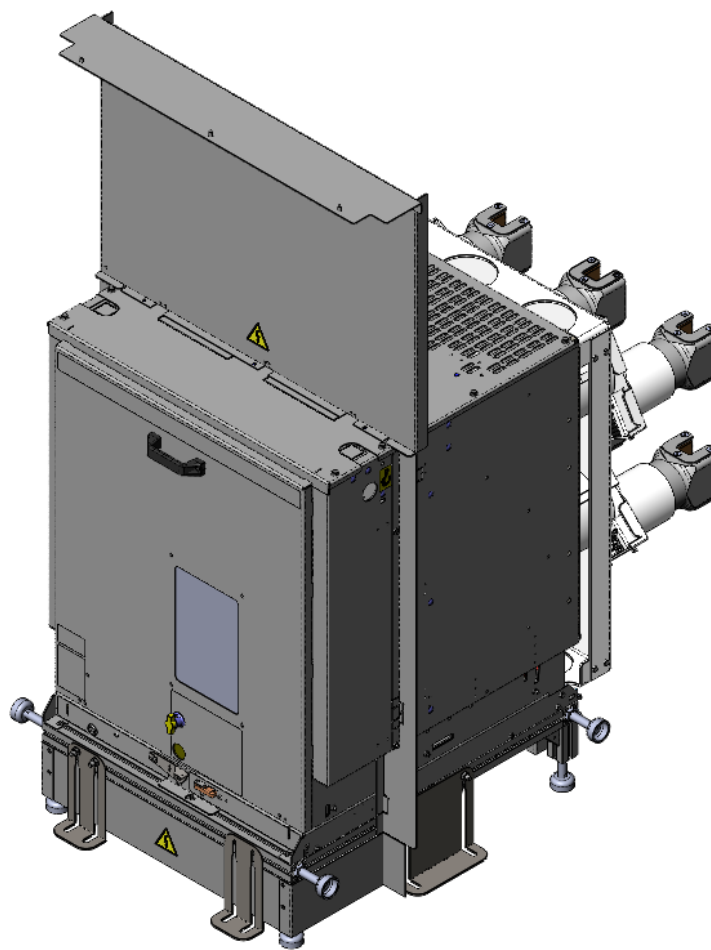


EPD



# Environmental Product Declaration

OneFit IEC version for horizontal insertion system

Production site: ABB Dalmine



DOCUMENT KIND Environmental Product Declaration	IN COMPLIANCE WITH ISO 14025 and EN 50693			
PROGRAM OPERATOR The Norwegian EPD Foundation	PUBLISHER The Norwegian EPD Foundation			
REGISTRATION NUMBER OF THE PROGRAM OPERATOR NEPD-8295-7951-EN	ISSUE DATE 2024-12-04			
VALID TO 2029-12-04	STATUS Approved	SECURITY LEVEL Public		
OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 1VCD900076R0001	REV. S2870	LANG. EN	PAGE 1/19

<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		
<b>Company contact</b>	Stefano Magoni – EPD_ELSE@abb.com ELSE R&D IT Apparatus & Service Manager		
<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>	OneFit Horizontal		
<b>Product description</b>	OneFit is a hard-bus retrofill design concept featuring an integrally safe plug-in technology for connection of new standard apparatus to existing panels. OneFit comprises a frame housing the circuit breaker, connected to the existing switchgear bushings by an additional power circuit that acts as an internal interface with the new breaker.		
<b>Functional unit</b>	The functional unit of this study is to distribute, protect, and control the electricity in a power distribution network, with a nominal voltage of 17.5 kV, use rate of 30 %, and load rate of 50 %, during a service life of 20 years in Europe		
<b>Reference flow</b>	A specific OneFit configuration, including related accessories and packaging.		
<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</b>	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. 2, 2024-07-01.		
<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 1VCD900075R0001.		
<b>EPD type</b>	Specific product with extrapolation rules		
<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>	2023		
<b>LCA software</b>	SimaPro 9.5 (2023)		
<b>LCI database</b>	Ecoinvent v3.9.1 (2022)		
<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

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](https://global.abb/group/en/sustainability) or scan the QR code.



