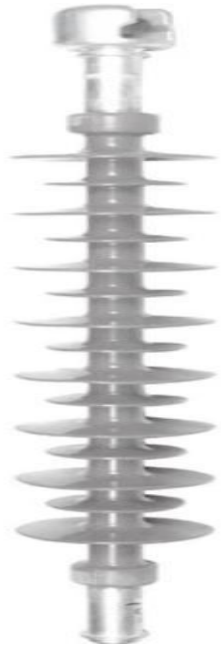
ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Composite Insulator
Melbye Group AS



EPD HUB, HUB-2366
Publishing date 15 December 2024, last updated on 15 December 2024, valid until 15 December 2029.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Melbye Group AS
Address	Prost Stabels Vei 22, 2019 Skedsmokorset, Norway
Contact details	kontakt@melbye.no
Website	https://melbye.com/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR Version 1.1, 5 Dec 2023
Sector	Electrical product
Category of EPD	Sister EPD
Parent EPD number	HUB-2302
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4, D
EPD author	ADITYA DHARMENDRA NISHAD & ANKUSH VASUDEO SUNKALE
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Magaly González Vázquez, as an authorized verifier acting for EPD Hub Limited

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Composite Insulator
Additional labels	See appendix
Product reference	170kV210-1667-20231025, 170kV120-1658-20231025, 145kV210-1580-20231028-YB,
Place of production	Yangguang Avenue East ,Miaoshan,Jianxia(430223) Wuhan, Hubei, China
Period for data	01/01/2023 - 31/12/2023
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	-

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit
Declared unit mass	7.8 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	3.61E+01
GWP-total, A1-A3 ($kgCO_2e$)	3.28E+01
Secondary material, inputs (%)	16.3
Secondary material, outputs (%)	92.7
Total energy use, A1-A3 (kWh)	159
Net freshwater use, A1-A3 (m^3)	0.55

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Melbye Group is one of Norway's oldest family-owned companies, with a history dating all the way back to 1907. We have a proud tradition of technical innovation and trade, and today, we are a leading provider of forward-thinking products and system solutions for critical infrastructure. We have expertise within transmission and utilities, fiber, ducts and chambers and safety.

We serve customers throughout the Nordic region and the United Kingdom, engage with stakeholders across Europe, and collaborate with around 200 partners and suppliers .

While our headquarters are located just outside Oslo, Norway, we also have offices at multiple locations in Norway, Sweden, and the United Kingdom, as well as representatives in Finland, India and China. Together, we are more than 120 co-workers who share the company's core values: Innovation, teamwork, and professionalism.

With advanced expertise spread across our core areas and a dedication to long-term operation and future-oriented development, we stand at the forefront of addressing future challenges. We take pride in contributing to the development of critical infrastructure that will shape tomorrow's society.

PRODUCT DESCRIPTION

Insulators, as one of the main components for the external insulation of transmission lines, are used to support or hang conductors so that they work where there are towers, and ensure that lines have reliable electric insulation strength.The product consists of a Hot dip galvanized cast iron fittings, crimped on FRP Rod and finally injection moulded silicon rubber. composite insulators have been widely used in power systems because of their excellent electrical properties, anti-corrosion properties and mechanical strength. These insulators are compact and lightweight structure that can withstand significant mechanical stress without compromising electrical performance.

This EPD covers the products:
170kV210-1667-20231025,
170kV120-1658-20231025,
145kV210-1580-20231028-YB
In the annex to this EPD, a scaling table is provided to reflect the GWP impacts for the range of products produced in the same plant.

Further information can be found at https://melbye.com/.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	32.05	China
Minerals	67.95	China
Fossil materials	-	-
Bio-based materials	-	-

In insulator end fittings are of metals, which contributes to 32.05% of the total material and the rest 67.95% (minerals) is rubber and frp rod.

