



G3NIUS

Smarter. Greener. Better.
BY GRESMALT

ENVIRONMENTAL PRODUCT DECLARATION

Porcelain Stoneware Ceramic Tiles
7.4 mm thickness

in compliance with: ISO 14025:2010 and EN 15804+A2:2019

Program Operator:	EPDItaly
Publisher:	EPDItaly
Declaration Number:	EPD-G3NIUS-01-23
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Valid to:	26/11/2028



1. GENERAL INFORMATION

OWNER OF THE DECLARATION:



Gruppo Ceramiche Gresmalt S.p.A
 Strada Statale 467, n°45 - 42013
 Casalgrande (RE), Italy

PLANT INVOLVED IN THE EPD:

Via Mazzalasio, n°39 - 42019 Scandiano (RE), Italy

SCOPE OF APPLICATION

This document refers to 7.4 mm thickness products manufactured with “G3NIUS” technology, available in various formats including 20x20, 45x45, 30x60, 60x60, 20x60, 20x80, 80x80, and 60x120.

PROGRAM OPERATOR:



EPDITALY (www.epditaly.it)
 Via Gaetano De Castillia, n° 10
 - 20124 Milano, Italy

INDEPENDENT VERIFICATION:

This declaration has been developed in accordance with the EPDItaly Regulations; further information and the Regulations themselves are available on the website: www.epditaly.it.

The EN 15804 standard is the framework reference for PCR (PCR ICMQ-001/15 rev 3). The PCR revision was carried out by ICMQ - info@epditaly.it.

Independent verification of the declaration and data according to ISO 14025:2010.

INTERNAL EXTERNAL

Third party verification performed by: ICMQ S.p.A, Via Gaetano De Castillia, n°10 - 20124 Milan, Italy. Accredited by Accredia.

CPC-BASED CODE:

37370-0

COMPANY CONTACT:

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TECHNICAL SUPPORT:



Department of Sciences and Methods for
 Engineering | LCA Working Group
 University of Modena and Reggio Emilia
 Via Amendola n°2, Pad. Morselli - 42122
 Reggio Emilia, Italy

COMPARABILITY:

Environmental declarations of products belonging to the same category but belonging to different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

RESPONSIBILITY:

Gruppo Ceramiche Gresmalt releases EPDItaly from any non-compliance with environmental legislation self-declared by the manufacturer itself. The holder of the declaration will be responsible for the information and supporting evidence; EPDItaly declines all responsibility for the manufacturer's information, data, and results of the life cycle assessment.

REFERENCE DOCUMENTS:

This declaration has been developed following the EPDItaly Programme Regulations, Regolamentoo rev. 5.2, available on the website: www.epditaly.it.

PRODUCT CATEGORY RULES (PCR):

PCR ICMQ-001/15 rev3
 EN 15804+A2:2019 provides the framework reference for PCR.

2. ABOUT G3NIUS

G3NIUS is the new line of eco-friendly products that the Gresmalt Group offers to customers who are more aware of sustainability issues. The Gresmalt Group has been one of the leading manufacturers in the Italian ceramic floor and wall tile industry since it was founded in 1968. The Group produces around 20 million m²/year of porcelain tiles in three Italian factories. Since 2005, when it was a pioneer in the ceramic sector and carried out its first environmental impact assessment with a Life Cycle Assessment (LCA), the Gresmalt Group has placed sustainability at the heart of its corporate culture. Since 2015, the company has been implementing an ambitious innovation project aimed at incorporating the four pillars of sustainability (environmental, economic, social and technological) into its business model, transforming it from linear to circular.

The G3NIUS line collections are the main result of this challenging journey, supported by the European Commission through the LIFE programme. Using the eco-design approach, G3NIUS has been designed and engineered with the environmental performance of the product throughout its entire life cycle in mind: from cradle to grave, i.e. from the sourcing of raw materials, through production and use, to the end of the product's life. This monitoring is made possible by digitizing production processes in line with the Industry 4.0 manufacturing paradigm. A network of line sensors assesses technology and sustainability KPIs in real time during G3NIUS Industry 4.0-based production.

