ABB

PRODUCT ENVIRONMENTAL PROFILE

Environmental Product Declaration

MNS 3.0 Low Voltage Switchgear

SGS Italia S.p.A.
Via Caldera, 21
20153 MILANO

VERIFIED

SGS Italia S.p.A.

DATE: 2024-07-26

REGISTRATION NUMBER ABBG-00403-V01.01-EN	IN COMPLIANCE WITH PCR-ED4-EN-2021 09 06 SUPPLEMENTED BY PSR-0005-ED3.1-EN-2023 12 08
VERIFIER ACCREDITATION NUMBER VH51	INFORMATION AND REFERENCE DOCUMENTS www.pep-ecopassport.org
DATE OF ISSUE 06-2024	VALIDITY PERIOD 5 years
INDEPENDENT VERIFICATION OF THE DECLARATION AND DATA, IN COMPLIANCE WITH ISO 14025: 2006	
INTERNAL ☐	EXTERNAL ☒
THE PCR REVIEW WAS CONDUCTED BY A PANEL OF EXPERTS CHAIRED BY JULIE ORGELET (DDEMAIN)	PEP eco PASS PORT®
PEP ARE COMPLIANT WITH XP C08-100-1 :2016 OR EN 50693:2019 THE ELEMENTS OF THE PRESENT PEP MAY NOT BE COMPARED WITH ELEMENTS FROM ANY ANOTHER PROGRAM.	
DOCUMENT IN COMPLIANCE WITH ISO 14025: 2006 « ENVIRONMENTAL LABELS AND DECLARATIONS. TYPE III ENVIRONMENTAL DECLARATIONS »	

EPD Owner	ABB S.p.A Via Luciano Lama,33, 20099 Sesto San Giovanni (MI)-Italy www. abb.com
Manufac-turer name and address	ABB Xiamen Low Voltage Equipment Co. Ltd. ABB Industrial Center, No. 881 of Fang Shan Xi Er Road, Xiang'An District, Xiamen, Fujian, China, 361000
Company contacts	EPD_ELSP@in.abb.com
Reference product	MNS 3.0 Low Voltage Switchgear
Description of the prod-uct	AC Low Voltage power systems are world widely common electrical energy distribution solutions. It is platform which deliver a stable power distribution as well as reliable protection and control systems. MNS 3.0 switchgear and protection solutions serve as control and protective devices by managing all critical operation conditions and are providing safety for maintenance personnel and equipment. MNS 3.0 switchgear assembly is of scalable design, enabling ABB to supply integrated solutions for challenging business environment. MNS 3.0 have the possibility to access cable termination at the front side. It is the leading technology combining maintenance-free frame structures and busbars, a fully modular construction and the capability to integrate feeder, motor starter, variable speed drives, power factor compensation etc.
Functional unit	The functional unit is to protect persons against direct contact with live parts and allow measurements, control and protection various electromechanical devices during a service lifetime of 20 years with a demanded current level up to 4000 A. This Product is considered as Passive product-non continuous operation product through which the main current passes during non-continuous operation. The load rate/ rated current considered is 30% and use time rate is 30%.
Reference lifetime	20 years
Product cat-egory	Electrical, Electronic and HVAC-R Products Other Equipment Category
Use Scenario	The use phase has been modeled based on the sales mix data (2023), and the corresponding low voltage electricity countries mix.
Geograph-ical representa-tiveness	Raw materials & Manufacturing: [Global] Assembly: [China] Distribution / Use: [Global] specific sales mix EoL: [Global]
Technologi-cal repre-sentative-ness	Materials and processes data are specific to the production of MNS 3.0 Low Voltage Switchgear. For secondary data Ecoinvent dataset has been used
LCA Study	This study is based on the LCA study described in the LCA report 1TNA816284
EPD type	Product family declaration
EPD scope	"Cradle to grave"
Year of re-ported pri-mary data	2023
LCA soft-ware	SimaPro 9.5.0.1 (2023)
LCI data-base	Ecoinvent v3.9 (2023)
LCIA meth-odology	EN 15804:2012+A2:2019

Contents

ABB Purpose & Embedding Sustainability

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 105 thousand talented employees in over 100 countries.

