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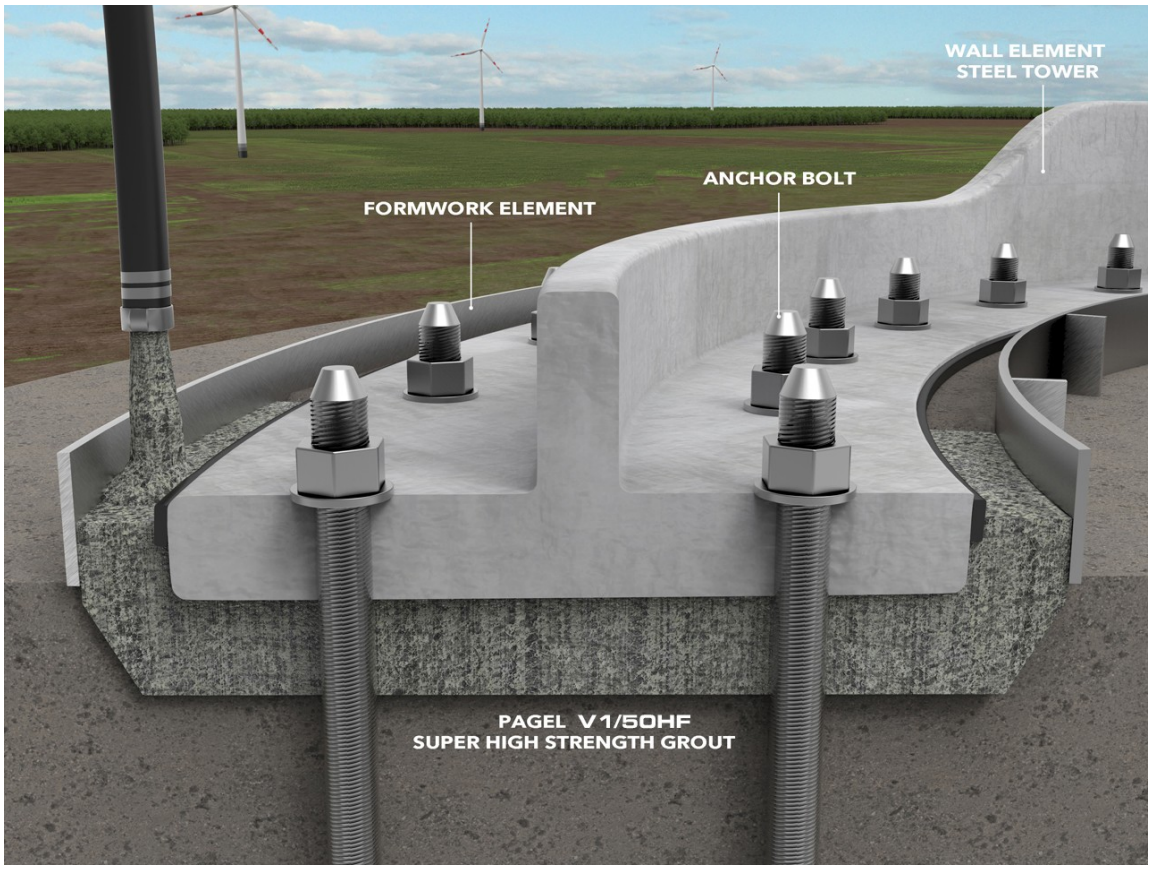
ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804+A2

PAGEL Spezial-Beton GmbH & Co. KG
V1/50HF High-Strength Grout



PAGEL Spezial-Beton

Owner of the declaration
PAGEL Spezial-Beton GmbH & Co. KG
Wolfsbankring 9
45355 Essen
Germany

Product
V1/50HF High-Strength Grout

Declared product / Declared unit
1 kg of applied mortar

This declaration is based on Product Category Rules
EN 15804:2012 + A2:2019,
NPCR Part A:2021 ,
NPCR 009 Part B for Technical chemical Products for Construction

