

Environmental Product Declaration



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

Knauf Diamant GKFI

from

Knauf d. o. o.



Programme:

Programme operator:

EPD registration number:

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General information

Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden www.environdec.com
Product Category Rules:	EN 15804:2012+A2:2019 (Core PCR) PCR 2019:14. Construction Products and Construction Services. Version 1.11
Product group classification:	UN CPC 37530
Reference year for data:	2019
Geographical scope:	Croatia

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Third party verifier: *Angela Schindler, Umweltberatung, Salem, Germany*

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

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Company information

Owner of the EPD: Knauf d. o. o., Croatia

Contact: www.knauf.hr, info@knauf.hr, T +385 (0)22 688 500, F +385 (0)22 688 540

Description of the organisation: Knauf was founded in 1932 and is one of the world's leading manufacturers for building products with manufacturing sites and sales organizations in more than 80 countries. The headquarters are in Iphofen, Germany, and the company is still family-owned. The Knauf Group is managed by the general partners Alexander Knauf, Manfred Grundke, and Joerg Kampmeyer. Starting with gypsum as the basic building material, the company group has expanded and diversified. It is now providing high quality solutions for drywall and ceiling systems, plasters for indoor and outdoor applications, flowing screeds, floor systems, thermal insulation materials as well as construction machines.

Product-related or management system-related certifications:

Knauf d. o. o. is certified according to ISO 9001, ISO 14001 as well as ISO 45001.

Name and location of production site(s):

Knauf d. o. o.
Uzdolje polje 91
22300 Knin
<http://www.knauf.hr>

Product information

Product name: Knauf Diamant GKFI

Product identification: The product covered by this environmental product declaration is the plasterboard Knauf Diamant GKFI 12.5

Product description: For detailed information on the product declared in this Environmental Product Declaration please see Table 1 below.

UN CPC code: 37530 Articles of plaster or of compositions based on plaster

Table 1: Product description and technical specification

Product	Knauf Diamant GKFI
Type (EN 520)	DFH2IR
Application Area	all fields of interior works as cladding of premium drywall systems with enhanced requirements for sound insulation and fire protection, and in case of special requirements on mechanical resistance and in rooms with moderately high humidity (constant relative air humidity of $\leq 70\%$)
System	metal stud partitions, ceiling linings and suspended ceilings, attic linings, timber stud partitions (non-load bearing), installation shaft walls, room-in-room systems Knauf Cubo
Technical Specifications	
Reaction to fire	A2-s1, d0 (B)
Thickness (mm)	12.5 (+0.5 / -0.5)
Width (mm)	1250 (+0 / -4)
Length (mm)	2000 – 2500 (+0 / -5)
Weight (kg/m²)	12.96
Density (kg/m³)	≥ 1000
Flexural Strength, longitudinal (EN 520) (N)	≥ 725
Flexural Strength, transverse (EN 520) (N)	≥ 300
Shrinkage and expansion air humidity per 1 % change in the relative air humidity (mm/m)	0.005 – 0.008
Shrinkage and expansion temperature per 1 Kelvin change of temperature (mm/m)	0.013 – 0.02
Thermal conductivity (λ) (W/m²K)	0.27
Max. temperature, constant (°C)	≤ 50
Water vapour resistance factor dry / wet (μ)	10 / 4
Total water absorption (%)	≤ 10

LCA information

Table 2: System boundaries chosen for EPD

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE	USE STAGE								END OF LIFE STAGE				Resource recovery stage
	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
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	GLO	EU	HR	EU	EU	-	-	-	-	-	-	-	EU	EU	HR	EU	EU
Specific data	X			Ge	Ass	-	-	-	-	-	-	-	Ass	Ge	Ge	Ge	Ass

MND – module not declared

Ge – generic data used

Ass – assumptions applied

Declared unit: 1 m² of plasterboard Knauf Diamant GKFI at manufacturer's plant gate

Reference service life: According to the Guideline for Sustainable Building /BBSR2011/ a reference service life of 50 years can be considered for gypsum plasterboards. There are no influences on ageing of plasterboards Knauf Diamant GKFI during use following the established engineering practice.

