ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Pittsburgh Corning Europe NV
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-PCE-20200300-IBB1-EN
Issue date	15.03.2021
Valid to	14.03.2026

FOAMGLAS® T3+

Pittsburgh Corning Europe NV

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED

1. General Information

Pittsburgh Corning Europe NV	**FOAMGLAS® T3+**
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Pittsburgh Corning Europe NV Albertkade 1 B-3980 Tessenderlo Belgium
Declaration number EPD-PCE-20200300-IBB1-EN	**Declared product / declared unit** FOAMGLAS® T3+ / declared unit 1 kg uncoated cellular glass insulation material
This declaration is based on the product category rules: Mineral insulating materials, 12.2018 (PCR checked and approved by the SVR)	**Scope:** This document refers to the production of 1 kg uncoated "FOAMGLAS® T3+" cellular glass manufactured in Belgium at Tessenderlo and in Czech Republic at the Klasterec production facilities of Pittsburgh Corning Europe NV. The reference year of production is 2019. The environmental impacts of the coated product "FOAMGLAS® T3+ in boards & blocks" are to be assessed with the help of a markup factor in the amount of 0.8% for Global Warming Potential.
Issue date 15.03.2021	The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
Valid to 14.03.2026	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	 Matthias Klingler (Independent verifier)
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	

2. Product

2.1 Product description/Product definition

FOAMGLAS® T3+ is an insulation product for buildings made of cellular glass. It is applied to the desired dimensions in the form of slabs, panels, or other specific elements. The FOAMGLAS® T3+ is in general unfaced as a slab. In some cases, depending on the end-use, the slabs can be faced with bitumen on the top with a PE-foil (e.g. READY, BOARDS) or a white mineral liner (ROOFBLOCK, ROOF BOARDS). Also, on the bottom, the white mineral liner can be applied (cf. BOARDS).

The product is declared with a density of 95 kg/m³ (±15%) and is supplied in thicknesses of 40 mm to 200 mm.

For the placing on the market of the product FOAMGLAS® T3+ in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Construction Products Regulation (CPR)* applies. The product declaration of performance (DOP) is taking into consideration *EN 13167*:2015 Thermal insulation products for buildings – Factory made cellular glass (CG) products – Specification and the CE-marking.

For the application and use the respective national provisions apply.

2.2 Application

FOAMGLAS® T3+ products are used for roof, facades, interior, in contact with the ground, or specific insulation.

2.3 Technical Data

The technical specifications of FOAMGLAS® T3+ within the scope of this EPD and within the CE marking, is according to *EN 13167 and EN 14305.*

Voluntary data: CEN KEYMARK certificate n°001-BK-516-001; ATG H539; KOMO-CTG100-9; SIA CH672-

13; ACERMI16-023-1179; Natureplus n°Zt-PCE-0406-1101-101

Technical data according *EN 13167*

Name	Value	Unit
Thermal conductivity λD	0.036	W/(mK)
Water vapour diffusion resistance factor μ = ∞ (infinite being > 40000)	∞ (infinite)	-
Gross density	95	kg/m³
Compressive strength	0.5	N/mm²
Reaction to fire	Class A1	
Dimensional stability at 70°C/95%RH DS70/90	(≤0.5mm)	
Water absorption (short/long)	≤ 0.5	kg/m²
Point load	PL ≤ 1.5	mm
Bending Strength	BS ≥ 450	kPa
Compressive creep (long behaviour)	CC(1.5/1 /50)225	kPa

2.4 Delivery status

FOAMGLAS® T3+ are available in the following thicknesses from 40 to 200 mm
FOAMGLAS® T3+ are available in the following dimensions:
- Slabs & Blocks: 600x450mm; 300x450mm
- Boards: 1200x600mm

Other dimensions are available on request.

