


# PRODUCT ENVIRONMENTAL PROFILE

## Environmental Product Declaration

### OTDC16-32 Switch Disconnectors



REGISTRATION NUMBER ABBG-00033-V01.01-EN		IN COMPLIANCE WITH PCR-ED4-EN-2021 09 06 SUPPLEMENTED BY PSR-0005-ED2-EN-2016 03 29	
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<b>EPD Owner</b>	<b>ABB Oy, Muottitie 2A, 65101 Vaasa, Finland</b> <a href="http://www.abb.com">www.abb.com</a>
<b>Manufacturer name and address</b>	ABB Oy, Muottitie 2A, 65101 Vaasa, Finland
<b>Company contact</b>	EPD_ELSP@in.abb.com
<b>Reference product</b>	OTDC32F3 Switch Disconnecter
<b>Description of the product</b>	OTDC32F3 is a robust DC Switch Disconnecter for upto 1500V DC applications. It provides reliable switching and isolation in a wide variety of applications. Its efficient design makes your operations smoother and more sustainable.
<b>Functional unit</b>	The functional unit is to turn off all or part of an installation by separating the installation or part of the installation of all electrical energy, for safety reasons with a rated voltage $U$ and rated current $I_n$ ensuring isolation characterized by rated voltage $U_i$ for a reference lifetime of 20 years.  Rated voltage [V]: 1000V Rated current [A]: 32A Rated Insulation Voltage [V]: 1250V Number of poles: 3
<b>Other products covered</b>	OTDC16-32 range of Switch Disconnectors having 2/4/6/8 poles and current ratings from 16A to 32A
<b>Reference lifetime</b>	20 years
<b>Product category</b>	Electrical, Electronic and HVAC-R Products
<b>Use Scenario</b>	The use phase has been modeled based on the sales mix data (2021), and the corresponding low voltage electricity countries mix
<b>Geographical representativeness</b>	Raw materials & Manufacturing: [Europe / Global] Assembly: [Estonia] Distribution / Use: [Global] specific sales mix EoL: [Global]
<b>Technological representativeness</b>	Materials and processes data are specific for the production of OTDC32F3 Switch Disconnecter
<b>LCA Study</b>	This study is based on the LCA study described in the LCA report 1SCC301246D0201
<b>EPD type</b>	Product family declaration
<b>EPD scope</b>	"Cradle to grave"
<b>Year of reported primary data</b>	2021
<b>LCA software</b>	SimaPro 9.3.0.3 (2022)
<b>LCI database</b>	ecoinvent v3.8 (2021)
<b>LCIA methodology</b>	EN 50693:2019

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# 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 110 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

ABB Oy, Smart Power located in Vaasa / Finland, develops, manufactures and markets a comprehensive range of low voltage products and the market's most extensive assortment of low voltage systems. Our customers include industry, panel builders, machine and equipment manufacturers, electrical contractors and electrical power plants.

ABB Oy Smart Power adopts and implements for its own activities an integrated Quality/Environmental/Health Management System in compliance with the following standards:

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

ABB offers a wide range of low voltage switch disconnector for various applications and distribution.

OTDC16-32 products are assembled in the Plastone OÜ, Haapsalu, Estonia. In the factory, the different components and subassemblies are assembled on the manufacturing line. All components and subassemblies are produced by ABB's suppliers and are assembled in the Haapsalu factory plant.

Plastone are contracted to produce high quality plastic components by means of injection moulding. They also offer comprehensive additional related services. Plastone mainly focuses on plastic products for the health care sector and the electrical and electronics industry. Quality evaluation and continuous improvement of products are the central values in Plastone's value chain. The Haapsalu plant mainly assembly works are performed.

Plastone follow ISO9001:2015 - Quality Management Systems and ISO14001:2015 - Environmental Management Systems. In addition, all our factories are certified according to the ISO 13485: 2016 quality standard for healthcare products.

