

EPD



# Environmental Product Declaration

Medium-voltage Air-insulated switchgear UniSec SBC 24kV 630A

Production site: Dalmine; Italy



DOCUMENT KIND Environmental Product Declaration	IN COMPLIANCE WITH ISO 14025 and EN 50693			
PROGRAM OPERATOR The Norwegian EPD Foundation	PUBLISHER The Norwegian EPD Foundation			
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OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 2RDA045997	REV. A	LANG. EN	PAGE 1/16

<b>EPD Owner</b>	ABB Switzerland Ltd, Group Technology Management		
<b>Organization No.</b>	CHE-101.538.426		
<b>Manufacturer name and address</b>	ABB S.p.A. Via Friuli, 4, 24044 Dalmine, Italy		
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<b>Program operator</b>	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway phone: +47 23 08 80 00, email: post@epd-norge.no		
<b>Declared product</b>	UniSec of Specific configuration – Feeder with circuit-breaker and switch-disconnector SBC 24kV 630A rated current, 25kA		
<b>Product description</b>	UniSec switchgear is used in medium voltage secondary power distribution systems. It is ideal for use in transformer substations, for controlling and protecting feeders and power transformers, UniSec is the ABB solution for a fully automated power distribution network.		
<b>Functional unit</b>	To distribute electric power, during a service of 20 years with a use rate of 100 % and a load rate of 35 %		
<b>Reference flow</b>	A single UniSec SBC 24.06.25. Examined reference flow is also equipped with a Switch disconnector GSEC, a Circuit Breaker VD4/R, Current Transformer TPU 63.15 and Voltage Transformer TJC6. Low voltage compartment (LVC) is considered without customer specific materials. Reference flow is modeled including related accessories and packaging.		
<b>CPC code</b>	46211 - Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits, for a voltage exceeding 1000 V		
<b>Independent verification</b>	Independent verification of the declaration and data, according to ISO 14025:2010  <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL  Independent verifier approved by EPD-Norge: Elisabet Amat  Signature: 		
<b>Approved by</b>	Håkon Hauan, CEO EPD-Norge  Signature: 		
<b>Reference PCR and PSR</b>	EN 50693:2019 – Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. EPDIItaly007 – Electronic and Electrical Products and Systems, Rev. 3, 2023/01/13. EPDIItaly015 – Electronic and Electrical Products and Systems – Switchboards, Rev. 1.5 2022/03/22.		
<b>Program instructions</b>	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019, Version 3.0, 2019/04/24.		
<b>LCA study</b>	This EPD is based on the LCA study described in the LCA report 2RDA045988.		
<b>EPD type</b>	Specific product		
<b>EPD scope</b>	Cradle-to-grave		
<b>Product RSL</b>	20 years		
<b>Geographical representativeness</b>	Manufacturing (suppliers): Global	Manufacturing (ABB): Italy	Downstream: Europe
<b>Reference year</b>	2022		
<b>LCA software</b>	SimaPro 9.4.0.2 (2022)		
<b>LCI database</b>	Ecoinvent v3.8 (2021)		
<b>Comparability</b>	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.		
<b>Liability</b>	The owner of the declaration shall be liable for the underlying information and evidence. EPD-Norge shall not be liable with respect to manufacturer, life cycle assessment data, and evidence.		

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## Sustainability at ABB

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At ABB, we actively contribute to a more sustainable world, leading by example in our own operations and partnering with customers and suppliers to enable a low-carbon society, preserve resources, and promote social progress.

Learn more on our website [global.abb/group/en/sustainability](https://global.abb/group/en/sustainability) or scan the QR code.



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## General Information

The product declared in this Environmental Product Declaration is the UniSec SBC 24kV 630A 25kA, including 3 Current Transformer, 3 Voltage Transformer a Circuit Breaker VD4/R, a Switch disconnector GSec and packaging.

General technical specifications of the product are presented below.

Technical information			
	SBC	VD4/R	GSec
Rated voltage [kV]	24	24	24
Rated current [A]	630	630	630
Rated short circuit breaking current [kA 1s]	25	20	20
Rated frequency [Hz]	50/60	50/60	50/60

The UniSec SBC is manufactured by the ABB ELDS (Electrification Distribution Solutions) located in Dalmine (Italy).