2.5 Base materials/Ancillary materials

The main constituents of the product or its components are:
- *Sand 15%*
- *Feldspar 20%*
- *Recycled content (glass/scrap) 50% to 60%*
- *Others 5% to 15%*

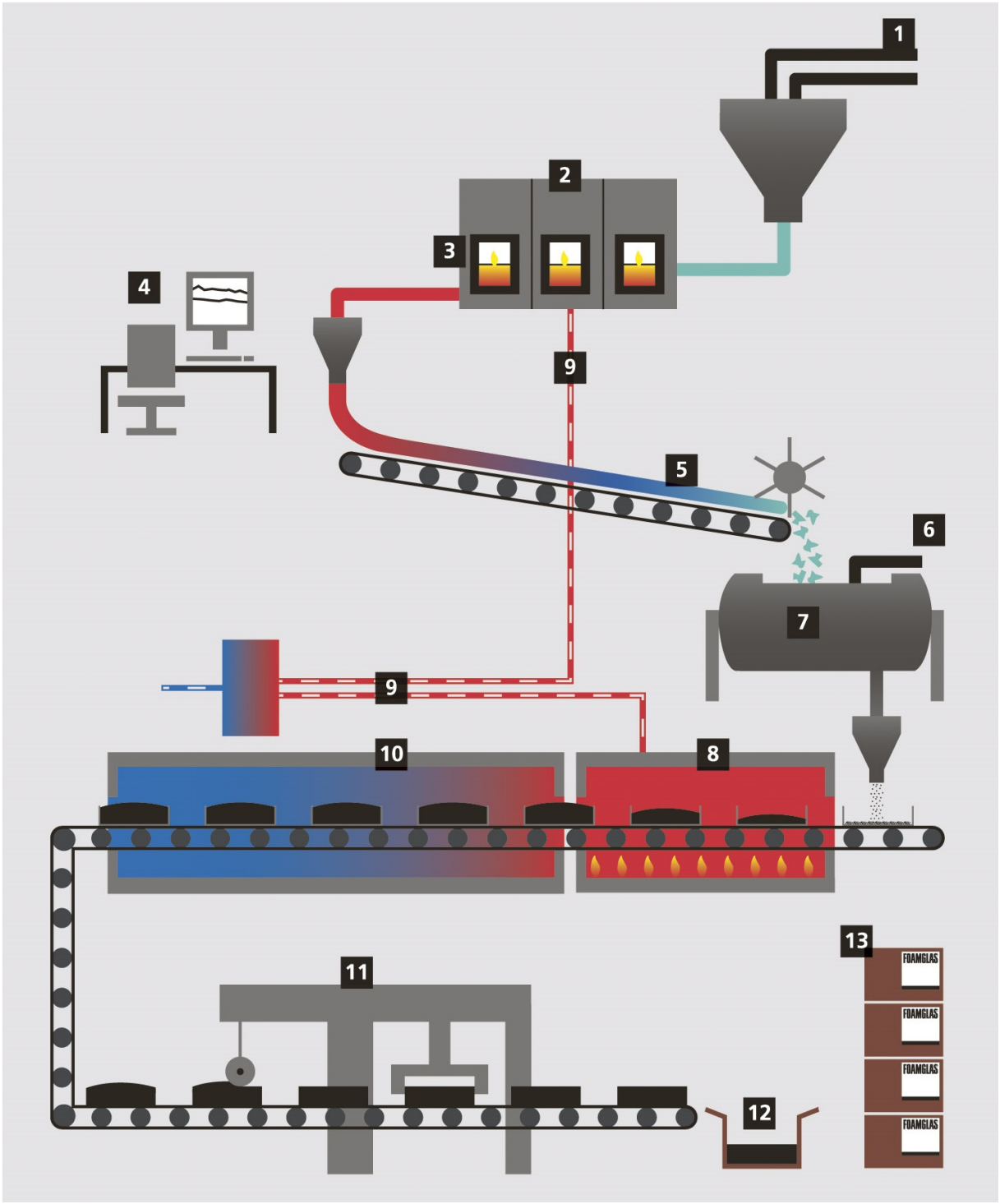
1) This product/article/at least one partial article contains substances listed in the ECHA candidate list (date: 19.01.2021) exceeding 0.1 percentage by mass: ***no***

2) This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**

3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): **no**

2.6 Manufacture

The product is made following the protocol of the company. All glass constituents (recycled glass, sand, sodium carbonate, feldspar, sodium sulfate, sodium nitrate, iron oxide, and FOAMGLAS®-scrap) are melted (at ca. 1250°C) in the furnace and drawn into the shape of a thin-walled tube to enable efficient grinding. Melted glass from the melter furnace is put in grinders to produce fine glass powder. In the grinding process, additives are added so that afterwards, glass foaming processes can be envisaged. In the foaming furnace, cellular glass blocks are made in moulds by heating (sintering towards ca 850°C) the glass powder after the grinding process. After the foaming process, the annealing process starts by moving the foamed blocks on the lehr where they cool according to a precisely determined curve. The cooled blocks are cut into rectangular blocks and if necessary, ground or cut to thinner sizes. The produced material is released, labelled, marked, and packed for commercialisation and various end-use applications (roof, wall, facade and other construction elements).