With G3NIUS, Gresmalt Group emphasizes the responsible and efficient use of natural and energy resources by offering a ceramic floor and wall tile product that minimizes its environmental impact throughout its entire life cycle. This is a circular strategy, because reducing the use of non-renewable resources and reusing processing waste and secondary raw materials (SRMs) does not compromise the quality and utility function of the ceramic building product, which is also enhanced by its inherent durability (50 years). All this is in line with the European Commission's Circular Economy Action Plan (CEAP, 2020¹), which recalls the European Commission's Ecodesign Directive (2011²) and announces the extension of its scope through the proposal for a Regulation on Ecodesign for Sustainable Products (2022³).

3. SCOPE AND TYPE OF THE EPD

SYSTEM BOUNDARIES:

The entire life cycle of the product is considered (cradle-to-grave) and the modules described below are declared in this EPD. In accordance with the framework defined by EN 15804+A2:2019, the following table shows the different phases of the life cycle of the ceramic product and identifies the specific phases (system boundaries) taken into consideration in this EPD.

¹COM(2020) 98; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions—A New Circular Economy Action Plan for a Cleaner and More Competitive Europe. European Commission: Brussels, Belgium, 2020.

²COM(2011) 571; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions—Roadmap to a Resource Efficient Europe. European Commission: Brussels, Belgium, 2011.

³European Commission. Proposal for Ecodesign for Sustainable Products Regulation; European Commission: Brussels, Belgium, 2022.

PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END-OF-LIFE STAGE				RESOURCE RECOVERY STAGE
					RELATED TO THE BUILDING FABRIC					RELATED TO THE BUILDING						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials sourcing	Transport	Manufacturing	Transport to site	Construction - Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse. Recovery Recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

x: module included in the LCA

- **Modules A1-A3** include the processes of production and consumption of energy and materials in the considered system (A1). transport of raw materials, auxiliary materials and packaging to the factory gate and all internal transports (A2). Manufacturing processes, production of auxiliary materials and packaging, process waste treatments, gaseous emissions, and the factory (A3).
- **Module A4** includes transport from the production plant to the customer or to the point of installation/ implementation of the product considered.
- **Module A5** considers all phases of tile installation (such as adhesive consumption) and treatment of packaging waste (recycling). Material and energy credits are declared in module D.
- **Module B1** takes the use of tiles into consideration. During the use of ceramic tiles, the generation of hazardous indoor emissions is not expected.
- **Module B2** is about tile cleaning. It is considered the supply of water and detergent for tile cleaning, including wastewater treatment, during the entire life of the tiles (50 years).
- **Modules B3-B4-B5** refer to the repair, replacement, and renovation of tiles. If the tiles are correctly installed, repair, replacement and renovation processes are not necessary and are therefore not considered in the presented study.
- **Modules B6-B7** consider the use of energy for the operation of technical systems integrated in the building (B6) and the use of operating water for technical systems related to the building. These consumptions are not considered relevant with respect to the subject matter of this EPD. Cleaning water is declared in module B2.
- **Module C1** deals with the process of demolition and deconstruction of tiles from the building.
- **Module C2** considers the transport of the demolished tile to a recycling or disposal process.
- **Module C3** considers each process (collection, crushing process, etc.) suitable for tile recycling.
- **Module C4** includes all landfill processes, including pre-treatment and disposal site management.
- **Module D** includes credits from all end-of-life flows that leave the boundaries of the system of the product concerned.

TYPE OF EPD:

This EPD refers to G3NIUS medium porcelain tile product manufactured at the Gresmalt Group plant located in Scandiano (RE) in Italy.

GEOGRAPHICAL REPRESENTATIVENESS:

The environmental performance was calculated with reference to the plant in Scandiano (RE) in Italy. The reference market is instead global.

SOFTWARE AND DATABASE:

SimaPro v. 9.5 software was used to carrying out the LCA modelling with background LCI datasets taken from the Ecoinvent database v. 3.8.

