MACCAFERRI

Environmental Product Declaration (EPD)

GABIONS

implemented with plastic coated
double twist mesh

EPD®
THE INTERNATIONAL EPD® SYSTEM

EPD in accordance with
ISO 14025 and EN 15804+A1

PCR: 2012:01 Construction products and construction services version 2.2
Geographical scope: Global
EPD registration number: **S-P-01465**
Date of publication (issue): 2019-01-18
Date of validity: 2023-12-17 (5 years)

SUMMARY

PROGRAMME RELATED INFORMATION

This EPD is developed under The International EPD ® System Programme Operator, in compliance with the General Program Instruction version 2.5. for the EPD development and the Product Category Rules PCR CPC 54 “Construction products and Construction services” 2012:01 version 2.2. More information about the International EPD ® System is available on the website https://www.environdec.com/

1. THE COMPANY

Since 1879, Officine Maccaferri has been at the heart of the Maccaferri Industrial Group. Its continued growth is based upon long-held values of innovation, integrity, excellent service and respect for the environment.

Our vision is to become a leading international provider of advanced solutions to the civil, geotechnical and environmental construction markets. We deliver solutions from retaining walls to hydraulic works and from rockfall mitigation systems to soil reinforcement.

By implementing a strategy of vertical integration, we research, manufacture materials, design, supply and build solutions within these fields. Our differentiating factor is our people and their knowledge capital, which we share with our clients to overcome their engineering challenges.

Maccaferri Gabions are cages which are engineered from double twisted hexagonal woven steel wire mesh. Delivered flat-packed, our gabions are assembled and then filled with stones at the project site.

There are numerous uses for these modular units and are typically used to form flexible, permeable and monolithic structures such as retaining walls, channel linings, hydraulic control structures and erosion protection. They are increasingly being used in architectural applications as well.

Maccaferri gabion baskets are made from high quality steel wire, which is heavily galvanised. An additional protective polymeric coating is also applied for gabions that are to be used in more aggressive environments, or where a longer design life is required.

We offer a wide range of gabions to suit specific project needs, from prefilled gabions to gabions specifically designed for use with soil bioengineering techniques.

Jumbo Gabion

Our Jumbo Gabions are used on large scale civil engineering projects where large volumes of gabions are to be constructed. Identical in concept to our regular gabions, Jumbo Gabions are just much larger!

Cubiroc - Prefilled Gabion

Cubiroc prefilled gabions represent a new generation of gabion for Maccaferri. In comparison with traditional gabions which are filled on the job site, Cubiroc units are prefilled and then transported to the project ready for deployment into the works.

ReadyMac

The ReadyMac Gabion is a specific basket, prefilled with gabion stone, ready to be deployed straight into the works.

Green Gabion

Maccaferri Green Gabions are modular gabion units used for streambank stabilization, restoration and erosion protection solutions.

MacSoil

MacSoil is a prismatic (or trapezoidal) gabion element engineered from double twisted hexagonal woven steel wire mesh. It is used to form low-height retaining structures or revetment protection works and has the final appearance of a vegetated natural slope.

Sack Gabion

Sack gabions are cylindrical baskets engineered from double twisted hexagonal woven steel wire mesh. The tubular units are filled with gabion stone at the project site and laced tightly shut. This modular unit is then used to provide erosion protection for river banks, scour protection of bridge piers, or any situation that requires immediate defence from the erosion effects of water.

Gabion – Strong Face

Maccaferri Strong Face gabions are an excellent solution for use when a gabion wall, or revetment needs a stronger than normal face. The units can be used where there are higher loads within the gabion structure or in situations where a higher abrasion resistance is required on the face of the gabion.

The products covered by the present EPD are all gabions implemented with plastic coated steel wire and produced in two plants: Italy and Slovakia. The process of analysis has been performed on a sample of Gabion variants selected against the production mass criteria and representing at least 70% of total Gabion production in each plant in the reference year.

The reference CPC code is 412 “Products of iron or steel”.

