



ENVIRONMENTAL PRODUCT DECLARATION OF KNAUF GYPSUM POWDER PRODUCTS

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC 2021
This EPD covers multiple products.

EPD PROGRAM

PROGRAM OPERATOR

CPC CODE

EPD REGISTRATION NUMBER

PUBLICATION DATE

VALID UNTIL

GEOGRAPHICAL SCOPE

The international EPD System, <https://environdec.com/>

EPD INTERNATIONAL AB

37530 Articles of plaster or of composition based on plaster

S-P-07074

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Global



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► Company Information

Knauf is one of the world's leading manufacturers of modern insulation materials, drylining systems, plasters and accessories, thermal insulation composite systems, paints, floor screeds, dry floor systems, and construction equipment and tools.

Knauf's factory in Stanos, Amphilochia, Greece, covers 100 acres of land, of which 13 acres is building cover. In the same geographical area, it operates a gypsum quarry (180 acres) owned by the company. The factory operates on a 24-hour basis while a significant part of its production is exported to the Balkan countries, Eastern Mediterranean and North Africa. Knauf has a vertical production from the raw material, gypsum, a product of its own mining that is processed in its facilities into complete structural elements (gypsum, plasterboard) with maximum added value. Inspection of all raw materials is carried out daily by the well-equipped quality control department, before their use in the production lines.

► Product Information

This is an average EPD for gypsum powder products produced in the Amphilochoia plant in Greece. The LCIA results of the LCA represents the weighted average product. There is no significant differentiation among the environmental performance of each product. The products included are:

- **Knauf Fugenfueller Leicht**
- **Knauf Fugenfueller Impregnated**
- **Knauf Perlfix**
- **Knauf FE 60 Magic**
- **Gypsum for constructions**
- **Decorative Gypsum**
- **Gypsum Plaster MP 75L**
- **Gypsum Plaster Rotband**

Knauf Fugenfueller Leicht and **Knauf Fugenfueller Impregnated** are powder materials based on gypsum and various admixtures that give the required properties for their use. The impregnated material is water repellent and has the same color as the impregnated Knauf plasterboard. They are used for the joint treatment of gypsum boards with, or without, the use of the appropriate jointing tape depending on the type of the plasterboards edges.

Knauf Perlfix is a special gypsum-based adhesive for applying gypsum boards on vertical surfaces.

Knauf FE 60 Magic is a self levelling floor screed made of calcium carbonate and calcium sulfate, portland cement, special additives, liquidators and sand of specific grain size.

Knauf gypsum for constructions is a particularly fast-curing, high-strength special gypsum for installation and repair work. Ideal for setting and fixing electrical sockets, as well as for attaching Knauf cornice strips and Knauf plaster profiles. Suitable for filling holes and slots, it is applied on wall and ceiling surfaces internally.

Knauf Decorative gypsum is a fast-setting universal plaster suitable for making decorative plastered objects.

Gypsum Plasters **Knauf MP 75L** and **Knauf Rotband** are light and particularly efficient pre-mixed dry mortar on proven plaster gypsum basis with special light aggregates for smoothed interior surfaces. Knauf MP 75L is specifically formulated for machine application and Knauf Rotband for hand application.

The composition for the product is presented in Table below:

Material	Percentage (%) by mass	Mass (kg) per declared unit
Gypsum	94-96	0,94-0,96
Other minerals & additives	4-6	0,04-0,06

Packaging material	Mass (kg) per declared unit
Wooden pallets	2,71E-02
Polyethylene film	4,03E-03

No substance in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" exceeds 0.1% wt in the final products.

► System Boundaries

Gypsum products System Boundaries Diagram

X= Included, MND= Module Not Declared																	
	Product stage			Construction stage		Use stage							End-of-life stage				Resource recovery stage
	Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	GLO	GLO	GR														
Specific data used	>90%																
Variation-products	<10%																
Variation-sites	Not relevant																

A1: Raw Material Supply

The production starts with the material supply. This stage includes the mining and processing of raw materials, the generation of electricity and fuels required for the manufacturing stage. Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is the main raw material while rest are materials such as starch, glass and other additives.