4. PRODUCT DESCRIPTION

The products in the G3NIUS collections are made of porcelain stoneware, a compactly engineered ceramic material suitable for floor and wall coverings in residential settings where mechanical strength, frost resistance and chemical inertness are required. The product is manufactured using natural inorganic raw materials (illitic-caolinitic clays, sodium-potassium feldspars, and feldspathic sands). In order to sinter the ceramic body, which has frost-resistant properties thanks to a water absorption of less than 0.5% by weight, the tiles are fired in cycles at maximum temperatures of 1210 to 1230°C. The glazing and surface decoration of the product facilitate cleaning and provide resistance to stains and chemicals. This EPD covers G3NIUS porcelain stoneware tiles that comply with UNI EN 14411, ISO 13006, and Group B1a standards (water absorption <0.5%). With a wide range of sizes, decorations, colors and matt or glossy surfaces, G3NIUS is suitable for every style and decor. This product complies with the following specifications:

TECHNICAL CHARACTERISTIC	REFERENCE STANDARD	VALUE REQUIRED	COMPLIANCE WITH THE STANDARD
Water absorption	ISO 10545-3	≤ 0.5%	according to
Breaking strength	ISO 10545-4	thickness < 7.5 mm ≥ 700 N	according to
Bending strength	ISO 10545-4	≥ 35 N/mm ²	according to
Resistance to abrasion PEI	ISO 10545-7	according to manufacturer's data	indicated in the catalogue
Thermal shock resistance	ISO 10545-9	no sample must show visible defects	according to
Frost resistance	ISO 10545-12	resistant	resistant
Skid resistance (Ramp Method)	DIN EN 16165 ANNEX B	according to manufacturer's data	indicated in the catalogue
Size characteristics	ISO 10545-2	length and width ± 0.6% (max ± 2 mm) thickness ± 5% (max ± 0.5 mm) wedging ± 0.5% (max ± 2 mm) flatness ± 0.5% (max ± 2mm)	according to
Linear thermal expansion coefficient	ISO 10545-8	test method available	$\alpha \leq 7 \times 10^{-6}/^{\circ}\text{C}$
Resistance to chemicals	ISO 10545-13	min. B	according to
Slip resistance factor in the presence of water and bare feet	DIN EN 16165 ANNEX A	according to manufacturer's data	indicated in the catalogue
Stain resistance	ISO 10545-14	class ≥ 3	according to

5. MANUFACTURING PROCESS

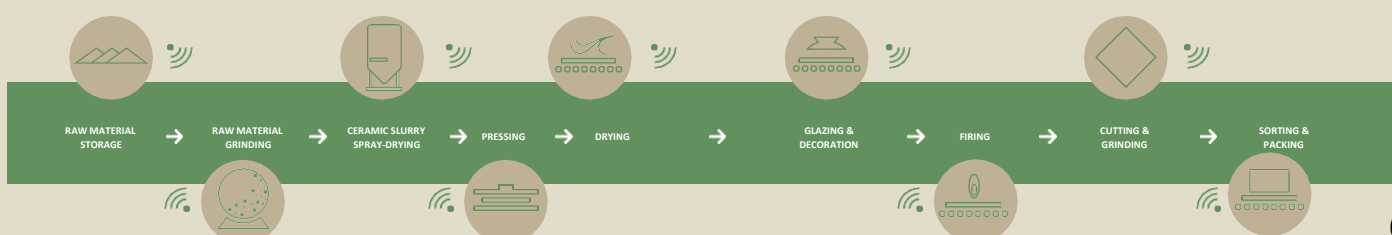
The production of G3NIUS starts with the sourcing of raw materials (clays, kaolins, feldspars and sands), which are extracted from various mines and delivered to the Gresmalt Group's factories. G3NIUS prioritizes the use of local raw materials, within a radius of approximately 300 km from the factories, and for the others, those delivered by less polluting means of transport, such as rail. The table below shows the composition of G3NIUS porcelain stoneware bodies.