ABB's Electrification business offers a wide-ranging portfolio of products, digital solutions and services, from substation to socket, enabling safe, smart and sustainable electrification. Offerings encompass digital and connected innovations for low voltage and medium voltage, including EV infrastructure, solar inverters, modular substations, distribution automation, power protection, wiring accessories, switchgear, enclosures, cabling, sensing, and control.

ABB is committed to continually promoting and embedding sustainability across its operations and value chain, aspiring to become a role model for others to follow. With its ABB Purpose, ABB is focusing on reducing harmful emissions, preserving natural resources, and championing ethical and humane behavior.

General Information

MNS 3.0 and MNS Rear switchgear production line is located in Xiang'an Torch Industrial Park of Xiamen, ABB Xiamen Hub, with an investment of 2 billion yuan (approximate $300 million) and covering an area of ~ 430 K square meters, officially came into service in Nov. 2018. It integrated six ABB companies in Xiamen to create smarter production workshop and workplace with higher efficiency through optimized resource allocation and unified management. ABB in Xiamen, with nearly 3,500 employees in total, has a full range of businesses including R&D, manufacturing, engineering, sales and services, as well as ABB China's supply chain management and corporate functions.

Quality/Environmental/Health Management System in compliance with the following standards:

ISO 9001/2015 - Quality Management System
ISO 14001/2015 - Environmental management system
ISO 45001:2018 - Occupational Health and Safety Management System
ISO 50001：2018-Energy Management System
ISO 14064-1：2018 greenhouse gases verification statement
Sedex Members Ethical Trade Audit (SMETA)

The ABB Xiamen facility offers a wide range of low voltage switchgear assembly, including complete packages and services for AC stations. Smart systems and technologies for electrical distribution are supplied to utilities, industrial, and tertiary sector customers.

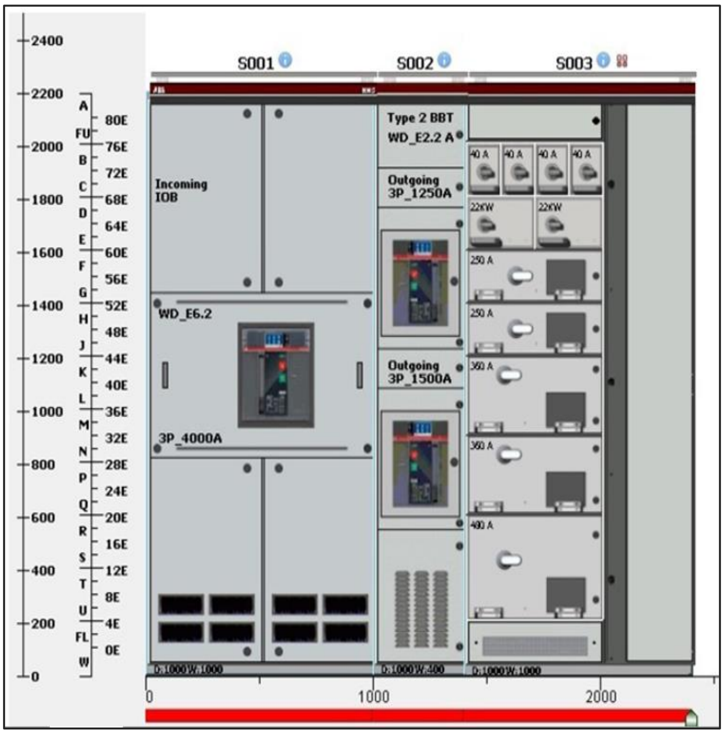
Low Voltage power systems are world widely common electrical energy distribution solutions. It is platform which deliver a stable power distribution as well as reliable protection and control systems. MNS 3.0 switchgear and protection solutions serve as control and protective devices by managing all critical operation conditions and are providing safety for maintenance personnel and equipment. Analyzed MNS 3.0 switchgear configuration is one example of wide MNS 3.0 switchgears possible configurations of current ratings, mechanical and electrical equipment.