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0.8945

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 unit
Mass per declared unit	7.8 kg
Functional unit	Rated Voltage 170KV, Specified Mechanical Load 210KN
Reference service life	30 Years

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

Process rejection of Socket and ball is 1.5%, Core Rod 1.5%, Silicone Rubber 5% is considered.
Actual transport distances are considered for materials,
Rubber injection moulding is done inhouse on FRP Rod and metal end fittings are fitted at each end by crimping.
Conventional energy supply from grid is considered,
Insulators are packed in wooden boxes which are mounted on a pallet, both the pallet and box is outsourced.
Manufacturing waste – Dust generated from rod finishing is collected by authorized agency for land filling.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Insulators end use is in Norway and Sweden, accordingly, shipping distance plus distance from port to customer is considered as 100Km as an average distance.
There is no material loss in installation of insulator, as it is made up of rubber and cannot break and not prone to any physical damaged.
Insulator is installed directly on the line, so no extra installation material is required.
Installation of product is done manually however we have considered 0.01kwh/kg as standard as energy used for installation.

End of life for A5 waste:
We have assumed 50 KM as an average distance to recycling company and transportation is by lorry >32 metric ton, EURO6.
For Nails used in packaging - Steel Scrap 85 % can be recycled reference World Steel Association (pg19, 2020) & 15 % goes to landfill.
For wooden untreated pallet, wood incineration energy and heat benefit is accounted for as per Wood packaging EU scenario.

PRODUCT USE AND MAINTENANCE (B1-B7)

This is not in scope of this EPD
Air, soil, and water impacts during the use phase have not been studied.
Reference service life – 30 years, Installation is considered in Scandinavia.

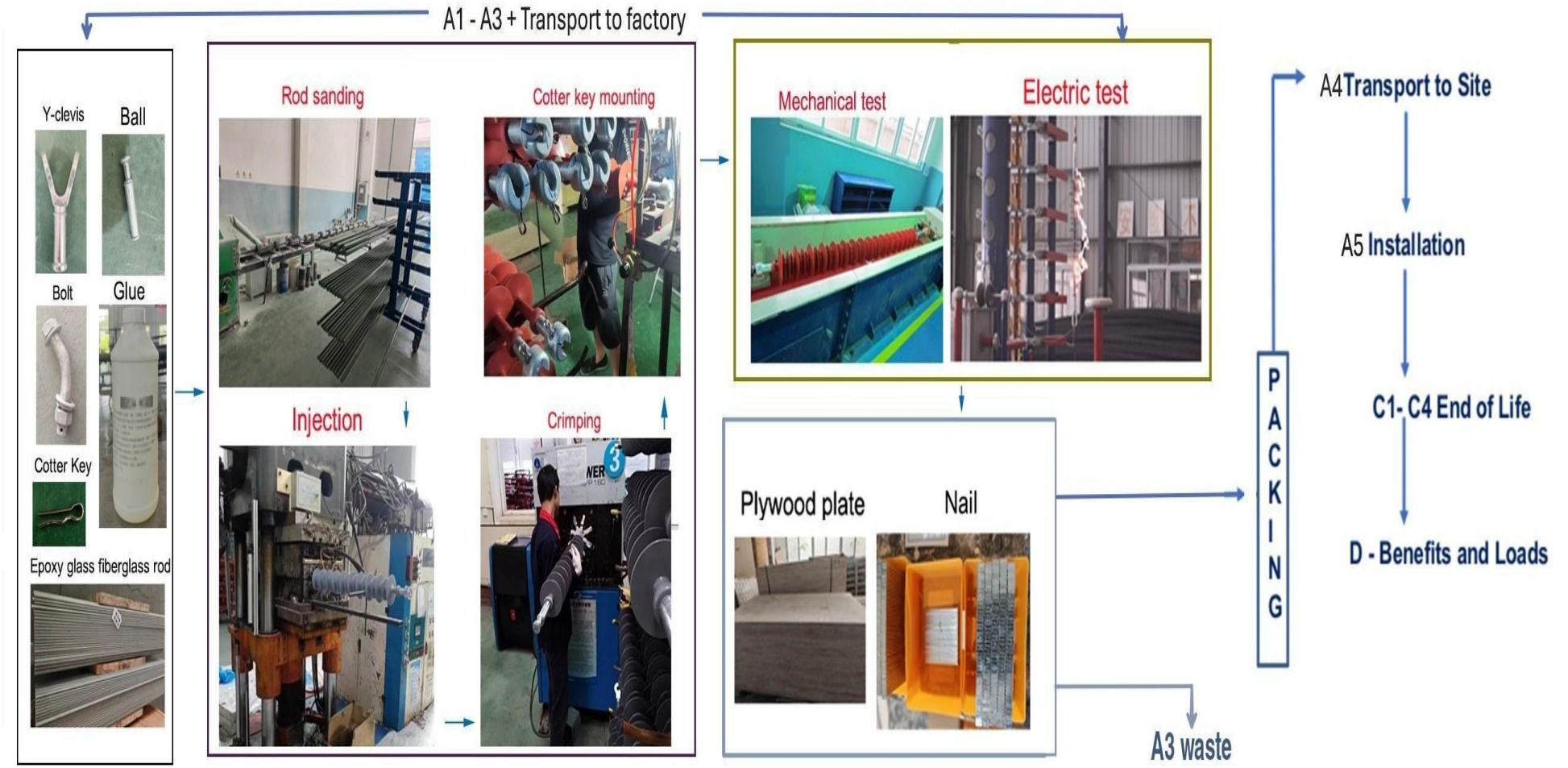
PRODUCT END OF LIFE (C1-C4, D)

