Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 50693:2019 for:

ABB SACE Infinitus I25L

from

ABB S.p.A.

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products from a company, based on a representative product
EPD registration number:	EPD-IES-0026059:001
Version date:	2025-12-15
Validity date:	2030-12-14

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

The list of the ABB SACE Infinitus I25L configurations included in this EPD is provided in the “Product information” section, table “SACE Infinitus I25L configurations” on page 4.

PROGRAMME INFORMATION

Programme Information	
Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Product Category Rules (PCR)
CEN standard EN 50693 serves as the core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2024:06 - Electronic and electric equipment, and electronic components (non-construction), version 1.0.1, UN CPC: 46211
PCR review was conducted by: Sophie Kieselbach. The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@environdec.com
Complementary Product Category Rules (C-PCR): C-PCR-001 2024:06 – Electrical Switchgear and Control Gear Solutions, version 1.0.1, UN CPC: 46211 PSR-0005-ed3.1-EN-2023 12 08, Specific Rules for Electrical Switchgear and Control Gear Solutions

Verification
External and independent (‘third-party’) verification of the declaration and data, according to ISO 14025:2006, via: ☒ Individual EPD verification without a pre-verified LCA/EPD tool Third-party verifier: TÜV Italia S.r.l., Viale Fulvio Testi 280/6, 20126 Milano Accredited by: Accredia, 00077
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent

system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: ABB S.p.A.

Address: Via Luciano Lama, 33, 20099 Sesto San Giovanni (MI) – Italy

Contact: EPD_ELSP@in.abb.com

LCA practitioner: 2B Srl, E-mail: info@to-be.it, Website: www.to-be.it

Description of the organisation: 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 140 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's Frosinone factory represents a centre of excellence in ABB for the development and manufacture of low-voltage circuit breakers. The 150,000 square-meter facility with 800 employees is highly automated and produces more than three million circuit breakers every year.

ABB IT-ELSP (Electrification Smart Power) adopts and implements for its own activities an integrated Quality/Environmental/Health Management System in compliance with the following standards:

- UNI EN ISO 9001:2015 - Quality Management Systems – Requirements;
- UNI EN ISO 14001/2015 - Environmental management systems – Specification with guidance for use;
- UNI EN ISO 45001:2018 - Occupational Health and Safety Assessment Series – Requirements;
- SA 8000:2014 - Social Accountability 8000 – SA 8000.

PRODUCT INFORMATION

Product name: ABB SACE Infinitus I25L

Product identification: ABB SACE Infinitus I25L with 2500A rating of frame and 1 kVDC rated voltage. ABB SACE Infinitus I25L is produced in three versions (S, H, V) depending on the fault clearance requirements (dI/dt) with six rating plug variants (800A, 1000A,1250A, 1600A, 2000A, 2500A):18 configurations.

- S Version-> No internal inductance;
- H version -> Internal inductance included;
- V Version -> Internal + external inductance included.

The 18 configurations of ABB SACE Infinitus I25L included in this EPD fulfil the criteria for a homogeneous product family as defined by the EN 50693 standard: same main function, same product standards and similar manufacturing technology (same type of materials and processes). Environmental impacts are assessed using a representative product, following the extrapolation rules outlined in Annex A.1 of EN 50693.

Technical characteristics	Unit	Version S	Version H	Version V
Frame Size	[A]	2500		
Rated Voltage	[Vdc]	1000		
Nominal currents	[A]	800, 1000, 1250, 1600, 2000, 2500		
Power losses		1.3kW @ 1kA, single pole		
Max. current slope admissible (dI/dt)	[A/us]	<80	<100	No limit
Withstand capability Icw@1s	[kA]	3.8	3.8	3.8
Poles		Switching: 1p (bipolar configuration available 2p) Isolation: 2p		
Certification		IEC 60947-2, DNV		