A2: Transportation of raw materials to manufacturer

Transport is relevant for delivery of raw materials from the supplier to the gate of manufacturing plant. The main material for the production, gypsum, is extracted and transported by trucks from owned quarries which are located 10 km from the manufacturing plant, while the rest are transported by trucks and vessels from different countries all over the world.

A3: Manufacturing

Manufacturing starts with the crushing and baking of raw gypsum in specially formed mills to form stucco (calcium sulphate hemihydrate). Baked gypsum is combined with other solid and liquid mixing additives to produce the binder.

C1: De-construction, demolition

The deconstruction and demolition of the product takes place with the demolition of the whole building. It is assumed that energy for the binder is minor compared to the other materials of the building, thus the environmental impact of this module is set to be zero.

C2: Transportation of waste

A distance of 100 km by lorry 16-32 tonnes from construction/demolition sites to disposal sites has been chosen as a conservative assumption.

C3: Waste processing for reuse, recovery and/or recycling

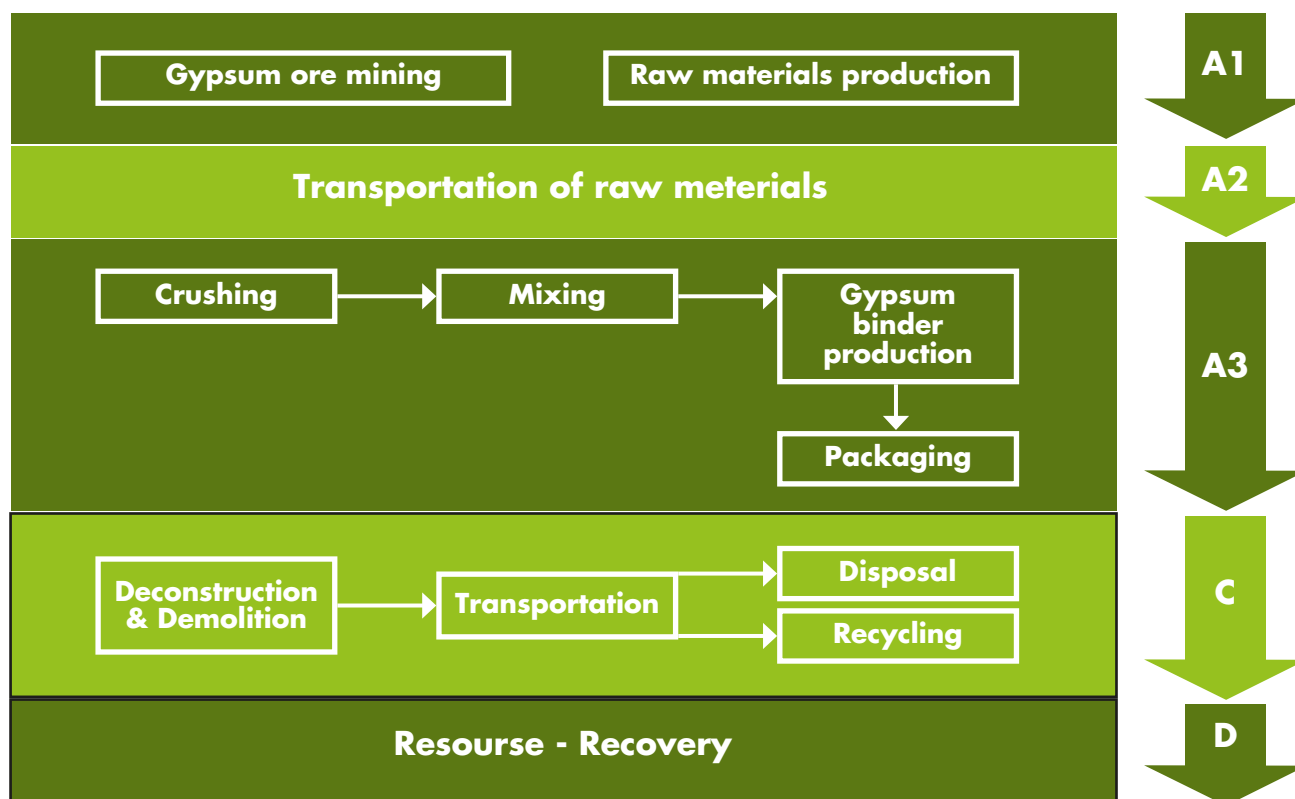
It is assumed that gypsum binder will be 100% landfilled after its life cycle, thus the environmental impact of this module is set to be zero.

