*10 ⁻²	9,07*10 ⁻²
GWP-luluc	kg CO ₂ eq.	3,84*10 ⁻⁴	8,21*10 ⁻⁶	4,42*10 ⁻⁵	4,36*10 ⁻⁴
ODP	kg CFC 11 eq.	1,67*10 ⁻⁷	3,82*10 ⁻⁹	1,01*10 ⁻⁹	1,72*10 ⁻⁷
AP	mol H ⁺ eq.	4,39*10 ⁻³	1,05*10 ⁻⁴	7,85*10 ⁻⁵	4,57*10 ⁻³
	kgSO ₂ _eq.	3,71*10 ⁻³	9,29*10 ⁻⁵	6,73*10 ⁻⁵	3,87*10 ⁻³
Eutroph. Aq. Freshwater	kg_P_eq.	2,18*10 ⁻⁴	1,34*10 ⁻⁶	9,05*10 ⁻⁶	2,28*10 ⁻⁴
	kg PO ₄ ³ eq.	6,70*10 ⁻⁴	4,12*10 ⁻⁶	2,78*10 ⁻⁵	7,02*10 ⁻⁴
Eutroph. Aq. Marine	kg_N_eq.	2,58*10 ⁻⁵	1,24*10 ⁻⁷	1,24*10 ⁻⁶	2,72*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	7,87*10 ⁻³	3,94*10 ⁻⁴	2,23*10 ⁻⁴	8,49*10 ⁻³
POCP	kg NMVOC eq.	2,30*10 ⁻³	1,11*10 ⁻⁴	7,86*10 ⁻⁵	2,49*10 ⁻³
ADP-minerals& metals*	kg Sb eq.	1,31*10 ⁻⁵	7,25*10 ⁻⁸	8,77*10 ⁻⁸	1,33*10 ⁻⁵
ADP-fossil*	MJ	11,10	0,308	0,272	11,70
Water Use*	m ³ _world eq. depr	2,16*10 ⁻¹	9,26*10 ⁻⁴	9,07*10 ⁻³	0,226
GWP - GHG	kg CO ₂ eq.	1,56	2,05*10 ⁻²	1,35*10 ⁻²	1,56

Table 15: Impact indicators for the system Argatherm Acoustix.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1,38	1,94*10 ⁻²	3,13*10 ⁻²	1,43
GWP-fossil	kg CO ₂ eq.	1,31	1,92*10 ⁻²	1,63*10 ⁻²	1,35
GWP-biogenic	kg CO ₂ eq.	6,96*10 ⁻²	1,43*10 ⁻⁴	1,49*10 ⁻²	8,47*10 ⁻²
GWP-luluc	kg CO ₂ eq.	3,24*10 ⁻⁴	7,71*10 ⁻⁶	5,72*10 ⁻⁵	3,89*10 ⁻⁴
ODP	kg CFC 11 eq.	1,51*10 ⁻⁷	3,59*10 ⁻⁹	1,35*10 ⁻⁹	1,56*10 ⁻⁷
AP	mol H ⁺ eq.	3,86*10 ⁻³	9,83*10 ⁻⁵	9,62*10 ⁻⁵	4,06*10 ⁻³
	kgSO ₂ _eq.	3,27*10 ⁻³	8,73*10 ⁻⁵	8,25*10 ⁻⁵	3,44*10 ⁻³
Eutroph. Aq. Freshwater	kg_P_eq.	1,83*10 ⁻⁴	1,26*10 ⁻⁶	1,00*10 ⁻⁵	1,94*10 ⁻⁴
	kg PO ₄ ³ eq.	5,64*10 ⁻⁴	3,87*10 ⁻⁶	3,08*10 ⁻⁵	5,99*10 ⁻⁴
Eutroph. Aq. Marine	kg_N_eq.	2,10*10 ⁻⁵	1,16*10 ⁻⁷	1,40*10 ⁻⁶	2,25*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	6,91*10 ⁻³	3,70*10 ⁻⁴	2,77*10 ⁻⁴	7,56*10 ⁻³
POCP	kg NMVOC eq.	2,02*10 ⁻³	1,04*10 ⁻⁴	9,83*10 ⁻⁵	2,22*10 ⁻³
ADP-minerals& metals*	kg Sb eq.	1,03*10 ⁻⁵	6,81*10 ⁻⁸	1,12*10 ⁻⁷	1,05*10 ⁻⁵
ADP-fossil*	MJ	9,40	0,29	0,325	10,00
Water Use*	m ³ _world eq. depr	1,84*10 ⁻¹	8,70*10 ⁻⁴	1,08*10 ⁻²	0,195
GWP - GHG	kg CO ₂ eq.	1,31	1,64*10 ⁻²	1,93*10 ⁻²	1,35