SACE Infinitus I25L configurations							
List of SKUs included in the EPD	Weight of the product (kg)	Ue = Rated operating voltage (V)	In = Rated current (A)	Nominal current (A)	Np = Number of protected poles	Icu = Rated breaking capacity (kA)	IP = Degree of protection
Infinitus I25L H/10 1P2L 2500A	**321**	**1000**	**2500**	**2500**	**2 / 1 protected pole**	**100**	**IP 20 (breaker)/ IP 30 (frontal part)**
Infinitus I25L H/10 1P2L 2000A	321	1000	2500	2000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L H/10 1P2L 1600A	321	1000	2500	1600	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L H/10 1P2L 1250A	321	1000	2500	1250	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L H/10 1P2L 1000A	321	1000	2500	1000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L H/10 1P2L 800A	321	1000	2500	800	2 / 1 protected pole	100	IP 20 (breaker)/ IP

SACE Infinitus I25L configurations							
List of SKUs included in the EPD	Weight of the product (kg)	Ue = Rated operating voltage (V)	In = Rated current (A)	Nominal current (A)	Np = Number of protected poles	Icu = Rated breaking capacity (kA)	IP = Degree of protection
							30 (frontal part)
Infinitus I25L V/10 1P2L 2500A	611	1000	2500	2500	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L V/10 1P2L 2000A	611	1000	2500	2000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L V/10 1P2L 1600A	611	1000	2500	1600	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L V/10 1P2L 1250A	611	1000	2500	1250	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L V/10 1P2L 1000A	611	1000	2500	1000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L V/10 1P2L 800A	611	1000	2500	800	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 2500A	263	1000	2500	2500	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 2000A	263	1000	2500	2000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 1600A	263	1000	2500	1600	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 1250A	263	1000	2500	1250	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 1000A	263	1000	2500	1000	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)
Infinitus I25L S/10 1P2L 800A	263	1000	2500	800	2 / 1 protected pole	100	IP 20 (breaker)/ IP 30 (frontal part)

Representative product for this EPD: ABB SACE Infinitus I25L H/10 1P2L 2500A. This model has been selected as the representative product as it reflects an intermediate configuration with respect to material weight.

UN CPC code: The UN CPC code of the product is 46211 - Electrical apparatus for switching or protecting electrical circuits, or for making connexions to or in electrical circuits, for a voltage exceeding 1000 V.

Product description: ABB SACE Infinitus I25L is the world's first circuit breaker based on semiconductor technology certified according to IEC 60947-2. Motivation is the emerging of new low-voltage DC electrical distribution systems which impose new requirements on interruption speeds in order to handle and clear fault currents. The low inductivity of these systems in connection with high power storage connected (Li-ion batteries, (Super-) Capacitors) leads to fast rising and very high short circuit currents not able to be handled with traditional devices. In order to enable the protection (and

the required availability) of these electrical distribution systems, power semiconductor technology needs to be deployed to interrupt the faults in < 20-100 us.

ABB SACE Infinitus I25L comes with smart technology that provides protection and control with low losses. It achieves this through digital metering and communication functions that optimize energy management across any building's connected subsystem, including automation system.

From a safety standpoint, the ABB SACE Infinitus offers advanced electrical protection in all situations. If a fault should occur, arc fault mitigation reduces energy release to almost zero, with integrated galvanic isolation providing protection for maintenance personnel. Key application cases of ABB SACE Infinitus include marine, smart transportation, smart building, renewables.

Name and location of production site: ABB S.p.A., Via E. Fermi 40 - 03100 Frosinone (FR) – Italy.

CONTENT DECLARATION

The constituent materials of the reference product and its packaging are listed in the table below, along with their weight specifications.