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## General Information

This Environmental Product Declaration is a “specific product EPD” with extrapolation rules. A representative product configuration is declared as reference product, and the results can be extrapolated for other configurations according to the provided extrapolation rules. The EPD covers the OneFit horizontal product, including related accessories and packaging while the circuit breaker or contactor used are excluded:

The product covers a wide variety of ratings as summarized below.

Description	OneFit IEC
Rated voltage [kV]	From 7.2 up to 24
Rated current [A]	From 400 up to 3150
Short circuit current [kA]	From 16 up to 50

Technical information of the reference product is presented below.

Description	Reference product
Weight [kg]	205.93
Rated voltage [kV]	17.5
Rated current [A]	3150
Short circuit current [kA]	50

The product is manufactured by ABB S.p.A. located in Dalmine. 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

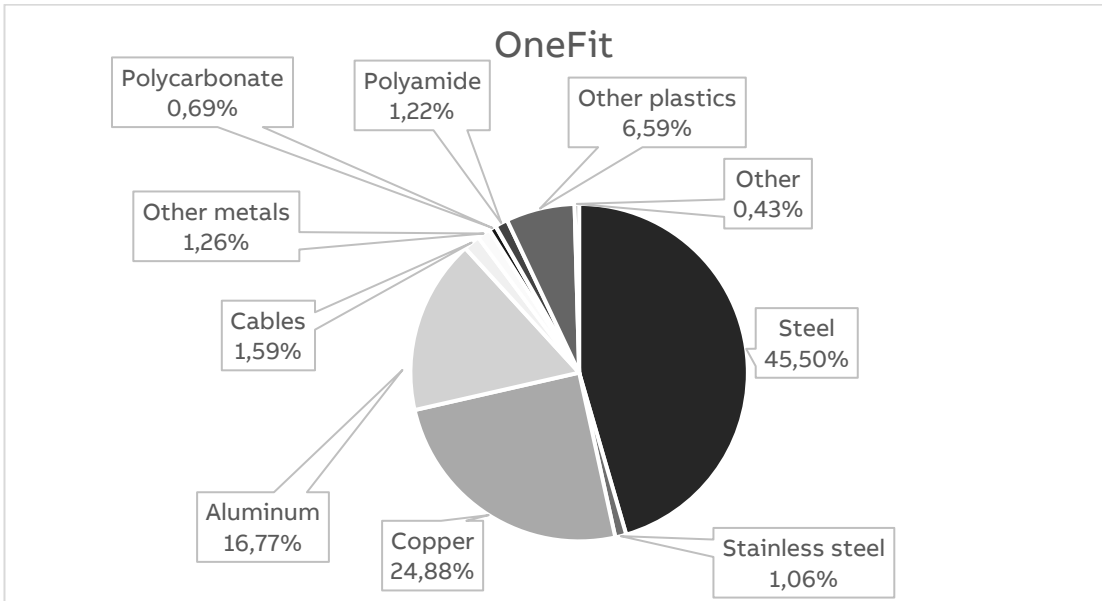
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# Constituent Materials

The constituent materials of the reference product are presented below.

Type	Material	Weight [kg]	Weight %
<b>Metals</b>	Steel, low-alloyed	93.33	45.50
	Steel, stainless	2.17	1.06
	Copper	51.04	24.88
	Aluminum	34.40	16.77
	Cables	3.26	1.59
	Other metals	2.57	1.26
<b>Plastics</b>	Polycarbonate	1.42	0.69
	Polyamide	2.50	1.22
	Other Plastics	13.53	6.59
<b>Other</b>	Other	0.88	0.43
<b>Total</b>		<b>205.15</b>	<b>100</b>



The constituent materials of the packaging and accessories are presented below.