Table 16: Impact indicators for the system Argatherm Ultrafine.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1,39	2,70*10 ⁻²	2,38*10 ⁻²	1,44
GWP-fossil	kg CO ₂ eq.	1,33	2,68*10 ⁻²	9,54*10 ⁻³	1,36
GWP-biogenic	kg CO ₂ eq.	6,26*10 ⁻²	1,84*10 ⁻⁴	1,42*10 ⁻²	7,70*10 ⁻²
GWP-luluc	kg CO ₂ eq.	2,91*10 ⁻⁴	1,12*10 ⁻⁵	4,36*10 ⁻⁵	3,46*10 ⁻⁴
ODP	kg CFC 11 eq.	1,14*10 ⁻⁷	4,77*10 ⁻⁹	9,81*10 ⁻¹⁰	1,20*10 ⁻⁷
AP	mol H ⁺ eq.	3,60*10 ⁻³	1,37*10 ⁻⁴	6,53*10 ⁻⁵	3,80*10 ⁻³
	kgSO ₂ _eq.	3,04*10 ⁻³	1,22*10 ⁻⁴	5,60*10 ⁻⁵	3,22*10 ⁻³
Eutroph. Aq. Freshwater	kg_P_eq.	1,61*10 ⁻⁴	1,94*10 ⁻⁶	7,81*10 ⁻⁶	1,71*10 ⁻⁴
	kg PO ₄ ³ eq.	4,95*10 ⁻⁴	5,97*10 ⁻⁶	2,40*10 ⁻⁵	5,25*10 ⁻⁴
Eutroph. Aq. Marine	kg_N_eq.	1,82*10 ⁻⁵	1,72*10 ⁻⁷	1,12*10 ⁻⁶	1,95*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	6,36*10 ⁻³	5,10*10 ⁻⁴	2,08*10 ⁻⁴	7,08*10 ⁻³
POCP	kg NMVOC eq.	1,87*10 ⁻³	1,43*10 ⁻⁴	6,61*10 ⁻⁵	2,08*10 ⁻³
ADP-minerals& metals*	kg Sb eq.	8,57*10 ⁻⁶	9,36*10 ⁻⁸	7,13*10 ⁻⁸	8,73*10 ⁻⁶
ADP-fossil*	MJ	8,80	0,399	0,147	9,35
Water Use*	m ³ _world eq. depr	1,61*10 ⁻¹	1,32*10 ⁻³	5,44*10 ⁻³	0,168
GWP - GHG	kg CO ₂ eq.	1,33	2,68*10 ⁻²	9,63*10 ⁻³	1,37

(*) **Disclaimer:** the results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Use of resources

Table 17: Use of resources for the system Argacem HP.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as materials	MJ	1,25	3,42*10 ⁻³	0,549	1,80
Use of renewable primary energy resources used as raw materials	MJ	0,475	5,79*10 ⁻⁴	0,451	0,93
Total use of renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	1,72	4,00*10⁻³	0,549	2,73
Use of non-renewable primary energy excluding non-renewable primary energy resources used as materials	MJ	13,45	0,299	0,38	14,03
Use of non-renewable primary energy resources used as raw materials	MJ.	3,36*10 ⁻⁵	0	8,36*10 ⁻⁵	1,24*10 ⁻⁴
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	13,47	0,299	0,38	14,03
Use of secondary materials	kg	0	0	0	0
Use of renewable secondary fuels	MJ	1,25	3,42*10 ⁻³	0,549	1,80
Use of non-renewable secondary fuels	MJ	4,06*10 ⁻⁴	1,00*10 ⁻⁵	5,39*10 ⁻⁵	4,70*10 ⁻⁴
Net Use of Fresh Water	m ³	6,06*10 ⁻³	2,47*10 ⁻⁴	2,52*10 ⁻⁴	6,56*10 ⁻³

Table 18: Use of resources for the system Argatherm.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as materials	MJ	1,26	4,44*10 ⁻³	0,549	1,82
Use of renewable primary energy resources used as raw materials	MJ	0,50	7,53*10 ⁻⁴	0,451	0,95
Total use of renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	1,76	5,02*10⁻³	1,00	2,77
Use of non-renewable primary energy excluding non-renewable primary energy resources used as materials	MJ	13,39	0,335	0,322	14,05