MACCAFERRI

VIEW OF THE GABIONS

2.1 THE PRODUCTION PROCESS

The production (figure 4) process includes the weaving of the double twist wire mesh, starting from steel wire, whose the polymeric coating can eventually be performed on site through an extrusion process of the polymer. The steel used in the wire is 100% from electric arc route.

Technical Characteristics of the double twist wire mesh products GABIONS are listed and detailed in the technical data sheet available on Maccaferri website (https://www.maccaferri.com/). According to Construction Product Regulation CEE 305/2011 the essential technical characteristics, as per Harmonized Documents EAD 200039-00-0102 and EAD 200019-00-0102, are reported in the Declaration of Performances (DOP).

This EPD describes the impacts of the Gabions produced in Italy and Slovakia, using as reference products the Gabion variant most produced in each plant for the reference year. The results reported in this EPD, through the selected reference products for Italy and Slovakia, are representative of the product family in Italy and Slovakia respectively.

Figure 4: Production process of the Gabions

MACCAFERRI

2.2 PRODUCT COMPOSITION

The composition of the reference products is reported in Table 1.

They are implemented with galvanized steel wire (diameter 2.7 mm for the mesh and 3.4 for the edges), plastic coated (polymeric coating - thickness 0.5 mm).

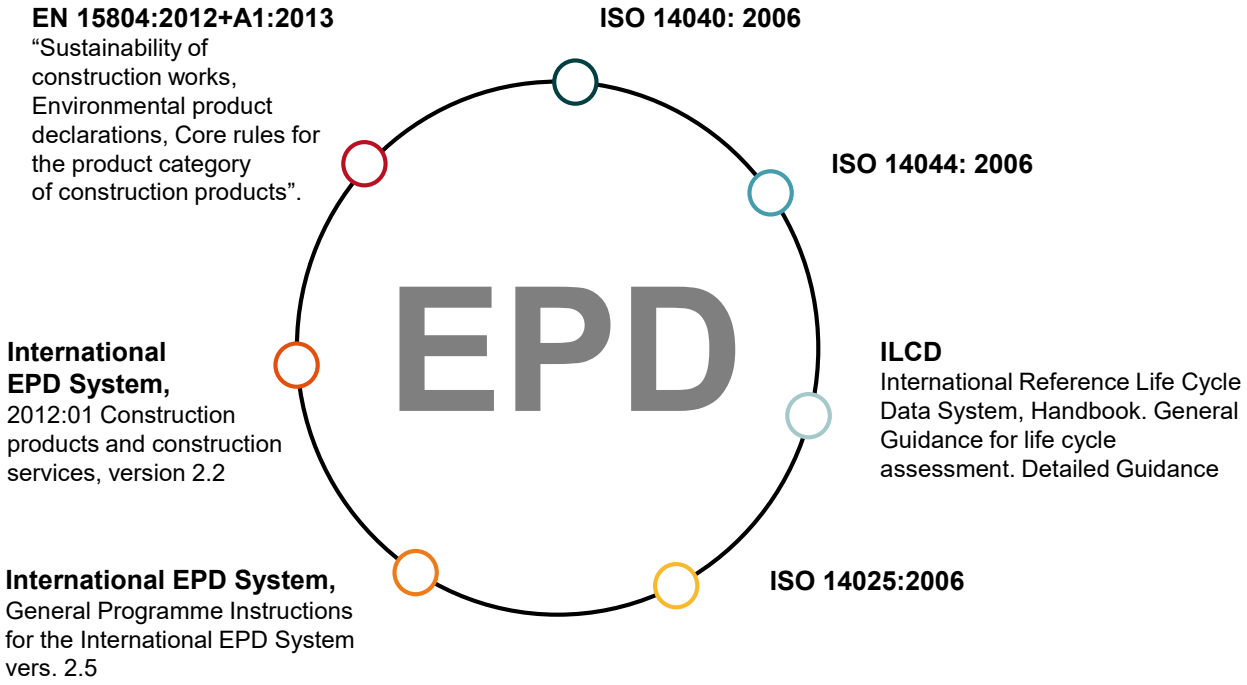
The content of SVHC does not exceed 0.1 % of the weight of the gabions.