Product composition							
Material	**Weight (kg)**	**Percentage (%)**	**Pre-consumer recycled content (kg)**	**Post-consumer recycled content (kg)**	**Pre-consumer recycled content (%)**	**Post-consumer recycled content (%)**	**Product variants range (kg)**
Steel	1.09E+02	34.0%	0.00E+00	1.53E+01	0%	4.8%	1.09E+02 - 1.11E+02
Coppers and copper alloys	8.27E+01	25.7%	0.00E+00	3.16E-01	0%	0.1%	7.90E+01 - 1.15E+02
Electrical and electronic components	6.60E+01	20.6%	0.00E+00	0.00E+00	0%	0%	1.22E+01 - 3.21E+02
Plastics	5.41E+01	16.8%	0.00E+00	0.00E+00	0%	0%	5.35E+01 - 5.44E+01
Ceramic	3.53E+00	1.1%	0.00E+00	0.00E+00	0%	0%	-
Aluminium	2.97E+00	0.9%	0.00E+00	0.00E+00	0%	0%	-
PCBA	2.59E+00	0.8%	0.00E+00	0.00E+00	0%	0%	-
Paper	2.39E-02	<0.1%	0.00E+00	0.00E+00	0%	0%	2.39E-02 - 2.51E-02
Batteries	6.30E-03	<0.1%	0.00E+00	0.00E+00	0%	0%	-
Magnet	2.19E-03	<0.1%	0.00E+00	0.00E+00	0%	0%	-
Silver	3.51E-04	<0.1%	0.00E+00	0.00E+00	0%	0%	-
Total product weight	**3.21E+02**	**100.0%**	**0.00E+00**	**1.56E+01**	**0%**	**4.9%**	**1.093E+02 - 1.112E+02**

Packaging composition with the biogenic carbon content of packaging					
Material	**Weight (kg)**	**Percentage (%)**	**Biogenic carbon content (kg)**	**Biogenic carbon content (%)**	**Product variants range (kg)**
Wood	5.66E+01	81.3%	2.31E+01	97.9%	5.66E+01 - 7.04E+01
PE	8.35E+00	12.0%	0.00E+00	0.0%	8.35E+00 - 9.12E+00
Steel	2.46E+00	3.5%	0.00E+00	0.0%	2.46E+00 - 2.48E+00
Cardboard	7.99E-01	1.1%	3.40E-01	1.4%	7.99E-01 - 2.70E+00
Paper	6.88E-01	1.0%	1.61E-01	0.7%	-
Bentonite	5.18E-01	0.7%	0.00E+00	0.0%	-
PET	3.10E-01	0.4%	0.00E+00	0.0%	-
Total packaging weight	**6.97E+01**	**100.0%**	**2.36E+01**	**100.0%**	**6.97E+01 - 8.62E+01**

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO_2.

The list of Substances of Very High Concern (SVHCs) contained in the product that exceeds the limits for registration with the European Chemicals Agency is presented in the following table.

SVHC present in excess of 0.1% for MCCBs	
Hazardous substances from the candidate list of SVHC	**CAS No.**
Lead (CAS # 7439-92-1)	7439-92-1
1,2 – Dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
Propane sultone	1120-71-4
Ethylene thiourea	96-45-7

LCA INFORMATION

Functional unit: The functional unit of SACE Infinitus I25L H/10 1P2L 2500A is to protect the installation from overloads and short circuits in a circuit with rated voltage Ue = 1000V, rated current In = 2500A, with Np = 2 / 1 protected poles, a rated breaking capacity Icu = 100kA, and degree of protection against ingress of solid foreign objects and water with harmful effects in accordance with the standard IEC 60529 IP = 20 (breaker) / 30 (frontal part), in the Industrial application area, according to the default use scenario provided by the PSR, and during the reference service life of the product of 20 years.

In order to adapt the functional unit to the technical specifications of the other products considered in this EPD, please refer to the values reported in “SACE Infinitus I25L configurations” table.