The OTDC products comprises the sizes from 16 to 1000 A. Switches comply with the latest specification of modern low voltage installations.

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# OTDC product cluster

Product cluster declared in this LCA includes the following OTDC16-32 Switch Disconnectors and covers both IEC & UL Variants of each of the following product ranges:

Base Product	IEC Variants	UL Variants	Number of poles	Rated voltage [U]	Rated current [I <sub>n</sub> ]	Rated Insulation Voltage [U <sub>i</sub> ]
OTDC16-32F2	OTDC16-32F2	-	2	1000V	16-32A	1250V
OTDC16-32F3	OTDC16-32F3	-	3	1000V	16-32A	1250V
OTDC16-32F4	OTDC16-32F4	-	4	1000V	16-32A	1250V
OTDC16-32FT2	OTDC16-32FT2	-	2	1000V	16-32A	1250V
OTDC16-32FT3	OTDC16-32FT3	-	3	1000V	16-32A	1250V
OTDC16-32FT4	OTDC16-32FT4	-	4	1000V	16-32A	1250V
OTDC16-25U2	-	OTDC16-25U2	2	1000V	16-25A	1250V
OTDC16-32U4	-	OTDC16-32U4	4	1000V	16-32A	1250V
OTDC16U6	-	OTDC16U6	6	1000V	16A	1250V
OTDC16-25UT2	-	OTDC16-25UT2	2	1000V	16-25A	1250V
OTDC16-32UT4	-	OTDC16-32UT4	4	1000V	16-32A	1250V
OTDC16UT6	-	OTDC16UT6	6	1000V	16A	1250V

Table 1: Technical characteristics of OTDC16-32 Switch Disconnector.

The accessories associated with these products are also included in the study.

## Reference Product:

The reference product for the LCA of the complete range of OTDC Switches from 16-32A is OTDC32F3.

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# Constituent Materials

The OTDC32F3 weighs about 228g including its installed accessories, packaging and paper documentation.

OTDC32F3				
Materials	Name	IEC 62474 MC	[g]	%
Metals	Steel	M-119	26	11.4%
	Cu and Cu alloys	M-121	19.2	8.4%
	Stainless Steel	M-100	7.5	3.3%
Plastics	Polyamide	M-258	145.2	63.5%
	Polypropylene	M-252	0.3	0.1%
	Unsaturated Polyester	M-301	0.03	<0.1%
Other	Paper / Cardboard	M-341	30.4	13.3%
Total			228.6	100.0%

Table 2: Weight of materials for OTDC32F3.