The manufacturing and assembly of the MNS 3.0 switchgears along with their equipment takes place in ABB facility in Xiamen, China

MNS Low Voltage Switchgear

AC Low Voltage power systems are world widely common electrical energy distribution solutions. It is platform which deliver a stable power distribution as well as reliable protection and control systems. MNS 3.0 switchgear and protection solutions serve as control and protective devices by managing all critical operation conditions and are providing safety for maintenance personnel and equipment. Analyzed MNS 3.0 switchgear configuration is one example of wide MNS 3.0 switchgears possible configurations of current ratings, mechanical and electrical equipment.

The product declared in this Life Cycle Assessment includes example configuration of MNS 3.0 switchgear with one incomer section and two feeder sections with withdrawable modules. In this analysis, electrical equipment such as ACB, MCCB, Power Contactors, Current Trans-formers cable terminal blocks, connecting wiring and cabling are out of scope. The below picture shows the analyzed configuration of the MNS 3.0



Front layout of MNS 3.0 switchgear

MNS 3.0 product rating:

Product	Rated operational voltage [Ue]	Rated operational current [Ie]	Rated insulation voltage [Ui]	Short Circuit Current [Icw]	Rated Control Supply Voltage (Uimp)
MNS 3.0	Up to 690 V_{ac}	Up to 4000 A	Up to 1000 V	Up to 100 kA	Up to 12 kV

Table 1: Technical characteristics of MNS 3.0 Low Voltage Switchgear
(Refer Technical catalogue for complete details)

Constituent Materials

MNS 3.0 Low Voltage Switchgear

MNS 3.0 Low Voltage Switchgear weighs 1425 kg including its packaging.

Materi-als	Name	IEC 62474 MC	[g]	Weight %
Metals	Steel	M-119	781296.8	54.8%
	Cu and Cu Alloys	M-121	383883.7	26.9%
	Stainless Steel	M-100	26619.0	1.9%
	Aluminium	M-120	11519.9	0.8%
	Zinc Alloys	M-124	8122.5	0.6%
Plastics	Unsaturated Polyester	M-301	43748.6	3.1%
	Polyamide	M-258	34072.4	2.4%
	Rubber	M-259	15732.4	1.1%
	Polycarbonate	M-254	13034.9	0.9%
	Melamine	M-272	11233.0	0.8%
	ABS	M-256	6398.6	0.4%
	PolyVinylChloride	M-250	3481.4	0.2%
	Other Polymers	NA	3223.8	0.2%
Other	Wood	M-340	83000.0	5.8%
	Paper/Cardboard	M-341	68.0	<0.1%
Total			1425435	100.0%