Installation of product is done manually however we have considered 0.01kwh/kg as standard as energy used in removing the insulator (energy consumption during demolition) from the line. As Insulators are used in Norway and Sweden transport by lorry (16-32 Metric tons) class Euro 6 and distance as 50 kms is considered.

For Steel Scrap 85 % can be recycled reference World Steel Association (pg19, 2020) & 15 % goes to landfill, this for the virgin material used.

20% recycling content in end fitting is not considered again in benefits. Silicon moulded rubber and core rod are sent for incineration to recycling companies in Norway and Sweden.
D —
For wooden untreated pallet, wood incineration energy and heat benefit is accounted for as per Wood packaging EU scenario.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. We have not considered plastic strap used in packaging which accommodates to less than 0.1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	No allocation
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	-

This EPD is product and factory specific and does not contain average calculations.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.8, Plastics Europe, Federal LCA Commons and One Click LCA databases as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	2.93E+01	4.13E-01	3.10E+00	3.28E+01	6.56E-01	3.32E+00	MND	MND	MND	MND	MND	MND	MND	2.58E-02	3.43E-02	1.55E+01	2.60E-03	-4.05E+00
GWP – fossil	kg CO_2e	2.93E+01	4.13E-01	6.38E+00	3.61E+01	6.56E-01	3.79E-02	MND	MND	MND	MND	MND	MND	MND	2.58E-02	3.43E-02	1.55E+01	2.60E-03	-4.05E+00
GWP – biogenic	kg CO_2e	0.00E+00	0.00E+00	-3.28E+00	-3.28E+00	0.00E+00	3.28E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.50E-03
GWP – LULUC	kg CO_2e	7.21E-03	1.57E-04	1.87E-03	9.24E-03	4.52E-04	7.05E-06	MND	MND	MND	MND	MND	MND	MND	2.57E-06	1.28E-05	3.33E-04	2.45E-06	1.14E-03
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	3.07E-06	9.55E-08	1.05E-07	3.27E-06	1.34E-07	7.44E-09	MND	MND	MND	MND	MND	MND	MND	5.52E-09	8.54E-09	9.86E-08	1.05E-09	-2.43E-07
Acidification potential	mol H^+e	1.40E-01	1.93E-03	5.70E-02	1.99E-01	1.91E-02	5.55E-04	MND	MND	MND	MND	MND	MND	MND	2.68E-04	1.10E-04	3.31E-03	2.44E-05	-5.77E-03
EP-freshwater[2)]	kg Pe	3.89E-03	3.27E-06	2.57E-03	6.46E-03	2.61E-06	2.64E-07	MND	MND	MND	MND	MND	MND	MND	8.55E-08	2.45E-07	1.11E-05	2.72E-08	-2.64E-05
EP-marine	kg Ne	3.21E-02	6.19E-04	7.86E-03	4.05E-02	4.69E-03	2.50E-04	MND	MND	MND	MND	MND	MND	MND	1.19E-04	2.43E-05	1.13E-03	8.45E-06	-7.30E-04
EP-terrestrial	mol Ne	2.55E-01	6.82E-03	8.81E-02	3.50E-01	5.21E-02	2.80E-03	MND	MND	MND	MND	MND	MND	MND	1.30E-03	2.69E-04	1.27E-02	9.29E-05	-2.40E-02
POCP ("smog")[3)]	kg NMVOCe	1.04E-01	2.08E-03	2.33E-02	1.29E-01	1.36E-02	7.54E-04	MND	MND	MND	MND	MND	MND	MND	3.58E-04	1.06E-04	3.40E-03	2.70E-05	-1.06E-02
ADP-minerals & metals[4)]	kg Sbe	3.87E-04	1.10E-06	1.24E-05	4.00E-04	9.86E-07	7.79E-08	MND	MND	MND	MND	MND	MND	MND	1.31E-08	8.38E-08	9.86E-06	5.97E-09	1.44E-06
ADP-fossil resources	MJ	5.62E+02	6.21E+00	6.33E+01	6.31E+02	8.48E+00	4.93E-01	MND	MND	MND	MND	MND	MND	MND	3.47E-01	5.47E-01	3.16E+00	7.12E-02	-6.69E+01
Water use[5)]	m^3e depr.	1.63E+03	2.84E-02	2.79E+00	1.63E+03	2.72E-02	1.90E-02	MND	MND	MND	MND	MND	MND	MND	9.33E-04	2.52E-03	2.78E-01	2.26E-04	5.86E-01