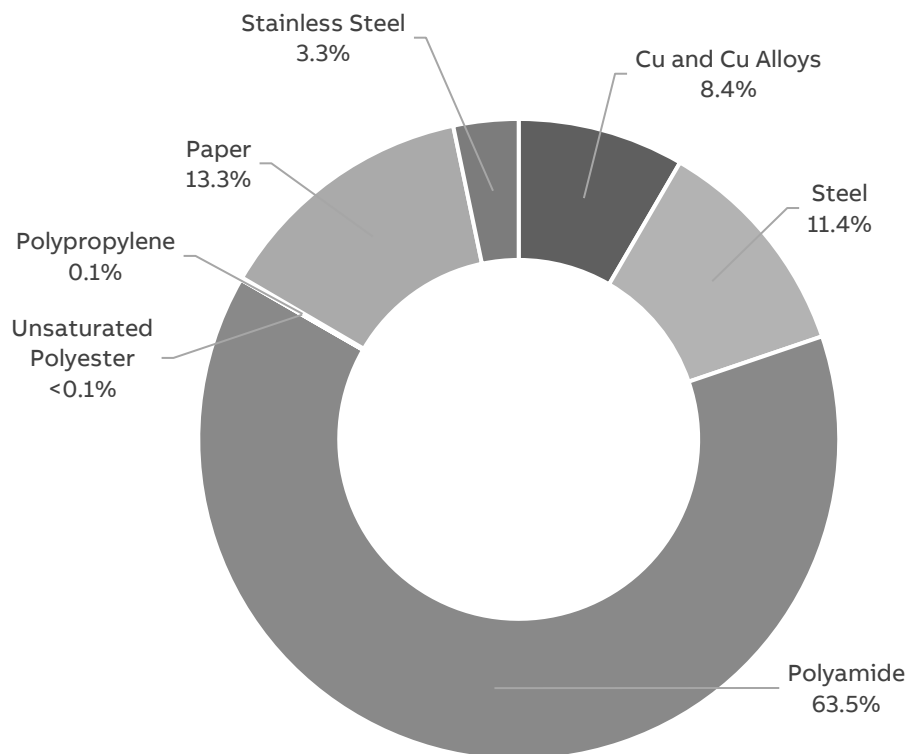


Figure 1: Composition of OTDC32F3.

Along the whole OTDC16-32 product cluster, a set of different build configurations have been covered by this analysis.

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Packaging weighs 24g, with the following substance composition:

Material	Unit	Total	%
Corrugated Cardboard	g	24	10.5%

Table 3: Weight of Packaging for OTDC32F3

Official declarations 1SCC301239D0201 [11] and 1SCC301240D0201 [12] states compliance of ABB Switch Disconnectors respectively to RoHS II and REACH regulations; annex 1SCC301239D0201 [11] provides exemptions considered for RoHS II while annex 1SCC301240D0201 [12] lists REACH substances present in a concentration above 0,1% adding reference to products where involved parts are mounted.

From declarations and annexes mentioned here above it can be noted that OTDC Switches are in compliance to RoHS regulation without support of exemptions and no substances present inside candidate list by REACH must be notified since their concentration is always below 0.1%.

## Functional unit and Reference Flow

The Functional unit is to turn off all or part of an installation by separating the installation or part of the installation of all electrical energy, for safety reasons with a rated voltage  $U$  and rated current  $I_n$  ensuring isolation characterized by rated voltage  $U_i$  for a reference lifetime of 20 years. ( table 1 )

The Reference Flow of the study is a single Switch Disconnector (including its packaging and accessories) with mass described, table 2.

## System boundaries and life cycle stages

The life cycle of the Switch Disconnector, 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.

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Manufacturing	Distribution	Installation	Use	End-of-Life (EoL)
Acquisition of raw materials	Transport to distributor/ logistic center  Transport to place of use	Installation	Usage  Maintenance	Deinstallation
Transport to manufacturing site		EoL treatment of generated waste (packaging)		Collection and transport
Components/parts manufacturing				EoL treatment
Assembly				
Packaging				
EoL treatment of generated waste				

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 2021, 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].

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

## Allocation rules

Allocation coefficients are based on the OTDC32F3 line's occupancy area for electricity consumption since, 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 water consumption, has been based on this criterion.

## 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 as per PCR. This distance has been added to the one already included in the market processes used for the model, as a result of a conservative choice made by the LCA operators.

Application of grease lubricant on the Switch Disconnectors operating mechanism has been excluded since it is negligible.

Surface treatments like galvanizing, tin and silver plating as well as their related transport processes (back and forth from the finishing suppliers) have been considered in the LCA model.

Scraps for metal working and plastic processes are included when already defined in ecoinvent[6].

## Energy Models

LCA Stage	EN 15804:2012 +A2:2019 module	Energy model	Notes
Raw material extraction and processing	A1-A2	Electricity, {RER}  market group for   Cut-off Electricity, {GLO}  market group for   Cut-off	Based on materials and supplier locations
Manufacturing	A3	Electricity, {EE}  market for   Cut-off	Specific Energy model for Plastone OU manufacturing plant, 100% renewable
Installation (Packaging EoL)	A5	Electricity, {GLO}  market group for   Cut-off	
Use Stage	B1	Electricity, [country]x   market for   Cut-off, S **	Solar Low voltage, based on 2021 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 page 11 for further description

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# 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 software were used. They are a list of all the components and assemblies that constitute the finished product, organized by level. Each item is matched with its code, quantity, weight and supplier. The BOMs were then processed, adding material, surface area and other weight data, taken from technical drawings. 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 2021, which was a representative production year. The ecoinvent v3.8 cut-off by classification system processes [6] are used to model the background system of the processes.