1 Mixing and batching of the raw materials: Recycled glass, feldspar, sodium carbonate, iron oxide, manganese oxide, sodium sulphate, sodium nitrate.
2 The melting furnace has a constant temperature of 1250°C.
3 Molten glass is drawn out of the furnace.
4 Control room for monitoring the production.
5 The glass is drawn off and falls onto the conveyor band where it cools down before entering the ball mill.
6 Addition of "carbon black".
7 Ball mill grinds all ingredients into a fine powder before putting them into stainless steel moulds.
8 The filled moulds pass through a cellulating oven (foaming furnace) with a temperature of 850°C. This is where the material gains its unique cell structure.
9 Energy recovery of heat.
10 The FOAMGLAS® blocks pass through an annealing oven to allow carefully controlled cooling without thermal stress.
11 The blocks are cut to size and sorted by batch. Production waste is recycled.
12 FOAMGLAS® slabs are then packaged, labelled and palletized.
13 Finished FOAMGLAS® products are stored and prepared for transport.

Quality assurance
Quality is assured through internal and external monitoring. The product complies with the Declaration of Performance. It also bears the *CEN Keymark*

2.7 Environment and health during manufacturing

During the entire manufacturing process, no other health protection measures extending beyond the legally specified industrial protection measures for commercial enterprises are needed. Health and safety management is in accordance with *EN ISO 45001* and *OHSAS 18001*.

Environmental protection during manufacturing:
Water/Soil:
Water incurred during manufacturing and plant cleaning is treated mechanically in a waste water treatment system on the plant site and re-used in the production process. Waste water corresponds with the local specifications and the low Al_2O_3 suspended particles contained in the waste water support waste water cleaning.

Noise:
The noise emissions into the environment by production equipment fall short of the permissible limit values.

The requirements concerning quality management, environmental management and energy management are complied with: (*EN ISO 9001, EN ISO 14001, EN ISO 50001*)

2.8 Product processing/Installation

Recommendations on product processing depend on the respective product and system and are outlined in the respective documentation and data sheets (available at www.foamglas.com).
The product does not contain any concentrations of substances known to be hazardous to health. Dust incurred during sawing is inert and non-crystalline.
Depending on requirements, FOAMGLAS® elements are applied dry or using mineral or bituminous adhesives.
The insulating slabs are staggered and butt-joined with or without glue. The professional liability associations' rules apply. When applying the products under review, conventional industrial protection measures must be observed in accordance with information supplied by the manufacturer.
According to the present state of knowledge, hazards for water, air and soil cannot arise if FOAMGLAS® is applied as designated

2.9 Packaging

Re-usable wooden pallets, PE shrink foil and cardboard elements serve as packaging material. Packaging material (PE foil and cardboard) is disposed of on the building site. Thermal utilisation takes place.

2.10 Condition of use

Material composition does not alter during use. FOAMGLAS® T3+ products can be used practically indefinitely when used as designated. They are impervious to moisture, pests, acids and chemicals.

2.11 Environment and health during use

Ingredients: No particular features regarding the material composition for the period of use. In accordance with official emission measurements for indoor air, FOAMGLAS® T3+ is an insulating material which does not display VOC (volatile organic compounds) or carcinogenic emissions after 3 and 28 days (see section 7.2) according to the German Committee for the Health-Related Evaluation of Building Products (AgBB scheme). (emissions test as per *EN 16516*)

2.12 Reference service life

Material composition does not alter during use. The declaration of the service life (RSL) is 100 years. FOAMGLAS® products can be used practically indefinitely when used as designated. FOAMGLAS® products are impervious to moisture, ants, acids and chemicals.

