ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	GLAPOR cellular glass
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-GLP-20170195-CBA3-EN
Issue date	2017-12-11
Valid to	2022-12-10

GLAPOR cellular glass

GLAPOR Werk Mitterteich GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com / https://epd-online.com

GLAPOR
SCHAUMGLASPRODUKTE

General Information

GLAPOR Werk Mitterteich GmbH

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-GLP-20170195-CBA3-EN

This Declaration is based on the Product Category Rules:
Mineral insulating materials, 07.2014
(PCR tested and approved by the SVR)

Issue date
2017-12-11

Valid to
2022-12-10

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

GLAPOR cellular glass

Owner of the Declaration
GLAPOR Werk Mitterteich GmbH
Hüblteichstraße 17
D-95666 Mitterteich

Declared product / Declared unit
GLAPOR cellular glass/ 1 m^3 at 120 kg/m^3

Scope:
The EPD represents cellular glass produced at the GLAPOR production site at Mitterteich/GER.

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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Angela Schindler
(Independent verifier appointed by SVR)

Product

Product description / Product definition

GLAPOR cellular glass boards cellular glass products are vapour-tight, lightweight insulation materials for the construction industry made of 100 % recycled glass. By combining the physical properties of glass with the insulating properties of a closed cell structure, GLAPOR cellular glass products provide high compressive strength, are lightweight, fire resistant and resistant to rodents. The permanent, continuous production process guarantees consistent high quality.

This EPD is valid for the GLAPOR cellular glass boards:

- GLAPOR cellular glass boards PG 600 (110 kg/m³)

The LCA-related information can be extrapolated to other products via their specific densities, notably to:

- GLAPOR cellular glass boards PG 900.2 (135 kg/m³)
- GLAPOR cellular glass boards PG 1000 (135 kg/m³)

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration EN 13167:2012+A1:2015, Thermal insulation products for buildings. Factory made cellular glass (CG) products and the CE-marking.

Application
GLAPOR cellular glass boards are used in a wide range of applications. The cellular glass is always a great option, be it for lightweight wheelchair ramps through to high-strength helicopter landing pads. The applications for its use in structural engineering projects are defined in the application norm DIN 4108-10. The cellular glass boards are also used in civil engineering projects, lightweight constructions and technical insulation.

Such applications include:
For structural engineering projects:
• unused, used roof surfaces that can be accessed on foot or with vehicles
• inside thermal insulation of ceilings and walls
• load-bearing thermal insulation for under screed and other floor constructions
• façade insulation systems under panels, wall bridge elements and base insulation and fire barriers
• perimeter insulation for walls and below floor slabs
Industrial buildings: technical insulation
• fresh water tank
• ventilation ducts and ventilation systems
Public buildings: special applications

• accessible building
• radon security thanks to cellular glass constructions
• lightweight constructions

More details on the application of GLAPOR cellular glass can be found under www.glapor.de.

Technical Data

Name	Value	Unit
Thermal conductivity (/EN 1602/)	0.052 - 0.058	W/(mK)
Calculation value for thermal conductivity (/DIN 4108-4:2016/)	0.054 - 0.06	W/(mK)
Water vapour diffusion resistance factor (value for calculations: 40'000)	∞	-
Water vapor diffusion equivalent air layer thickness	-	m
Sound absorption coefficient	-	%
Gross density (/EN 1602/ +/- 10%)	110 - 135	kg/m³
Compressive strength (/EN 826/)	>0.6 to >1.0	N/mm²
Fire resistance (/EN 13501-1/)	Euroclass A1	

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 13167:2012+A1:2015, Thermal insulation products for buildings. Factory made cellular glass (CG) products. Specification/.

Base materials / Ancillary materials
GLAPOR cellular glass is composed of:

- 87% of recycled glass
- 12% of sodium silicate ("water glass")
- 1% of glycerine

In addition, minor quantities of kaolin are used.

The product does not contain substances listed in the Candidate List of Substances of Very High Concern for Authorisation" (accessed 4.10.2017) exceeding the limit value of 0.1% for registration by the European Chemicals Agency.

Reference service life
For an EPD cradle-to-gate, no reference service life according to the series of standards on service life planning /ISO 15686/ can be declared.

According to the table on expected service lives for the German BNB scheme /BBSR 2011/, a service life of ≥ 50 years can be assumed for all relevant applications.

LCA: Calculation rules

Declared Unit
The declaration is valid for 1 m³ of GLAPOR cellular glass with a density of 120 kg/m³, with a typical thickness of 160 mm and with a thermal conductivity of 0.054 W/(mK) (Source: /Fraunhofer 2017/).

Declared unit

Name	Value	Unit
Declared unit	1	m³
Gross density	120	kg/m³
Conversion factor to 1 kg	0.0083333	-

The selected product represents the product with the highest production volume as the "typical product". The declared values can be extrapolated to any product and thickness via the respective area weight.