Material	Weight [kg]	Weight [%]
<b>Steel</b>	0.41	0.89
<b>PE</b>	0.83	1.78
<b>Plastics</b>	0.35	0.76
<b>Wood</b>	45.00	96.58
<b>Total</b>	<b>46.59</b>	<b>100</b>



# LCA Background Information

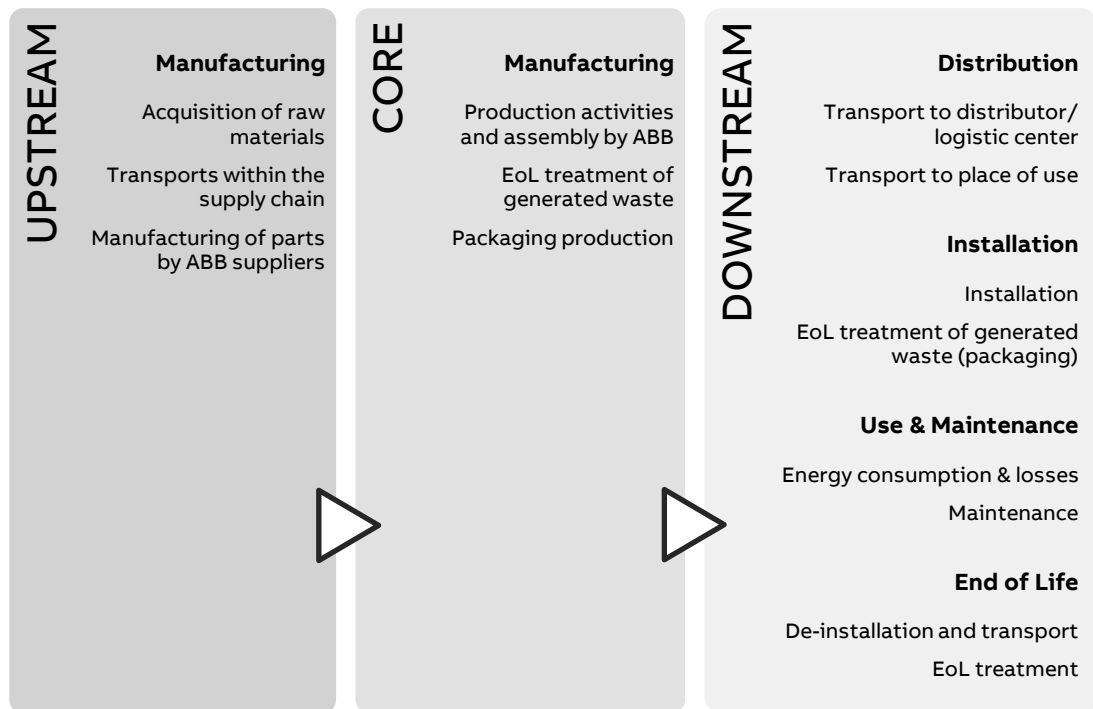
## Functional Unit

The functional unit of this study is to distribute, protect, and control the electricity in a power distribution network, with a nominal voltage of 17.5 kV, use rate of 30%, and load rate of 50%, during a service life of 20 years in Europe. The reference flow is a specific OneFit configuration, 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 is a “cradle-to-grave” analysis, and the system boundaries are defined according to EN 50693, as required by the PCR. For transparency reasons, the manufacturing stage is further divided into an upstream and core stage.



## Data quality

Both primary and secondary data are used. The main sources for primary data are the bill of materials (BOM) and technical drawings. This is extracted from: 1) SAP – the enterprise resource planning system, and 2) SmarTeam, Windchill, PDMPPro – product data management systems. Site specific foreground data are provided by the Production Manager, Industrializer, the Health, Safety & Environment Manager and the Supply Chain Manager Function.

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For all processes for which primary data are not available, generic background data originating from the ecoinvent v3.9.1 database, with system model “allocation, cut-off by classification”, are used. The database Industry Data 2.0 is also used for Polyoxymethylene (POM)/EU-27 and Steel ElectroGalvanized which are not available by ecoinvent. The LCA software used for the calculations is SimaPro 9.5

### Allocation rules

The utility consumption and waste generation by ABB, in the core manufacturing stage, is allocated to the production of one reference product according to applicable rules. For the end-of-life allocation, the “Polluter Pays” principle is adopted according to what is defined in the CEN/TR 16970 standard. However, the potential benefits and avoided loads from recovery and recycling processes are not considered because it is not required by the PCR.