Time representativeness: The life cycle assessment is based on primary data from the production year 2019.

Database(s) and LCA software used:
GaBi v10.0 was used as LCA software. Only datasets from this software and corresponding database(s) were used during modelling.

Description of system boundaries: The type of the EPD is cradle-to-gate with options. Declared modules are A1-A3, A4, A5, C1, C2, C3, C4 and D.

The **product stage** includes modules A1 (raw material supply, provision of secondary material), A2 (transport of raw and secondary materials to the manufacturer), and A3 (manufacturing including preparation (e. g., calcination) and processing of raw materials for the manufacture of the product, provision of energy and (transport) packaging materials). The product stage is given as aggregated information.

Table 3: Assumptions for the construction process stage (A4, A5)

Transport (A4)	100 km by truck (default value to support extrapolation on building level)
Assembly	Manually
Energy consumption	0.0018 kWh/m ² for electrical screwdriver
Construction waste	5 % (landfilling)
Treatment of packaging waste	Incineration of wooden pallet (credits for thermal energy and electricity in D) Recycling of steel components (outside system boundaries)
Not considered	Substructures (metal studs, wood beams, brick work) Fixing material (screws, cramps, glue) and joint filler

Excluded lifecycle stages: B1-B7

Plasterboards are passive construction products with no energy or water consumption during use. Following the rules of engineering there are usually no influences on the ageing of the boards as long as they are installed. Minor damages can be repaired by applying appropriate gypsum fillers.

Table 4: Assumptions for End of Life

De-construction and demolition C1	90 % manually 10 % machinery (electricity demand considered in LCA)
Transport (C2)	100 km by truck (default value to support extrapolation on building level)
Recycling (C3)	0 %
Disposal (C4)	100 % landfilling

Further assumptions: see Table 4 for assumptions for transport processes

Table 5: General assumptions for transport processes (A2, A4, C2)

Vehicle type	Truck-trailer, Euro 5, 34 – 40 t gross weight / 27 t payload capacity
Capacity utilization (including empty runs)	50 %

More information: More product-related information is available at www.knauf.hr

This LCA study was carried out by:

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Environmental Product Declaration in accordance with ISO 14025 and EN 15804:2012 + A2:2019 for Knauf Diamant GKFI

MANUFACTURING OF GYPSUM BOARDS

- ① Boardliner of visible side is fed to the boardline and cut on edges
- ② Gypsum slurry of raw materials is spread on boardliner
- ③ Feeding of second sheet of board liner (backside of plasterboard)
- ④ Setting section
- ⑤ Shears
- ⑥ Turning table
- ⑦ Multi-level dryer
- ⑧ Trimming of transverse edges
- ⑨ Stacking of boards