System boundary
Type of EPD: cradle-to-gate - with options.

The system boundary of *module A1-A3* encompasses all processes related to the production of cellular glass. The system boundary for the recycled glass is assumed to be after the sorting of the glass cullets that are to be recycled. Within the system boundary of A1-A3 are considered:

- grinding of recycled glass cullets
- production of all ancillary materials
- electricity production
- heat generation for the production process
- production of packaging material
- all transport, including transport of glass cullets to the external grinding and transport of inputs to the production site.

The process does not generate waste water.

The process generates about 30% of production waste that is used for the production of cellular glass gravel. For this product an economic allocation is applied.

No other waste is generated in significant quantities.

Module A4 contains the average transport scenario from the production site to the construction site.

Module A5 contains the disposal of the PE packaging in a municipal waste incineration plant, from which energy is exported from the product system; the benefits of this exported energy are reported in Module D.

In the end-of-life, 2 scenarios are declared

Scenario 1: recycling into cellular glass gravel

Module C2/1 contains a default transport scenario (350 km by lorry) of the cellular glass from the deconstruction site to the GLAPOR production site (see also module A4).

Module C3/1 contains the electricity consumption used

to crush the deconstructed cellular foam board into gravel smaller than 60 mm.

Module D/1 contains the benefits of replacing natural crushed gravel and of the exported energy from the energy recovery from the treatment of PE in a municipal waste incineration plant.

Scenario 2: landfilling:

Module C2/2 contains a default transport scenario (50 km by lorry) of the cellular glass from the deconstruction site to the inert material landfill.

Module C4/2 contains the landfilling of the cellular glass.

Module D/2 contains the benefits of the exported energy from the energy recovery from the treatment of PE in a municipal waste incineration plant.

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 database ecoinvent 3.3 (Alloc. rec.) was used as background database.

LCA: Scenarios and additional technical information

Transport to construction site (A4)

A default distance of 350 km is assumed for the transport from the production to the construction site. Capacity utilisation and fuel consumption are taken from the ecoinvent dataset for an average transport by lorry in Europe and have not been modified.

Construction (A5)

0,66 kg of PE packaging foil has been inventoried that is used for energy recovery in a municipal waste incineration plant. According to the ecoinvent DS used, 5 MJ/kg of electricity and 10.2 MJ/kg of heat are recovered from 1 kg of PE waste.

The use of multi-way pallets has not been taken into account as packaging material.

Service life

Name	Value	Unit
Life Span (according to BBSR)	≥ 50	a

C1-C4 End-of-life scenario

In the end-of-life, 2 scenarios are declared:

Scenario 1: recycling into cellular glass gravel

Module C2/1 contains a default transport scenario (350 km by lorry) of the cellular glass from the deconstruction site to the GLAPOR production site (see also module A4).

Module C3/1 contains the electricity consumption used to crush the deconstructed cellular foam board into gravel smaller than 60 mm.

Scenario 2: landfilling

Module C2/2 contains a default transport scenario (50 km by lorry) of the cellular glass from the deconstruction site to the inert material landfill.

Module C4/2 contains the landfilling of the cellular glass in an inert material landfill.

D Benefits and burdens beyond system boundary

Module D/1 contains the benefits of replacing natural crushed gravel and of the exported energy from the energy recovery from the treatment of PE packaging in a municipal waste incineration plant.

Module D/2 contains solely the benefits of the exported energy from the energy recovery from the treatment of PE packagin in a municipal waste incineration plant.

GLAPOR
SCHAUMGLASPRODUKTE

LCA: Results

For the calculation of the impact assessment CML version 2013, updated 2016 applies.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

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	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: GLAPOR cellular glass / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C4/2	D/1	D/2
GWP	[kg CO_2-Eq.]	8.73E+1	4.68E+0	1.99E+0	4.68E+0	6.69E-1	6.62E-1	0.00E+0	-1.37E+0	-1.11E+0
ODP	[kg CFC11-Eq.]	9.82E-6	8.96E-7	8.79E-10	8.96E-7	1.28E-7	3.39E-8	0.00E+0	-1.37E-7	-1.06E-7
AP	[kg SO_2-Eq.]	2.09E-1	1.38E-2	2.65E-5	1.38E-2	1.97E-3	9.44E-4	0.00E+0	-3.08E-3	-1.42E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	6.86E-2	2.26E-3	7.79E-6	2.26E-3	3.22E-4	3.43E-4	0.00E+0	-6.50E-4	-3.58E-4
POCP	[kg ethene-Eq.]	9.90E-3	6.51E-4	4.62E-6	6.51E-4	9.30E-5	5.62E-5	0.00E+0	-2.97E-4	-9.44E-5
ADPE	[kg Sb-Eq.]	7.35E-6	1.13E-7	3.08E-10	1.13E-7	1.61E-8	1.50E-8	0.00E+0	-2.16E-7	-1.47E-8
ADPF	[MJ]	1.35E+3	7.14E+1	3.30E-2	7.14E+1	1.02E+1	1.06E+1	0.00E+0	-2.15E+1	-1.80E+1