BODY RAW MATERIALS	MINIMUM (%)	MAXIMUM (%)
Illytic-caolinitic clays	27	33
Caolinitic clays	15	30
Sodium and Potassium feldspars	15	35
Feldspathic sands	15	30
Ceramic waste (unfired + fired)	5	10
Certified recycled raw materials	5	10
Fluidifying agents	0	0.5
Pigments for dry coloring	0	2

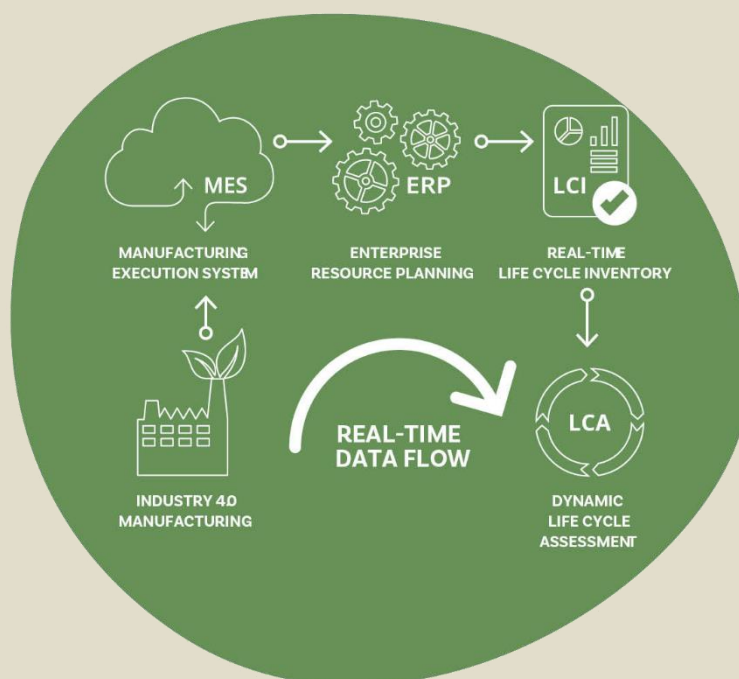
When the raw materials arrive at the factories, they are milled with water in large circular mills to produce a solid-liquid suspension called a slurry. The slurry is then evaporated in a spray dryer in counterflow to a stream of hot air to produce an agglomerate of fine particles called spray-dried powder. The spray-dried powder is pressed into tiles which, after drying to remove residual humidity, are glazed, and decorated using glazes, inks and additives applied by digital printers. The main components of the glazes and additives used are as follows:

GLAZES COMPONENTS	AUXILIARY ADDITIVES
Powdered clays	Suspending agents
Powdered kaolins	Dispersants
Powdered sodium-potassium feldspars	Binders
Powdered quartz	Glaze fixers
Powdered alumina	Primers for inkjet
Ceramic frits	Fluidifying agents
Ceramic stains	Mediums for digital inks

G3NIUS, does not contain substances included in the Candidate List of Substances of Very High Concern (REACH Regulation, date: 10/06/2022) above 0.1% by weight. G3NIUS does not contain any other carcinogenic, mutagenic, or toxic to reproduction (CMR) substances of category 1A or 1B that are not on the candidate list above 0.1% by mass. G3NIUS, as a construction product, has not been treated with biocidal products or treated with biocidal products (it is then a treated product in the sense of the (EU) Regulation on Biocidal Products No. 528/2012). At this point, the decorated tiles are sent to the kilns for firing, which takes place at temperatures between 1210 and 1230°C. The fired product may be subjected to further end-of-line operations such as squaring, a process to obtain porcelain tiles with perfectly square edges. Finally, the tiles are sent to the sorting line, which is mainly characterized by a unit that checks the surface and color, as well as the size and flatness. At the end of these operations, the G3NIUS tiles are packaged in completely recycled cardboard boxes, stacked on wooden pallets, and protected by PET film. The tiles are stored in the warehouse until the order is prepared for dispatch to the customer. The manufacturing process of the G3NIUS tiles covered by this EPD is shown below.



During the G3NIUS production process, material flows, thermal and electrical energy consumption and air emissions were tracked for each stage of the operation. As the production facilities studied are fully digitized in line with Industry 4.0, Internet of Things (IoT) technologies were used to implement this approach. Smart meters were installed on each piece of equipment to collect production data, as shown in the figure below.



This sensor network is connected to the Manufacturing Execution System (MES), a software solution that links the factory environment to the Enterprise Resource Planning (ERP) management system. This connection enables the acquisition of real-time process data, useful not only for operations management but also for inventory analysis for Dynamic Life Cycle Assessment (LCA).