Program operator:
EPD Global
Majorstuen P.O. Box 5250
N-0303 Oslo
Norway

Declaration number
NEPD-11216-11216-2

Registration number
NEPD-11216-11216-2

Issue date
17.03.2026

Valid to
16.03.2031

EPD Software
Emidat Platform v1.0.0

General Information

Product
V1/50HF High-Strength Grout

Program Operator
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Declaration Number
NEPD-11216-11216-2

This declaration is based on Product Category Rules
EN 15804:2012 + A2:2019,
NPCR Part A:2021 ,
NPCR 009 Part B for Technical chemical Products for Construction

Statements
The owner of the declaration shall be liable for the underlying information and evidence. The Norwegian EPD Foundation shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Declared unit
1 kg of applied mortar with a reference service life of 50 years

General information on verification of EPD from EPD tools
Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD Global's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD Global, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD Global's General Programme Instructions for further information on EPD tools.

Verification of EPD tool
Charlotte Merlin, FORCE Technology
(no signature required)

Owner of the declaration
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Manufacturer
PAGEL Spezial-Beton GmbH & Co. KG
Wolfsbankring 9
45355 Essen, Germany

Place of production
Essen, Germany

Management system
ISO 14001 , ISO 9001

Organisation no
DE 125082005

Issue date
17.03.2026

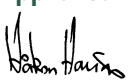
Valid to
16.03.2031

Year of study
2024

Comparability
EPDs of construction products may not be comparable if they do not comply with EN 15804 and are not seen in a building context. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database (including primary and secondary data).

Development and verification of EPD
The declaration was created using the Emidat EPD tool v1.0, developed by Emidat GmbH. The EPD tool has been approved by EPD Global.

Developer of EPD: Maya Rakha
Reviewer of company-specific input data and EPD: Patrick Schäffel

Approved

Håkon Hauan, The Norwegian EPD Foundation

Product

Product description

› Certificate of conformity in accordance with DAfStb guideline (VeBMR) "Production and use of cement-bound grouting concrete and grouting mortar" (QDB)

› Factory production control acc. to DIN EN 1504-6

› Company certification acc. to DIN EN ISO 9001:2015 and DIN EN ISO 14001:2015

Application description

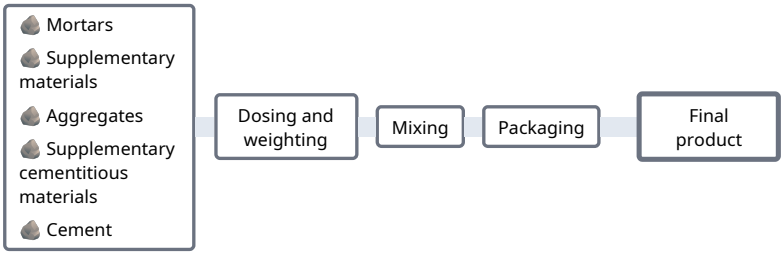
› Grouting of wind turbines

› Joint grouting

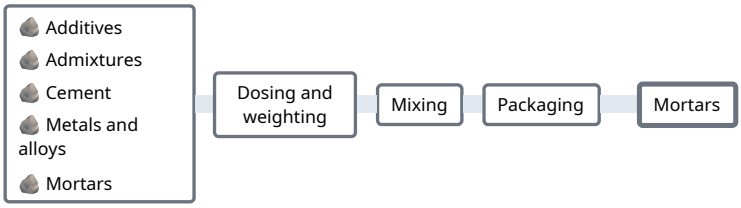
› Cavity filling

› Grouting of prefabricated parts

Production process



Upstream production processes



Product specification

Name of ingredient	Share of total weight	Country of origin
Aggregates	50 - 80 %	Germany
Cement	10 - 25 %	Germany
Mortars	0 - 2 %	Germany
Supplementary cementitious materials	2 - 10 %	Germany
Supplementary materials	2 - 10 %	Germany

