EPD

Environmental Product Declaration

Medium Voltage Air-insulated switchgear UniSec SDC 12-17,5-24 kV 630A

Production site: Dalmine, Italy

DOCUMENT KIND	IN COMPLIANCE WITH			
Environmental Product Declaration	ISO 14025 and EN 50693			
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EPD Owner	ABB Switzerland Ltd, Group Technology Management		
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Manufacturer name and address	ABB S.p.A. Via Friuli, 4, 24044 Dalmine, Italy		
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Program operator	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway phone: +47 23 08 80 00, email: post@epd-norge.no		
Declared product	UniSec SDC panels – Feeder with SF6 switch-disconnector, 12/17,5/24kV 630A rated current and 25kA Short Circuit Current		
Product description	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, for infrastructure, airports, etc. UniSec is the ABB solution for a fully automated power distribution network.		
Functional unit	The functional unit of this study is a switchgear with main function of protect and distribute electric power, during a service life of 20 years with a use rate of 100% and a load factor of 35%.		
Reference flow	A single UniSec SDC 12/17,5.06.25. Examined reference flow is also equipped with a SF6 Switch disconnector GSEC. Low voltage compartment (LVC) is considered without customer specific materials. Reference flow is modeled including related accessories and packaging.		
CPC code	46211 - Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits, for a voltage exceeding 1000 V		
Independent verification	Independent verification of the declaration and data, according to ISO 14025:2010 ☐ INTERNAL ☒ EXTERNAL Independent verifier approved by EPD-Norge: Elisabet Amat Signature: 		
Approved by	Håkon Hauan, CEO EPD-Norge Signature: 		
Reference PCR	EN 50693:2019 – Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. EPDItaly007 – Electronic and Electrical Products and Systems, Rev. 3.0, 2023/01/13. EPDItaly015 – Electronic and Electrical Products and Systems – Switchboards, Rev. 1.5, 2022/02/23.		
Program instructions	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019, Version 3.0, 2019/04/24.		
LCA study	This EPD is based on the LCA study described in the LCA report 2RDA046792.		
EPD type	Specific product		
EPD scope	Cradle-to-grave		
Product RSL	20 years		
Geographical representativeness	Manufacturing (suppliers): Global	Manufacturing (ABB): Italy	Downstream: Europe
Reference year	2022		
LCA software	SimaPro 9.5 (2023)		
LCI database	Ecoinvent v3.9.1 (2022)		
Comparability	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.		
Liability	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

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.

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 or scan the QR code.

General Information

The products declared in this Environmental Product Declaration is the UniSec SDC 12/17,5/24kV 630A 25kA with different height (1700mm or 2000mm) and different width (375mm, 500mm or 750mm), included related accessories and packaging.

General technical specifications of the product are presented below.

SDC	Rated Voltage (kV)	Rated Current (A)	Short Circuit Current (kA)	Frequency (Hz)	Width (mm)	Height (mm)
12/17.06.25	12 / 17,5	630	25	50/60	375	1700
12/17.06.25	12 / 17,5	630	25	50/60	500	1700
12/17.06.25	12 / 17,5	630	25	50/60	750	1700
12/17.06.25	12 / 17,5	630	25	50/60	375	2000
12/17.06.25	12 / 17,5	630	25	50/60	500	2000
12/17.06.25	12 / 17,5	630	25	50/60	750	2000
24.06.25	24	630	25	50/60	375	1700
24.06.25	24	630	25	50/60	500	1700
24.06.25	24	630	25	50/60	750	1700
24.06.25	24	630	25	50/60	375	2000
24.06.25	24	630	25	50/60	500	2000
24.06.25	24	630	25	50/60	750	2000

The SDC panels are manufactured by the ABB site located in Dalmine, Italy.