Table 2: Weight of materials MNS 3.0 Low Voltage Switchgear

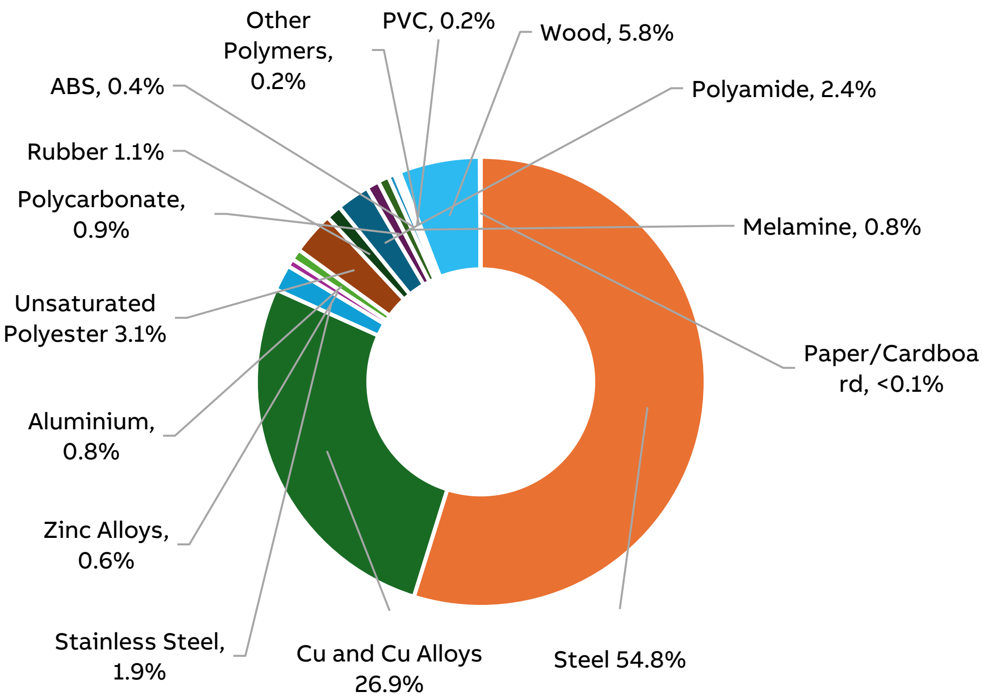


Figure 1: Composition of MNS 3.0 Low Voltage Switchgear

The following tables shows the packaging weights for MNS 3.0 Low Voltage Switchgear

Material	Weight (g)
Wood	**83000**
Polyethylene	**700**
Total	**83700**

Table 3: Weight of materials MNS 3.0 Packaging

No cut-off criteria have been applied to the analysis of the product and its packaging. Additional packaging for semifinished products along the supply chain haven't been considered.

LCA background information

Functional unit and Reference Flow

The functional unit is the reference unit used to quantify the performance of the service delivered by a product to the user. The main purpose of the functional unit is to provide a reference to which inputs and outputs are related in the LCA.
The functional unit is to protect persons against direct contact with live parts and allow measurements, control and protection various electromechanical devices during a service lifetime of 20 years with a demanded current level up to 4000 A. This Product is considered as Passive product-non continuous operation product through which the main current passes during non-continuous operation. The load rate/ rated current considered is 30% and use time rate is 30%.
The Reference Flow of the study is a MNS 3.0 Low Voltage Switchgear (including its packaging).

System boundaries and life cycle stages

The life cycle of the Low Voltage Switchgear, an EEPS (Electronic and Electrical Products and Systems), is a “from cradle to grave” analysis and covers the following main life cycle stages: manufacturing, including the relevant acquisition of raw material, preparation of semi-finished goods, etc. and processing steps; distribution; installation, including the relevant steps for the preparation of the product for use; use including the required maintenance steps within the RSL (reference service life of the product) associated to the reference product; end-of-life stage, including the necessary steps until final disposal or recovery of the product system.

The following table shows the stages of the product life cycle and the information stages according to EN 50693:2019 [3] for the evaluation of electronic and electrical products and systems.

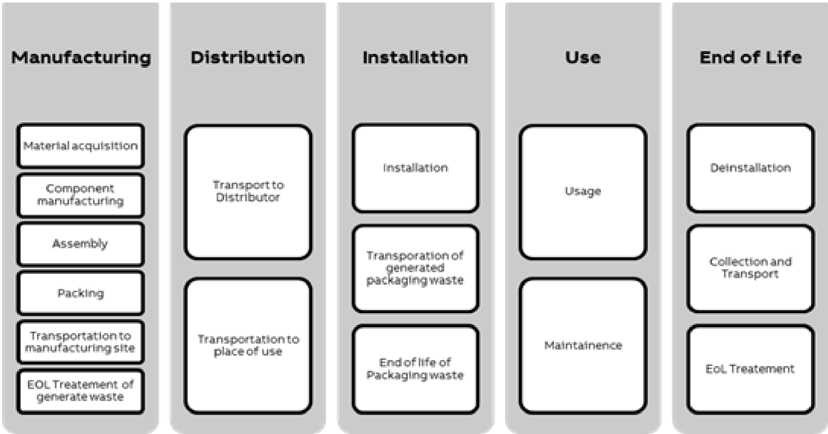


Table 4: Phases for the evaluation of construction products according to EN50693:2019 [3].

Temporal and geographical boundaries

The ABB component suppliers are sourced all over the world. All primary data collected are from 2023, which is a representative production year. Secondary data are also representative for this year, as provided by ecoinvent [6].

The selected ecoinvent [6] processes in the LCA model have a global representativeness, due to the unclear origin of each component. In this way, a conservative approach has been adopted.