Technical data

	Unit	Value
Gross density	kg / m³	2350
Mixing water demand	l / kg	0.08

Market

Europe

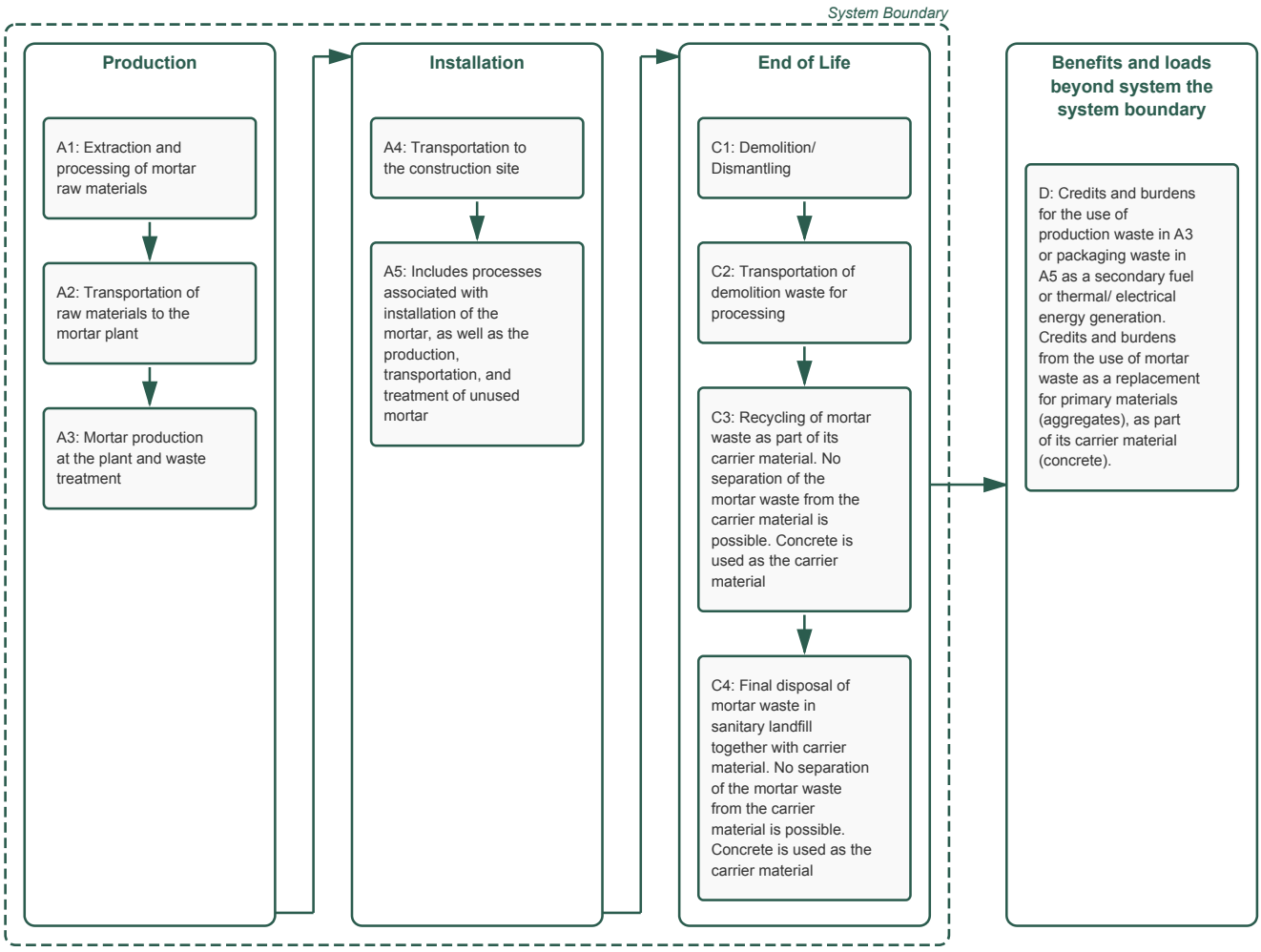
Recipients
B2B

LCA: Calculation rules

Declared unit
1 kg of applied mortar

Reference service life
50 years
This value represents a conventional reference lifespan, not a guaranteed performance duration, and assumes normal exposure conditions, adequate design, and routine maintenance.