2.13 Extraordinary effects

Fire
Unfaced FOAMGLAS® is classified as Euro class A1 in accordance with *EN 13501-1* Class A1 building products do not display any hazard potential regarding smoke development, flammability or burning drips. The melting temperature of FOAMGLAS® insulating slabs is above 1000 °C (*DIN 4102-17*) and the maximum application limit temperature is approx. 430 °C.
Faced FOAMGLAS®, in form of faced blocks or boards consist of core material class A1 with a facing classified class E in accordance with *EN 13501-1*

Fire protection

Name	Value
Building material class	A1
Burning droplets	zero
Smoke gas development	zero

Water
Thanks to its closed-cell structure, exposure to moisture cannot impair the insulating properties of FOAMGLAS®. Even when exposed to water over long periods of time (e.g. floods), the insulating material remains intact.

Mechanical destruction
FOAMGLAS® is extremely resilient in all respects, and there is no risk of mechanical destruction if used as designated. It does not represent any environmental hazards thanks to its mineral composition. See Material Safety Data Sheets for FOAMGLAS® and *natureplus* certificate.

2.14 Re-use phase

When sorted, the declared products can be re-ground and re-used as additives in the manufacture of FOAMGLAS® (material recycling). Otherwise sorted products - even those still bearing adhesive – are suitable for re-use as filling material for brick production, civil engineering, road construction or for sound barriers, for example (material recycling). Within the re-use of existing surface insulated with FOAMGLAS®, the existing layer can be topped with a new layer of FOAMGLAS®

2.15 Disposal

Where the recycling options referred to above are not practical, foam glass residue incurred on the construction site as well as residue from deconstruction can be easily deposited without preliminary treatment in Class I landfills thanks to their non-leaching mineral components. Packaging can be utilised thermally. The waste code number as per the

List of Wastes Ordinance (*AVV/EWC*) for FOAMGLAS® (uncontaminated) is 17 06 04. In combination with bituminous waterproofing substances and adhesive, waste code number 17 09 04 is for unsorted waste.

2.16 Further information

Further information on FOAMGLAS® insulating materials are available online on the manufacturer's website: www.foamglas.com.

3. LCA: Calculation rules

3.1 Declared Unit

The Declaration refers to the life cycle of 1kg FOAMGLAS® T3 +. The gross density of the product is 95 kg / m³ ± 15%

Declared unit

Name	Value	Unit
Gross density	95	kg/m^3
Declared unit	1	kg
conversion factor [Mass/Declared Unit]	1	-

3.2 System boundary

Type of EPD: Cradle to Grave with options, modules C1-C4, and module D (A1-A3, C, D and additional modules)
The LCA addresses the life cycle stage of production, installation, end-of-life (EoL) and potential benefits beyond the system boundaries.
The product stage comprises of modules A1 (raw material supply), A2 (transport) and A3 (production). The following individual processes were included in the product stage **A1- A3** of production:

- Processes for providing preliminary products and energy
- Transporting the raw materials and preliminary materials to the plant
- The manufacturing process in the plant including energy-related expenses, disposal of residual materials and emissions
- Production of packaging

Module **A4** takes into account the transportation of product to the construction site. The treatment of the packaging materials is assigned to module **A5** .
Module **C1** takes into accounts the de-construction or demolition of the product before taking it for treatment/disposal through means of transportation (module **C2).** Module **C3** is the waste processing of the product before recycling/recovery/reuse. Landfilling with residual materials is assigned to module **C4** .
Module **D** accounts for the potential credits resulting from the thermal and electrical energy generated when burning packaging materials in module A5 (energy substitution).
There are 3 EoL scenarios in the study: Landfill, Reuse and Recycling. Module D/2 takes into account potential credits for 100% reuse of material and module D/3 considers potential credits for replacing kaolin in the brick industry.

3.3 Estimates and assumptions

- An average product based on production volume in Tessenderlo and Klasterec was calculated.
- In the product system, external cullet or waste glass is used as a secondary material/preliminary product within the framework of the LCA. This recycled glass is regarded as a waste product and is therefore calculated as input without loads.
- EU region datasets for grid electricity and thermal energy from natural gas were used for taking potential credits.
- The calorific values (incineration) of packaging material considered are corrugated board: 14 MJ/kg, polyethene-film (PE): 40 MJ/kg and wooden pallet: 16 MJ/kg.
- For the calculation of biogenic content, the biotic carbon dioxide considered is corrugated board: 1.57 kg CO_2/kg corrugated board, wooden pallet: 1.36 kg CO_2/kg wooden pallet.