### Cut-off criteria

According to PCR EPDItaly 007, the cut-off criteria can be set to a maximum of 5% of the overall environmental impacts. In this LCA, according to sub-PCR EPDItaly015, the production, use, and disposal of the packaging for components and semi-finished intermediates, as well as the materials constituting the switchboard itself whose total mass does not exceed 2% of the device's total weight, material and energy flows related to the installation stage, and devices external to the product required for installation, are all included in the cut-off criteria.

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# Inventory Analysis

## Manufacturing Stage (upstream)

The life cycle inventory in the upstream manufacturing stage is based on the primary data available from ABB. Datasets are applied accordingly, to the best of our knowledge, to represent each material, manufacturing process, and surface treatment.

Additionally, 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.

## Manufacturing Stage (core)

In the core manufacturing stage, utility consumption and waste generation at the ABB manufacturing site are accounted for. The packaging materials and accessories associated with the product are also considered. Modelling decisions and assumptions that are highly relevant to the results are as following:

- 100% renewable electricity is considered, which is procured by the ABB manufacturing site through Guarantees of Origins.

## Distribution

The transport distance from the ABB manufacturing site to the site of installation is assumed to be 300 km by lorry, as suggested by the PCR EPDIItaly015, as the actual distance is unknown. The environmental impacts can be multiplied accordingly if the actual distance is known.

	Dataset	Amount	Unit	Represent.
Transport	Transport, freight, lorry 16-32 metric ton, EURO4 {RER}	300	km	PCR

## 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.

	Scenario	Transport	Representation
Packaging End-of-Life	Packaging waste by waste management operations (Eurostat, 2021)*	100 km by lorry (assumption)	Europe

\*Due to lack of data from Eurostat, 100% landfill is assumed for silica sand

## Use

The use stage considers the reference power losses at the reference current (3150A) over the reference service life as defined in the functional unit. This is calculated using the following formula, according to PCR EPDIItaly015:

$$E_{use}[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000} = \frac{188.53 \text{ W} * 8760 \text{ hours} * 20 \text{ years} * 0.3}{1000} = 9909.01 \text{ kWh}$$

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Where:

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

	Dataset	Amount	Unit	Represent.
<b>Energy</b>	<i>Electricity, medium voltage {RER}/ market group for / Cut-off, S</i>	0.362	kg CO <sub>2</sub> -eq./kWh	Europe

As far as maintenance is concerned, it is assumed that there are no interventions during the product’s service life, according to PCR EPDItaly007 and PCR EPDItaly015.

### 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.

	Scenario	Transport	Representation
<b>Product End-of-Life</b>	IEC/TR 62635 (Annex D.3)*	100 km by lorry (assumption)	Europe

\*A conservative approach is adopted by considering all parts as either: requiring selective treatment, difficult to process, or going through a separation process; no individual part is considered as a single recyclable material.

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# Environmental Indicators

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.