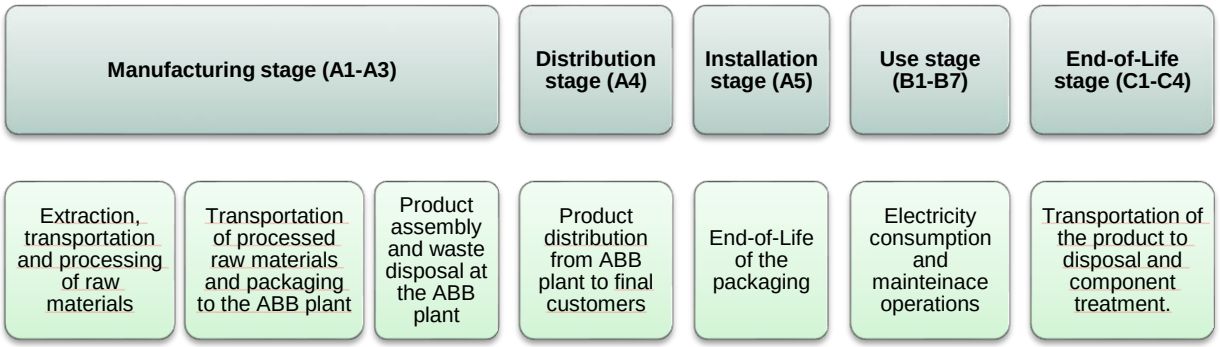
Reference service life: The Reference Service Life (RSL) considered for this product is of 20 years. The RSL coincides with the technical lifespan of the product.

Time representativeness: primary data collected refer to 2024.

Geographical scope: ABB suppliers are located all over the world. Assembly takes place in Frosinone, Italy. Use and end-of-life stages consider client locations in Norway and the Netherlands.

Databases and LCA software used: ecoinvent v3.10 and Carbon Minds databases and SimaPro Craft v10.2 LCA software.

Description of system boundaries: From cradle to grave.



Benefits beyond the system, such as those from avoided disposal operations and the substitution of primary materials or energy through material or energy recovery, are not considered in this study.

Allocation criteria: No multi-output allocation is applied in this LCA. The "point of substitution" principle is applied in the end-of-life allocation, in accordance with the EN 50693:2019 standard.

Cut-off criteria: No cut-off criteria are applied, except for crane energy use during installation, considered negligible (<1%). All BoM materials, packaging, and consumables are included. It is assumed that capital goods do not provide a significant contribution to the LCA, therefore they are excluded. Infrastructure included in database processes (e.g., ecoinvent) is accounted.

Data quality declaration: The following table declare the share specific data contributing to the GWP-GHG results in the manufacturing stage.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Raw material extraction and components production	Database	Ecoinvent v3.10 and Carbon Minds	2023 & 2024	Secondary data	0.00%
Transport of component to manufacturing site	Database	Ecoinvent v3.10	2023	Primary data	0.52%
Assembly of the product – core consumption	Database	Ecoinvent v3.10	2023	Primary data	0.06%
PA46 GF	Database	Confidential	2025	Primary data	0.05%
BMC GF	Database	Confidential	2025	Primary data	2.21%
EPD brass	EPD	EPD-IES-0020104_BRASS IN STRIPS, SHEETS, PLATES AND DISKS	2025	Primary data	<0.01%
EPD extruded products - copper	EPD	EPD-IES-0020107_COPPER EXTRUDED PRODUCTS	2025	Primary data	0.07%
EPD other - copper	EPD	EPD-IES-0020103_COPPER OTHER IN STRIPS, SHEETS AND PLATES	2025	Primary data	0.11%
EPD strip - steel	EPD	EPD-IES-0022940	2025	Primary data	2.10%
Other processes	Databases	Ecoinvent v3.10 and Carbon Minds	2023 & 2024	Secondary data	0.00%
Total share of primary data, of GWP-GHG results for A1-A3			5.12%		

The share of specific data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more specific data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

The environmental impact associated with proxy data does not exceed the limit of 10% of the default impact categories for the product system.

The data quality assessment is carried out using the data quality levels and criteria defined by the PEF method (European Commission, 2021), as outlined in Annex E of EN 15804 and requested in the GPI v5.0.1. The data quality assessment cover data that together contribute to at least 80% of the results of each of the declared environmental impact indicators. The average data quality level of this LCA is “Good”.

Impact assessment method: EN 15804:2012+A2:2019/AC:2021, version EF 3.1, February 2023.