C4: Disposal

As it is mentioned above, gypsum binder will be 100% landfilled after its life cycle.

D: Reuse-Recovery-Recycling potential

Since the product is 100% landfilled, the benefits and loads resulting from reuse and recycling is zero.



► LCA Information

Declared unit: The declared unit is 1 kg of gypsum binder.

Goal and Scope: This EPD evaluates the environmental impacts of the production of 1 kg of gypsum binder from Cradle to gate with module C1-C4 and D.

System Boundary: The system boundaries are set to be cradle to gate (A1-A3) with modules C+D. Cut-off rules: The cut-off criteria adopted is as stated in "EN 15804:2012+A2:2019". Where there is insufficient data for a unit process, the cut-off criteria are 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass. The cut-off rule was used in cases of some additives used for the mixing of baked gypsum. The total mass is approximately 0,01%.

Allocations: Wherever possible, allocation was avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes. Where allocation cannot be avoided, the inputs and outputs of the system were partitioned between its different products or functions in a way that reflects the underlying physical or economic relationships between them. In this case, the allocation concerns the electricity for lighting and the diesel consumption for other general utilities in the manufacturing plant and it is based on the mass of the final products.

Assumptions:

Transportation: In modules A2 and C2, a EURO4 lorry 16-32 metric ton was utilized for road transportation and a bulk carrier for dry goods for sea transportation.

Module C1: It is assumed that energy for the binder is minor compared to the other materials of the building, thus the environmental impact of this module is set to be zero.

Module C2: A conservative assumption of 100 km by lorry 16-32 metric ton was used.

Module C3 and C4: There is no provision for gypsum binder waste reuse and it is 100% landfilled.

Data quality: ISO 14044 was applied in terms of data collection and quality requirements. The impact of the production of raw materials recovered from Ecoinvent database v.3.8. The data concerning the modules A2 (Transportation) and A3 (Product manufacturing) were provided by Knauf and they were extracted from the company's SAP system and BDE. Regarding electricity mix, the latest (2020) national residual electricity mix as published in DAPEEP SA was utilized. The emission factor for natural gas is provided from National Inventory Report of 2020 for Greece. The end-of-life are based on the most representative scenarios for this product. Background data for these stages are retrieved from Ecoinvent v.3.8.

Geographical Scope: Worldwide

Time representativeness: Data obtained refers to the year 2021.

Software used: OpenLCA v.1.10.3

► Environmental Performance

ENVIRONMENTAL IMPACTS	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	1,31E-01	0,00E+00	1,65E-02	0,00E+00	1,30E-02	0,00E+00
GWP-fossil	kg CO2 eq	1,30E-01	0,00E+00	1,65E-02	0,00E+00	1,29E-02	0,00E+00
GWP-biogenic	kg CO2 eq	3,02E-04	0,00E+00	5,55E-06	0,00E+00	4,75E-05	0,00E+00
GWP-luluc	kg CO2 eq	1,65E-04	0,00E+00	5,58E-06	0,00E+00	1,34E-05	0,00E+00
GWP-GHG¹	kg CO2 eq	1,29E-01	0,00E+00	1,63E-02	0,00E+00	1,27E-02	0,00E+00
ODP	kg CFC-11 eq	2,25E-08	0,00E+00	3,77E-09	0,00E+00	3,35E-09	0,00E+00
AP	mol H+ eq	4,01E-04	0,00E+00	8,25E-05	0,00E+00	3,22E-02	0,00E+00
EP-freshwater²	kg PO4-3 eq	1,19E-04	0,00E+00	3,42E-06	0,00E+00	8,76E-06	0,00E+00
EP-freshwater²	kg P eq	3,87E-05	0,00E+00	1,11E-06	0,00E+00	2,86E-06	0,00E+00
EP-marine	kg N eq	7,94E-05	0,00E+00	2,88E-05	0,00E+00	3,37E-05	0,00E+00
EP-terrestrial	mol N eq	7,90E-04	0,00E+00	3,14E-04	0,00E+00	3,66E-04	0,00E+00
POCP	kg NMVOC eq	2,77E-04	0,00E+00	8,95E-05	0,00E+00	2,09E-03	0,00E+00
ADPe³	kg Sb eq	4,82E-07	0,00E+00	5,98E-08	0,00E+00	4,10E-08	0,00E+00
ADPf³	MJ	2,01E+00	0,00E+00	2,51E-01	0,00E+00	2,83E-01	0,00E+00
WDP³	m3 eq	3,77E-02	0,00E+00	1,17E-03	0,00E+00	1,24E-02	0,00E+00