The manufacturing site is certified according to the following standards:

- ISO 9001:2015 – Quality Management Systems
- ISO 14001:2015 – Environmental Management Systems
- ISO 45001:2018 – Occupational Health and Safety Management Systems

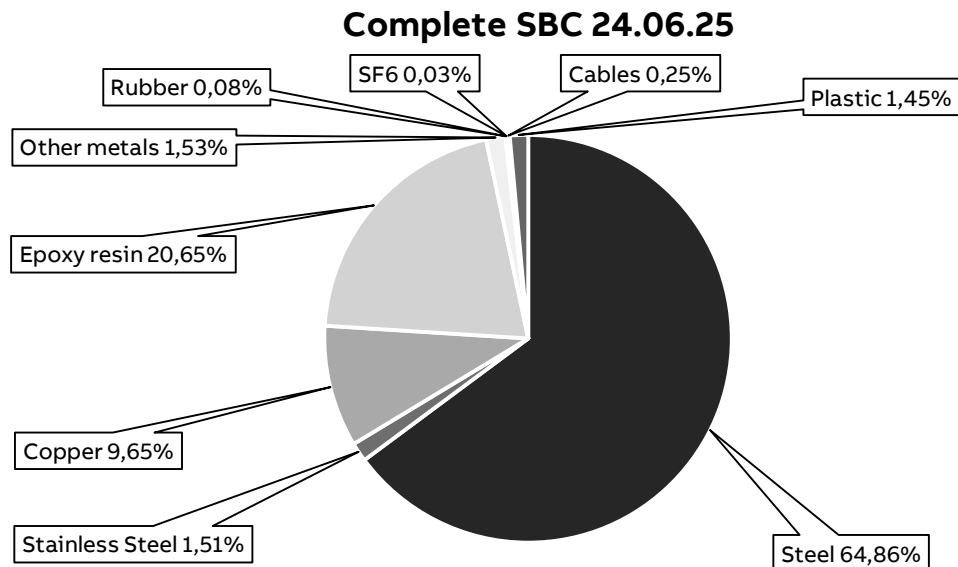
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## Constituent Materials

The medium-voltage air-insulated switchgear UniSec SBC 24.06.25 weighs 638.29 kg with sub-ABB components Gsec and Circuit Breaker VD4/R 24.06.20, and the constituent materials are presented below.

Type	Material	Weight [kg]	%
Plastics	Polycarbonate	1.06	0.17
	ABS	1.97	0.31
	Polyethylene	0.05	0.01
	Polypropylene	0.15	0.02
	Polyamide	0.96	0.15
	Polyoxymethylene	0.59	0.09
	Other Plastic	4.47	0.70
Metals	Steel	413.99	64.86
	Stainless Steel	9.61	1.51
	Copper	61.61	9.65
	Other Metals	9.74	1.53
Others	SF <sub>6</sub>	0.20	0.03
	Epoxy resin	131.81	20.65
	Rubber	0.49	0.08
	Cables	1.59	0.25
<b>Total</b>		<b>638.29</b>	<b>100</b>