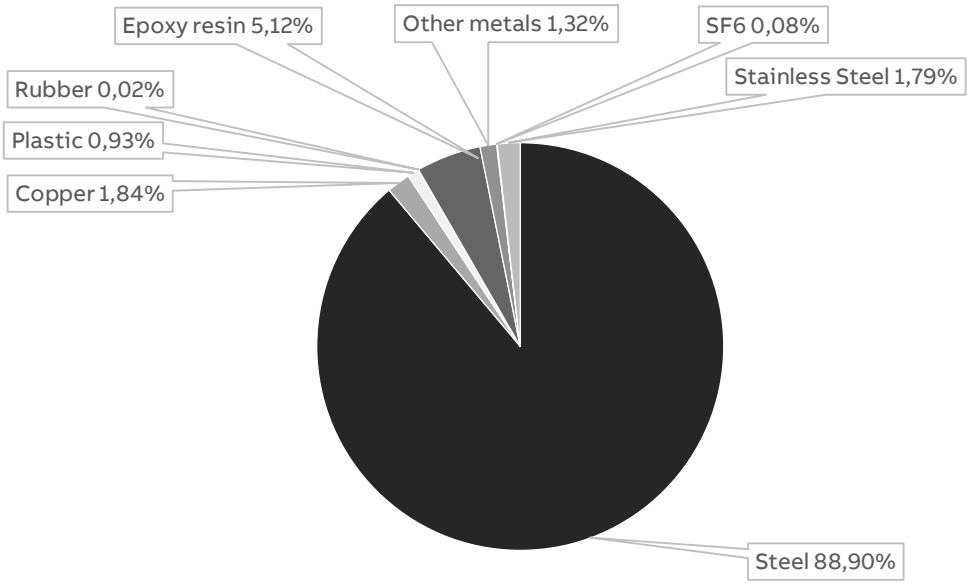
The manufacturing site is certified according to the following standards:

- ISO 9001:2015 – Quality Management Systems
- ISO 14001:2015 – Environmental Management Systems
- ISO 45001:2018 – Occupational Health and Safety Management Systems
- ISO 50001:2018 – Energy management systems

Constituent Materials

The UniSec SDC 12/17,5kV weighs 250,29 kg, including sub-ABB component switch disconnector GSec 24.06.20 (without packaging). The constituent materials and weights are presented below.
The declared functional unit of the reference flow of this study is a single SDC with a rating of 12/17,5kV, and the related main dimensions are 500mm for width and 1700mm for height.

Type	Material	Weight [kg]	Weight %
Plastics	Polycarbonate	1.03	0.41%
	ABS	0.22	0.09%
	Polyethylene	0.002	0.00%
	Polyoxymethylene	0.59	0.24%
	Other plastic	0.14	0.06%
	Polyamide	0.34	0.14%
Metals	Steel	222.51	88.90%
	Stainless Steel	4.48	1.79%
	Copper	4.61	1.84%
	Other metals	3.31	1.31%
Others	Rubber	0.05	0.02%
	Epoxy resin	12.82	5.12%
	SF6	0.2	0.08%
Total		**250.29**	**100%**



The packaging for the reference flow SDC 12/17,5kV weighs 15.23kg, and the constituent materials are presented below.

Description	Material	Weight [kg]	Weight %
Protection for packaging	Polyethylene foam	2.30	15.08%
Pallet	Wood	12.80	84.05%
Plate and screw	Steel	0.13	0.87%
Total		**15.23**	**100%**