¹ GWP-GHG indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product, with characterization factors (CFs) based on IPCC (2013).

² Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq.

³ The results of these environmental impact indicators shall be used with care as the uncertainties of these results are high or as there is limited experienced with the indicator.

RESOURCE USE	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	8,35E-01	0,00E+00	3,38E-03	0,00E+00	9,44E-03	0,00E+00
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	8,35E-01	0,00E+00	3,38E-03	0,00E+00	9,44E-03	0,00E+00
PENRE	MJ	2,01E+00	0,00E+00	2,51E-01	0,00E+00	2,83E-01	0,00E+00
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	2,01E+00	0,00E+00	2,51E-01	0,00E+00	2,83E-01	0,00E+00
SM	kg	0,00E+00	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	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	8,77E-04	0,00E+00	2,71E-05	0,00E+00	2,90E-04	0,00E+00

► Environmental Performance

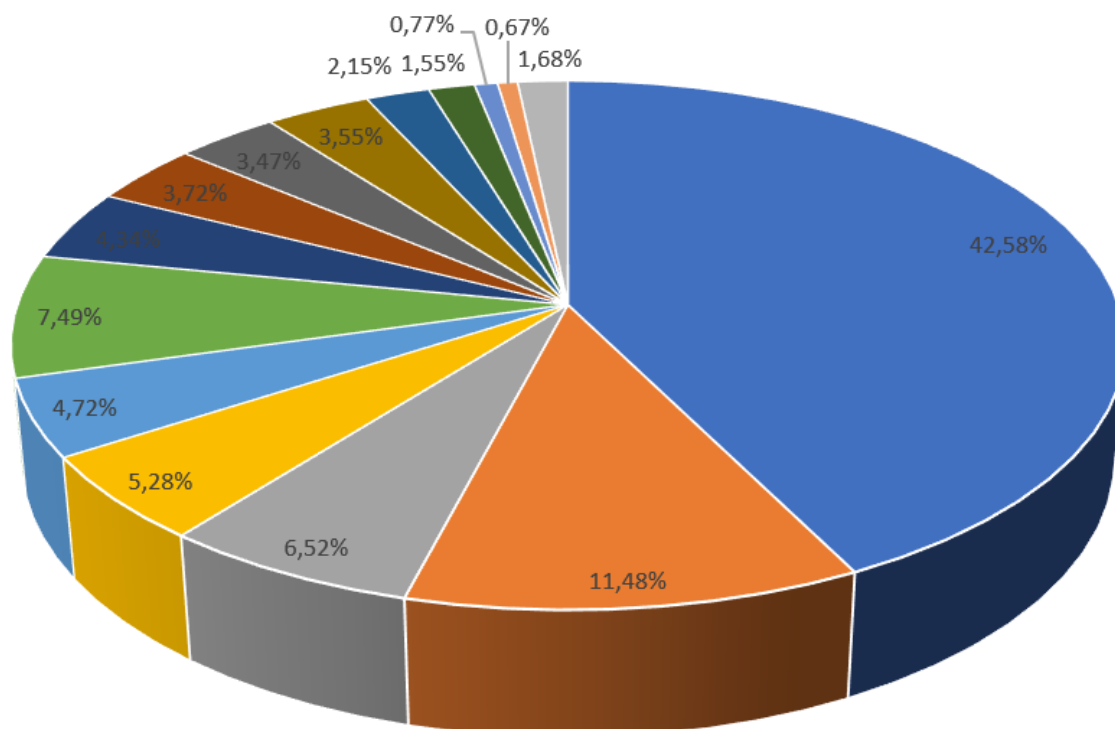
OUTPUT FLOWS AND WASTE CATEGORIES	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	2,32E-06	0,00E+00	6,54E-07	0,00E+00	4,08E-07	0,00E+00
NHWD	kg	1,01E-02	0,00E+00	1,20E-02	0,00E+00	1,01E+00	0,00E+00
RWD	kg	1,02E-05	0,00E+00	1,72E-06	0,00E+00	1,67E-06	0,00E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ADDITIONAL IMPACTS	Unit	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	2,73E-09	0,00E+00	1,19E-09	0,00E+00	2,61E-08	0,00E+00
IRP⁴	kBq U235 eq	1,44E-02	0,00E+00	1,31E-03	0,00E+00	1,80E-03	0,00E+00
ETP-FW	CTUe	1,73E+00	0,00E+00	1,85E-01	0,00E+00	3,44E-01	0,00E+00
HTP-c	CTUh	7,36E-11	0,00E+00	6,81E-12	0,00E+00	3,30E-11	0,00E+00
HTP-nc	CTUh	1,41E-09	0,00E+00	1,95E-10	0,00E+00	1,59E-09	0,00E+00
SQP	dimensionless	4,38E+00	0,00E+00	1,68E-01	0,00E+00	2,81E-01	0,00E+00