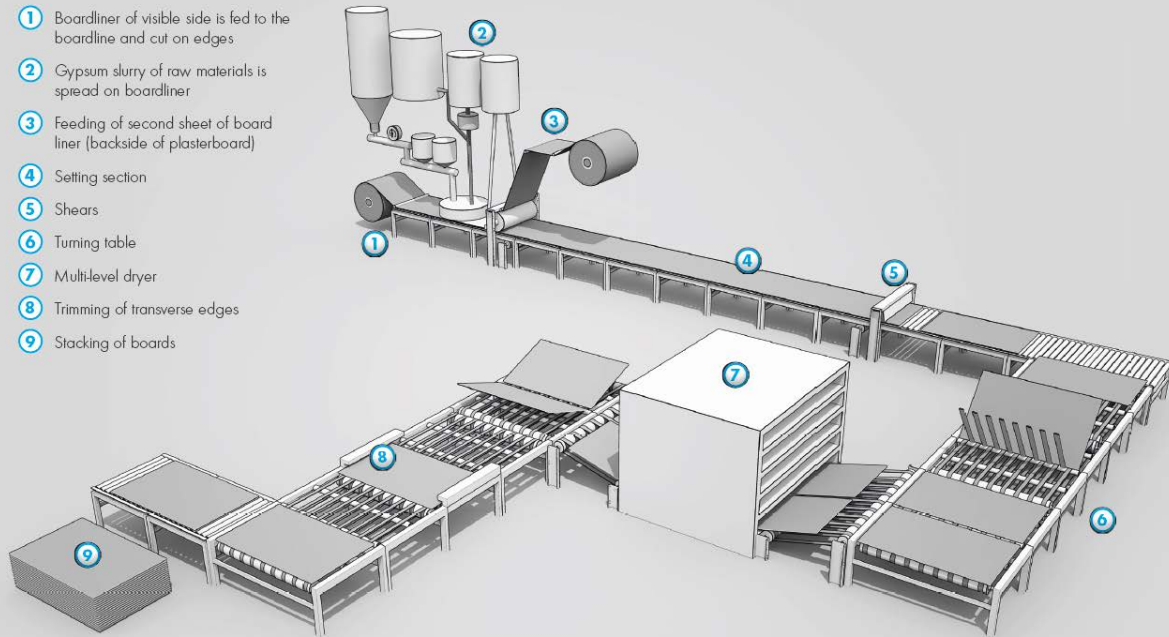


Figure 1: Manufacturing process of gypsum boards

LIFE CYCLE OF GYPSUM BOARDS

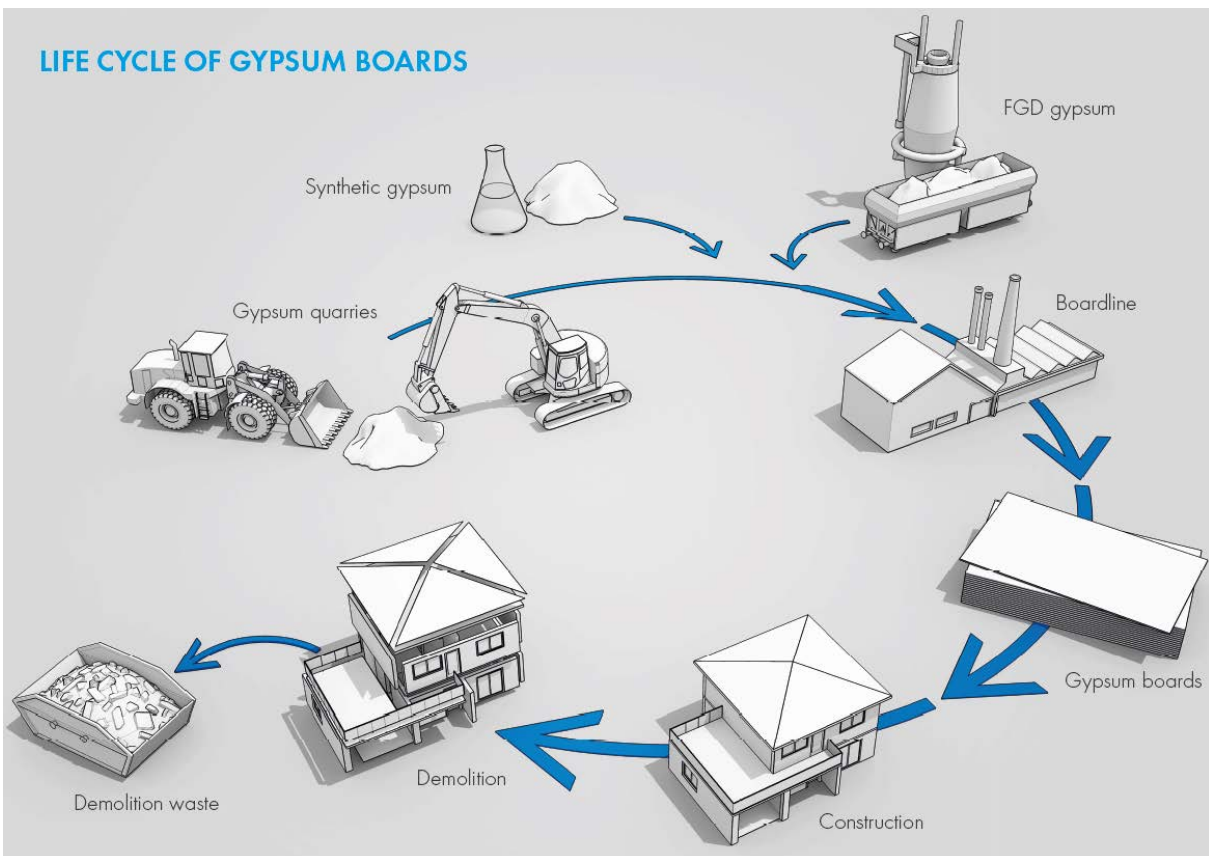


Figure 2: Principal life cycle of gypsum boards with potential recycling and disposal of demolition waste

Content information

Product

Table 6: Content of declared Diamant GKFI and packaging material

Product components	Weight %	Thereof: Pre-consumer material, weight-%	Thereof: Post-consumer material, weight-%	Thereof: Renewable material, weight-%
Gypsum	87.7	-	-	-
Boardliner	3.4	-	100	100
Mineral filler	8.4	-	-	-
Additives	< 1.0	-	-	17.2
Board weight kg/m ²	12.96			
Packaging materials	Weight, kg/DU	Weight-% (versus the product)		
Wooden pallet	0.07	0.54		
Steel (edge protection, strapping)	0.007	0.05		
TOTAL	0.077	0.59		

The declared products contain no or below 0.1 % w/w of hazardous substances listed on the Candidate list of Substances of Very High Concern, last updated: 2021-07-08.

Packaging

Distribution packaging: Stacking on wooden pallets and strapped with steel straps. Edges are protected with galvanised steel angles.

Consumer packaging: none (no individual packaging of plasterboards)

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: The board liner is made of 100 % waste paper (post-consumer recycled material). Thus, for the board liner only the environmental burdens from the processing of the waste paper are considered (waste paper enters the product system without burdens).

Environmental Information

ENVIRONMENTAL IMPACTS, Knauf Diamant GKFI, 1 m ² , 12.96 kg/m ² , at plant gate										
Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3	C4	D
Global warming potential (GWP)	Fossil	kg CO ₂ -eq.	2.50E+00	9.06E-02	1.69E-02	2.75E-03	8.56E-02	0.00E+00	1.86E-01	-6.13E-02
	Biogenic	kg CO ₂ -eq.	-9.78E-01	0.00E+00	1.69E-01	2.34E-05	0.00E+00	0.00E+00	8.32E-01	-3.83E-04
	Land use and land transformation	kg CO ₂ -eq.	1.91E-03	7.43E-04	6.80E-05	3.90E-06	7.02E-04	0.00E+00	5.48E-04	-7.04E-05
	TOTAL	kg CO ₂ -eq.	1.53E+00	9.13E-02	1.86E-01	2.78E-03	8.63E-02	0.00E+00	1.02E+00	-6.18E-02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC11-eq.	7.84E-11	1.16E-17	7.28E-17	6.59E-17	1.09E-17	0.00E+00	7.31E-16	-9.60E-16
Acidification potential (AP)		kg SO ₂ -eq.	5.43E-03	8.88E-05	9.37E-05	5.73E-06	8.38E-05	0.00E+00	1.33E-03	-7.37E-05
Eutrophication potential (EP)	Freshwater	kg PO ₄ ³⁻ -eq.	4.28E-05	8.24E-07	1.05E-07	2.26E-08	7.78E-07	0.00E+00	9.62E-07	-3.62E-07
	Freshwater	kg P eq.	1.40E-05	2.69E-07	3.41E-08	7.39E-09	2.54E-07	0.00E+00	3.14E-07	-1.18E-07
	Marine	kg N eq.	1.48E-03	2.80E-05	2.58E-05	1.36E-06	2.64E-05	0.00E+00	3.44E-04	-2.23E-05
	Terrestrial	mol N eq.	1.62E-02	3.35E-04	3.05E-04	1.43E-05	3.17E-04	0.00E+00	3.78E-03	-2.36E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	4.20E-03	7.68E-05	7.58E-05	3.69E-06	7.26E-05	0.00E+00	1.04E-03	-6.64E-05
Abiotic depletion potential	Minerals and metals ¹⁾	kg Sb-eq.	2.29E-06	6.91E-09	1.74E-09	8.10E-10	6.52E-09	0.00E+00	1.77E-08	-4.18E-08
	Fossil energy carriers ¹⁾	MJ, net calorific value	4.22E+01	1.21E+00	2.30E-01	4.90E-02	1.14E+00	0.00E+00	2.47E+00	-8.37E-01
Water scarcity potential ¹⁾		m ³ eq.	6.45E-01	7.88E-04	1.43E-02	4.42E-04	7.44E-04	0.00E+00	1.99E-02	-3.30E-02