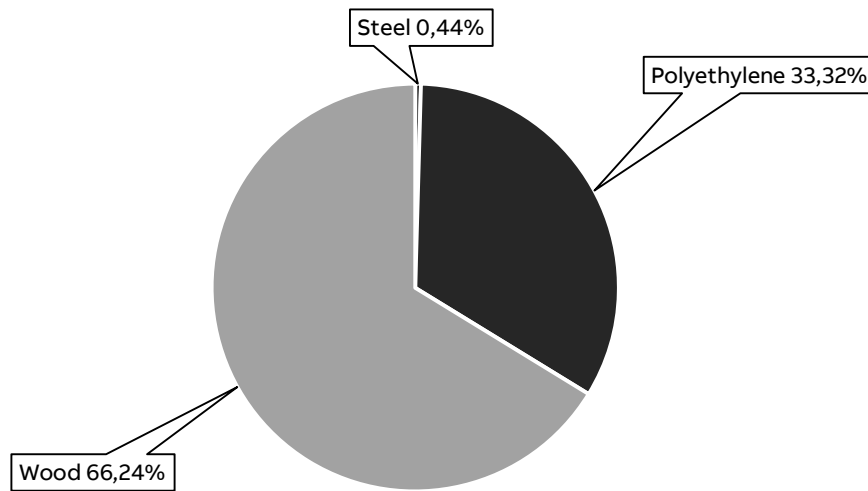


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The single use packaging is also included in the analysis, specifically in the manufacturing core stage. The packaging is common for all the panels of UniSec switchgear; it is composed of steel fixing brackets, a protective film and a wooden pallet, resulting in a total weight of 26,12 kg.

Type	Material	Weight [kg]	%
Plastics	Polyethylene	8.71	33.32
Metals	Steel	0.11	0.44
Others	Wood	17.3	66.24
<b>Total</b>		26.12	100

**SBC 24.06.25 Packaging**





# LCA Background Information

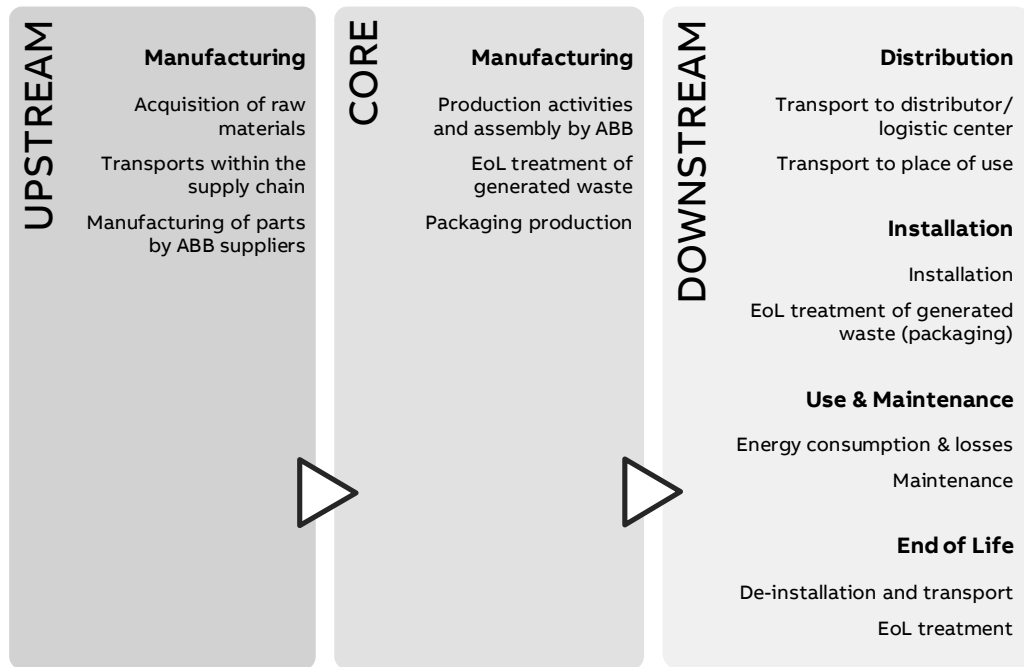
## Functional Unit

The functional unit to this study is a switchgear, which is used to distribute electric power, during a service of 20 years with a use rate of 100 % and a load rate of 35 %. The reference flow is a single UniSec SBC 24.06.25 device, including related accessories and packaging.

Note, the reference service life (RSL) of 20 years is a theoretical period selected for calculation purposes only – this is not representative for the minimum, average, nor actual service life of the product.

## System Boundaries

The life cycle assessment of the UniSec SBC, an EEPs (Electronic and Electrical Products and Systems), is a “cradle-to-grave” analysis. The figure below shows the product life cycle stages and the information considered in the LCA.



In terms of exclusions from the system boundary, according to Standard/PCR, capital goods such as machinery, tools, buildings, infrastructure, packaging for internal transports, and administrative activities, which cannot be allocated directly to the production of the reference product, are excluded.

Infrastructures, when present, such as in processes deriving from the ecoinvent database, have not been excluded. Scraps for metal working and plastic processes are also included when already defined in ecoinvent.