Boundaries in the life cycle

As indicated in the PCR capital goods such as buildings, machinery, tools and infrastructure, the packaging for internal transport which cannot be allocated directly to the production of the reference product, may be excluded from the system boundary.

Infrastructures, when present, such as processes deriving from the ecoinvent [6] database have not been excluded.

Data quality

In this LCA, both primary and secondary data are used. Site specific foreground data have been provided by ABB. Main data sources are the bill of materials & drawings which are available on the ERP (SAP) & Windchill. For all processes for which primary are not available, generic data originating from the ecoinvent database [6], allocation cut-off by classification, are used. The ecoinvent database available in the SimaPro software [7] is used for the calculations.

The data quality characterized by quantitative and qualitative aspects, is presented in Appendix 1. Each data quality parameter has been rated according to DQR tables from Chapter 7.19.2.2 of the Product Environmental Footprint Guide v.6.3 to give an indication of geography, technology, and temporal representativeness.

Environmental impact indicators

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. According to “PCR-ed4-EN-2021 09 06” and EN 50693 [3] the environmental impact indicators must be determined using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019 [8].

PCR-ed4-EN-2021 09 06 and the EN 50693:2019 [3] standard establish four indicators for climate change: Climate change (total) which includes all greenhouse gases; Climate change (fossil fuels); Climate change (biogenic) which includes the emissions and absorption of biogenic carbon dioxide and biogenic carbon stored in the product; Climate change (land use) - land use and land use transformation. Other indicators as per the PCR [1].

Allocation rules

Allocation coefficients are based on quantity of panels produced for MNS 3.0 for electricity apart from assembly processes, the whole production line is temperature-regulated throughout the year. The allocation of the total amount of waste generated by the production line and the water consumption is also based on the same criterion.

All these flows have been allocated and divided by the total number of Low Voltage Switchgear produced in 2023.

Limitations and simplifications

Raw materials life cycle stage includes the extraction of raw materials as well as the transport distances to the manufacturing suppliers. These distances are assumed to be 1000 km assuming no specific data available (PCR-ed4-EN-2021_09_06, ch 2.5.3). This distance has been added to the one already included in the market processes used for the model, because of a conservative choice made by the LCA operators.

Surface treatments like galvanizing, tin and silver plating etc have been considered in the LCA model. Scraps for metal working and plastic processes are included as per the PSR [2].

Energy Models

LCA Stage	EN 15804:2012 +A2:2019 module	Energy model	Notes
Raw material extraction and processing	A1-A2	Electricity, {RoW}| market group for | Cut-off Electricity, {GLO}| market group for | Cut-off	Based on materials and supplier's locations
Manufacturing	A3	Electricity, low voltage {CN}| market group for electricity, low voltage | Cut-off, S	CN Country mix
Installation (Packaging EoL)	A5	Electricity, {GLO}| market group for | Cut-off	
Use Stage	B1	Electricity, [country]x | market for | Cut-off, S **	Low voltage, based on 2023 country sales mix
EoL	C1-C4	Electricity, {GLO}| market group for | Cut-off	

Table 5: Energy models used in each LCA stage.

** Please refer the use phase for further description

Inventory analysis

In this LCA, both primary and secondary data are used. Site specific foreground data have been provided by ABB. For data collection, Bills of Material (BOM) extracted from ABB's internal SAP and Windchill ERP were used. They are a list of all the components and assemblies that constitute the finished product, organized by hierarchy level. Each item is matched with its code, quantity, weight, and supplier. The BOMs were then processed, adding material, surface area, volume, and weight data, taken from technical drawings/datasheets. Finally, the manufacturing process and surface treatment were assigned, according to information provided by R&D personnel. Road distances between the suppliers and ABB were calculated using Google Maps, and marine distances using Distances & Time (Searates).

All primary data collected from ABB are from 2023, which was a representative production year. The ecoinvent cut-off by classification system processes [6] are used to represent the LCA model to improve both the inventory and modelling phase of the product, a specific modular dataset framework has been adopted. Raw materials and Manufacturing processes datasets from Ecoinvent database [6] have been clustered and listed inside two distinct mater data tables ABB Raw Materials and ABB Materials & Processes. Data used in the analysis is not older than 10 years.