LCA Background Information

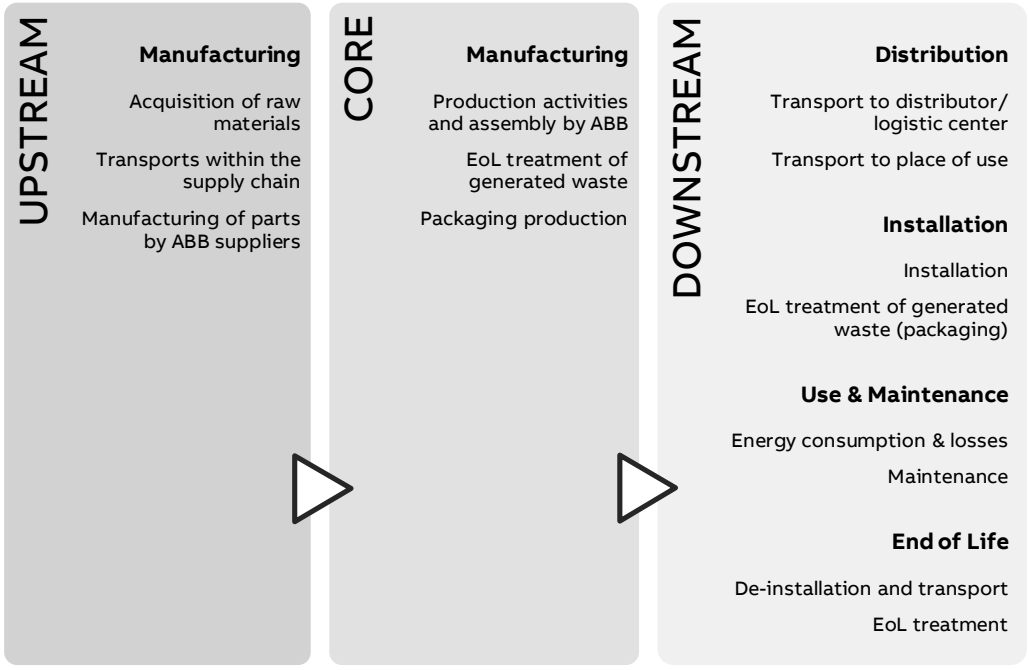
Functional Unit

The functional unit of this study is a switchgear with main function of protect and distribute electric power, with a load factor of 35% and a use rate of 100%, during a service life of 20 years in Europe. The reference flow is a single SDC 12/17,5kV with a height of 1700mm and a width of 500mm, 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 of the minimum, average, nor actual service life of the product.

System Boundaries

The life cycle assessment of the reference flow SDC 12/17,5kV, 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.

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 v3.9.1 which was released in 2022.

In terms of geographical boundaries, the materials and components used in the production of the reference flow SDC 12/17,5kV are globally sourced. The supply chains are often complex and can extend across multiple countries and continents. Therefore, materials and 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 are also used. This includes the LCA of GSec (ABB document ID: 2RDA045546, rev. B) and the EPD of the Current Transformer TPU 43.13 (ABB document ID: 1VLG101084, rev. A).

For all processes for which primary data are not available, generic data originating from the ecoinvent v3.9.1 database, “allocation, cut-off by classification”, are used. The LCA software used for the calculations is SimaPro 9.5.

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 at the ABB manufacturing site is allocated to the production of one reference flow SDC 12/17,5kV 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 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.

Cut-off criteria

According to PCR EPDItaly007 “Electronic and electrical products and systems”, the cut-off criteria can be set to a maximum of 2% of the overall environmental impacts. In this LCA, components like adhesive, glue and grease have been excluded as their weights are negligible. This same applies to packaging, where small parts such as sticking labels are even 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.

Inventory Analysis

Manufacturing stage

As presented in chapter Constituent Materials, low-alloyed steel is the most frequently used material, followed by epoxy resin, copper and stainless steel.

Using the ecoinvent database, the steels are mainly modelled with *Steel, low-alloyed {GLO}| market for* and 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, *Metal working, average* and *Injection molding* are the most frequently used processes. Surface treatments are also included, and the most common surface treatment is *Zinc coat, pieces {GLO}| market for.*

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 the reference flow SDC 12/17,5kV 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 the ABB manufacturing site to the site of installation is assumed to be 300 km over land, as suggested by the EPDItaly015, as the actual customer's distance is unknown. The selected ecoinvent process is *transport, freight, lorry 16-32 metric ton, EURO4 {RER}*.

Installation

The installation phase implies manual activities as well as the support of a lifting machinery, whose energy consumption is negligible. 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 with the ecoinvent process *transport, freight, lorry 16-32 metric ton, EURO4 {RER}*, as actual location of disposal is unknown.

Use

The use stage considers the reference power 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":

$$E_{use}[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000} = 806.25\ kWh$$

Where:

- E_{use} = Total energy use over the reference service life
- P_{use} = Reference power consumption in watts
- *RSL* = Reference Service Life in years
- α = Use time rate
- 8760 is the number of hours in a year
- 1000 is the conversion factor from W to kW

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; *Electricity, medium voltage [RER]| market group for | Cut-off, S*	Ecoinvent v3.9.1	0.361	kg CO_2-eq./kWh

Maintenance was not considered because it does not imply any relevant use of material or energy.

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.

Environmental Indicators

UniSec SDC 12/17,5kV

The environmental indicators for the reference flow SDC 12/17,5kV with an height of 1700mm and a width of 500mm are presented.