Due to the large amounts of components in the Switch Disconnecter, raw material inputs have been modelled with data from ecoinvent[6] representing either a European [RER] or Global [RoW] market coverage based on the supplier's location. These datasets are assumed to be representative.

## Manufacturing stage

The Switch Disconnecters are composed of a multitude of components, all of which are made from numerous materials. Most of the inputs to the products' manufacturing stage are already produced component parts.

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 Switch Disconnecters before shipping them.

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

The entire OTDC suppliers' network has been modelled with the calculation of each transportation stage: from the first manufacturing supplier to the next. All the distances from the last subassembly suppliers' factories to the ABB manufacturing facility have been calculated.

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

The energy mix used for the production phase is representative for Plastone OU production site and includes renewable energy only (100% Hydroelectric).

The complete energy mix has been modeled considering the certificate on Guarantee of origins provided to ABB for the year 2021.

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## Distribution

The transport distances from ABB manufacturing plant to the distribution centers (regional distribution centers / local sales organizations) have been calculated considering the specific 2021 sales mix data for OTDC16-32 product cluster (SAP ERP sales data as a source).

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

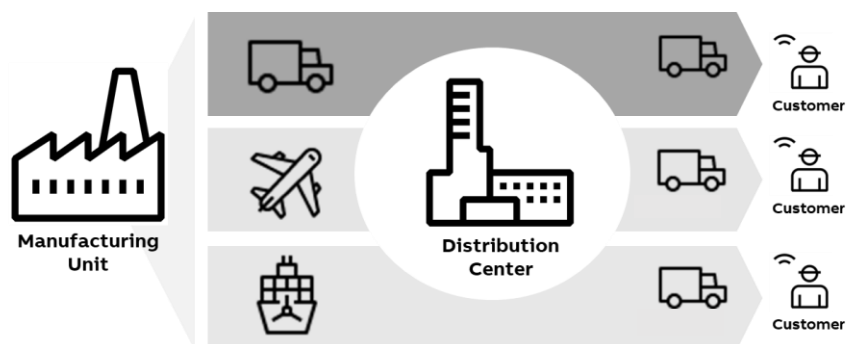


Figure 4: Distribution methodology.

## Installation

The installation phase only implies manual activities, and no energy is consumed. This phase also includes the disposal of the packaging of the Switch Disconnecter.

For the disposal of the packaging after installation of the Switch Disconnecter at the end of its life, a transport distance of 1000 km (according to PCR[1]) was assumed. The chosen transportation datasets from Ecoinvent [6] and their corresponding parameters are described in Annex 1SCC301258D0201 [13].

The actual disposal site is unknown and is managed by the customer.

## Use

Use and maintenance are modelled according to the PCR [1].

During the use phase, OTDC Switch Disconnecter, dissipates some electricity due to power losses. They are calculated according to the data provided in the catalogue of the Switch Disconnecter and following the PCR [1] & PSR [2] rules:

Parameters		
Iu	[A]	32
Iu	[%]	50
h/year	[h]	8760
RSL	[years]	20
Time operating coefficient	[%]	30

Table 6: Use phase parameters

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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 switch at a given value of current:

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

The above calculations have been performed according to the number of poles (3) on which relevant current flows during use phase.

The Energy model used for this phase has been modeled based on the 2021 actual sales mix data (SAP ERP sales data as a source). Because these OTDC Switches are used for Photovoltaic application in Solar Farms, the Solar Energy low voltage electricity country mix for each country<sub>(x)</sub> has been selected with its respective percentage on the total sales mix (Electricity, low voltage [country]<sub>x</sub> | market for | Cut-off, S).