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. 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 experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	1.98E-06	4.70E-08	1.40E-07	2.17E-06	2.68E-08	9.85E-09	MND	MND	MND	MND	MND	MND	MND	7.19E-09	3.98E-09	2.89E-08	4.92E-10	-9.31E-08
Ionizing radiation[6)]	kBq U235e	2.20E+00	3.05E-02	3.44E-01	2.57E+00	3.97E-02	2.25E-03	MND	MND	MND	MND	MND	MND	MND	1.60E-03	2.82E-03	2.95E-02	3.22E-04	-1.23E-01
Ecotoxicity (freshwater)	CTUe	3.82E+02	5.47E+00	7.67E+01	4.65E+02	5.61E+00	4.60E-01	MND	MND	MND	MND	MND	MND	MND	2.09E-01	4.55E-01	3.85E+01	4.64E-02	-2.14E+01
Human toxicity, cancer	CTUh	7.15E-08	1.57E-10	1.21E-09	7.29E-08	3.74E-10	2.71E-10	MND	MND	MND	MND	MND	MND	MND	8.00E-12	1.18E-11	1.96E-09	1.16E-12	-1.26E-08
Human tox. non-cancer	CTUh	8.67E-07	5.62E-09	4.27E-08	9.15E-07	3.97E-09	9.80E-10	MND	MND	MND	MND	MND	MND	MND	1.51E-10	4.63E-10	1.87E-08	3.04E-11	-4.77E-07
SQP[7)]	-	5.32E+01	6.61E+00	2.98E+02	3.58E+02	2.40E+00	1.46E-01	MND	MND	MND	MND	MND	MND	MND	4.51E-02	6.37E-01	2.13E+00	1.52E-01	-1.97E+01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	2.09E+01	7.64E-02	2.37E+01	4.47E+01	6.56E-02	6.82E-03	MND	MND	MND	MND	MND	MND	MND	1.98E-03	7.07E-03	3.66E-01	6.18E-04	-4.64E+00
Renew. PER as material	MJ	0.00E+00	0.00E+00	2.40E+01	2.40E+01	0.00E+00	-2.40E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renew. PER	MJ	2.09E+01	7.64E-02	4.77E+01	6.87E+01	6.56E-02	-2.40E+01	MND	MND	MND	MND	MND	MND	MND	1.98E-03	7.07E-03	3.66E-01	6.18E-04	-4.64E+00
Non-re. PER as energy	MJ	4.56E+02	6.21E+00	6.43E+01	5.27E+02	8.48E+00	4.93E-01	MND	MND	MND	MND	MND	MND	MND	3.47E-01	5.47E-01	3.16E+00	7.12E-02	-6.69E+01
Non-re. PER as material	MJ	0.00E+00	0.00E+00	5.98E-01	5.98E-01	0.00E+00	-5.98E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-re. PER	MJ	4.56E+02	6.21E+00	6.49E+01	5.27E+02	8.48E+00	-1.04E-01	MND	MND	MND	MND	MND	MND	MND	3.47E-01	5.47E-01	3.16E+00	7.12E-02	-6.69E+01
Secondary materials	kg	1.27E+00	1.84E-03	4.05E-03	1.27E+00	3.67E-03	4.30E-04	MND	MND	MND	MND	MND	MND	MND	1.36E-04	1.54E-04	5.03E-03	1.50E-05	5.58E-01
Renew. secondary fuels	MJ	6.63E-02	1.87E-05	3.57E-05	6.64E-02	1.19E-05	1.06E-06	MND	MND	MND	MND	MND	MND	MND	4.44E-07	1.36E-06	6.94E-05	3.91E-07	6.13E-06
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	5.21E-01	8.12E-04	3.06E-02	5.52E-01	6.24E-04	4.59E-04	MND	MND	MND	MND	MND	MND	MND	2.11E-05	7.25E-05	6.86E-03	7.79E-05	-4.36E-02