	PRODUCT COMPOSITION OF THE GABION (REFERENCE PRODUCTS)	
	Gabion 2x1x1, mesh 8X10, wire PVC D27 (Italy)	Gabion 2x1x1, mesh 8X10, wire PVC D27 (Slovakia)
	BoM - contribution (% in weight) of components to 1 kg of product	
PVC	14	14
Steel (zinc aluminum coated wire)	86	86
	Packaging (kg)	
Polyester strap	0.00106	0.00106

Table 1: BoM of the reference product for the two plants (Italy and Slovakia)

3.1 METHODOLOGY

The study behind the present EPD has been performed according to the state of art of the LCA methodology, with specific reference to the construction sector, in accordance to the following standard and guide lines:



The goal of the study is the evaluation of the potential environmental impacts of Gabions implemented with polymeric coated steel wire.

The EPD is mainly addressed to the business-to-business communication. The data elaboration has been performed with the Gabi software, version 8.0.6.0.20. The database used are the most updated ones implemented in Gabi software. More in detail, main database used is thinkstep. The LCIA method used is CML 2001 version 4.2 (April 2013).

3.2 DECLARED UNIT

The declared unit is 1 kg of Gabion, plus its packaging

3.3 SYSTEM BOUNDARY

The EPD only covers the Cradle to Gate stage (as represented in Table 2 and showed in Figure 5) because other stages are very dependent on particular scenarios and are better developed for specific construction works.

PRODUCT STAGE	A1	Raw Material Supply	X
	A2	Transport	X
	A3	Manufacturing	X
CONSTRUCTION PROCESS STAGE	A4 to A5	Transport from the gate to the installation site, Construction/ Installation	Mnd*
USE STAGE	B1 to B7	Use, Maintenance, Repair, Replacement, Refurbishment, Operational energy use, Operational water use	Mnd*
END-OF-LIFE STAGE	C1 to C4	Deconstruction/Demolition, Transport, Waste processing, Disposal	Mnd*
BENEFITS and LOADS BEYOND SYSTEM BOUNDARY	D	Reuse, Recycling potential	Mnd*

* Module Not Declared

Table 2: Life cycle stages included in the study for Officine Maccaferri Gabions

The following stages are included in the study:

Raw Materials supply (A1). Production of raw materials used in the products, of as well as the production of energy carriers used in the production process.

Transport of raw materials to the factory (A2)

Manufacturing of the Officine Maccaferri Gabions (A3).

It includes the following production phases:

- Extrusion for the implementation of the polymeric coating (only for Italian plant)
- Weaving of the double twist mesh, inserting of additional components and product implementation
- Final check on finished product and packaging.

Moreover, in module A3, the production of primary packaging and of the ancillary materials and the treatment of waste generated from the manufacturing processes are accounted for.

The electricity used in the manufacturing processes is from the national grid, for both the plants.

The reference year of the study is from November 2016 to October 2017.