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## Temporal and geographical boundaries

In terms of temporal boundaries, all primary data collected from ABB are from 2022, which is considered a representative production year. Secondary data are provided by ecoinvent v3.8 which was released in 2021.

In terms of geographical boundaries, the materials and components used in the production of the UniSec SBC are globally sourced. The supply chains are often complex and can extend across multiple countries and continents. Therefore, materials and/or background processes with global representativeness are selected from ecoinvent. Thus, a conservative approach is adopted.

## Data quality

Both primary and secondary data are used. The main sources for primary data are the bill of materials and technical drawings, while site specific foreground data are provided by ABB. Furthermore, information and data obtained from other LCA studies is also used. This includes the LCA of GSec (ABB document ID: 2RDA045546, rev. A), and the EPD of the VD4/R (ABB document ID: 2RDA045506, rev. A). Information about the power losses for Current Transformer have been provided by the manufacturer.

For all processes for which primary data are not available, generic data originating from the ecoinvent v3.8 database, “allocation, cut-off by classification”, are used. The LCA software used for the calculations is SimaPro 9.4.0.2.

## Environmental impact indicators

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. In accordance with the PCR EPDItaly007, the environmental impact indicators are determined by using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019.

## Allocation rules

The utility consumption and waste generation of ABB’s plant in the manufacturing stage are allocated to the production of one UniSec SBC by using allocation rules. This is done by allocating electricity to surface area and production volume, heating and waste to surface area.

Water is allocated directly to the employees of the line involved in the study.

For the end-of-life allocation, the “Polluter Pays” principle is adopted according to what is defined in the CEN/TR 16970 standard, as required by the PCR EPDItaly007. This means, waste treatment processes are allocated to the product system that generates the waste until the end-of-waste state is reached. The environmental burdens of recycling and energy recovery processes are therefore allocated to the product system that generates the waste, while the product system that uses the exported energy and recycled materials receives it burden-free. However, the potential benefits and avoided loads from recovery and recycling processes are not considered because it is not required by EPDItaly007.

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## Cut-off criteria

The raw material life cycle stage includes the extraction of raw materials but neglects the production of various components at ABB's suppliers (glue, grease and adhesive), as their mass represents less than 2% of that of the whole product, as stated in the paragraph of cut-off criteria of EPDIItaly-015: "Materials making up the switchboard itself whose total mass does not exceed 2% of the total weight of the device".

This same applies for packaging, where small parts such sticking labels are even a smaller fraction of the total mass.

Surface treatments like tin plating, and painting have been considered in the LCA model. Black oxide and phosphate conversion coating (negligible usage) have been excluded due to the model complexity and unavailability of reference data.

Scraps for metal working and copper transformation, considered as waste from the internal transformation process from raw material to finished product, were calculated and included in the LCA model.

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# Inventory Analysis

## Manufacturing stage

As seen from the constituent materials, steel and epoxy resin are the most frequently used materials, followed by copper and stainless steel.

Using the ecoinvent database, the steels are mainly modelled with *Steel, low-alloyed {GLO} market for | Cut-off, S* and the epoxy resin is mainly modelled with ecoinvent material *Epoxy resin, liquid {RoW} market for epoxy resin, liquid | Cut-off, S*. To account for the production activities of metal and plastic parts, *Hot rolling* and *Injection molding* are the most frequently used processes. Surface treatments are also included, and the most common surface treatments are *Zinc coat, coils {GLO} market for | Cut-off, S*; *Zinc coat, pieces {GLO} market for | Cut-off, S*, and *Powder coat, steel {GLO} market for | Cut-off, S*.

Supply chain transports are added as far as data is available between ABB, the suppliers, and sub-suppliers. Only primary suppliers are considered. The rest of the transports are assumed to already be included in ecoinvent's "market for"-processes.

For the ABB manufacturing site, which is considered in the core manufacturing stage, utility consumption and waste generation are allocated to the production of one UniSec SBC according to the defined allocation rules. The packaging materials and accessories associated with the product are also considered in the core manufacturing stage.