## Reference Product

Impact category	Unit	Total	Cradle-to-grave					
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
<b>GWP – total</b>	kg CO <sub>2</sub> eq.	5.11E+03	1.49E+03	-3.19E+01	1.41E+01	2.36E+01	3.58E+03	2.99E+01
<b>GWP – fossil</b>	kg CO <sub>2</sub> eq.	4.98E+03	1.46E+03	2.88E+01	1.41E+01	2.42E+00	3.45E+03	2.42E+01
<b>GWP – biogenic</b>	kg CO <sub>2</sub> eq.	1.16E+02	2.25E+01	-6.08E+01	1.29E-02	2.12E+01	1.27E+02	5.67E+00
<b>GWP – luluc</b>	kg CO <sub>2</sub> eq.	1.13E+01	2.50E+00	1.29E-01	6.90E-03	7.38E-04	8.62E+00	2.79E-02
<b>ODP</b>	kg CFC-11 eq.	8.39E-05	2.06E-05	7.24E-07	3.09E-07	2.92E-08	6.19E-05	2.59E-07
<b>AP</b>	mol H+ eq.	6.16E+01	4.39E+01	2.36E-01	5.85E-02	7.81E-03	1.73E+01	1.05E-01
<b>EP – freshwater</b>	kg P eq.	6.59E+00	3.42E+00	1.40E-02	9.95E-04	2.16E-04	3.15E+00	7.13E-03
<b>EP – marine</b>	kg N eq.	6.25E+00	2.99E+00	8.40E-02	2.23E-02	9.62E-03	3.08E+00	6.85E-02
<b>EP – terrestrial</b>	mol N eq.	6.63E+01	3.77E+01	9.12E-01	2.38E-01	3.37E-02	2.71E+01	2.79E-01
<b>POCP</b>	kg NMVOC eq.	2.04E+01	1.12E+01	2.86E-01	8.56E-02	1.11E-02	8.75E+00	8.81E-02
<b>ADP – minerals and metals</b>	kg Sb eq.	5.48E-01	5.41E-01	1.64E-04	4.56E-05	4.25E-06	6.86E-03	1.83E-04
<b>ADP – fossil</b>	MJ, net calorific value	9.79E+04	1.74E+04	5.98E+02	2.01E+02	2.02E+01	7.93E+04	2.62E+02
<b>WDP</b>	m <sup>3</sup> eq.	1.57E+03	7.16E+02	3.51E+01	8.18E-01	1.00E-01	8.11E+02	3.33E+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.

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ENVIRONMENTAL PRODUCT DECLARATION

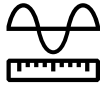
Resource use parameters	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
PENRE	MJ, low cal. value	9.73E+04	1.69E+04	5.60E+02	2.01E+02	2.02E+01	7.93E+04	2.62E+02
PERE	MJ, low cal. value	1.89E+04	2.72E+03	8.77E+02	3.13E+00	4.00E-01	1.52E+04	2.45E+01
PENRM	MJ, low cal. value	5.46E+02	5.08E+02	3.84E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	6.50E+02	1.04E+01	6.39E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	9.78E+04	1.74E+04	5.98E+02	2.01E+02	2.02E+01	7.93E+04	2.62E+02
PERT	MJ, low cal. value	1.95E+04	2.73E+03	1.52E+03	3.13E+00	4.00E-01	1.52E+04	2.45E+01
FW	m <sup>3</sup>	8.27E+01	1.95E+01	1.02E+00	2.87E-02	4.05E-03	6.20E+01	1.24E-01
MS	kg	6.19E+01	6.18E+01	1.32E-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.

System output indicators	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
HWD	kg	3.25E-01	2.20E-01	1.87E-03	1.28E-03	1.17E-04	1.00E-01	9.81E-04
NHWD	kg	7.15E+02	4.21E+02	6.23E+00	9.85E+00	1.82E+01	2.18E+02	4.28E+01
RWD	kg	6.06E-01	2.63E-02	1.87E-03	6.55E-05	7.58E-06	5.78E-01	4.91E-04
MER	kg	1.46E+01	0.00E+00	1.16E-02	0.00E+00	1.39E+01	0.00E+00	7.43E-01
MFR	kg	2.21E+02	3.45E+01	1.37E+00	0.00E+00	1.52E+01	0.00E+00	1.70E+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	6.45E+01	0.00E+00	8.36E-02	0.00E+00	5.79E+01	0.00E+00	6.53E+00
EEE	MJ	3.58E+01	0.00E+00	4.65E-02	0.00E+00	3.22E+01	0.00E+00	3.63E+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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## Extrapolation rules

Due to significant variations in environmental impacts within the product, extrapolation rules have been established in accordance with EN 50693. Two sections of extrapolation rules have been created to analyze the impacts of different product configurations and rated currents. To comprehend the environmental impact of a specific configuration, it is necessary to aggregate the results from the different sections based on the product specifications and rated current.