System boundary



Data quality
The foreground data are based on extensive and detailed data collection at the production site of the manufacturer, covering key processes such as raw material sourcing, formulation, and manufacturing. These foreground data are fully linked with corresponding datasets from the background database (ecoinvent 3.10) or with EN15804+A2-compliant EPDs, ensuring consistency, reliability, and maintaining alignment with the latest industry standards.

The following EN15804+A2-compliant EPDs are used as datasets in this EPD:

Element	Year
Cement	2025

The overall data representativeness is rated as good with an overall score of 4.00/5 , in accordance with EN 15804+A2 Annex E guidance on data quality assessment, considering geographical, technical, and temporal representativeness.

The following table discloses all processes or activities assessed with very poor or poor data representativeness according to EN 15804+A2, as well as those assessed as fair that contribute more than 30 % to any core impact indicator in A1–A3:

Element	Minimal Representativeness	Source	Year
Recycling	Very poor	ecoinvent 3.10	2023
Electricity from grid	Poor	ecoinvent 3.10	2023
Plastic bucket	Poor	ecoinvent 3.10	2023
Polypropylene foil	Poor	ecoinvent 3.10	2023
Supplementary cementitious materials	Poor	ecoinvent 3.10	2023

System boundaries (X=included, MND=module not declared)

	Production			Installation		Use stage							End-of-Life				Next product system
	Raw material supply	Transport	Manufacturing	Transport	Installation Process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Demolition	Transport	Waste Processing	Disposal	Benefits and loads beyond the system boundary
Module	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			DE	Europe	Europe	MND	MND	MND	MND	MND	MND	MND	Europe	Europe	Europe	Europe		Europe

For the geographies modeled in A1 and A2, refer to *Product specification*.

Type of EPD: Cradle to gate with options, modules A4-5, C1-C4, and D

Stage of Material Production and Construction

Module A1: Extraction and processing of mortar raw materials

Module A2: Transportation of raw materials to the mortar plant

Module A3: Mortar production at the plant and waste treatment

Module A4: Transportation to the construction site

Module A5: Includes processes associated with installation of the mortar, as well as the production, transportation, and treatment of unused mortar

Disposal Stage

Module C1: Demolition/Dismantling

Module C2: Transportation of demolition waste for processing

Module C3: Recycling of mortar waste as part of its carrier material. No separation of the mortar waste from the carrier material is possible. Concrete is used as the carrier material

Module C4: Final disposal of mortar waste in sanitary landfill together with carrier material. No separation of the mortar waste from the carrier material is possible. Concrete is used as the carrier material

Credits and burdens outside the system boundaries

Module D: Credits and burdens for the use of production waste in A3 or packaging waste in A5 as a secondary fuel or thermal/electrical energy generation. Credits and burdens from the use of mortar waste as a replacement for primary materials (aggregates), as part of its carrier material (concrete).

Cut-off criteria

No cut-offs were applied.

Allocation

Foreground inventory data (energy and fuels, ancillary materials, emissions and waste) was collected at the production-process level. Using the total output of the production process in 2024, these flows are allocated to the reference product based on mass.

Fly ash is a byproduct of coal combustion, mainly from coal-fired power plants. An economic allocation factor was calculated, based on market prices for fly ash and for electricity production from coal.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Transport to the building site (A4)	Value	Unit
Transported mass: Product and packaging	1.01	kg
Truck: Distance	300.00	km
Truck: Energy demand	1.58	MJ / t*km
Truck: Activity	transport, freight, lorry >32 metric ton, EURO6	-
Truck: Capacity utilization	53.30	%

Installation into the building (A5)	Value	Unit
Treatment of packaging waste	Reuse	
Treatment of packaging waste	Incineration	
Treatment of packaging waste	Recycling	
Installation loss	5.00	%
Water	0.08	kg
Product mass after installation	1.08	kg

During installation, water is added to the product. For the remaining lifecycle stages, this LCA considers the total mass of the product including the water.