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	2.04E+00	7.91E-03	3.43E-01	2.39E+00	1.12E-02	5.44E-04	MND	MND	MND	MND	MND	MND	MND	4.65E-04	5.88E-04	4.03E-03	0.00E+00	-6.52E-02
Non-hazardous waste	kg	2.67E+01	1.33E-01	1.41E+01	4.09E+01	1.03E-01	8.86E-01	MND	MND	MND	MND	MND	MND	MND	3.27E-03	1.02E-02	5.43E+00	4.93E-01	-3.26E+00
Radioactive waste	kg	1.44E-03	4.19E-05	1.45E-04	1.63E-03	5.98E-05	2.88E-06	MND	MND	MND	MND	MND	MND	MND	2.44E-06	3.77E-06	3.48E-06	0.00E+00	-3.64E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	1.17E+01	1.17E+01	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	5.70E-02	5.70E-02	0.00E+00	6.60E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	2.00E+00	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	2.12E-01	2.12E-01	0.00E+00	8.80E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	5.30E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.98E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	2.83E+01	4.09E-01	6.35E+00	3.50E+01	6.51E-01	3.75E-02	MND	MND	MND	MND	MND	MND	MND	2.55E-02	3.39E-02	1.55E+01	2.54E-03	-3.93E+00
Ozone depletion Pot.	kg $CFC_{-11}e$	2.56E-06	7.57E-08	9.46E-08	2.73E-06	1.06E-07	5.99E-09	MND	MND	MND	MND	MND	MND	MND	4.37E-09	6.76E-09	9.65E-08	8.31E-10	-2.39E-07
Acidification	kg SO_2e	1.17E-01	1.48E-03	4.95E-02	1.68E-01	1.53E-02	3.86E-04	MND	MND	MND	MND	MND	MND	MND	1.91E-04	8.88E-05	2.46E-03	1.84E-05	-4.17E-03
Eutrophication	kg PO_4^3e	3.50E-02	3.41E-04	1.23E-02	4.77E-02	1.72E-03	3.06E-04	MND	MND	MND	MND	MND	MND	MND	4.44E-05	1.88E-05	3.13E-03	3.98E-06	-2.01E-03
POCP (“smog”)	kg C_2H_4e	7.31E-03	5.43E-05	1.75E-03	9.11E-03	3.97E-04	1.21E-05	MND	MND	MND	MND	MND	MND	MND	4.18E-06	4.13E-06	9.90E-05	7.73E-07	-1.24E-03
ADP-elements	kg Sbe	3.65E-04	1.07E-06	1.33E-05	3.79E-04	9.67E-07	7.00E-08	MND	MND	MND	MND	MND	MND	MND	1.29E-08	8.15E-08	8.31E-06	5.88E-09	1.42E-06
ADP-fossil	MJ	5.40E+02	6.21E+00	6.53E+01	6.11E+02	8.48E+00	4.93E-01	MND	MND	MND	MND	MND	MND	MND	3.47E-01	5.47E-01	3.16E+00	7.12E-02	-6.69E+01

Data quality assessment

The data quality assessment has been conducted on the life cycle modules that are considered mandatory acc. to EN 15804 and the respective PCR – modules A1-A3, C1-C4 and D. The cradle-to-gate stage (A1-A3) and transport (A4) represents primary and measured data over which the manufacturer has direct control. The installation (A5), end-of-life stages (C2-C4) and module D are based on scenarios, and secondary data sources have been used for their modelling.