## Distribution

The transport distance from ABB's plant to the site of installation is assumed to be 3500 km intracontinental transport by lorry, as suggested in EN 50693, and the scenario is representative for Europe.

## Installation

The installation phase only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the packaging materials used.

The end-of-life scenario for packaging materials is based on "Packaging waste by waste management operations" by Eurostat (2020), which is representative for Europe. A transport distance of 100 km by lorry is assumed as actual location of disposal is unknown.

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## Use

The use stage considers the power losses and SF<sub>6</sub> losses over the reference service life of 20 years as defined in the functional unit. This is calculated using the following formula, according to PCR EPDItaly015 – “Electronic and electrical products and systems - Switchboards”:

$$E_{use}[kWh] = \frac{(P_{use\ UniSec} + P_{use\ CTs}) * 8760 * RSL}{1000}$$

$$E_{use}[kWh] = \frac{(16.55W + 14.43W) * 8760\ hours * 20\ years}{1000} = 5427.13\ kWh$$

Where:

- $E_{use}$  = Total energy use over the reference service life
- $P_{use\ UniSec}$  = Reference power consumption in watts for the switchgear
- $P_{use\ CTs}$  = Reference power consumption in watts for 3 Current Transformers
- $RSL$  = Reference Service Life in years
- 8760 is the number of hours in a year
- 1000 is the conversion factor from W to kW

The current and the load factor used in the scenario are: Ir=630 A; LF=35%.

Because this product is sold globally and is not limited to any specific country, the latest energy mix of the European Union is adopted as suggested by the standard EN 50693. The emission factor of the energy mix is presented below.

Energy mix	Source	Amount	Unit
European energy mix; <i>Electricity, medium voltage [RER] market group for   Cut-off, S</i>	Ecoinvent v3.8	0.405	kg CO <sub>2</sub> -eq./kWh

Maintenance occurs during the use phase. From the environmental impacts point of view, it can be omitted from the analysis due to the fact that negligible energy is consumed. The subcomponent GSec is a sealed pressured container and the leakage is considered in the use stage.

## End of life

Decommissioning of the product only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the product.

The end-of-life scenario for the product is based on IEC/TR 62635 (Annex D.3), which is representative for Europe. A conservative approach is adopted by using the rates given for materials that go through a separation process, except for electronics for which selective treatment is assumed, and this includes the losses in the separation processes. A transport distance of 100 km by lorry is assumed as actual location of disposal is unknown.

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# Environmental Indicators

## UniSec SBC 24.06.25

Impact category	Unit	Total	UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life	
<b>GWP – total</b>	kg CO <sub>2</sub> eq.	6.32E+03	3.31E+03	9.72E+01	3.84E+02	2.02E+01	2.31E+03	2.05E+02
<b>GWP – fossil</b>	kg CO <sub>2</sub> eq.	6.11E+03	3.27E+03	1.09E+02	3.84E+02	1.21E+01	2.23E+03	1.08E+02
<b>GWP – biogenic</b>	kg CO <sub>2</sub> eq.	1.96E+02	3.42E+01	-1.23E+01	3.48E-01	8.11E+00	6.93E+01	9.67E+01
<b>GWP – luluc</b>	kg CO <sub>2</sub> eq.	9.24E+00	3.94E+00	7.15E-02	1.52E-01	1.08E-03	5.02E+00	5.87E-02
<b>ODP</b>	kg CFC-11 eq.	4.65E-04	2.52E-04	1.26E-05	8.95E-05	2.28E-07	1.05E-04	5.22E-06
<b>AP</b>	mol H+ eq.	8.28E+01	6.88E+01	3.21E-01	1.94E+00	8.56E-03	1.15E+01	2.90E-01
<b>EP – freshwater</b>	kg P eq.	6.84E+00	4.65E+00	1.52E-02	2.49E-02	2.54E-04	2.13E+00	2.05E-02
<b>EP – marine</b>	kg N eq.	8.12E+00	5.25E+00	7.54E-02	6.69E-01	1.01E-02	1.98E+00	1.32E-01
<b>EP – terrestrial</b>	mol N eq.	1.35E+02	1.08E+02	8.22E-01	7.32E+00	3.25E-02	1.73E+01	8.26E-01
<b>POCP</b>	kg NMVOC eq.	2.58E+01	1.85E+01	2.49E-01	2.09E+00	9.46E-03	4.72E+00	2.23E-01
<b>ADP – minerals and metals</b>	kg Sb eq.	1.18E+00	1.17E+00	6.92E-04	1.35E-03	8.42E-06	4.99E-03	7.38E-04
<b>ADP – fossil</b>	MJ, net calorific value	9.72E+04	4.34E+04	2.07E+03	5.85E+03	2.23E+01	4.53E+04	6.37E+02
<b>WDP</b>	m <sup>3</sup> eq.	2.23E+03	1.66E+03	4.55E+01	1.76E+01	3.15E-01	4.92E+02	1.06E+01