Use of non-renewable primary energy resources used as raw materials	MJ.	6,00*10 ⁻⁵	0	8,36*10 ⁻⁵	1,44*10 ⁻⁴
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	13,39	0,335	0,322	14,05
Use of secondary materials	kg	0	0	0	0
Use of renewable secondary fuels	MJ	1,26	4,44*10 ⁻³	0,549	1,82
Use of non-renewable secondary fuels	MJ	4,28*10 ⁻⁴	1,31*10 ⁻⁵	5,39*10 ⁻⁵	4,95*10 ⁻⁴
Net Use of Fresh Water	m ³	6,13*10 ⁻³	3,28*10 ⁻⁵	2,47*10 ⁻⁴	6,41*10 ⁻³

Table 19: Use of resources for the system Argatherm Acoustix.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as materials	MJ	1,09	4,17*10 ⁻³	0,762	1,85
Use of renewable primary energy resources used as raw materials	MJ	0,454	7,07*10 ⁻⁴	0,629	1,08
Total use of renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	1,54	4,88*10⁻³	1,39	2,94
Use of non-renewable primary energy excluding non-renewable primary energy resources used as materials	MJ	11,24	0,314	0,384	11,94
Use of non-renewable primary energy resources used as raw materials	MJ.	6,00*10 ⁻⁵	0	8,95*10 ⁻⁵	1,50*10 ⁻⁴
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	11,24	0,314	0,384	11,94
Use of secondary materials	kg	0	0	0	0
Use of renewable secondary fuels	MJ	1,09	4,17*10 ⁻³	0,762	1,85
Use of non-renewable secondary fuels	MJ	3,91*10 ⁻⁴	1,23*10 ⁻⁵	6,89*10 ⁻⁵	4,72*10 ⁻⁴
Net Use of Fresh Water	m ³	5,16*10 ⁻³	3,08*10 ⁻⁵	2,99*10 ⁻⁴	5,49*10 ⁻³

Table 20: Use of resources for the system Argatherm Ultrafine.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as materials	MJ	0,936	5,01*10 ⁻³	0,613	1,55
Use of renewable primary energy resources used as raw materials	MJ	0,358	9,07*10 ⁻⁴	0,508	0,87
Total use of renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	1,29	5,92*10⁻³	1,12	2,42
Use of non-renewable primary energy excluding non-renewable primary energy resources used as materials	MJ	10,45	0,43	0,173	11,05
Use of non-renewable primary energy resources used as raw materials	MJ.	6,46*10 ⁻⁵	0	1,01*10 ⁻⁵	7,47*10 ⁻⁵
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as materials)	MJ	10,45	0,43	0,173	11,05
Use of secondary materials	kg	0	0	0	0
Use of renewable secondary fuels	MJ	0,936	5,01*10 ⁻³	0,613	1,55
Use of non-renewable secondary fuels	MJ	3,72*10 ⁻⁴	1,76*10 ⁻⁵	6,22*10 ⁻⁵	4,52*10 ⁻⁴
Net Use of Fresh Water	m ³	4,53*10 ⁻³	4,19*10 ⁻⁵	1,56*10 ⁻⁴	4,73*10 ⁻³

Additional Impact Indicators

Table 21: Additional Impact Indicators for the system Argacem HP.

Indicator	Unit	A1	A2	A3	Tot. A1-A3
Particulate matter emission	kg_PM2.5_eq.	$4,71 \cdot 10^{-4}$	$6,89 \cdot 10^{-6}$	$9,25 \cdot 10^{-4}$	$1,40 \cdot 10^{-3}$
Ionizing radiation, human health*	kBq_U235_eq.	0,101	$1,24 \cdot 10^{-3}$	$1,62 \cdot 10^{-3}$	$1,04 \cdot 10^{-1}$
Eco-toxicity (freshwater)**	CTUe	13,80	0,121	0,167	14,10
Human Toxicity, carcinogenic effects**	CTUh	$3,42 \cdot 10^{-9}$	$9,19 \cdot 10^{-10}$	$1,82 \cdot 10^{-9}$	$6,58 \cdot 10^{-8}$
Human Toxicity, non-carcinogenic effects**	CTUh	$2,10 \cdot 10^{-7}$	$3,42 \cdot 10^{-9}$	$3,47 \cdot 10^{-9}$	$2,17 \cdot 10^{-7}$
Land Use**	Kg_C_Deficit	1,34	0,06	0,233	1,63

Table 22: Additional Impact Indicators for the system Argatherm.