Demolition (C1)	Value	Unit
Diesel for dismantling	0.07	MJ
PM 2.5 emissions	1.79e-05	kg
PM 10 emissions	6.85e-05	kg

Transport to the waste facility (C2)	Value	Unit
Mass to landfill	0.97	kg
Mass to recycling	0.11	kg
Distance to recycling	50.00	km
Distance to landfill	50.00	km
Truck: Activity	transport, freight, lorry >32 metric ton, EURO6	-
Truck: Capacity utilization	53.30	%
Truck: Distance	50.00	km
Truck: Energy demand	1.58	MJ / t*km

Waste processing (C3)	Value	Unit
Material for recycling	0.11	kg
Recycling rate	10.00	%

Disposal (C4)	Value	Unit
Material for landfill	0.97	kg

Reuse, recovery and/or recycling potentials (D)	Value	Unit
Amount of secondary material that the system takes in	0.10	kg
Substitution of gravel	0.10	kg
Substitution of electrical energy production	0.02	MJ
Substitution of thermal energy production	0.17	MJ

Calculation of benefits and loads per EN 15804+A2.

LCA: Results

The following results are based on the market-based electricity approach applied to the foreground system (A3). Further details on electricity data are provided in the Additional Requirements section.

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2-eq.	3.10e-01	3.15e-02	2.47e-02	6.62e-03	5.60e-03	4.89e-04	6.23e-03	-1.65e-02
GWP-fossil	kg CO_2-eq.	3.10e-01	3.14e-02	2.15e-02	6.62e-03	5.59e-03	4.73e-04	6.08e-03	-1.64e-02
GWP-biogenic	kg CO_2-eq.	-9.26e-04	1.58e-05	3.19e-03	6.61e-07	2.81e-06	1.62e-05	1.46e-04	-3.68e-05
GWP-luluc	kg CO_2-eq.	4.02e-04	1.12e-05	2.36e-05	5.76e-07	1.99e-06	4.11e-08	3.16e-06	-3.08e-06
ODP	kg CFC-11-Eq	1.48e-09	6.55e-10	2.00e-10	1.01e-10	1.17e-10	7.24e-12	1.76e-10	-7.14e-10
AP	mol H+-Eq	4.72e-04	7.42e-05	4.47e-05	5.98e-05	1.32e-05	4.27e-06	4.31e-05	-2.15e-05
EP-freshwater	kg P-Eq	1.19e-04	2.21e-06	7.10e-06	1.93e-07	3.94e-07	1.38e-08	5.04e-07	-9.22e-07
EP-marine	kg N-Eq	1.39e-04	1.95e-05	1.26e-05	2.77e-05	3.46e-06	1.98e-06	1.64e-05	-6.08e-06
EP-terrestrial	mol N-Eq	1.37e-03	2.11e-04	1.24e-04	3.03e-04	3.75e-05	2.17e-05	1.79e-04	-6.39e-05
POCP	kg NMVOC-Eq	4.55e-04	1.29e-04	4.41e-05	9.05e-05	2.29e-05	6.46e-06	6.42e-05	-4.45e-05
ADPE	kg Sb-Eq	8.55e-07	8.98e-08	1.26e-07	2.37e-09	1.60e-08	1.69e-10	9.64e-09	-3.64e-08
ADPF	MJ, net calorific value	2.48e+00	4.72e-01	3.99e-01	8.66e-02	8.39e-02	6.18e-03	1.49e-01	-3.59e-01
WDP	m^3 world Eq deprived	1.68e-02	2.37e-03	3.89e-02	2.12e-04	4.22e-04	1.51e-05	4.17e-04	-1.96e-03

GWP-total: Global Warming Potential - total , **GWP-fossil**: Global warming potential - fossil , **GWP-biogenic**: Global Warming Potential - biogenic , **GWP-luluc**: Global Warming Potential - luluc , **ODP**: Depletion potential of the stratospheric ozone layer , **AP**: Acidification potential, Accumulated Exceedance , **EP-freshwater**: Eutrophication potential - freshwater , **EP-marine**: Eutrophication potential - marine , **EP-terrestrial**: Eutrophication potential - terrestrial , **POCP**: Photochemical Ozone Creation Potential , **ADPE**: Abiotic depletion potential - non-fossil resources , **ADPF**: Abiotic depletion potential - fossil resources , **WDP**: Water (user) deprivation potential