ENVIRONMENTAL IMPACTS – ADDITIONAL MANDATORY AND VOLUNTARY INDICATORS, Knauf Diamant GKFI, 1 m ² , 12.96 kg/m ² , at plant gate									
Parameter	Unit	TOTAL A1-3	A4	A5	C1	C2	C3	C4	D
Global warming potential excl. Biogenic carbon (GWP-GHG)	kg CO ₂ -eq.	2.47E+00	8.95E-02	1.66E-02	2.73E-03	8.46E-02	0.00E+00	1.83E-01	-6.05E-02
Human toxicity, cancer effects ¹⁾	CTUh	2.58E-07	5.31E-10	9.96E-10	4.83E-11	5.02E-10	0.00E+00	1.65E-08	-8.36E-10
Human toxicity, non-cancer effects ¹⁾	CTUh	9.69E-02	2.09E-04	7.02E-04	1.20E-03	1.98E-04	0.00E+00	2.63E-03	-2.35E-03
Eco-toxicity (freshwater) ¹⁾	CTUe	8.25E+00	8.73E-01	1.35E-01	2.06E-02	8.24E-01	0.00E+00	1.41E+00	-1.41E-01
Land use related impacts / soil quality ¹⁾	-	4.58E-10	1.76E-11	1.28E-11	5.83E-13	1.66E-11	0.00E+00	2.08E-10	-1.44E-11
Particulate Matter emissions	Disease incidences	2.35E-08	9.10E-10	1.29E-09	2.20E-11	8.60E-10	0.00E+00	2.29E-08	-4.65E-10
Ionizing radiation, human health ²⁾	kBq U235 eq.	2.25E+01	4.15E-01	5.96E-02	1.55E-02	3.92E-01	0.00E+00	5.22E-01	-1.75E-01

Disclaimers according to EN 15804 + A2

¹⁾ The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

²⁾ This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

USE OF RESOURCES, Knauf Diamant GKFI, 1 m², 12.96 kg/m², at plant gate

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3	C4	D
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	4.08E+00	6.74E-02	1.28E+00	2.26E-02	6.36E-02	0.00E+00	6.21E-01	-2.19E-01
	Used as raw materials	MJ, net calorific value	1.53E+00	0.00E+00	-1.25E+00	0.00E+00	0.00E+00	0.00E+00	-2.87E-01	0.00E+00
	TOTAL	MJ, net calorific value	5.62E+00	6.74E-02	3.21E-02	2.26E-02	6.36E-02	0.00E+00	3.34E-01	-2.19E-01
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	4.22E+01	1.21E+00	2.31E-01	4.90E-02	1.14E+00	0.00E+00	2.48E+00	-8.37E-01
	Used as raw materials	MJ, net calorific value	1.25E-02	0.00E+00	-6.25E-04	0.00E+00	0.00E+00	0.00E+00	-1.19E-02	0.00E+00
	TOTAL	MJ, net calorific value	4.22E+01	1.21E+00	2.30E-01	4.90E-02	1.14E+00	0.00E+00	2.47E+00	-8.37E-01
Secondary material		kg	5.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	1.73E-02	7.71E-05	3.50E-04	2.20E-05	7.28E-05	0.00E+00	6.09E-04	-8.64E-04