Indicator	Unit	A1	A2	A3	Tot. A1-A3
Particulate matter emission	kg_PM2.5_eq.	$5,49 \cdot 10^{-4}$	$8,95 \cdot 10^{-6}$	$9,25 \cdot 10^{-4}$	$1,48 \cdot 10^{-3}$
Ionizing radiation, human health*	kBq_U235_eq.	$9,69 \cdot 10^{-2}$	$1,62 \cdot 10^{-3}$	$1,62 \cdot 10^{-3}$	$1,00 \cdot 10^{-1}$
Eco-toxicity (freshwater)**	CTUe	13,30	0,158	0,167	13,60
Human Toxicity, carcinogenic effects**	CTUh	$6,18 \cdot 10^{-8}$	$1,19 \cdot 10^{-9}$	$1,82 \cdot 10^{-9}$	$6,48 \cdot 10^{-8}$
Human Toxicity, non-carcinogenic effects**	CTUh	$2,11 \cdot 10^{-7}$	$4,45 \cdot 10^{-9}$	$3,47 \cdot 10^{-9}$	$2,19 \cdot 10^{-7}$
Land Use**	Kg_C_Deficit	1,31	0,078	0,233	1,62

Table 23: Additional Impact Indicators for the system Argatherm Acoustix.

Indicator	Unit	A1	A2	A3	Tot. A1-A3
Particulate matter emission	kg_PM2.5_eq.	$5,09 \cdot 10^{-4}$	$8,41 \cdot 10^{-6}$	$9,27 \cdot 10^{-4}$	$1,44 \cdot 10^{-3}$
Ionizing radiation, human health*	kBq_U235_eq.	$7,78 \cdot 10^{-2}$	$1,52 \cdot 10^{-3}$	$1,87 \cdot 10^{-3}$	$8,13 \cdot 10^{-2}$
Eco-toxicity (freshwater)**	CTUe	10,60	0,148	0,209	13,30
Human Toxicity, carcinogenic effects**	CTUh	$5,05 \cdot 10^{-8}$	$1,12 \cdot 10^{-9}$	$2,44 \cdot 10^{-9}$	$6,18 \cdot 10^{-8}$
Human Toxicity, non-carcinogenic effects**	CTUh	$1,76 \cdot 10^{-7}$	$4,18 \cdot 10^{-9}$	$4,38 \cdot 10^{-9}$	$2,11 \cdot 10^{-7}$
Land Use**	Kg_C_Deficit	1,10	0,073	0,322	1,31

Table 24: Additional Impact Indicators for the system Argatherm Ultrafine.

Indicator	Unit	A1	A2	A3	Tot. A1-A3
Particulate matter emission	kg_PM2.5_eq.	$4,65 \cdot 10^{-4}$	$1,22 \cdot 10^{-6}$	$8,32 \cdot 10^{-6}$	$4,86 \cdot 10^{-4}$
Ionizing radiation, human health*	kBq_U235_eq.	$7,55 \cdot 10^{-2}$	$1,93 \cdot 10^{-3}$	$9,82 \cdot 10^{-4}$	$7,84 \cdot 10^{-2}$
Eco-toxicity (freshwater)**	CTUe	9,32	0,205	0,136	9,66
Human Toxicity, carcinogenic effects**	CTUh	$4,32 \cdot 10^{-8}$	$1,56 \cdot 10^{-9}$	$1,72 \cdot 10^{-9}$	$4,65 \cdot 10^{-8}$
Human Toxicity, non-carcinogenic effects**	CTUh	$1,55 \cdot 10^{-7}$	$5,81 \cdot 10^{-9}$	$2,94 \cdot 10^{-9}$	$1,64 \cdot 10^{-7}$
Land Use**	Kg_C_Deficit	1,06	0,099	0,258	1,42

(*) Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

() Disclaimer:** the results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Waste production and output flows

Waste production

Table 25: Flows in final products for Argacem HP.

Results per declared unit		
Indicator	Unit	Tot. (A1-A3)
Hazardous waste disposed	kg	$4,43 \cdot 10^{-5}$
Non-hazardous waste disposed	kg	$4,59 \cdot 10^{-5}$
Radioactive waste disposed	kg	0

Table 26: Flows in final products for Argatherm.