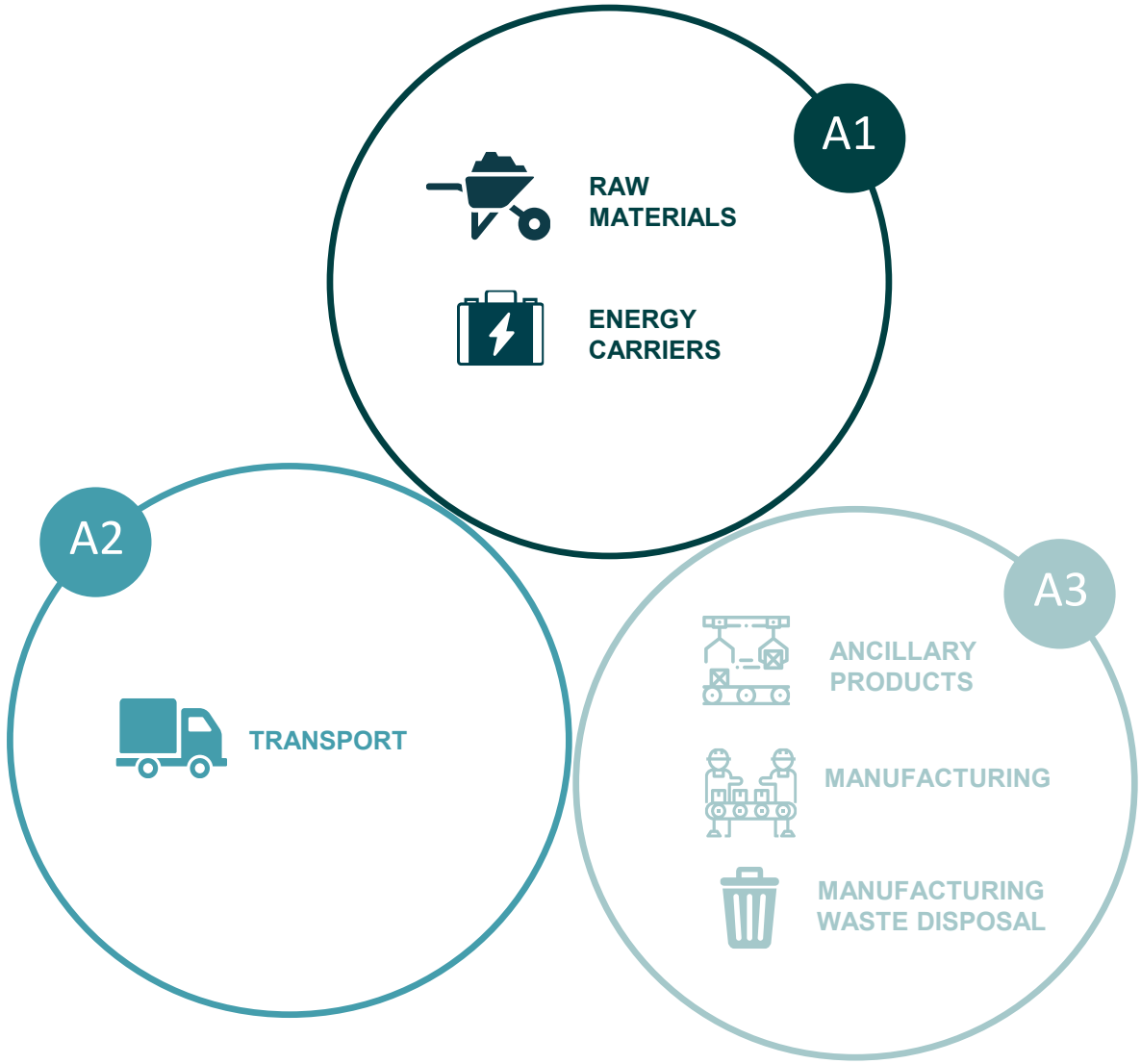


Figure 5: System boundaries for the Officine Maccaferri Gabions

3.4 MAIN ASSUMPTIONS, CUT OFFS AND BACKGROUND DATA INFORMATION

Regarding the exclusion of product life cycle stages and processes, the capital goods have not been accounted for, as well as the use and the end of life phases.

The main assumptions applied in the study are reported below.

- For the majority of the raw materials as well as for the packaging for the finished products an European production is assumed.
- A default mean a transportation (truck Euro 4 > 32 t) with an utilisation ratio of 0.61 has been assumed when primary data on transport size were not available.
- For the energy consumption and the ancillary consumption in the manufacturing process, an allocation based on the mass of finished products from the plants has been applied.

Background data used in the study are from LCI database and are not older than 5 years.

3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

For the production in Italy, the variability of impacts for products in the family is lower than 10%, whereas for Slovakia it is higher than ±10%.
More in detail, the range span from +74% in GWP to -30% in ODP.