### Material extrapolation

This chapter focuses on understanding the environmental impact of different product configurations for OneFit. Due to the significant variability in assembly configurations, extrapolation rules have been developed for mandatory assemblies with a notable environmental impact. For those with a minor impact, a representative table has been created to aggregate these impacts. Additionally, a table for the environmental impact of optional components has been compiled. The purpose of this approach is to help readers understand the environmental impacts of various OneFit configurations by summing the results from all extrapolations and tables, both mandatory and optional. For assemblies' groups that have been extrapolated (Cassette, Wiring, Aluminum frame, Pipe, Orientable Conductor, Door), it has been crucial to introduce either multiplicative coefficients or regression coefficients. These coefficients enable the reader to determine the environmental impact of a specific configuration and should be applied as follows:

- When multiplicative coefficients are provided, multiply the reference product results by the configuration's coefficients.
- When regression coefficients are provided, use the given formula.

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**Mandatory components**

*Cassette*

The cassette is selected according to the circuit breaker or contactor used and its ratings from the following table.

Circuit breaker	A1.1	A1.2	A1.3	A1.4	A1.5	A1.6	A1.7	A1.8
HD4/P	12.06.16--- 12.12.32			12.12.40--- 12.20.40	24.06.16--- 24.12.25			
	17.06.16--- 17.12.32			17.12.40--- 17.20.40				
HD4/W				12.06.16--- 17.12.32	24.06.16--- 24.12.25			
VD4 Digitup/P	12.06.16--- 17.12.32							
VD4/LR		12.12.40--- 12.20.40			24.16.32--- 24.25.32		12.25AN.50	12.32AF.50
		17.12.40--- 17.20.40					17.25AN.50	17.32AF.50
VD4/P	12.06.16--- 12.12.32			12.12.40--- 12.20.40	24.06.16--- 24.12.25			
	17.06.16--- 17.12.32			17.12.40--- 17.20.50				
VD4/P/LR				12.12.40--- 17.20.40				
VD4/W				12.06.16--- 17.12.40				
VD4/Z			12.12.32					
VD4G/LR-50						12.25.50--- 12.32AF.50	17.25.50- 17.32AF.50	
VM1/P	12.06.16--- 12.12.32			12.12.40--- 12.20.40	24.06.16--- 24.12.25			
	17.06.16--- 17.12.32			17.12.40--- 17.20.32				
VM1/W				12.06.16--- 17.12.32				
VSC	07/P 400A--- 12/P 400A							

Extrapolated cassette assemblies' environmental impacts are presented through multiplicative coefficients in the following table (reference product marked with \*).

Cassette	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
A1.1	0.50	0.51	0.31	0.47	0.60	0.55	0.56	0.53	0.61	0.56	0.67	0.50	1.43
A1.2	0.49	0.49	0.32	0.48	0.52	0.55	0.54	0.51	0.60	0.54	0.67	0.48	1.27
A1.3	0.70	0.71	0.49	0.75	0.80	0.74	0.76	0.73	0.74	0.75	0.84	0.70	1.52
A1.4	0.70	0.71	0.49	0.79	0.72	0.75	0.75	0.72	0.74	0.75	0.84	0.68	1.37
A1.5	0.82	0.83	0.41	0.91	0.86	0.87	0.84	0.84	0.86	0.87	0.74	0.84	2.52
A1.6	0.98	0.98	1.00	0.99	0.98	0.98	0.99	0.98	0.98	0.98	1.00	0.96	0.73
A1.7*	3.36E+02	3.25E+02	1.05E+01	3.97E-01	5.33E-06	1.59E+00	1.27E-01	3.41E-01	3.41E+00	1.28E+00	2.95E-03	3.81E+03	1.32E+01
A1.8	1.02	1.02	1.02	1.04	1.04	1.03	1.04	1.03	1.03	1.03	1.55	1.02	1.24

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Wiring (\* is the reference product)