BIOGENIC CARBON CONTENT:

As required by EN 15804:2012+A2:2019 the carbon content of the product and packaging is declared separately. In the case of G3NIUS ceramic tiles, all components are inorganic, so the calculation of biogenic carbon is not applicable. On the other hand, regarding the mass of the packaging, it appears to be less than 5 percent of the total mass of the product, so the declaration of the biogenic carbon content of the packaging has been omitted.

FUNCTIONAL UNIT AND REFERENCE FLOW:

The covering of 1m² of surface (floor and wall) with G3NIUS porcelain stoneware ceramic tiles with an average weight of 13.80 kg/m² and a lifetime of 50 years.

REFERENCE SERVICE LIFE:

The reference service life considered in the EPD is 50 years. The results of the Module B2 are referred to 50 years of maintenance of the tiles.

6. LIFE CYCLE ASSESSMENT RESULTS

The following tables show the results of the LCA (Life Cycle Assessment) study for 1 m² of G3NIUS porcelain stoneware tiles, corresponding to 13.80 kg/m². It is possible to convert the results into kg using the following conversion factor: 0.0724. The calculation method used for the environmental impact analysis is EN15804+A2:2019 v.1.01. The results of the Module B2 are based on 50 years of maintenance of the tiles. Resource consumption indicators obtained using the Cumulative Energy Demand (LHV) V1.00 method and the ReCiPe 2016 Midpoint (H) V1.08 method is also reported below.

LCA results are relative and do not predict impacts on category endpoints, threshold exceedances, safety margins or risks.

6.1 ENVIRONMENTAL IMPACT

PARAMETER		STAGES														
Core Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2-Eq.	7.42E+00	2.21E+00	3.40E+00	0.00E+00	4.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-02	1.62E-01	6.81E-02	2.54E-02	-8.65E-01
GWP-fossil	kg CO2-Eq.	7.55E+00	2.20E+00	3.13E+00	0.00E+00	9.19E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-02	1.62E-01	6.79E-02	2.52E-02	-1.16E+00
GWP-biogenic	kg CO2-Eq.	-1.26E-01	6.81E-03	2.66E-01	0.00E+00	-9.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.32E-05	4.99E-04	2.10E-04	2.32E-04	2.98E-01
GWP-luluc	kg CO2-Eq.	2.55E-03	8.19E-04	1.83E-03	0.00E+00	4.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-06	5.94E-05	2.50E-05	5.37E-06	-5.34E-04
ODP	kg CFC11-Eq.	1.22E-06	5.07E-07	9.94E-08	0.00E+00	6.64E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	3.75E-08	1.57E-08	1.25E-08	-4.03E-07
AP	mol H ⁺ -Eq.	1.84E-02	8.06E-03	1.36E-02	0.00E+00	9.34E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-04	4.59E-04	1.93E-04	2.47E-04	-5.58E-03
EP-freshwater	kg P-Eq.	5.59E-04	1.46E-04	5.88E-04	0.00E+00	3.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-06	1.04E-05	4.38E-06	1.42E-06	-1.30E-04
EP-marine	kg N-Eq.	5.71E-03	1.42E-03	2.50E-03	0.00E+00	7.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	9.35E-05	3.93E-05	9.32E-05	-3.88E-04
EP-terrestrial	mol N-Eq.	5.96E-02	1.56E-02	2.74E-02	0.00E+00	2.74E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-03	1.02E-03	4.28E-04	1.02E-03	-3.50E-03
POCP	kg NMVOC-Eq.	1.72E-02	5.75E-03	7.45E-03	0.00E+00	4.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E-04	3.88E-04	1.63E-04	2.92E-04	-3.91E-03
ADPE	kg Sb-Eq.	2.29E-05	6.91E-06	5.34E-06	0.00E+00	1.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-08	5.21E-07	2.19E-07	4.82E-08	3.01E-06
ADPF	MJ	8.79E+01	3.32E+01	1.91E+01	0.00E+00	1.75E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.21E-01	2.44E+00	1.03E+00	8.15E-01	-1.05E+02
WDP	m ³ world-Eq. deprived	5.50E+00	1.08E-01	2.20E-01	0.00E+00	1.37E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	7.92E-03	3.33E-03	2.63E-03	-8.49E-01

1 m² of Porcelain Stoneware Tiles G3NIUS 7.4 mm (13.80 kg/m². S.L. 50 years)

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for nonfossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential.