IMPACT CATEGORY	Gabion – Modules A1-A3	
	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Italy)	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Slovakia)
Abiotic Depletion (ADP fossil) [MJ]	1,39E+01	1,44E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	4,98E-05	5,08E-05
Acidification Potential (AP) [kg SO2-Equiv.]	2,38E-03	2,52E-03
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	3,93E-04	4,14E-04
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	8,73E-01	9,06E-01
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	3,98E-09	4,07E-09
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	3,19E-04	2,88E-04

Table 3: Environmental profile for Officine Maccaferri Gabions

3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	Gabions – Modules A1-A3	
	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Italy)	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Slovakia)
Use of renewable primary energy excluding renewable primary resources used as raw materials [MJ, net calorific value]	3,15E+00	2,80E+00
Use of renewable primary energy resources used as raw materials [MJ, net calorific value]	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	3,15E+00	2,80E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	1,37E+01	1,44E+01
Use of non-renewable primary energy resources used as raw materials [MJ, net calorific value]	2,90E+00	2,90E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	1,66E+01	1,73E+01
Use of secondary material [kg]	8,60E-01	8,60E-01
Use of non renewable secondary fuels [MJ, net calorific value]	8,56E-07	8,76E-07
Use of renewable secondary fuels [MJ, net calorific value]	6,75E-08	6,91E-08
Use of net fresh water [m^3]	2,27E-01	2,29E-01

Table 4: Indicators of resources use for Officine Maccaferri Gabions

3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

INDICATOR OF WASTE	Gabion – Modules A1-A3	
	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Italy)	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Slovakia)
Hazardous waste disposed [kg]	1,88E-07	2,10E-07
Non-hazardous waste disposed [kg]	1,03E-03	1,95E-03
Radioactive waste disposed [kg]	1,88E-03	1,14E-03

Table 5: Indicators of waste for Officine Maccaferri Gabions

INDICATOR OF OUTPUT FLOWS	Gabion – Modules A1-A3	
	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Italy)	Gabion 2x1x1, mesh 8X10, Wire PVC D27 (Slovakia)
Materials for energy recovery [kg]	9,17E-04	1,08E-04
Materials for recycling recovery [kg]	1,60E-02	3,74E-02

Table 6: Indicators of output flows for Officine Maccaferri Gabions

4. REFERENCE

EC-JRC, 2010. International reference Life Cycle data System Handbook. General Guidance for life cycle assessment. Detailed Guidance

Ecoinnovazione, 2018. Technical report: LCA study of plastic coated double twist products for Geoengineering works

EN 15804:2012+A1:2013 “Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products”

International EPD® System, 2017. General Programme Instructions for the International EPD System, vers. 2.5

International EPD® System, 2012. PCR 2012:01 Construction products and construction services, version 2.2

International Organisation for Standardization (ISO), 2006a Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006, Geneva

International Organisation for Standardization (ISO), 2006b Environmental management – Life Cyle assessment –Requirements and guidelines. ISO 14044:2006, Geneva

International Organisation for Standardization (ISO), 2006c Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures. ISO 14025:2006, Geneva

5. GLOSSARY

ENVIRONMENTAL IMPACT: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects [ISO 14001:2004].

ENVIRONMENTAL DECLARATION: Claim which indicates the environmental aspects of a product or service. An environmental label or declaration may take the form of a statement, symbol or graphic on a product or package label, in product literature, in technical bulletins, in advertising or in publicity, amongst other things. [ISO 14020:2000].

HAZARDOUS WASTE: Hazardous waste is waste that poses substantial or potential threats to public health or the environment [EPD, General Programme Instructions 2.5].

IMPACT CATEGORY: Class representing environmental issues of concern to which life cycle inventory analysis results may be assigned [ISO 14040:2006]

LIFE CYCLE ASSESSMENT (LCA): Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040:2006]

PRODUCT CATEGORY RULES (PCR): Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories [ISO 14025:2006].