Item code	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
WIRING IEC L=6M	1.63	1.63	1.77	1.84	1.85	1.89	1.90	1.81	1.81	1.81	1.85	1.68	1.82
WIRING IEC EVD4 BASE	0.77	0.77	1.57	0.98	0.90	1.00	1.02	0.86	0.95	0.94	1.02	0.80	0.97
WIRING IEC EVD4+1 ETHERNET	0.81	0.81	1.60	1.04	0.95	1.08	1.10	0.91	1.01	1.00	1.09	0.85	1.03
WIRING IEC EVD4+2 ETHERNET	0.85	0.85	1.64	1.10	0.99	1.15	1.17	0.96	1.08	1.06	1.16	0.89	1.09
WIRING IEC EVD4+1 OPTICAL	0.77	0.77	1.57	0.98	0.91	1.01	1.03	0.86	0.95	0.94	1.03	0.81	0.98
WIRING IEC EVD4+2 OPTICAL	0.78	0.77	1.57	0.99	0.91	1.01	1.03	0.86	0.95	0.94	1.03	0.81	0.98
WIRING VD4 DIGITAL SOCKET L=3M	0.87	0.87	1.18	1.07	1.18	1.07	1.09	1.01	1.02	1.01	1.08	0.92	1.07
WIRING IEC L=3M*	3.30E+01	3.29E+01	8.19E-02	3.88E-02	3.40E-07	1.24E+00	9.52E-02	8.65E-02	9.93E-01	2.91E-01	1.63E-02	4.65E+02	2.41E+01

Aluminum frame, Pipe, Orientable Conductor, Door

The impacts of each assembly group (aluminium frame, pipe, orientable conductor, door) can be calculated according to the following formula:

$$EI_{m,n} = \alpha_{m,n} * regressor$$

Where:

- $EI_{m,n}$  is the “m” Environmental Impact category (on columns) of group assembly “n” (on rows)
- $\alpha_{m,n}$  is the coefficient for impact category “m” of the “n” group assembly listed in the following table
- regressor:
  - $l$  is the total length of the aluminium bars in mm (support sides and legs)
  - $m_p$  is the average mass of pipe assemblies in kg (multiplied by six)
  - $m_c$  is the average mass of orientable conductor assemblies in kg (multiplied by six)
  - $m_d$  is the mass of door assembly in kg

Group Assembly	Regressor	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
Aluminum frame	$l$	3.51E-02	3.48E-02	2.09E-04	8.39E-05	4.23E-10	2.17E-04	1.25E-05	3.81E-05	3.93E-04	1.30E-04	2.13E-07	3.58E-01	4.54E-03
Pipe	$6 * m_p$	1.11E+01	1.09E+01	1.84E-01	2.46E-02	1.39E-07	2.51E-01	1.98E-02	2.03E-02	2.51E-01	7.16E-02	3.76E-03	1.20E+02	4.10E+00
Orientable conductor	$6 * m_c$	1.01E+01	9.93E+00	1.87E-01	1.82E-02	1.23E-07	6.71E-01	5.30E-02	3.45E-02	4.74E-01	1.34E-01	8.74E-03	1.23E+02	9.59E+00
Door	$m_d$	3.62E+00	3.55E+00	6.36E-02	3.86E-03	8.33E-08	1.89E-02	1.74E-03	4.31E-03	4.43E-02	1.66E-02	2.21E-04	4.32E+01	7.53E-01

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Remaining mandatory components

Category	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
Aggregate impacts	8.96E+01	1.28E+02	3.89E+01	1.86E-01	2.92E-06	7.73E-01	4.36E-02	2.26E-01	2.01E+00	6.48E-01	2.08E-03	2.01E+03	8.95E+01