Disclaimer 1 - for the indicator IRP:
This impact category mainly concerns the possible impact of low dose ionising radiation on human health from the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials are also not measured by this indicator.

Disclaimer 2 - for the indicators ADPE, ADPF, WDP:
The results of these environmental impact indicators should be used with caution, as uncertainties about these results are high because experience with the indicator is limited.

Disclaimer 3 - for the indicators PM, IRP, ETP-fw, HTP-c, HTP-nc, SQP:
The results of these environmental impact indicators are not declared in the EPD, as uncertainties about these results are high and experience with the indicators is limited.

6.2 RESOURCE USE

PARAMETER		STAGES														
Core Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	1,00E+00	5,01E-01	3,66E+00	INA	2,57E+01	INA	INA	INA	INA	INA	3,51E-03	3,59E-02	1,51E-02	1,67E-02	-2,12E+00
PERM	MJ	3,32E+00	0,00E+00	2,87E-01	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	4,32E+00	5,01E-01	3,94E+00	INA	2,57E+01	INA	INA	INA	INA	INA	3,51E-03	3,59E-02	1,51E-02	1,67E-02	-2,12E+00
PENRE	MJ	8,69E+01	3,32E+01	1,91E+01	INA	1,83E+01	INA	INA	INA	INA	INA	6,21E-01	2,44E+00	1,03E+00	8,15E-01	-1,05E+02
PENRM	MJ	1,04E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	8,79E+01	3,32E+01	1,91E+01	INA	1,83E+01	INA	INA	INA	INA	INA	6,21E-01	2,44E+00	1,03E+00	8,15E-01	-1,05E+02
SM	kg	1,16E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m ³	1,31E-01	4,00E-03	1,35E-02	INA	3,51E-01	INA	INA	INA	INA	INA	3,61E-05	2,92E-04	1,23E-04	9,86E-04	-1,97E-02

1 m² of Porcelain Stoneware Tiles G3NIUS 7.4 mm (13.80 kg/m², S.L. 50 years)
 PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.

6.3 OUTPUT FLOWS AND WASTE CATEGORIES

PARAMETER		STAGES														
Core Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	9,03E+03	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NHWD	kg	3,22E+02	0,00E+00	0,00E+00	INA	4,69E+04	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	5,94E+00	0,00E+00
RWD	kg	1,60E-04	2,25E-04	7,84E-05	INA	3,53E-05	INA	INA	INA	INA	INA	4,32E-06	1,66E-05	6,97E-06	5,51E-06	-4,58E-06
CRU	kg	0,00E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	6,84E+02	0,00E+00	2,21E+02	INA	4,88E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	1,39E+01	0,00E+00	0,00E+00
MER	kg	8,05E+01	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	6,16E-01	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

1 m² of Porcelain Stoneware Tiles G3NIUS 7.4 mm (13.80 kg/m², S.L. 50 years)
 HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy.

6.4 INTERPRETATION OF THE RESULTS

Modules A1-A3 are responsible for a large part of the impacts analyzed. A detailed analysis of the results for modules A1-A3 shows that the main impacts in the Global Warming Potential (GWP) category are due to atmospheric emissions of fossil carbon dioxide, mainly from atomization and firing processes. Atmospheric emissions of *Bromochlorodifluoromethane (Halon 1211)*, which are mainly produced during the transportation of natural gas, mainly affect the Ozone Depletion Potential (ODP) category. Emissions of nitrogen oxides affect the Photochemical Oxidation (POCP) category, mainly from the supply of raw materials by sea. The Eutrophication Potential (EP) category is mainly affected by phosphate emissions to water from the treatment of coal waste used in the production of electricity. For the Acidification Potential (AP) category, the main impact is always due to sulphur dioxide emissions related to the production of natural gas used in the production process. The Abiotic Depletion Potential for non-fossil resources (ADPE) category is mainly affected by the consumption of the resource tellurium, which is used in the production of copper, which is used in the construction of transport equipment used in the procurement of raw materials. Finally, the impact in the category Abiotic Depletion Potential for Fossil Resources (ADPF) is mainly caused by the consumption of natural gas due to the production process of Gresmalt.