RAW MATERIAL: Primary or secondary material that is used to produce a product. Secondary material includes recycled material. [ISO 14040:2006]

RECOVERED MATERIAL (SECONDARY MATERIAL): Material that would have otherwise been disposed of as waste or used for energy recovery, but has instead been collected and recovered as a material input, in lieu of new primary material, for a recycling or a manufacturing process. [ISO 14021:1999].

SYSTEM BOUNDARY: Set of criteria specifying which unit processes are part of a product system [ISO 14040:2006].

SVHC: Substances that may have serious and often irreversible effects on human health and the environment can be identified as substances of very high concern (SVHCs). If a substance is identified as an SVHC, it will be added to the Candidate List for eventual inclusion in the Authorization List of the REACH Regulation). The inclusion in this list implicates legal duties for manufacturers, importers o companies, which use those substances as such, in formulation or in their products.

6. ADDITIONAL INFORMATION

6.1 ADDITIONAL INFORMATION CONCERNING THE PROGRAMME AND THE EPD

EPDs within the same product category but from different programme may not be comparable.

EPDs 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. This EPD and the PCR CPC 54 “Construction products and Construction services”are available on the website of The International EPD® System (www.environdec.com).

The verifier and the Programme Operator do not make any claim nor have any responsibility of the legality of the products included in the present EPD.

The LCA study and the present EPD have been issued with the technical scientific support of Ecoinnovazione S.r.l., spin-off ENEA (http://ecoinnovazione.it/?lang=en).

6.2 ADDITIONAL INFORMATION ON THE PRODUCTS AND ON THE COMPANY

Beautiful at a glance – Aesthetics are important. Gabion retaining wall blocks, filled with local material, are more in sympathy with their surroundings. Gabion structures can also be designed so that re-vegetation takes place when plants colonise the interstitial spaces between the rock fill, thus returning the solution to nature.

Budget friendly – Historically, in order to build beautiful infrastructure, great investments were necessary. Things are a little different with gabions, as their inherent nature reduces transportation and the overall retaining wall cost. But just tagging gabions as a low-cost solution would be unfair. Gabions are a high value-added product as their return is unmeasurable if you take into account variables such as environmental and aesthetical achievements.

Smart and flexible – Many modern buildings and infrastructure being designed or updated today are making use of gabions in order to renew their look and meet the demands of sustainability. Gabion solutions constitute an architectural lever when it comes to landscaping and urban design.

Scalable – Even if the baseline technology remains the same, the wire-mesh of each retaining wall block can be adapted to different needs. Gabions structures, furthermore, are perfectly scalable as they can be used for massive structures but also for small-scale constructions.

Gabion units covered by the present EPD are produced in Italy (Bellizzi) and Slovakia (Senica) plants. The management and production system in both the plants is certified in compliance to ISO 9001. In addition, the Italian plant has an environmental management system certified in compliance to ISO 14001.

In selected factories, the gabion mesh is produced in compliance with CPR – Construction Product Regulation 305/2011, having CE marking in compliance with ETA 15/0219 and ETA 17/0002.

Additional information on the company and on the products covered by the present EPD are available at maccaferri.com and info@hq.maccaferri.com

7. VERIFICATION AND REGISTRATION

MACCAFERRI

CEN STANDARD EN 15804 SERVED AS CORE PCR TERRAMESH – MODULES A1-A3	
EPD Programme:	The International EPD® System. For more information - www.environdec.com
PCR:	PCR 2012:01 Construction products and construction services version 2.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. Contact via info@environdec.com
EPD Registration no:	S-P-01465
EPD validity:	2023-12-17 (5 years)
EPD valid within the following geographical area:	International
Technical support:	Ecoinnovazione S.r.l. – spin-off ENEA - Via d'Azeglio 51, 40123 Bologna ecoinnovazione www.ecoinnovazione.it
Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	SGS SGS Italia S.p.A. Via Caldera 21, 20153 Milano.www.it.sgs.com
Accredited or approved by:	
Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	SGS
Accredited or approved by:	Accredia, certificate n.006H