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]).

Disassembly manuals can be provided to the customer to support product disposal.

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# Environmental impacts

The following tables show the environmental impact indicators of the life cycle of a single switch, as indicated by PEP Ecopassport PCR and EN 50693:2019 [3]. The indicators are divided into the contribution of the processes to the different modules (upstream, core and downstream) and stages (manufacturing, distribution, installation, use and end-of-life).

## OTDC32F3

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use	End of Life
GWP-total	kg CO <sub>2</sub> eq	3.22E+00	1.72E+00	4.72E-02	3.14E-02	1.38E+00	4.52E-02
GWP-fossil	kg CO <sub>2</sub> eq	3.22E+00	1.75E+00	4.71E-02	7.88E-03	1.37E+00	3.83E-02
GWP-biogenic	kg CO <sub>2</sub> eq	4.88E-03	-3.32E-02	3.96E-05	2.35E-02	7.65E-03	6.89E-03
GWP-luluc	kg CO <sub>2</sub> eq	3.81E-03	1.31E-03	1.99E-05	2.98E-06	2.45E-03	2.17E-05
ODP	kg CFC11 eq	2.44E-07	6.88E-08	1.10E-08	1.85E-09	1.58E-07	5.15E-09
AP	mol H <sup>+</sup> eq	2.93E-02	1.75E-02	4.54E-04	4.16E-05	1.11E-02	1.97E-04
EP-freshwater	kg P eq	2.17E-03	1.26E-03	2.72E-06	5.33E-07	8.94E-04	6.57E-06
EP-marine	kg N eq	4.94E-03	3.03E-03	1.31E-04	2.50E-05	1.69E-03	7.02E-05
EP-terrestrial	mol N eq	4.32E-02	2.42E-02	1.44E-03	1.55E-04	1.68E-02	5.36E-04
POCP	kg NMVOC eq	1.32E-02	6.82E-03	4.04E-04	4.90E-05	5.76E-03	1.58E-04
ADP-m&m	kg Sb eq	5.34E-04	3.88E-04	1.02E-07	1.84E-08	1.45E-04	5.25E-08
ADP-fossil	MJ	4.40E+01	2.56E+01	7.17E-01	1.22E-01	1.71E+01	4.62E-01
WDP	m <sup>3</sup>	2.77E+00	1.43E+00	2.32E-03	7.04E-04	1.33E+00	2.76E-03
PENRE	MJ	3.95E+01	2.11E+01	7.17E-01	1.22E-01	1.71E+01	4.62E-01
PENRM	MJ	4.43E+00	4.43E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	4.40E+01	2.55E+01	7.17E-01	1.22E-01	1.71E+01	4.62E-01
PERE	MJ	8.11E+01	2.07E+00	8.53E-03	1.68E-03	7.90E+01	2.36E-02
PERM	MJ	4.84E-01	4.84E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	8.16E+01	2.55E+00	8.53E-03	1.68E-03	7.90E+01	2.36E-02
SM	kg	2.38E-02	2.38E-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
FW	m <sup>3</sup>	8.26E-02	3.73E-02	7.93E-05	2.36E-05	4.51E-02	1.10E-04
HWD	kg	1.12E-03	8.40E-05	1.59E-06	2.93E-07	1.03E-03	8.00E-07
N-HWD	kg	5.52E-01	2.36E-01	5.80E-02	1.73E-02	1.99E-01	4.14E-02
RWD	kg	9.85E-05	4.58E-05	4.87E-06	8.17E-07	4.45E-05	2.48E-06
MfR	kg	3.21E-01	4.75E-02	0.00E+00	7.19E-02	0.00E+00	2.02E-01
MfER	kg	1.73E-02	7.81E-03	0.00E+00	5.99E-03	0.00E+00	3.48E-03
Efp	disease inc.	2.08E-07	9.98E-08	4.98E-09	9.37E-10	9.81E-08	3.75E-09
IrHH	kBq U-235 eq	2.51E-01	1.21E-01	3.57E-03	6.19E-04	1.23E-01	2.69E-03
ETX FW	CTUe	1.87E+02	1.17E+02	5.43E-01	1.33E-01	6.91E+01	6.50E-01
HTX CE	CTUh	5.73E-09	3.59E-09	1.80E-11	3.22E-12	2.08E-09	3.32E-11
HTX N-CE	CTUh	2.40E-07	1.46E-07	5.67E-10	1.46E-10	9.15E-08	1.94E-09
IrLS	Pt	1.88E+01	1.14E+01	7.20E-01	1.40E-01	6.03E+00	4.25E-01