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-marine compartment; EP-terrestrial: Eutrophication potential-accumulated exceedance; POCP: Formation potential of tropospheric ozone; ADP-minerals & metals: Abiotic Depletion for non-fossil resources potential; ADP-fossil: Abiotic Depletion for fossil resources potential; WDP: Water deprivation potential.

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ENVIRONMENTAL PRODUCT DECLARATION

Resource use parameters	Unit	Total	UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life	
PENRE	MJ, low cal. value	9.52E+04	4.17E+04	1.70E+03	5.85E+03	2.23E+01	4.52E+04	6.37E+02
PERE	MJ, low cal. value	1.38E+04	4.74E+03	1.07E+03	8.25E+01	7.62E-01	7.82E+03	5.43E+01
PENRM	MJ, low cal. value	1.99E+03	1.62E+03	3.69E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	9.28E+00	0.00E+00	9.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	9.72E+04	4.34E+04	2.07E+03	5.85E+03	2.23E+01	4.52E+04	6.37E+02
PERT	MJ, low cal. value	1.38E+04	4.74E+03	1.08E+03	8.25E+01	7.62E-01	7.82E+03	5.43E+01
FW	m <sup>3</sup>	8.66E+01	4.60E+01	1.80E+00	6.52E-01	9.69E-03	3.78E+01	4.00E-01
MS	kg	1.80E+02	1.79E+02	7.83E-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	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

PENRE: Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; PERE: Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM: Use of non-renewable primary energy resources used as raw material; PERM: Use of 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); PERT: Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW: Net use of fresh water; MS: Use of secondary materials; RFS: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels.

Waste production indicators	Unit	Total	UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life	
HWD	kg	9.52E+04	4.17E+04	1.70E+03	5.85E+03	2.23E+01	4.52E+04	6.37E+02
NHWD	kg	1.38E+04	4.74E+03	1.07E+03	8.25E+01	7.62E-01	7.82E+03	5.43E+01
RWD	kg	1.99E+03	1.62E+03	3.69E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	9.28E+00	0.00E+00	9.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.72E+04	4.34E+04	2.07E+03	5.85E+03	2.23E+01	4.52E+04	6.37E+02
CRU	kg	1.38E+04	4.74E+03	1.08E+03	8.25E+01	7.62E-01	7.82E+03	5.43E+01
ETE	MJ	8.66E+01	4.60E+01	1.80E+00	6.52E-01	9.69E-03	3.78E+01	4.00E-01
EEE	MJ	1.80E+02	1.79E+02	7.83E-02	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; MER: materials for energy recovery; MFR: material for recycling; CRU: components for reuse; ETE: exported thermal energy; EEE: exported electricity energy.

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## Additional Environmental Information

### Recyclability potential

The recyclability potential of the UniSec SBC is calculated by dividing “MFR: material for recycling” in the end-of-life stage by the total weight of the product. As a result, the recyclability potential of the product is 72 %

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

Production mix from import, medium voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process.

Energy mix	Data source	Amount	Unit
<i>ABB_Electricity mix Dalmine factory {IT}_Bio38%-Solar36%-Hydro23%- Other3%_2022</i>	Ecoinvent v3.8	0.169	kg CO <sub>2</sub> -eq/kWh

### Dangerous substances

The product contains no substances given by the REACH Candidate list.

### Indoor environment

The product meets the requirements for low emissions.

### Carbon footprint

Carbon footprint has not been worked out for the product.

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