Inventory data of product stage (A1-A3) have been collected via a questionnaire and personal contact with a representative of the manufacturer. The collected information includes primary data about annual quantities of used raw and supplementary materials (including production losses) as well as information about suppliers, transportation types and distances, energy and water consumption, and waste generation. Where specific data has been unavailable, secondary data sources are used – the ecoinvent database, statistical data, peer-reviewed papers, and reports, as relevant. Published EPDs have been used for raw materials when available, and their quality can be considered very good. Otherwise, generic datasets for the ecoinvent database have been used. The quality and representability of the ecoinvent datasets are assessed in Annex 2 of this report.
All significant materials and processes are included in the assessment. The cut-off rules of EN 15804, ISO 14040, ISO 14044, and the PCR apply, so data can be considered complete and consistent. Data collection was conducted by trained personnel, and procedures were documented to ensure traceability. Data sources were evaluated for their reliability based on their publication and peer-review status, with preference given to sources with established credibility.

Interpretation of the results

The raw material supply (Module A1) has the biggest share in most of the impact categories, along with module A3 manufacturing. This can be explained with the acquisition and processing of resources, which needs various machines, energy, and fuels. Energy use in the manufacturing process (A3) is also a significant contributor.

Transport of raw materials to the factory in module A2, and the transport of the product to the building (or a warehouse) in A4) are of smaller significance. The ancillary materials are negligible for the results due to their small amounts.

End-of-life processing of the packaging materials (A5) and the product itself (C1-C4) makes up a small share in the results. The recycling and incineration potential of the materials lead to replacing virgin raw materials and energy, and these benefits are shown in the calculations for module D.

Assumptions and limitations associated with the interpretation.

Life-Cycle Assessment (LCA) is a comprehensive method used to evaluate the environmental impacts associated with all stages of a product's life cycle. However, certain assumptions and limitations are inherent to this methodology, which must be considered when interpreting the results.

The system boundaries define which processes are included in the LCA. All significant processes contributing to the environmental impact are included within these boundaries. The data used in the LCA, whether primary or secondary, is accurate and representative of the actual processes. Some materials/energy in small amounts (less than 1%) are excluded due to lack of data or unavailable proxies. The recycling and incineration rates modelled in the end-of-life scenario reflect the current situation on the market where the product is sold and used.

Conclusions and recommendations.

The environmental impacts are highest during the production stage (A1-A3). Optimization of the supply chain for raw materials (modules A1 and A2) and the manufacturing process (module A3) can help reduce the product's environmental impacts. The actions taken to decrease environmental impacts in product stage (A1-A3) have a multiplicative effect on further life cycle modules as well.

Possible solutions can be use of recycled and alternative raw materials, renewable energy, and the use of more sustainable transport options. Use of recycled materials will help to reduce impacts and the emissions will decrease in proportion to the ratio of recycled content. Electricity generated from renewable energy sources should be used in the manufacturing plant and sustainable transportation options should be preferred instead of conventional transportation.

Detailed cut-off documentation

The LCA includes all industrial processes from raw material acquisition to production, distribution, installation, and end-of-life stages. The study includes modules A1-A3, A4, A5, C1-C4 and D modules, and does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR.
For easier modelling and because of lack of accuracy in available modelling resources many constituents under 1% of product mass are excluded. These include some ancillary materials which are all present in the manufacturing only in very small amounts and have no serious impact on the emissions of the product. The stage-specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available, are included in the calculation.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy, and water use related to company management and sales activities are excluded.

SCALING TABLE FOR DIFFERENT TYPES OF COMPOSITE INSULATORS:

This EPD covers the following listed insulators:

Composite Insulator Description	Weight (Kg)	Total Length	GWP-total, (kgCO2e)	GWP-fossil, (kgCO2e)
170kV120-1658-20231025	4.6	1658	31.84	31.84
170kV210-1667-20231025	7.8	1667	52.34	52.33
145kV210-1580-20231028-YB	8.4	1580	52.54	52.52

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

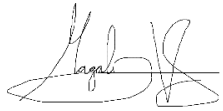
I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Magaly González Vázquez, as an authorized verifier acting for EPD Hub Limited
15.12.2024



VERIFIED ISO 14025