Table 7: Impact indicators for OTDC32F3

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Impact category	Unit	Total
Biogenic Carbon content of the product	kg	1.85E-02
Biogenic Carbon content of the associated packaging	kg	1.2E-02

Table 8: Inventory Flow indicators of OTDC32F3.

### 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 re-newable 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)

### 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

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**Waste category indicators**

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

**Output flow indicators**

MfR	Materials for recycling
MfER	Materials for energy recovery

**Others 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

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## Extrapolation for Homogeneous environmental family

This LCA covers different build configurations than the representative product from the IEC and UL types. All the analyzed configurations have the same main functionality, product standards and manufacturing technology

The different life cycle stages can be extrapolated to other products of the same homogeneous environmental family by applying a rule of proportionality to the parameters in the following tables, divided by different life cycle stages.

Switch Disconnecter	LCA Stage	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals & metals	ADP-fossil	WDP
OTDC16-32F2	Manu.	0.76	0.77	1.10	0.78	0.75	0.63	0.59	0.74	0.69	0.70	0.54	0.77	0.77
	EoL	0.73	0.69	0.99	0.61	0.76	0.66	0.57	0.75	0.71	0.71	0.75	0.70	0.65
OTDC16-32F3	Manu.	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
	EoL	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
OTDC16-32F4	Manu.	1.24	1.23	0.90	1.22	1.25	1.37	1.41	1.26	1.31	1.30	1.46	1.23	1.23
	EoL	1.27	1.31	1.01	1.39	1.24	1.34	1.43	1.25	1.29	1.29	1.25	1.30	1.35
OTDC16-32FT2	Manu.	0.77	0.78	1.16	0.81	0.77	0.64	0.60	0.76	0.71	0.71	0.54	0.79	0.78
	EoL	0.74	0.69	0.99	0.61	0.77	0.66	0.58	0.75	0.71	0.72	0.76	0.70	0.66
OTDC16-32FT3	Manu.	1.01	1.01	1.05	1.03	1.02	1.01	1.00	1.02	1.01	1.01	1.00	1.01	1.02
	EoL	1.00	1.01	1.00	1.00	1.01	1.00	1.00	1.01	1.01	1.01	1.01	1.01	1.00
OTDC16-32FT4	Manu.	1.25	1.25	0.90	1.22	1.25	1.37	1.41	1.27	1.31	1.31	1.46	1.24	1.25
	EoL	1.27	1.32	1.01	1.39	1.25	1.35	1.43	1.26	1.30	1.29	1.26	1.31	1.35
OTDC16-25U2	Manu.	1.01	1.00	0.19	1.47	1.28	2.83	2.93	1.28	1.72	1.72	2.91	0.96	1.07
	EoL	2.00	2.31	0.30	3.36	1.28	2.71	3.88	1.61	1.97	1.92	1.44	2.17	2.80
OTDC16-32U4	Manu.	1.77	1.74	-0.30	2.52	2.22	5.54	5.77	2.32	3.24	3.23	5.81	1.65	1.92
	EoL	3.83	4.44	0.44	6.64	2.30	5.28	7.71	3.00	3.75	3.64	2.65	4.16	5.46
OTDC16U6	Manu.	2.58	2.51	-1.18	3.41	3.09	8.26	8.62	3.38	4.77	4.76	8.72	2.38	2.83
	EoL	5.68	6.60	0.58	9.92	3.37	7.86	11.54	4.42	5.56	5.39	3.90	6.18	8.14
OTDC16-25UT2	Manu.	1.07	1.05	0.27	1.49	1.31	2.86	2.93	1.33	1.75	1.75	2.91	1.02	1.14
	EoL	2.02	2.33	0.30	3.37	1.30	2.72	3.88	1.64	1.99	1.94	1.47	2.19	2.81
OTDC16-32UT4	Manu.	1.83	2.28	-0.23	3.12	2.88	8.68	9.70	3.13	4.63	4.59	10.73	2.16	2.53
	EoL	3.85	4.46	0.44	6.64	2.33	5.29	7.71	3.02	3.77	3.66	2.68	4.18	5.47
OTDC16UT6	Manu.	2.02	1.97	-1.34	2.79	2.46	6.01	6.11	2.62	3.61	3.62	5.98	1.87	2.21
	EoL	5.67	6.58	0.58	9.91	3.35	7.85	11.53	4.39	5.54	5.38	3.87	6.16	8.12