Impact category	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO_2 eq.	1.58E+03	9.42E+02	1.84E+02	1.49E+01	9.16E+00	3.92E+02	3.35E+01
GWP – fossil	kg CO_2 eq.	1.55E+03	9.33E+02	1.89E+02	1.49E+01	3.32E+00	3.81E+02	2.55E+01
GWP – biogenic	kg CO_2 eq.	2.73E+01	8.37E+00	-5.27E+00	1.36E-02	5.84E+00	1.03E+01	7.98E+00
GWP – luluc	kg CO_2 eq.	1.99E+00	1.11E+00	1.42E-01	7.28E-03	4.28E-04	7.02E-01	3.33E-02
ODP	kg CFC-11 eq.	3.70E-05	2.61E-05	5.26E-06	3.26E-07	1.25E-08	5.04E-06	2.93E-07
AP	mol H+ eq.	1.99E+01	1.73E+01	9.86E-01	6.17E-02	3.44E-03	1.41E+00	1.24E-01
EP – freshwater	kg P eq.	9.84E-01	6.34E-01	8.49E-02	1.05E-03	1.04E-04	2.56E-01	8.44E-03
EP – marine	kg N eq.	1.90E+00	1.40E+00	1.79E-01	2.35E-02	4.27E-03	2.50E-01	4.13E-02
EP – terrestrial	mol N eq.	6.12E+01	5.64E+01	1.98E+00	2.51E-01	1.41E-02	2.21E+00	3.29E-01
POCP	kg NMVOC eq.	6.19E+00	4.48E+00	7.97E-01	9.03E-02	4.70E-03	7.12E-01	1.03E-01
ADP – minerals and metals	kg Sb eq.	8.48E-02	7.93E-02	4.69E-03	4.81E-05	2.40E-06	5.58E-04	2.27E-04
ADP – fossil	MJ, net calorific value	2.06E+04	1.13E+04	2.37E+03	2.13E+02	9.45E+00	6.46E+03	3.01E+02
WDP	m^3 eq.	3.14E+02	2.22E+02	2.17E+01	8.63E-01	7.20E-02	6.60E+01	3.49E+00

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.

Resource use parameters	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
PENRE	MJ, low cal. value	2.03E+04	1.10E+04	2.27E+03	2.13E+02	9.45E+00	6.45E+03	3.01E+02
PERE	MJ, low cal. value	3.28E+03	1.16E+03	8.47E+02	3.30E+00	2.72E-01	1.24E+03	2.95E+01
PENRM	MJ, low cal. value	3.24E+02	2.27E+02	9.73E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	6.86E+00	0.00E+00	6.86E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	2.06E+04	1.13E+04	2.37E+03	2.13E+02	9.45E+00	6.45E+03	3.01E+02
PERT	MJ, low cal. value	3.29E+03	1.16E+03	8.54E+02	3.30E+00	2.72E-01	1.24E+03	2.95E+01
FW	m^3	1.43E+01	7.63E+00	1.49E+00	3.03E-02	2.51E-03	5.05E+00	1.37E-01
MS	kg	9.06E+01	7.48E+01	1.58E+01	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	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
HWD	kg	3.63E-01	3.39E-01	1.40E-02	1.35E-03	5.02E-05	8.18E-03	1.14E-03
NHWD	kg	4.35E+02	3.06E+02	5.47E+01	1.04E+01	6.02E+00	1.77E+01	3.99E+01
RWD	kg	6.43E-02	1.48E-02	1.88E-03	6.91E-05	5.08E-06	4.70E-02	5.98E-04
MER	kg	5.95E+00	7.00E-02	5.43E-01	0.00E+00	4.58E+00	0.00E+00	7.57E-01
MFR	kg	3.21E+02	1.11E+01	8.45E+01	0.00E+00	5.04E+00	0.00E+00	2.20E+02
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	3.33E+01	5.24E-01	4.07E+00	0.00E+00	2.53E+01	0.00E+00	3.35E+00
EEE	MJ	1.85E+01	2.91E-01	2.26E+00	0.00E+00	1.41E+01	0.00E+00	1.86E+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.

Extrapolation rules

This LCA covers different building configurations than the representative product. All the analyzed configurations have the same main functionality, product standards and manufacturing technology.
Despite similarities from the constructive point of view, the average environmental impacts of the reference flow SDC 12/17,5kV differ from the other SDC panels more than 10%. Therefore, to determine their impact indicators value, extrapolation rules are adopted.
The environmental impacts for the other panels can be obtained multiplying the impacts of the reference flow SDC 12/17,5kV for the correspondent conversion factor as shown in the following formula:

$$Value_{SDC\ panels} = Value_{reference\ flow} * ConversionFactor$$

Where:
$Value_{reference\ flow}$ can be found in the tables in previous chapter;
$ConversionFactor$ is constant and can be found in the following tables.

The conversion factors were calculated by dividing the results obtained from the LCA analysis of the other SDC panels (different ratings and different dimensions) for the ones related to the reference flow.

In the following 2 tables the conversion factors are presented split between Manufacturing (Upstream and Core), Installation and EoL for 1700mm and 2000mm height.