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

RESULTS OF THE LCA - RESOURCE USE: GLAPOR cellular glass / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C4/2	D/1	D/2
PERE	[MJ]	1.30E+2	4.08E-1	2.27E-3	4.08E-1	5.83E-2	9.53E-1	0.00E+0	-5.19E+0	-9.35E-1
PERM	[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
PERT	[MJ]	1.30E+2	4.08E-1	2.27E-3	4.08E-1	5.83E-2	9.53E-1	0.00E+0	-5.19E+0	-9.35E-1
PENRE	[MJ]	1.43E+3	7.19E+1	2.92E+1	7.19E+1	1.03E+1	1.31E+1	0.00E+0	-2.40E+1	-2.04E+1
PENRM	[MJ]	2.92E+1	0.00E+0	-2.92E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	1.46E+3	7.19E+1	3.75E-2	7.19E+1	1.03E+1	1.31E+1	0.00E+0	-2.40E+1	-2.04E+1
SM	[kg]	1.53E+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
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
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
FW	[m³]	4.12E-1	2.05E-3	4.95E-5	2.05E-3	2.93E-4	2.34E-3	0.00E+0	-5.91E-2	-2.54E-3

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 – OUTPUT FLOWS AND WASTE CATEGORIES: GLAPOR cellular glass / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C4/2	D/1	D/2
HWD	[kg]	1.58E-3	1.57E-5	4.09E-7	1.57E-5	2.24E-6	2.70E-5	0.00E+0	-3.34E-5	-3.17E-5
NHWD	[kg]	1.05E-3	2.36E-5	3.04E-9	2.36E-5	3.38E-6	1.74E-7	0.00E+0	-5.98E-7	-1.76E-7
RWD	[kg]	6.80E-3	1.09E-3	2.00E-7	1.09E-3	1.56E-4	6.97E-5	0.00E+0	-1.28E-4	-8.71E-5
CRU	[kg]	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
MFR	[kg]	6.29E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E+2	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	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
EEE	[MJ]	0.00E+0	0.00E+0	3.33E+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	6.79E+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

References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.):
Generation of Environmental Product Declarations (EPDs);
General Principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2015/10
www.ibu-epd.de

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

/EN 13167:2012+A1:2015/
EN 13167:2012+A1:2015, Thermal insulation products for buildings. Factory made cellular glass (CG) products. Specification.

/DIN 4108-10:2015/
DIN 4108-10:2015-12, Thermal insulation and energy economy in buildings - Part 10: Application-related requirements for thermal insulation materials - Factory made products

/EN 1602/
DIN EN 1602:2013-05, Wärmedämmstoffe für das Bauwesen - Bestimmung der Rohdichte; Deutsche Fassung EN 1602:2013

/EN 826/
DIN EN 826:2013-05, Wärmedämmstoffe für das Bauwesen - Bestimmung des Verhaltens bei Druckbeanspruchung; Deutsche Fassung EN 826:2013

/EN 13501-1/
DIN EN 13501-1:2010-01, Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten - Teil 1: Klassifizierung mit den Ergebnissen aus den Prüfungen zum Brandverhalten von Bauprodukten; Deutsche Fassung EN 13501-1:2007+A1:2009

/IBU 2017a/
Institut Bauen & Umwelt (2017a): PCR Part A: Calculation rules for the life cycle assessment and requirements on the project report. Version 1.6., Berlin.

/IBU 2017b/
Institut Bauen & Umwelt (2017b): PCR Part B: Requirements on the EPD for mineral insulation materials. Version 2017/04, Berlin.

/BBSR 2011/
BBSR (2011): Nutzungsdauer von Bauteilen in Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB). Version vom 3.11.2011, Bundesinstitut für Bau-, Stadt- und Raumforschung, Berlin.

/Fraunhofer 2017/
Fraunhofer (2017): Bestimmung des Wärmedurchlasswiderstands und der Wärmeleitfähigkeit nach DIN EN 12667 von Schaumglasplatten "PG 600". Prüfbericht P1-225/2017, Fraunhofer-Institut für Bauphysik, IBP, Stuttgart.

/ecoinvent 3.3/
http://www.ecoinvent.org/

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
Werner Environment & Development
Idaplatz 3
8003 Zürich
Switzerland

Tel +41 44 241 39 06
Fax ---
Mail frank@frankwerner.ch
Web **www.frankwerner.ch**

Owner of the Declaration
GLAPOR Werk Mitterteich GmbH
Hüblteichstraße 17
95666 Mitterteich
Germany

Tel +49 9633 4007690
Fax +49 9633 400769 19
Mail info@glapor.de
Web **www.glapor.de**