Table 9: Extrapolation factors for OTDC32F3  
Reference product: OTDC32F3 -Manufacturing / End of Life

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Switch Disconnecter	LCA Stage	Factor
OTDC16-32F2	Distribution	0.95
OTDC16-32F3		1.00
OTDC16-32F4		1.23
OTDC16-32FT2		1.00
OTDC16-32FT3		1.23
OTDC16-32FT4		1.41
OTDC16-25U2		1.27
OTDC16-32U4		1.27
OTDC16U6		2.59
OTDC16-25UT2		1.68
OTDC16-32UT4		1.86
OTDC16UT6		2.59

Table 10: Extrapolation factors for OTDC32F3  
Reference product: OTDC32F3 -Distribution

Switch Disconnecter	LCA Stage	Factor
OTDC16F2/FT2	Use Phase	0.20
OTDC16F3/FT3		0.30
OTDC16F4/FT4		0.40
OTDC16U2/UT2		0.13
OTDC16U4/UT4		0.27
OTDC16U6/UT6		0.40
OTDC25F2/FT2		0.40
OTDC25F3/FT3		0.60
OTDC25F4/FT4		0.80
OTDC25U2/UT2		0.27
OTDC25U4/UT4		0.53
OTDC32F2/FT2		0.67
OTDC32F3/FT3		1.00
OTDC32F4FT4		1.33
OTDC32U4/UT4		0.93

Table 11: Extrapolation factors for OTDC32F3  
Reference product: OTDC32F3-Use Phase

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## Additional environmental information

According to the waste treatment scenario calculation in Simapro, 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).

	OTDC32F3
Recyclability potential	94.2%

Table 12: Recyclability potential of OTDC32F3.

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# References

- [1] PEP Ecopassport PCR-ed4-EN-2021 09 06 “Product Category Rules for Electrical, Electronic and HVAC-R Products”  
(published: 6th September 2021)
- [2] PEP Ecopassport PSR-0005-ed2-EN-2016 03 29 “Product Specific Rules for Electrical Switchgear and Control gear Solutions” (published: May 2016)
- [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 v3.8 (2021). ecoinvent version 3.8. Swiss, Centre for Life Cycle Inventories, Dübendorf, Switzerland
- [7] PRé Consultants, 2021. Software SimaPro versione 9.3.1 ([www.pre.nl](http://www.pre.nl)).
- [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
- [10] 1SCC301258D0201 - LCA OTDC Annex Data Details
- [11] 1SCC301239D0201 - RoHS
- [12] 1SCC301240D0201- REACH
- [13] 1SCC301254D0201- LCA BoM Process Builder

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