Additional indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	disease incidence	5.21e-09	3.06e-09	6.99e-10	9.73e-09	5.45e-10	9.24e-10	9.79e-10	-1.93e-10
IRP	kBq U235-Eq	6.90e-03	5.73e-04	1.38e-02	3.88e-05	1.02e-04	2.77e-06	9.50e-05	-2.72e-03
ETP-fw	CTUe	7.05e-01	1.12e-01	8.86e-02	1.23e-02	1.99e-02	8.76e-04	2.04e-02	-2.36e-02
HTP-c	CTUh	2.68e-10	2.01e-10	9.81e-11	2.59e-11	3.58e-11	1.85e-12	2.75e-11	-3.45e-11
HTP-nc	CTUh	2.70e-09	3.11e-10	2.52e-10	1.17e-11	5.54e-11	8.39e-13	2.68e-11	-4.66e-11
SQP	dimensionless	1.18e+00	4.75e-01	1.90e-01	6.07e-03	8.44e-02	4.33e-04	2.93e-01	-1.89e-02

PM: Potential incidence of disease due to PM emissions , **IRP**: Potential Human exposure efficiency relative to U235 , **ETP-fw**: Potential Comparative Toxic Unit for ecosystems , **HTP-c**: Potential Comparative Toxic Unit for humans - cancer effects , **HTP-nc**: Potential Comparative Toxic Unit for humans - non-cancer effects , **SQP**: Potential Soil quality index

IRP: 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.

ETP-fw, **HTP-c**, **HTP-nc** and **SQP**: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with these indicators.

Use of resources

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.65e-01	7.49e-03	2.59e-01	5.30e-04	1.33e-03	3.78e-05	1.38e-03	-9.33e-03
PERM	MJ	1.98e-02	0.00e+00	-1.80e-02	0.00e+00	0.00e+00	-7.87e-05	0.00e+00	0.00e+00
PERT	MJ	1.85e-01	7.49e-03	2.41e-01	5.30e-04	1.33e-03	-4.09e-05	1.38e-03	-9.33e-03
PENRE	MJ	2.02e+00	4.72e-01	3.76e-01	8.66e-02	8.40e-02	6.18e-03	1.49e-01	-3.08e-01
PENRM	MJ	1.50e-01	0.00e+00	-9.21e-02	0.00e+00	0.00e+00	-5.06e-03	0.00e+00	-5.13e-02
PENRT	MJ	2.17e+00	4.72e-01	2.84e-01	8.66e-02	8.40e-02	1.13e-03	1.49e-01	-3.59e-01
SM	kg	1.04e-01	0.00e+00	5.21e-03	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.93e-02
RSF	MJ	4.60e-07	0.00e+00	2.30e-08	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	0.00e+00	0.00e+00
FW	m^3	1.38e-03	6.86e-05	1.04e-03	5.63e-06	1.22e-05	4.02e-07	1.55e-04	-1.86e-04

PERE: Primary energy resources - renewable: use as energy carrier , **PERM**: Primary energy resources - renewable: used as raw materials , **PERT**: Primary energy resources - renewable: total , **PENRE**: Primary energy resources - non-renewable: use as energy carrier , **PENRM**: Primary energy resources - non-renewable: used as raw materials , **PENRT**: Primary energy resources - non-renewable: total , **SM**: Use of secondary material , **RSF**: Renewable secondary fuels , **NRSF**: Non-renewable secondary fuels , **FW**: Net use of fresh water

Waste flows

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	8.90e-03	0.00e+00	4.45e-04	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
NHWD	kg	1.61e-03	0.00e+00	5.25e-02	0.00e+00	0.00e+00	0.00e+00	9.72e-01	0.00e+00
RWD	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

HWD: Hazardous waste disposed , **NHWD**: Non hazardous waste disposed , **RWD**: Radioactive waste disposed

Output flows

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CRU	kg	0.00e+00	0.00e+00	8.07e-03	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
MFR	kg	1.07e-03	0.00e+00	1.37e-03	0.00e+00	0.00e+00	1.08e-01	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	0.00e+00	0.00e+00
EEE	MJ	1.27e-02	0.00e+00	4.02e-03	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
EET	MJ	1.53e-01	0.00e+00	1.46e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

CRU: Components for re-use , **MFR**: Materials for recycling , **MER**: Materials for energy recovery , **EEE**: Exported electrical energy , **EET**: Exported thermal energy

Name	Value	Unit
Biogenic carbon content in product	4.42e-05	kg C
Biogenic carbon content in accompanying packaging	5.35e-04	kg C

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

Electricity consumption in the manufacturing phase is composed from the sources below. This EPD follows the market-based approach.