Results per declared unit		
Indicator	Unit	Tot. (A1-A3)
Hazardous waste disposed	kg	$6,01 \cdot 10^{-5}$
Non-hazardous waste disposed	kg	$4,49 \cdot 10^{-5}$
Radioactive waste disposed	kg	0

Table 27: Flows in final products for Argatherm Acoustix.

Results per declared unit		
Indicator	Unit	Tot. (A1-A3)
Hazardous waste disposed	kg	$5,94 \cdot 10^{-5}$
Non-hazardous waste disposed	kg	$3,74 \cdot 10^{-5}$
Radioactive waste disposed	kg	0

Table 28: Flows in final products for Argatherm Ultrafine.

Results per declared unit		
Indicator	Unit	Tot. (A1-A3)
Hazardous waste disposed	kg	$5,23 \cdot 10^{-5}$
Non-hazardous waste disposed	kg	$4,02 \cdot 10^{-5}$
Radioactive waste disposed	kg	0

Output flows

Table 29: Use of resources for the systems Argacem HP, Argatherm, Argatherm Acoustix and Argatherm Ultrafine.

Results per declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Components for re-use	kg	0	0	0	0
Material for recycling	kg	0	0	0	0
Materials for energy recovery	kg	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0

NOTE: It has to be specified that Diasen claimed: at the end of the service life of any product dealt with in this document, the products themselves can potentially recycled as inert materials.

Information on biogenic carbon content

Table 30: Biogenic carbon content for the products Argacem HP, Argatherm, Argatherm Acoustix and Argatherm Ultrafine.

Biogenic Carbon	Unit	Argacem HP	Argatherm	Argatherm Acoustix	Argatherm Ultrafine
Biogenic carbon in the product	Kg C	0,00	0,00	0,00	0,00
Biogenic carbon in the packaging	Kg C	$4,59 \cdot 10^{-2}$	$5,06 \cdot 10^{-2}$	$5,51 \cdot 10^{-2}$	$5,27 \cdot 10^{-2}$

Differences versus previous versions

Update of the Ecoinvent database and of the fuel mix. An additional product, ARGATHERM ULTRAFINE skim coat, has been included in this EPD.

Additional information

- The company Diasen is certificated ISO 9001, ISO 14001. Moreover, a wide amount of its product obtained other specific certification, as Avis Technique (French lab CSTB) and ITF for Sport Flooring system. It is associated to A.N.I.T (Associazione Nazionale Isolamento Termo-Acustico), to the Green Building Council Italia and N.R.C.A - National Roofing Contractors Association.
- The Product **Argatherm Acoustix** contains recycled pre-consumer materials (table 8). At the end of their life these ones can be recycled as inert materials.

References

- [1] General Programme Instructions For The International EPD® System - Version 3.01 2019-09-18;
- [2] Product Category Rules (PCR) - Construction Products PCR 2019:14 - Version 1.1;
- [3] ISO 14040:2006 - Environmental Management – Life cycle assessment – Principles and framework;
- [4] ISO 14044:2006 - Environmental Management – Life cycle assessment – Requirements and guidelines;
- [5] ISO 15804:2019 - Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products;
- [6] ISO 15942:2011 - Sustainability of construction works — Environmental product declarations — Communication format business-to-business;
- [7] Website: <https://www.enel.it/content/dam/enel-it/documenti-supperto/mercato/libero-luce/Table%20Mix%20Energetico%20Enel%20Energia.pdf>;
- [8] Association of Issuing Bodies, “*European Residual Mixes Results of the calculation of Residual Mixes for the calendar year 2019*”. Version 1.0, 2020-05-29;
- [9] L. Dalhgren, H. Stripple, “*A comparative Study of Various Concept for Shopping Bags and Cements Sacks*”. Study commissioned by BillerudKorsnäs AB. IVL Swedish Environmental Research Institute 2016. Report Number: U5732;
- [10] Ullmann's Encyclopaedia of Industrial Chemistry (2010). John Wiley & Sons, Inc., Hoboken, USA;
- [11] R. Petrucci, “Analisi Del Ciclo Di Vita (LCA) Inerente Alla Produzione Di Intonaci E Massetti Da Parte Del Cliente - Serie Diathonite, Argacem E Argatherm”. Università di Perugia - Report - Maggio 2022);

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