The environmental performance indicators to use in the EPD have been calculated according to the default environmental performance indicators and their methods as described at the website (www.environdec.com/indicators), which includes both inventory indicators and indicators of potential environmental impact.

In addition, as required by the PCR 2024-06 v1.0, the GWP-GHG indicator for climate impact is declared. The GWP-GHG indicator is equal to GWP-total except that the characterisation factor for biogenic CO_2 is set to zero.

No additional indicators and optional LCIA elements (i.e. normalisation, grouping and weighting methods) have been included in the LCA study.

LCA: Scenarios and additional technical information

Manufacturing stage (A1-A3)

All materials and components of the SACE Infinitus I25L H/10 1P2L 2500A are modelled based on the product's Bill of Materials (BoM). The product components are sourced globally and shipped to ABB's Frosinone plant, where final assembly is carried out. The electricity consumption of ABB's plant is modelled considering the Renewable Energy Certificate (REC). The GWP-GHG emission factor associated with the electricity mix of the REC is 0.0133 kg CO_2/kWh.

Distribution stage (A4)

Product distribution from the ABB factory to final customers in Norway and the Netherlands is included in the analysis. The following transportation processes from ecoinvent v3.10 are used in the distribution scenario for road and maritime transport: "transport, freight, lorry >32 metric ton, EURO5" and "transport, freight, sea, container ship".

Installation stage (A5)

The installation process is similar to that of air circuit breakers and involves three crane/lifting table-assisted steps within a 600 mm-wide cabinet. The product requires connection to a liquid cooling system, typically integrated into the LV system. Packaging disposal is included in the installation phase, modelled according to EN 50693.

Use stage (B1-B7)

The use stage includes maintenance activities (B2) and operational energy use (B6) and operation water use (B7).

The majority of maintenance activities are related to the inspection, verification of the cooling liquid system and replacement of internal hydraulic components. The cooling liquid must be replaced every three years (B2), while the hydraulic components of the cooling system should be replaced every six years to ensure proper operation (B7).

As regards the operational energy use (B6), the total energy consumption (TEC) for the product during the entire reference service life has been calculated with the following equation:

$$TEC\ [kWh] = EC\ [kWh]\ electronics + EC\ [kWh]\ cooling\ system + EC\ [kWh]\ total\ dissipated\ power$$

where

$$EC\ [kWh]\ \text{electronics} = P_{[kW]\ electronics} * \text{Use rate \%} * 8760\ \ (\text{hours in one year}) * RSL\ (year)$$
$$EC\ [kWh]\ \text{cooling system} = P_{[kW]\ \text{cooling system}} * \text{Use rate \%} * 8760\ \ (\text{hours in one year}) * RSL\ (year)$$
$$EC\ [kWh]\ total\ dissipated\ power = P_{[kW]\ total\ dissipated\ power} * \text{Use rate \%} * 8760\ \ (\text{hours in one year}) * RSL\ (year)$$

Power consumption of electronics, cooling systems, and power losses of the product are based on primary data, assuming 100% usage for electronics and cooling. In 2024, SACE Infinitus products were installed in marine propulsion test labs (Norway and Netherlands), representing an industrial application. A 30% use rate for power losses is applied, based on PSR 0005 of the PEP ecopassport, for circuit breaker, considered appropriate for this industrial context.

Reference product	Electronics					Cooling system			Total dissipated power			TEC (kWh)
	P (kW) - auxiliary power - open	Use rate (%) - auxiliary power - open	P (kW) - auxiliary power - close	Use rate (%) - auxiliary power - close	EC [kWh]	P [kW]	Use rate [%]	EC [kWh]	P 50% In [kW]	Use rate (%)	EC [kWh]	
Infinitus I25L H/10 1P2L 2500A	0.01702	75%	0.04272	25%	4107.564	0.272	100%	47654.4	0.9345	30%	49117.32	100879.28

SACE Infinitus is used in a variety of applications which correspond to different usage scenarios (marine and industrial) and different use rates (30% and 50%). Annex II provides a sensitivity analysis on environmental impacts by usage profile and a second analysis assessing the influence of geographic representativeness on results.