Extrapolation factors for SDC units with a height equal to 1700mm

SWG Unit	LCA phase	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-m&m	ADP-fossil	WDP
SDC_1700-500-24kV	Manufacturing Upstream	1.01	1.01	1.01	1.01	1.00	1.02	1.06	1.02	1.00	1.02	1.07	1.01	1.03
	Manufacturing Core	1.00	1.00	1.00	1.00	1.00	0.99	0.99	1.00	1.00	1.00	0.98	1.00	1.00
	Installation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	End of Life	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00
SDC_1700-375-12/17,5kV	Manufacturing Upstream	0.93	0.93	0.95	0.94	0.95	0.93	0.94	0.93	0.92	0.93	0.94	0.93	0.94
	Manufacturing Core	1.00	1.00	0.97	1.00	1.01	1.02	1.03	1.01	1.01	1.01	1.06	0.97	0.98
	Installation	0.78	0.39	1.00	0.60	0.74	0.72	0.68	0.73	0.74	0.74	0.61	0.69	0.55
	End of Life	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.92	0.92	0.92	0.92	0.92
SDC_1700-375-24kV	Manufacturing Upstream	0.95	0.95	0.96	0.95	0.95	0.96	1.00	0.95	0.92	0.96	1.02	0.95	0.98
	Manufacturing Core	1.00	1.00	0.97	1.00	1.01	1.02	1.03	1.01	1.01	1.01	1.04	0.96	0.97
	Installation	0.78	0.39	1.00	0.60	0.74	0.72	0.68	0.73	0.74	0.74	0.61	0.69	0.55
	End of Life	0.93	0.93	0.92	0.93	0.92	0.92	0.92	0.95	0.93	0.93	0.92	0.93	0.93
SDC_1700-750-12/17,5kV	Manufacturing Upstream	1.24	1.24	1.25	1.28	1.25	1.37	1.74	1.31	1.14	1.38	1.91	1.26	1.49
	Manufacturing Core	1.06	1.09	2.31	1.20	1.06	1.68	1.65	1.24	1.28	1.22	2.72	1.05	1.44
	Installation	1.07	0.43	1.44	0.78	1.00	0.98	0.90	0.99	1.02	1.01	0.79	0.93	0.70
	End of Life	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
SDC_1700-750-24kV	Manufacturing Upstream	1.23	1.23	1.19	1.36	1.26	1.29	1.57	1.27	1.13	1.32	1.69	1.24	1.41
	Manufacturing Core	1.04	1.08	2.31	1.15	1.05	1.39	1.38	1.16	1.18	1.15	1.93	1.03	1.25
	Installation	1.07	0.43	1.44	0.78	1.00	0.98	0.90	0.99	1.02	1.01	0.79	0.93	0.70
	End of Life	1.21	1.21	1.20	1.20	1.20	1.20	1.20	1.22	1.20	1.20	1.20	1.20	1.21