3.4 Cut-off criteria

In the assessment, all available data from the production process are considered, ie all raw materials used, utilized thermal energy, and electric power consumption using best available LCI datasets. The material and energy flow with a share of less than 1% (based on the total mass of the product) were neglected. The sum of the excluded material flows does not exceed 5% of mass, energy or environmental relevance. Machinery, plants and infrastructure required in the manufacturing process were not considered.

3.5 Background data

The software system "*GaBi 9* 2020" developed by thinkstep AG - was used to model and assess the life cycle. The data sets contained in the *GaBi database* are documented in the online *GaBi documentation* (2020). These datasets were applied for energy, transport, preliminary products and auxiliaries. No data records other than GaBi databases were used.

The Life Cycle Assessment was carried out for the geographical scope of Belgium (Tessenderlo plant) and Czech Republic (Klasterec plant). If no country-specific data sets were available, comparable data sets, preferably DE or EU-28 were used. For the Pittsburgh Corning Europe NV Tessenderlo plant, renewable energy mix of European Green 2019 was applied. For the Klasterec plant, electricity from hydropower (Slovakia region) was applied. Electricity source for both plants was provided along with valid energy certificates.

3.6 Data quality

All background datasets were taken from the *GaBi 9 2020 software database*. The background data used for the LCA was last revised less than 4 years ago. **Pittsburgh Corning Europe NV** supplied current primary production data for 2019. This production data was examined for plausibility. The corresponding datasets were available in the database for all

preliminary products used. The data quality can be regarded as very good.

3.7 Period under review

The data in this LCA are based on primary data on production in 2019 supplied by Pittsburgh Corning Europe NV. The volumes of raw materials, energy, auxiliaries and consumables used are considered as average annual values.

3.8 Allocation

The FOAMGLAS® products are produced in a separate production line, with no co-products, hence no co-product allocation rules were applied.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The background database is used from GaBi software, version 9.5 and Service pack number of the database used is 40

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate

Information on Biogenic Carbon Content for the declared unit

Name	Value	Unit
Biogenic Carbon Content in product	0	kg C
Biogenic Carbon Content in accompanying packaging	0.015	kg C

All the following technical scenario information is given for the declared unit (i.e., 1 kg FOAMGLAS® product)

Transport to the building site (A4)

Name	Value	Unit
Transport distance	350	km
Capacity utilisation (including empty runs)	61	%

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site (Paper)	0.009	kg
Output substances following waste treatment on site (Plastic)	0.022	kg
Output substances following waste treatment on site (Wood)	0.029	kg

End of life (C1 - C4)
There are 3 End-of-Life scenarios considered in the study,
Scenario 1: Landfill
Scenario 2: Reuse
Scenario 3: Recycle

Name	Value	Unit
Landfilling	1	kg
Reuse	1	kg
Recycled	0.44	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Thermal utilization of cardboard from the packaging	0.009	kg
Thermal utilization of PE Film (plastic) from the packaging	0.022	kg
Thermal utilization of wooden pallets from the packaging	0.029	kg
Recycling potential of FOAMGLAS	0.44	kg

5. LCA: Results

End-of-Life scenarios: 1. Landfill, 2. Reuse, 3. Recycling

C3 / 2 - Waste processing for reuse
C3 / 3 - Waste processing for recycling
C4 / 1 - Landfill
D - Potential benefits for thermal utilization of packaging materials
D / 2- Potential benefits for reuse
D / 3- Potential benefits for recycling