⁴ Ionizing radiation potential (IRP) 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.

► Interpretation

Gypsum binder production - Global Warming Potential Contribution



- Emissions from gypsum crushing and baking
- Electricity
- Cellulose production
- Hydrated lime production
- Heavy fuel oil production
- Packaging
- Polyethylene production
- Emissions from gypsum ore mining
- Calcium carbonate production
- Transportation
- Propylene glycol production
- Styrene-acrylonitrile copolymer production
- Emissions from gypsum binder production
- Diesel production
- Other

► Additional information

The EPD does not give information on release of dangerous substances to soil, water and indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available.

► Programme related information



Programme

The international EPD System www.environdec.com



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The CEN standard EN 15804 serves as the core Product Category Rules
PCR 2019:14 Construction products (EN 15804:A2); Version 1.2.4 ; 2022-09-07

PCR review was conducted by

The Technical Committee of the International EPD® System.

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

☐ EPD process certification ☒ EPD verification

Verification by:



Business Quality Verification P.C, Accredited by E.S.Y.D, Accreditation No. 1218
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EPD owner



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LCA Accountability



ENVIROMETRICS
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Procedure for follow-up during EPD validity involves third party verifier

☐ Yes ☒ No

The EPD owner has the sole ownership, liability and responsibility of the EPD. EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g.

identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

► References

General Programme Instructions of the International EPD® System. Version 4.0, 2021-03-29

PCR 2019:14 v.1.2.4 Construction products. EPD System. Date 2022-09-07. Valid until 2024-12-20

EN 15804:2012+A2:2019, Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

ISO 14020:2000 Environmental labels and declarations — General principles

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

ISO 14040:2006 Environmental management - Life cycle assessment-Principles and framework

ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines

Ecoinvent / Ecoinvent Centre, www.Ecoinvent.org

Residual Energy Mix 2020 from Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA)

► List of abbreviations

LCA	Life Cycle assessment
EPD	Environmental Product Declaration
PCR	Product category rules
GLO	Global
RER	Europe
RoW	Rest of the world
GWP-total	Global Warming Potential total
GWP-fossil	Global Warming Potential fossil
GWP-biogenic	Global Warming Potential biogenic
GWP-luluc	Global Warming Potential land use and land use change
ODP	Ozone Depletion Potential
AP	Acidification Potential
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication Potential fraction of nutrients reaching marine end compartment
EP-terrestrial	Eutrophication potential, Accumulated Exceedance
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 use
PERE	Use of renewable primary energy excluding 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 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
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
EE	Exported Energy
PM	Particulate matter emissions
IRP	Ionizing radiation, human health
ETP-FW	Ecotoxicity, freshwater
HTP-c	Human toxicity, cancer
HTP-nc	Human toxicity, non-cancer
SQP	Land use related impacts/Soil quality

ENVIRONMENTAL PRODUCT DECLARATION OF KNAUF GYPSUM POWDER PRODUCTS

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



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