Manufacturing stage

MNS 3.0 Low -voltage switchgear are composed of a multitude of components, all of which are made from of numerous materials. All the switchgear's components have been modelled according to their specific raw materials and manufacturing processes.

The single use packaging as well as paper documentation are also included in the analysis in the manufacturing stage. ABB receives packaging components from outside suppliers and packages the product before shipping them.

Most of the inputs to the products' manufacturing stage are already produced component parts from the supply chain. In the ABB manufacturing plant, the different components and subassemblies are assembled into the Low Voltage Switchgear. All the semi-finished and ancillary products are produced by ABB's suppliers.

All the specific distances from the last subassembly suppliers' factories up to the ABB manufacturing facility have been calculated.

In the ABB factory, the different components and subassemblies are assembled into the Low Voltage Switchgear. All the semi-finished and ancillary products are produced by ABB's suppliers.
The energy mix used for the production phase is representative for Average energy mix of China of Simapro.

Distribution

The transport distances from ABB manufacturing plant to the distribution centers (regional distribution centers / local sales organizations) have been calculated considering the total products sales mix data from 2023 (SAP ERP sales data as a source).
An additional 1000 km distance by road has been considered to cover the last distribution stage to the end customer (usage location).

As per PSR, additional distance 1000km is considered to account for the last mile delivery distance.

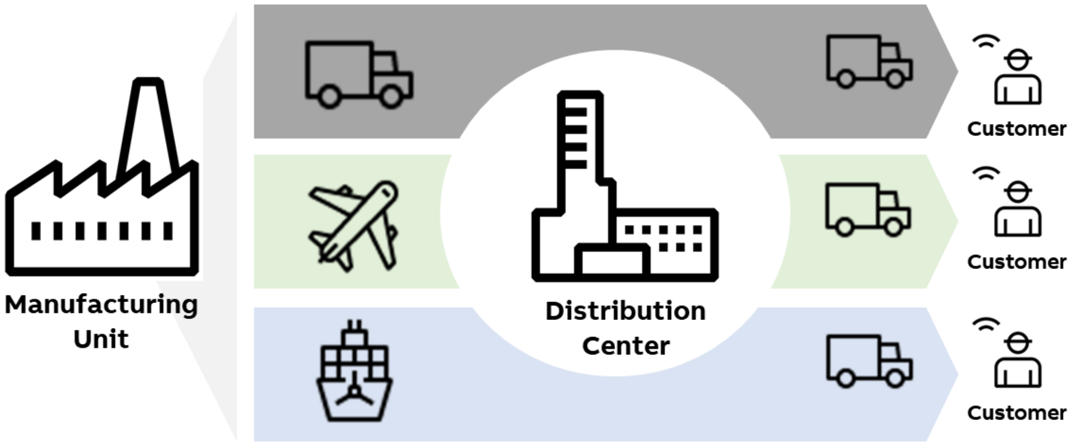


Figure 2: Distribution methodology.

Installation

The installation phase only implies manual activities, and no energy is consumed. This phase also includes the disposal of the packaging of the MNS 3.0 and MNS Rear Low voltage switchgear.

For the disposal of the packaging after installation of MNS 3.0 and MNS Rear at the end of its life, a transport distance of 100 km (according to PSR [2]) was assumed. The actual disposal site is unknown and is managed by the customer. The disposal scenario of packaging has been considered as 100% incineration as per the PSR [2].

Use

Use stage is modelled according to IEC61439-1:2020 Annex K and PSR for Electrical switchgear and control gear Solutions.
The Energy model used for this phase was built based on the 2023 actual sales mix data for the entire product range (SAP ERP sales data as a source). This approach has been taken since this list of countries will be the most representative also for the product.

During the use phase, the MNS 3.0 switchgear unit dissipates some energy due to loss in power circuits i.e. main busbar system. Because switchgear is not working with nominal current all the time, reduction factors from load rate and use-time rate must be applied.

Parameters		MNS 3.0
Iu	[kA]	4
Load rate	[%]	30
h/year	[h]	8760
RSL	[years]	20
Time operating coefficient	[%]	30

Table 6: Use phase parameters.