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg FOAMGLAS® T3+

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/2	C3/3	C4/1	D	D/2	D/3
GWP-total	[kg CO_2-Eq.]	1.45E+0	2.96E-2	1.23E-1	6.47E-4	2.35E-3	0.00E+0	1.95E-3	1.53E-2	-5.13E-2	-1.45E+0	-1.43E-1
GWP-fossil	[kg CO_2-Eq.]	1.50E+0	2.80E-2	5.79E-2	6.40E-4	2.23E-3	0.00E+0	1.93E-3	1.52E-2	-5.12E-2	-1.50E+0	-1.43E-1
GWP-biogenic	[kg CO_2-Eq.]	-4.72E-2	1.33E-3	6.53E-2	1.93E-6	1.06E-4	0.00E+0	1.70E-5	4.86E-5	-1.17E-4	4.72E-2	-2.25E-4
GWP-luluc	[kg CO_2-Eq.]	8.48E-4	2.28E-4	3.94E-6	4.99E-6	1.81E-5	0.00E+0	2.80E-6	4.37E-5	-3.35E-5	-8.48E-4	-3.43E-5
ODP	[kg CFC11-Eq.]	1.01E-13	3.38E-18	3.75E-17	7.41E-20	2.68E-19	0.00E+0	4.25E-17	5.62E-17	-4.98E-16	-1.01E-13	-2.61E-16
AP	[mol H^+-Eq.]	4.77E-3	2.95E-5	2.14E-5	3.09E-6	7.17E-6	0.00E+0	4.26E-6	1.09E-4	-6.91E-5	-4.77E-3	-1.32E-4
EP-freshwater	[kg PO_4-Eq.]	2.73E-5	8.55E-8	5.99E-9	1.87E-9	6.79E-9	0.00E+0	5.16E-9	2.60E-8	-6.16E-8	-2.73E-5	-5.23E-8
EP-marine	[kg N-Eq.]	1.79E-3	8.74E-6	6.07E-6	1.44E-6	3.23E-6	0.00E+0	9.47E-7	2.80E-5	-1.81E-5	-1.79E-3	-4.75E-5
EP-terrestrial	[mol N-Eq.]	1.89E-2	1.05E-4	9.84E-5	1.59E-5	3.61E-5	0.00E+0	9.95E-6	3.08E-4	-1.95E-4	-1.89E-2	-5.23E-4
POCP	[kg NMVOC-Eq.]	4.13E-3	2.40E-5	1.65E-5	4.03E-6	6.33E-6	0.00E+0	2.59E-6	8.48E-5	-5.23E-5	-4.13E-3	-1.44E-4
ADPE	[kg Sb-Eq.]	2.38E-7	2.02E-9	5.33E-10	4.42E-11	1.60E-10	0.00E+0	5.59E-10	1.36E-9	-8.00E-9	-2.38E-7	-1.01E-8
ADPF	[MJ]	2.30E+1	3.74E-1	4.19E-2	8.20E-3	2.97E-2	0.00E+0	3.39E-2	1.99E-1	-8.66E-1	-2.30E+1	-2.35E+0
WDP	[m^3 world-Eq deprived]	1.23E-1	2.51E-4	1.29E-2	5.51E-6	2.00E-5	0.00E+0	4.21E-4	1.59E-3	-4.94E-3	-1.23E-1	-2.65E-3

Caption	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 non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg FOAMGLAS® T3+

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/2	C3/3	C4/1	D	D/2	D/3
PERE	[MJ]	1.33E+1	2.10E-2	6.10E-1	4.61E-4	1.67E-3	0.00E+0	1.50E-2	2.61E-2	-1.77E-1	-1.33E+1	-9.55E-2
PERM	[MJ]	6.00E-1	0.00E+0	-6.00E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-6.00E-1	0.00E+0
PERT	[MJ]	1.39E+1	2.10E-2	1.00E-2	4.61E-4	1.67E-3	0.00E+0	1.50E-2	2.61E-2	-1.77E-1	-1.39E+1	-9.55E-2
PENRE	[MJ]	2.21E+1	3.75E-1	9.32E-1	8.21E-3	2.98E-2	0.00E+0	3.40E-2	1.99E-1	-8.66E-1	-2.21E+1	-2.35E+0
PENRM	[MJ]	8.90E-1	0.00E+0	-8.90E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-8.90E-1	0.00E+0
PENRT	[MJ]	2.30E+1	3.75E-1	4.20E-2	8.21E-3	2.98E-2	0.00E+0	3.40E-2	1.99E-1	-8.66E-1	-2.30E+1	-2.35E+0
SM	[kg]	5.60E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	3.94E-2	2.44E-5	3.06E-4	5.34E-7	1.94E-6	0.00E+0	1.74E-5	5.02E-5	-2.05E-4	-3.94E-2	-1.12E-4