Optional components

Group Assembly	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
Shutter microswitches for motorized truck C. B	3.12E+01	3.11E+01	7.03E-02	1.69E-02	2.07E-07	2.84E-01	1.59E-02	5.51E-02	4.07E-01	1.16E-01	2.22E-03	4.49E+02	2.41E+01
Heater Assembly	9.91E+00	9.48E+00	4.23E-01	8.76E-03	1.60E-07	5.11E-02	4.80E-03	1.01E-02	1.01E-01	4.04E-02	1.98E-04	1.10E+02	-2.40E-01
Earthing for C.B truck	9.28E+01	9.10E+01	1.69E+00	1.65E-01	1.13E-06	6.11E+00	4.80E-01	3.13E-01	4.30E+00	1.22E+00	7.78E-02	1.13E+03	8.73E+01
Current sensors	3.80E+01	3.74E+01	5.42E-01	1.11E-01	5.20E-07	1.87E-01	9.86E-03	4.02E-02	3.80E-01	1.39E-01	4.26E-04	4.95E+02	1.01E+01
Fan & Flow sensor	4.21E+01	4.18E+01	2.37E-01	8.82E-02	2.35E-06	3.89E-01	2.52E-02	5.18E-02	5.31E-01	1.74E-01	2.10E-03	4.66E+02	1.03E+01
Contacts signalization plug-in inserted Kit for C.B remote racking in-out	8.04E+00	7.97E+00	6.37E-02	1.12E-02	9.08E-08	3.38E-01	2.61E-02	2.08E-02	2.62E-01	7.80E-02	4.14E-03	1.13E+02	5.96E+00
Earth Connection assembly	5.69E-01	5.67E-01	1.14E-03	9.65E-04	6.31E-09	3.51E-02	2.74E-03	1.84E-03	2.51E-02	7.30E-03	4.44E-04	8.43E+00	5.47E-01
Insulating covers	9.23E+00	9.24E+00	-1.46E-02	4.06E-03	1.09E-07	3.39E-02	1.28E-03	7.39E-03	6.58E-02	2.78E-02	9.58E-06	1.71E+02	4.18E+00
Insulating shields	9.05E+01	8.99E+01	-8.50E-01	1.47E+00	4.43E-06	4.36E-01	2.67E-02	1.20E-01	9.12E-01	4.46E-01	1.86E-03	1.46E+03	3.39E+01



## Rated current extrapolation

This chapter aims to understand the environmental impact of different rated currents during the Use Phase. The impacts can be calculated according to the following formula:

$$EI_m = \alpha_m * i_r^2$$

Where:

- $EI_m$  is the category m Environmental Impact
- $i_r$  is the rated current in A
- $\alpha_m$  is the coefficient for impact category m listed in the following table:

Category	Climate change - Total [kg CO2 eq]	Climate change - Fossil [kg CO2 eq]	Climate change - Biogenic [kg CO2 eq]	Climate change - Land use and LU change [kg CO2 eq]	Ozone depletion [kg CFC11 eq]	Acidification [mol H+ eq]	Eutrophication aquatic freshwater [kg P eq]	Eutrophication aquatic marine [kg N eq]	Eutrophication terrestrial [mol N eq]	Photochemical ozone formation [kg NMVOC eq]	Dep of ab res - minerals and metals [kg Sb eq]	Dep of ab res - fossils [MJ]	Water use [m3]
$\alpha_m$	3.61E-04	3.47E-04	1.28E-05	8.69E-07	6.24E-12	1.74E-06	3.17E-07	3.10E-07	2.73E-06	8.81E-07	6.91E-10	8.00E-03	8.17E-05

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## Additional Environmental Information

### Circularity Values

The recyclability potential of the product (excluding packaging) 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 83 % The result is representative for Europe according to IEC/TR 62635.

The recyclability potential of the packaging is calculated by dividing “MFR: material for recycling” in the installation stage by the total weight of the packaging. The recyclability potential is 33% and is representative for Europe according to Eurostat (2021).

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

The ABB manufacturing site uses 100 % renewable energy, procured through Guarantees of Origins (GO's) and internal photovoltaic panels for the electricity.

Energy mix	Source	Amount	Unit
ABB_electricity mix 2023, Dalmine factory (80% hydro-20%solar)_V1	Ecoinvent v3.9.1	0.024	kg CO <sub>2</sub> -eq/kWh

### Dangerous substances

The product complies with REACH and RoHS directive requirements and does not contain any of the listed materials in excess of the authorized proportions. For further information about REACH and RoHS, please visit the ABB webpage: <https://new.abb.com/contact/form>.

### 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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