The formula for the calculation of the electricity consumed is shown below and it is described as follows, where P_{use} is the power consumed by the low voltage switchgear at a given value of current:

$$E_{use}\,[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000}$$

Since no maintenance happens during the use phase, the environmental impacts linked to this procedure have been considered as null in the analysis.

End of life

The end-of-life stage is modelled according to PCR [1] and IEC/TR 62635 [9]. The percentages for end-of-life treatments of materials are taken from IEC/TR 62635 [9].

Since no specific data is available, the transport distances from the place of use to the place of disposal are assumed to be 1000 km (local/domestic transport by lorry, according to PCR [1]).

Environmental impacts

The following table show the environmental impact indicators of the life cycle of a single Low Voltage Switchgear, as indicated by PCR [1] and EN 50693:2019 [3]. The indicators are divided into the contribution of the processes to the different stages (manufacturing, distribution, installation, use and end-of-life).

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use	End of Life
GWP-total	kg CO2 eq	1.79E+04	9.72E+03	2.30E+02	1.24E+02	7.57E+03	2.26E+02
GWP-fossil	kg CO2 eq	1.77E+04	9.66E+03	2.30E+02	2.91E+00	7.54E+03	2.24E+02
GWP-biogenic	kg CO2 eq	1.80E+02	3.27E+01	9.03E-02	1.21E+02	2.45E+01	1.49E+00
GWP-luluc	kg CO2 eq	3.46E+01	2.98E+01	1.19E-01	1.13E-03	4.50E+00	1.53E-01
ODP	kg CFC11 eq	2.26E-04	1.61E-04	3.67E-06	4.78E-08	5.89E-05	2.66E-06
AP	mol H+ eq	3.36E+02	2.96E+02	1.52E+00	2.03E-02	3.79E+01	1.05E+00
EP-freshwater	kg P eq	2.73E+01	2.35E+01	1.73E-02	6.91E-04	3.68E+00	3.53E-02
EP-marine	kg N eq	2.81E+01	1.99E+01	4.84E-01	9.66E-03	7.27E+00	4.20E-01
EP-terrestrial	mol N eq	3.32E+02	2.51E+02	5.23E+00	9.55E-02	7.26E+01	3.17E+00
POCP	kg NMVOC eq	1.02E+02	7.81E+01	1.73E+00	2.71E-02	2.11E+01	1.10E+00
ADP-m&m	kg Sb eq	3.72E+00	3.68E+00	5.74E-04	6.43E-06	3.61E-02	4.04E-04
ADP-fossil	MJ	2.03E+05	1.15E+05	3.24E+03	3.37E+01	8.19E+04	2.77E+03
WDP	m3	5.89E+03	5.00E+03	1.58E+01	1.91E-01	8.60E+02	1.94E+01
PENRE	MJ	2.01E+05	1.13E+05	3.24E+03	3.37E+01	8.19E+04	2.77E+03
PENRM	MJ	2.72E+03	2.72E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.03E+05	1.15E+05	3.24E+03	3.37E+01	8.19E+04	2.77E+03
PERE	MJ	2.91E+04	2.01E+04	3.96E+01	5.60E-01	8.84E+03	1.19E+02
PERM	MJ	1.43E+03	1.43E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	3.05E+04	2.15E+04	3.96E+01	5.60E-01	8.84E+03	1.19E+02
SM	kg	4.44E+02	4.44E+02	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
PET	MJ	2.34E+05	1.37E+05	3.28E+03	3.42E+01	9.07E+04	2.89E+03
FW	m3	1.54E+02	1.30E+02	4.97E-01	9.68E-03	2.29E+01	6.69E-01
HWD	kg	1.99E+00	1.80E+00	2.01E-02	1.98E-04	1.46E-01	1.41E-02
N-HWD	kg	3.83E+03	2.76E+03	2.60E+02	2.97E+00	5.02E+02	3.03E+02
RWD	kg	2.83E-01	1.73E-01	6.79E-04	8.21E-06	1.08E-01	1.72E-03
CfR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MfR	kg	1.69E+03	3.91E+02	0.00E+00	8.30E+01	0.00E+00	1.22E+03
MfER	kg	8.66E+01	0.00E+00	0.00E+00	8.30E+01	0.00E+00	3.56E+00
EN	MJ by energy vector	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Efp	disease inc.	1.43E-03	1.06E-03	2.16E-05	3.07E-07	3.30E-04	2.09E-05
IrHH	kBq U-235 eq	1.17E+03	6.78E+02	2.86E+00	3.39E-02	4.79E+02	7.03E+00
ETX FW	CTUe	3.23E+05	3.06E+05	1.86E+03	2.31E+01	1.40E+04	1.42E+03
HTX CE	CTUh	6.29E-05	6.02E-05	9.76E-08	4.15E-09	2.06E-06	5.42E-07
HTX N-CE	CTUh	3.88E-03	3.75E-03	3.00E-06	1.97E-07	9.26E-05	3.44E-05
IrLS	Pt	1.56E+05	1.36E+05	3.04E+03	2.63E+01	1.44E+04	2.43E+03