Caption	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

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg FOAMGLAS® T3+

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/2	C3/3	C4/1	D	D/2	D/3
HWD	[kg]	4.96E-8	1.74E-8	1.14E-10	3.82E-10	1.39E-9	0.00E+0	1.41E-11	3.03E-9	-3.44E-10	-4.96E-8	-1.98E-9
NHWD	[kg]	4.12E-2	5.74E-5	6.69E-3	1.26E-6	4.56E-6	0.00E+0	2.41E-5	1.00E+0	-3.86E-4	-4.12E-2	-6.23E-4
RWD	[kg]	1.09E-4	4.64E-7	1.85E-6	1.02E-8	3.68E-8	0.00E+0	5.15E-6	2.26E-6	-6.03E-5	-1.09E-4	-3.14E-5
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.40E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	6.09E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	2.02E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	4.15E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption	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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg FOAMGLAS® T3+

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/2	C3/3	C4/1	D	D/2	D/3
PM	[Disease Incidence]	4.81E-8	1.73E-10	1.88E-10	3.47E-11	3.92E-11	0.00E+0	3.58E-11	1.35E-9	-5.88E-10	-4.81E-8	-7.10E-9
IR	[kBq U235-Eq.]	1.51E-2	6.71E-5	2.25E-4	1.47E-6	5.33E-6	0.00E+0	8.45E-4	2.32E-4	-9.89E-3	-1.51E-2	-5.13E-3
ETP-fw	[CTUe]	3.78E+1	2.65E-1	1.68E-2	5.80E-3	2.10E-2	0.00E+0	1.45E-2	1.14E-1	-1.75E-1	-3.78E+1	-1.29E-1
HTP-c	[CTUh]	8.62E-10	5.54E-12	1.29E-12	1.21E-13	4.40E-13	0.00E+0	4.01E-13	1.68E-11	-7.96E-12	-8.62E-10	-1.76E-11
HTP-nc	[CTUh]	3.63E-8	2.87E-10	1.03E-10	7.28E-12	2.58E-11	0.00E+0	1.48E-11	1.86E-9	-2.96E-10	-3.63E-8	-6.73E-10
SQP	[-]	1.71E+1	1.31E-1	1.22E-2	2.88E-3	1.04E-2	0.00E+0	1.08E-2	4.15E-2	-1.27E-1	-1.71E+1	-7.61E-2

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

The transportation distance to waste processing system (module C2) is considered as 30 km. Specifically, for scenario 3, ie recycling, the transportation distance to the brick industry is 100 km, hence multiply the results in module C2 by 3.33 (i.e.,100/30) to get the result for 100 km.

The environmental impacts of the coated product are to be assessed with the help of a markup factor in the amount of 0.8% for Global Warming Potential and for all LCA results, the maximum deviation is 5.44%.

Disclaimer 1 - for the indicator IRPT 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 some construction materials is also not measured by this indicator.
Disclaimer 2 - The results of environmental impact indicators ADPE, ADPF, WDP, ETP-fw, HTP-c, HTP-nc, SQP shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The contributions from module A1 (raw materials) and A3 (energy) dominate in climate change impact. The modules A4, A5, C1, C2, C3 and C4 contributes less. The credits in this study i.e. module D result from the incineration of packaging materials. Module D/2 credit is highest as the 100% manufacturing impacts of the product are taken as a credit for its 100% reuse.

The significant contributor (> 50%) among all the raw materials is Sodium carbonate, with around 70% impact in Photochemical ozone formation and net freshwater use; and around 77% contribution in Eutrophication -freshwater. The relevant contributor (25% - 50%) for most of the impact categories are Sodium carbonate and Feldspar with around 40% contribution in Resource use (energy carriers) and Total use of renewable and non-renewable primary energy resources and 50% contribution in Climate change and Eutrophication freshwater. The other relevant contributor is iron oxide. Manganese dioxide contributes 60% in Resource use (mineral and metals), as the use of manganese ore for its production leads to depletion of mineral and metal resource.

7. Requisite evidence

7.1 Bio-persistence
FOAMGLAS® products do not contain fibres and also biocides.

7.2 Radioactivity
The radon diffusion coefficient FOAMGLAS® products is less than 10-11 *testreport No RAD 592* conducted at LaRUC Uni Cantabria of Spain – RiSE/SP Technical Research Institute of Sweden, Prague Technical University of Czech Republic.

7.3 Leaching
The ELUAT-tests on FOAMGLAS® products according the ICP-MS tests method *ISO 17294-2* result below limits (test report No 2017-382 conducted by Indikator laboratory). The AOX/EOX halogen (*ISO 9562*) value is zero (test report No 2017-380 Indikator laboratory).