Extrapolation factors for SDC units with a height equal to 2000mm

SWG Unit	LCA phase	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-m&m	ADP-fossil	WDP
SDC_2000-375-12/17,5kV	Manufacturing Upstream	1.03	1.03	1.03	1.03	1.03	1.04	1.02	1.04	1.05	1.03	1.02	1.03	1.03
	Manufacturing Core	0.85	0.89	2.44	0.94	0.94	0.93	0.90	0.89	0.91	0.89	1.02	0.91	0.96
	Installation	1.30	1.05	1.44	1.18	1.27	1.26	1.23	1.26	1.27	1.27	1.18	1.24	1.15
	End of Life	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.04	1.05	1.05	1.05	1.05	1.05
SDC_2000-375-24kV	Manufacturing Upstream	1.05	1.05	1.03	1.15	1.04	1.07	1.08	1.06	1.06	1.06	1.10	1.05	1.07
	Manufacturing Core	0.85	0.89	2.44	0.94	0.94	0.92	0.90	0.89	0.90	0.89	1.01	0.91	0.96
	Installation	1.30	1.05	1.44	1.18	1.27	1.26	1.23	1.26	1.27	1.27	1.18	1.24	1.15
	End of Life	1.06	1.06	1.05	1.06	1.06	1.06	1.06	1.09	1.06	1.06	1.06	1.06	1.06
SDC_2000-500-12/17,5kV	Manufacturing Upstream	1.11	1.11	1.08	1.10	1.09	1.12	1.08	1.11	1.14	1.10	1.08	1.10	1.09
	Manufacturing Core	0.87	0.92	2.42	0.96	0.95	0.93	0.91	0.91	0.92	0.91	0.98	0.93	0.96
	Installation	1.30	1.05	1.44	1.18	1.27	1.26	1.23	1.26	1.27	1.27	1.18	1.24	1.15
	End of Life	1.14	1.13	1.14	1.14	1.14	1.14	1.14	1.12	1.14	1.14	1.14	1.14	1.14
SDC_2000-500-24kV	Manufacturing Upstream	1.12	1.12	1.09	1.11	1.09	1.15	1.14	1.13	1.15	1.13	1.15	1.12	1.13
	Manufacturing Core	0.87	0.92	2.42	0.96	0.95	0.92	0.90	0.91	0.92	0.91	0.96	0.93	0.96
	Installation	1.30	1.05	1.44	1.18	1.27	1.26	1.23	1.26	1.27	1.27	1.18	1.24	1.15
	End of Life	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.15	1.14	1.14	1.15	1.14	1.14
SDC_2000-750-12/17,5kV	Manufacturing Upstream	1.33	1.33	1.32	1.36	1.32	1.44	1.81	1.40	1.22	1.46	1.98	1.34	1.57
	Manufacturing Core	1.03	1.07	2.33	1.17	1.04	1.66	1.62	1.21	1.25	1.20	2.72	1.03	1.43
	Installation	1.07	0.43	1.44	0.78	1.00	0.98	0.90	0.99	1.02	1.01	0.79	0.93	0.70
	End of Life	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.31	1.32	1.32	1.32	1.32	1.32
SDC_2000-750-24kV	Manufacturing Upstream	1.31	1.31	1.27	1.44	1.32	1.36	1.64	1.35	1.21	1.41	1.76	1.33	1.49
	Manufacturing Core	1.01	1.05	2.33	1.12	1.03	1.36	1.35	1.13	1.15	1.13	1.92	1.01	1.23
	Installation	1.07	0.43	1.44	0.78	1.00	0.98	0.90	0.99	1.02	1.01	0.79	0.93	0.70
	End of Life	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.33	1.32	1.32	1.32	1.32	1.32

The next table presents the conversion factors only for Distribution and Use.

Extrapolation factors for SDC units divided for the height 1700 and 2000mm

SWG Unit	LCA phase	All
Reference flow SDC_1700-500-12/17,5kV	Distribution	1.00
	Use	1.00
SDC_1700-500-24kV	Distribution	1.00
	Use	1.01
SDC_1700-375-12/17,5kV	Distribution	0.92
	Use	0.97
SDC_1700-375-24kV	Distribution	0.92
	Use	1.02
SDC_1700-750-12/17,5kV	Distribution	1.21
	Use	1.00
SDC_1700-750-24kV	Distribution	1.21
	Use	1.01

SWG Unit	LCA phase	All
SDC_2000-500-12/17,5kV	Distribution	1.15
	Use	1.00
SDC_2000-500-24kV	Distribution	1.16
	Use	1.00
SDC_2000-375-12/17,5kV	Distribution	1.07
	Use	0.98
SDC_2000-375-24kV	Distribution	1.07
	Use	1.00
SDC_2000-750-12/17,5kV	Distribution	1.32
	Use	1.00
SDC_2000-750-24kV	Distribution	1.31
	Use	1.01

Sensitivity analysis

A sensitivity analysis is conducted to understand how the impact category “GWP – total” varies for reference flow SDC 12/17,5kV with accessories. In particular, this analysis was carried out adding the Current Transformer TPU 43.13, for which an EPD has already been released. The higher impact indicator values are in upstream manufacturing, caused by the increase of raw materials, and in EOL stage for the deinstallation of the CTs.
In the following table the results are presented.

Scenario	Total	UPSTREAM	CORE	DOWNSTREAM			
		Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
Declared scenario Reference Flow SDC 12.06.25	1.58E+03	9.42E+02	1.84E+02	1.49E+01	9.16E+00	3.92E+02	3.35E+01
Scenario 2 SDC 12.06.25 + CT type TPU 43.13	2.06E+03	1.41E+03	1.91E+02	1.94E+01	9.16E+00	3.88E+02	4.67E+01

Additional Environmental Information

Recyclability potential

The recyclability potential of the Reference flow SDC 12/17,5kV is calculated by dividing “MFR: material for recycling” in the end-of-life stage with the total weight of the product. As a result, the recyclability potential of the product is 88%.

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
ABB_Electricity mix Dalmine factory {IT}_Bio37%-Solar37%-Hydro23%-Other2%_2022	Ecoinvent v3.9.1	0.169	kg CO_2-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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