Approach	Electricity	Quantity [kWh]	Emission Factor [kg CO_2e/kWh]
market-based	ecoinvent: electricity, high voltage, residual mix (DE)	2.53e-03	0.86
market-based	ecoinvent: electricity production, photovoltaic, 570kWp open ground installation, multi-Si (DE)	5.85e-04	0.11
market-based	ecoinvent: electricity production, wind, >3MW turbine, onshore (DE)	1.95e-03	0.03
market-based	ecoinvent: electricity production, hydro, pumped storage (DE)	9.16e-03	0.72
market-based	ecoinvent: electricity production, deep geothermal (DE)	1.75e-03	0.07
market-based	ecoinvent: electricity production, wood, future (GLO)	1.17e-03	0.05
market-based	ecoinvent: electricity production, natural gas, conventional power plant (DE)	2.34e-03	0.74
(location-based)	(ecoinvent: market for electricity, high voltage (DE))	(0.02)	(0.47)

Rows marked with () are provided for reference and not used in the assessment.

Electricity consumption in upstream production processes:

Electricity	Emission Factor [kg CO_2e/kWh]
ecoinvent: electricity, high voltage, residual mix (DE)	0.86
ecoinvent: electricity production, photovoltaic, 570kWp open ground installation, multi-Si (DE)	0.11
ecoinvent: electricity production, wind, >3MW turbine, onshore (DE)	0.03
ecoinvent: electricity production, hydro, pumped storage (DE)	0.72
ecoinvent: electricity production, deep geothermal (DE)	0.07
ecoinvent: electricity production, wood, future (GLO)	0.05
ecoinvent: electricity production, natural gas, conventional power plant (DE)	0.74
ecoinvent: electricity, high voltage, residual mix (DE)	0.86
ecoinvent: electricity production, photovoltaic, 570kWp open ground installation, multi-Si (DE)	0.11
ecoinvent: electricity production, wind, >3MW turbine, onshore (DE)	0.03
ecoinvent: electricity production, hydro, pumped storage (DE)	0.72
ecoinvent: electricity production, deep geothermal (DE)	0.07
ecoinvent: electricity production, wood, future (GLO)	0.05
ecoinvent: electricity production, natural gas, conventional power plant (DE)	0.74

Dangerous substances

The product contains no hazardous substances given by the REACH Candidate List or the Norwegian Priority List.

Additional environmental information

Additional environmental impact indicators required in NPCR Part A for construction products

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-IOBC	kg CO_2-eq.	3.11e-01	3.14e-02	2.16e-02	6.62e-03	5.59e-03	4.73e-04	6.08e-03	-1.65e-02

GWP-IOBC: Global Warming Potential - Instantaneous oxidation of biogenic carbon

Bibliography

CEN/TR 15941:2010	Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
EN 15942:2022-04	Sustainability of construction works - Environmental product declarations - Communication format business-to-business
ISO 14025:2011-10	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14040:2021-02	Environmental management - Life cycle assessment - Principles and framework
ISO 14044:2021-02	Environmental management - Life cycle assessment - Requirements and guidelines
EF 3.1	Environmental Footprint (EF) Life Cycle Impact Assessment method - Characterisation Factors version 3.1, European Commission, Joint Research Centre (JRC)
ecoinvent 3.10	ecoinvent, Zurich, Switzerland, database version 3.10
NPCR Part A:2021	Construction products and services, Version 2.0. Issue date: 24.03.2021; validity extended to 24.03.2026.
NPCR 009:2021	Product category rules, Part B: Technical chemical products for the building and construction industry. Issue date: 06.10.2021; validity extended to 30.06.2026.

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