WASTE PRODUCTION, Knauf Diamant GKFI, 1 m², 12.96 kg/m², at plant gate

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed		kg	3.67E-07	6.09E-11	2.52E-11	1.30E-11	5.75E-11	0.00E+00	2.63E-10	-1.70E-10
Non-hazardous waste disposed		kg	3.84E-01	1.80E-04	6.50E-01	3.47E-05	1.70E-04	0.00E+00	1.23E+01	1.12E-03
Radioactive waste disposed		kg	7.49E-04	1.46E-06	4.84E-06	7.29E-06	1.38E-06	0.00E+00	2.55E-05	-2.77E-05

OUTPUT FLOWS, Knauf Diamant GKFI, 1 m², 12.96 kg/m², at plant gate

Parameter	Unit	TOTAL A1-3	A4	A5	C1	C2	C3	C4	D
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	1.83E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.329	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Interpretation of Environmental Information

In general, the highest environmental impacts of the plasterboards covered by this EPD result from the product stage A1-A3 (at least 47 %). Due to the use of small amounts of renewable material in the declared product as well as the transport packaging, there are some credits in GWP-biogenic during A1-A3 for the uptake of biogenic carbon. Those uptakes in material were identified, tracked to the respective modules where they leave the system as emission (modules A5 and C4), and corrected manually in the life cycle model to avoid unbalanced consideration of biogenic carbon uptake. Some small credits given in module D result from the incineration and recycling of packaging only.

Biogenic Carbon Content

Table 7: content of biogenic carbon in product and packaging according to EN 15804+A2

BIOGENIC CARBON CONTENT, per 1 m ² of board at plant gate		
BIOGENIC CARBON CONTENT	Unit	Knauf Diamant GKFI
Biogenic carbon content in product	kg C	0.240
Biogenic carbon content in packaging	kg C	0.032

The content of biogenic carbon in the plasterboards covered by this EPD is less than 3 % of the board weight. This is due to the high content of minerals in the boards.

Additional information

No specific VOC emission tests have been done for the plasterboards Knauf Diamant GKFI produced in plant Knin. However, plasterboards Knauf Diamant GKFI from other Knauf plants have been tested and have fulfilled the requirements of the German AgBB scheme as well as the French VOC emission class A+.

VOCs are typically emitted from the organic ingredients of a product. The concentration of organic ingredients in plasterboard Knauf Diamant GKFI from plant Knin is in sum less than 1 % including boardliner. Thus, it seems reasonable to presume that the VOC emission tests run for Knauf Diamant GKFI produced in Knauf plants may be also applicable for plasterboards Knauf Diamant GKFI produced in Knin even if recipes are not 100 % the same.

References

General Programme Instructions of the International EPD® System. Version 3.01. (2019-09-18)

PCR 2019:14, Construction Products and Construction Services. Version 1.11. (2021-02-05)

ISO 9001: ISO 9001:2015 Quality management systems – Requirements

ISO 14001: ISO 14001:2015-09 Environmental management systems - Requirements with guidance for use

ISO 14025: ISO 14025:2006-07, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

EN 15804: EN 15804:2+A2:2020, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products





EN 520: EN 520:2004+A1:2009, Gypsum plasterboards - Definitions, requirements and test methods

ISO 45001:2018 Occupational health and safety management systems – Requirements

BBSR2017: Service life of building components for life cycle analyses according to the Assessment System for Sustainable Building, editor: German Federal Institute for Research on Building, Urban Affairs and Spatial Development, 2017 (Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB), Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR), Stand 24.02.2017)

GaBi2021: GaBi ts (v10): Software-System and Databases for Life Cycle Engineering, Sphera Solutions GmbH, Leinfelden-Echterdingen (Germany), 2021

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