Table 7: Impact indicators for MNS 3.0 Low Voltage Switchgear

Impact category	Unit	MNS 3.0
Biogenic Carbon content of the product	kg	3.37E-02
Biogenic Carbon content of the associated packaging	kg	6.83E+01

Environmental impact indicators

GWP-total	Global Warming Potential total (Climate change)
GWP-fossil	Global Warming Potential fossil
GWP-biogenic	Global Warming Potential biogenic
GWP-luluc	Global Warming Potential land use and land use change
ODP	Depletion potential of the stratospheric ozone layer
AP	Acidification potential
EP-freshwater	Eutrophication potential - freshwater compartment
EP-marine	Eutrophication potential - fraction of nutrients reaching marine end compartment
EP-terrestrial	Eutrophication potential -Accumulated Exceedance
POCP	Formation potential of tropospheric ozone
ADP-m&m	Abiotic Depletion for non-fossil resources potential
ADP-fossil	Abiotic Depletion for fossil resources potential, WDP
WDP	Water deprivation potential.

Resource use indicators

PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw material
PERM	Use of renewable primary energy resources used as raw material
PERT	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material
PENRM	Use of non-renewable primary energy resources used as raw material
PENRT	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PET	Total use of primary energy in the lifecycle

Secondary materials, water and energy resources

SM	Use of secondary materials
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	FW: Net use of fresh water

Waste category indicators

HWD	Hazardous waste disposed
N-HWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed

Output flow indicators

CfR	Component for reuse
MfR	Materials for recycling
MfER	Materials for energy recovery
EN	Exported Energy

Other indicators

Efp	Emissions of Fine particles
IrHH	Ionizing radiation, human health
ETX FW	Ecotoxicity, freshwater
HTX CE	Human toxicity, carcinogenic effects
HTX N-CE	Human toxicity, non-carcinogenic effects
IrLS	Impact related to Land use / soil quality

Table 8: Inventory flow other indicators

Additional environmental information

According to the waste treatment scenario calculation in Simapro [7], based on the recycling rate in the technical report IEC/TR 62635 Edition 1.0 [9] Table D.6, the following recyclability potentials were calculated. The recyclability potential is calculated based on the product weight (excluding packaging).

Product	Recyclability potential
MNS 3.0	89.6%

Table 10: Recyclability potential of MNS 3.0 Low Voltage Switchgear

References

[1] PCR “PEP-PCR-ed4-EN-2021_09_06” - Product Category Rules for Electrical, Electronic and HVAC-R Products (published: 6th September 2021)

[2] PSR “PSR-0005-ed3.1-EN-2023 12 08” - SPECIFIC RULES FOR Electrical switchgear and control gear Solutions

[3] EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems

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

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

[6] ecoinvent v3.9 (2023). ecoinvent database version 3.9 - (https://ecoinvent.org/)

[7] SimaPro Software version 9.5.0.1 - PRé Sustainability

[8] UNI EN 15804:2012+A2:2019: Sustainability of constructions - Environmental product declarations (September 2019).

[9] IEC/TR 62635 - Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment - Edition 1.0 2012-10