7. CALCULATION RULES

FUNCTIONAL UNIT:

NAME	AMOUNT	UNIT
Functional unit	1	m ²
Weight without packaging	13.80	kg/m ²
Conversion factor	0.0724	-

ASSUMPTIONS:

Data related to module A5-C4 have been taken from the PCR “European Federation of Ceramic Tile Manufacturers”, subsequently implemented by the PCRB of the IBU program operator “Ceramic tiles and panels v1.6”.

CUT OFF RULES:

All input and output processes were considered in the analysis and thus in the final results without any exclusion (cut-off: 0).

DATA QUALITY:

For the product stages (A1-A3), primary data on consumption of raw and auxiliary materials, water consumption, energy consumption, waste generation, air emissions, distances and transport modes have been used for the production sites concerned. In accordance with the requirements of EN 15804, the most recent data available for the 2021 production period (01/01/2021 - 31/12/21) were used. In addition, where primary data were not available for the period mentioned, primary data for 2018 were used as a proxy for 2021 or were transferred to 2021 by means of mass allocations. For the upstream and downstream phases, which are outside the direct control of the manufacturer, secondary data from the international Ecoinvent v. 3.8 database were used.

ALLOCATIONS:

The input and output processes refer to the total annual production of each plant, which was then recalculated by allocating the process to the productivity of G3NIUS 7.4 mm only. This approach was necessary because specific data on the production of G3NIUS 7.4 mm alone were not available, except for the distribution phase (A4 module). For the cogeneration process, the allocations are based on the thermal and electrical efficiency of the plant.

8. SCENARIOS AND ADDITIONAL INFORMATION

The following technical information on the declared modules and their scenarios is based on average data, in accordance with the European Federation of Ceramic Tile Manufacturers and subsequently implemented by the IBU programme operator's PCRb "Ceramic tiles and panels v1.6".

- **Transport (A4):** The goods transport products describe the transport services in metric ton-kilometers with average load factors that include the average proportion of empty return journeys; this assumption applies to all transport in this analysis. Additional information on transport related to module A4 is given in the table below.

NAME	VALUE	UNITS
National destination truck with a capacity of 16-32 tons (26.61 % of tiles sold)	300	km
European destination truck with a capacity of 16-32 tons (70% of tiles sold)	1390	km
Extra-European destination by ship (13.66% of tiles sold)	6520	km

- **Installation in the building (A5):** For the installation phase, 3 options are defined where different materials can be used. For option 1, adhesives, mortar, and water; for option 2, mortar and polysulphide dispersion adhesives; for option 3, cement adhesives (different quantities for different tile sizes). These considerations are based on average data provided by different ceramic tile manufacturers in Europe. For the purposes of this EPD, it is assumed that the tiles are installed using cementitious adhesives (Option 3). For the treatment of packaging waste, end-of-life recycling has been considered for plastic, cardboard, and wood. A loss of 6.5% of ceramic material has been considered.

NAME	VALUE	UNITS
Cementitious adhesive	6	km

- **Use (B1):** Ceramic tiles are robust and have a hard, abrasion-resistant surface. There is no environmental impact during the use phase.
- **Maintenance (B2)** Ceramic flooring products require regular cleaning to a greater or lesser extent depending on the type of building: residential, commercial, healthcare. The consumption of water and disinfectants has been taken into account. The values indicated in this stage refer to a period of 50 years for residential use and are described in the table below.

NAME	VALUE	UNITS
Water consumption	0.1	l
Detergent	0.2	ml
Floor tile maintenance cycle	2600	Number/LS

- **Residential use:** 0.2 ml of detergent and 0.1 l of water are used to wash 1 m² of ceramic tiles once a week. The scenario for this stage is based on average data provided by various ceramic tile manufacturers in Europe.
- **Repair, replacement and refurbishment (B3, B4, B5):** In general, the service life of ceramic tiles is the same as the service life of the building. Repair, replacement, and refurbishment are not required for ceramic tiles.
- **Operational energy and water use (B6, B7):** These modules are not relevant for ceramic tiles.