7.4 Formaldehyde and VOC emissions
tested according *EN 16516*, the formaldehyde & VOC indoor emissions results for FOAMGLAS® products (Laboratory *Bremer Umweltinstitut No H3989 at*

Bremen, Germany; Laboratoire Excell at Mérignac in France, No 192-17367; VITO SERVACO at Mol, Belgium No ML02001-28R):

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<5	µg/m3
Sum SVOC (C16 - C22)	<5	µg/m3
R (dimensionless)	0	
VOC without NIK	<5	µg/m3
Carcinogenic Substances	<1	µg/m3
Formaldehyde	<1	µg/m3

AgBB overview of results (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<5	µg/m3
Sum SVOC (C16 - C22)	<5	µg/m3
R (dimensionless)	0	
VOC without NIK	<5	µg/m3
Carcinogenic Substances	<1	µg/m3
Formaldehyde	<1	µg/m3

8. References

STANDARDS

DIN 4102-17
DIN 4102-17:2017-12 Fire behaviour of building materials and building components - Part 17: Melting point of mineral wool insulating materials - Terms and definitions, requirements and test

EN ISO 9001
EN ISO 9001:2015-11 Quality management systems – Requirements

EN ISO 9562
EN ISO 9562:2005-02 Water quality - Determination of adsorbable organically bound halogens (AOX)

EN 13167
EN 13167:2012+A1:2015/prA2:2018 Thermal insulation products for buildings - Factory made cellular glass (CG) products

EN 13501-1
EN 13501-1:2019-05, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

EN ISO 14001
EN ISO 14001:2015-11 Environmental management systems - Requirements with guidance for use

EN ISO 14025
EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)

EN ISO 14040
EN ISO 14040:2021-02 Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006)

EN ISO 14044
EN ISO 14044:2021-02 Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006 + Amd 1:2017)

EN 14305
EN 14305:2016-03 Thermal insulation for building equipment and industrial installations - Factory made cellular glass (CG) products

EN 15804
EN 15804:2020-03 Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products (EN 15804:2012+A2:2019)

EN 16516
EN 16516:2020-10 Construction products: Assessment of release of dangerous substances. Determination of emissions into indoor air

EN ISO 17294-2
EN ISO 17294-2:2017-01 Water quality - Application of inductively coupled plasma mass spectrometry (ICP-MS) - Part 2: Determination of selected elements including uranium isotopes

EN ISO 45001
EN ISO 45001:2018-06 Occupational Health and Safety Assessment Series (OHSAS) 18001:2007

EN ISO 50001
EN ISO 50001:2018-12 Energy management systems - Requirements with guidance for use

Product Category Rules, Part B: Guidelines for building-related products and services, Part B: Requirements to be met by the EPD for PCR Mineral Insulating Materials, Institut Bauen und Umwelt eV, www.bau-umwelt.com, 2018, version 1.1

Product Category Rules for Construction Products, Part A: Calculation rules for the life cycle assessment and requirements on the background Report according to EN 15804+A2:2019, 2020, version 1.0

CERTIFICATES

CEN Keymark Certificate n°001-BK-516-001; ATG H539; KOMO-CTG100-9; SIA CH672-13; ACERMI16-023-1179;

ECHA candidate list
Candidate List substances in articles (date: 19.01.2021)

Natureplus n°Zt-PCE-0406-1101-101

Green Energy Certificate (Klasterec)
KLA-renewable energy, Slovak Power Plants, Pittsburgh Corning CR

Green Energy Certificate (Tessenderlo)
Bron hernieuwbare energie 2019, Pittsburgh Corning Europe, Luminus Business Team

FURTHER REFERENCES

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Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (2018). Committee for Health-related Evaluation of Building Products. Requirements for the Indoor Air Quality in Buildings: Health-related Evaluation Procedure for Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products

AVV/EWC
Abfallverzeichnis-Verordnung (**AVV**)/ European Waste Catalogue (EWC). Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

Construction Products Regulation (CPR)
Regulation (EU) No 305/2011 Of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

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Dataset documentation for the software system and databases, LBP, University of Stuttgart and Sphera, Leinfelden-Echterdingen, 2020 (http://documentation.gabi-software.com/)

IBU 2016
Institut Bauen und Umwelt eV: General Program Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt eV Version 1., Berlin: Institut Bauen und Umwelt eV, 2016. www.ibu-epd.com

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