- **End of life (C1-C4):** (C1), this module is modelled according to a database demolition process, with energy and particulate emissions. (C2), the ceramic tile demolition waste is transported by lorry from the construction site to a container or treatment plant and an average distance of 20 km is considered. The return trip shall be included in the system. An average distance of 30 km can be considered from the container or treatment plant to the final destination (C3-C4), the end-of-life scenario is described in the following table:

NAME	VALUE	UNITS
Percentage of recycled material (C3)	70	%
Percentage of material in landfill (C4)	30	%

- **Benefits and loads beyond the product system boundary (D):** Module D includes credits from material recycling of tiles and packaging.

MINIMUM ENVIRONMENTAL CRITERIA (MEC - CAM):

Porcelain stoneware tiles are a ceramic material that is intrinsically inert and chemically stable and therefore does not emit any pollutants or substances that are harmful to the environment or to health during its service life, such as VOCs and radon. The design and construction of new buildings are activities that have a significant environmental impact on the territory. In order to regulate these activities, in 2017 the Italian Ministry of the Environment introduced the Minimum Environmental Criteria (MEC), also known by the acronym CAM. They aim to guide public administrations towards rationalizing consumption and purchases, providing guidance on how to identify design solutions, products or services that are better from an environmental point of view. CAM are therefore parameters set by the Italian State to regulate the construction of new buildings, their design, but also the renovation and maintenance of existing buildings. On the part of the public administration, they represent the environmental requirements for the various phases of the public administration's purchasing process, with the aim of identifying the best design solution, product, or service from an environmental point of view throughout the life cycle, taking into account the availability on the market. CAM are regulated by art. 18 of Law no. 221/2015 and subsequently by art. 34 "Energy and environmental sustainability criteria" of Legislative Decree no. 50/2016 "Procurement Code" (amended by Legislative Decree no. 11 October 2017), which makes their application mandatory for all contracting entities. The porcelain stoneware produced by Gresmalt complies with the CAM requirements, as shown in the table below. The raw material extraction criterion is not applicable.

REQUIREMENT	PARAMETER	DECLARED VALUE	EXCLUSION THRESHOLD	UNIT	TEST METHOD
Limitation of the presence of certain substances in additives	Lead	< 0.5	> 0.5	%	-
	Cadmium	< 0.1	> 0.1	%	-
	Antimony	< 0.25	> 0.25	%	-
Water consumption and use	Fresh water consumption (Cwp-a) in production	< 1	> 1	l/kg	-
	Quotient of wastewater recycling in production	> 90	< 90	%	-
Air emissions	Particulates (dust), cold emissions	< 5	> 5	g/m ²	EN 13284-1
	Particulates (dust), firing	< 200	> 200	mg/ m ²	EN 13284-1
	Fluorides (HF)	< 200	> 200	mg/ m ²	ISO 15713
Emissions into water	Emissions of suspended solids into water	0.0	> 40	mg/l	ISO 5667-17
	Cd emissions into water	0.0	> 0.015	mg/l	ISO 8288
	Cr(VI) emissions into water	0.0	> 0.15	mg/l	ISO 11083
	Pb emissions into water	0.0	> 0.15	mg/l	ISO 8288
Waste recovery	Recovery of total waste generated by the process(es) (1)	> 85	< 85	wt %	-
Release of hazardous substances	Lead	< 0.05	> 80	mg/m ²	EN ISO 10545-15
	Cadmium	< 0.01	> 7	mg/m ²	EN ISO 10545-15

Note (1): evaluated according to the general terms and definitions contained in Council Directive 75/442/EEC. Process waste does not include maintenance waste, organic waste and municipal waste from ancillary and administrative activities.

For ceramic tiles, the criterion uses the following parameters among those adopted at European level for the award of the Ecolabel to the "hard coverings" category (Decision 2009/607/EC).

9. REQUISITE EVIDENCE

G3NIUS porcelain stoneware tiles are a ceramic material that is intrinsically inert and chemically stable, and therefore does not emit any pollutants or substances hazardous to the environment or human health during its service life, such as VOCs and radon. For this reason, and according to the PCR, testing is not required as it is not relevant for this category of construction products.

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