End-of-life stage (C1-C4)

The default end-of-life scenario reported in the EN50693 standard is applied, considering the Annex G (Table G.4) for end-of-life treatment of different materials. A local transportation of 100 km by lorry (transport, freight, lorry >32 metric ton, EURO5) is assumed for product transportation to the disposal site.

ENVIRONMENTAL PERFORMANCE

Results per functional unit - Infinitus I25L H/10 1P2L 2500A											
Impact category indicators		**All stages**	**Manufacturing**	**Distribution**	**Installation**	**Use**					**End of life**
Indicator	**Unit**	**Total**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3-B5**	**B6**	**B7**	**C1-C4**
GWP-GHG	kg CO_2 eq.	1.84E+04	3.13E+03	7.54E+01	1.77E+01	0.00E+00	3.19E+02	0.00E+00	1.47E+04	1.68E+01	2.31E+02
GWP-total	kg CO_2 eq.	1.84E+04	3.04E+03	7.54E+01	1.03E+02	0.00E+00	3.20E+02	0.00E+00	1.46E+04	1.68E+01	2.32E+02
GWP-fossil	kg CO_2 eq.	1.84E+04	3.09E+03	7.54E+01	1.60E+01	0.00E+00	3.17E+02	0.00E+00	1.46E+04	1.68E+01	2.30E+02
GWP-biogenic	kg CO_2 eq.	4.48E+01	-4.69E+01	3.55E-02	8.65E+01	0.00E+00	3.26E+00	0.00E+00	2.44E-08	9.86E-03	1.81E+00
GWP-luluc	kg CO_2 eq.	1.74E+01	3.51E+00	2.65E-02	3.00E-02	0.00E+00	2.49E-01	0.00E+00	1.34E+01	1.09E-02	2.32E-01
ODP	kg CFC 11 eq.	5.88E-04	8.21E-05	1.49E-06	1.13E-07	0.00E+00	5.76E-06	0.00E+00	4.96E-04	2.97E-07	1.89E-06
AP	mol H^+ eq.	1.58E+02	9.63E+01	3.50E-01	2.78E-02	0.00E+00	1.45E+00	0.00E+00	5.48E+01	6.27E-02	5.25E+00
EP-freshwater	kg P eq.	1.42E+01	8.26E+00	4.98E-03	2.31E-03	0.00E+00	1.10E-01	0.00E+00	5.57E+00	4.32E-03	2.80E-01
EP-marine	kg N eq.	1.68E+01	6.61E+00	1.08E-01	1.85E-02	0.00E+00	2.69E-01	0.00E+00	9.41E+00	1.32E-02	3.78E-01
EP-terrestrial	mol N eq.	1.99E+02	8.58E+01	1.18E+00	8.89E-02	0.00E+00	2.86E+00	0.00E+00	1.05E+02	1.32E-01	3.74E+00
POCP	kg NMVOC eq.	6.05E+01	2.48E+01	4.65E-01	2.95E-02	0.00E+00	9.34E-01	0.00E+00	3.30E+01	6.20E-02	1.18E+00
ADP-minerals & metals	kg Sb eq.	2.05E+00	1.56E+00	1.96E-04	3.27E-05	0.00E+00	6.71E-03	0.00E+00	4.20E-01	1.18E-04	6.32E-02
ADP-fossil*	MJ	2.64E+05	3.84E+04	1.08E+03	8.58E+01	0.00E+00	4.05E+03	0.00E+00	2.18E+05	3.11E+02	2.30E+03
WDP*	m^3	6.31E+03	1.75E+03	5.04E+00	6.53E+00	0.00E+00	9.05E+01	0.00E+00	4.33E+03	5.55E+00	1.23E+02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; 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, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end 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-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.*

The environmental performance results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The results of the end-of-life stage (module C) should be considered when using the results of the production stage (modules A1-A3).

Results per functional unit - Infinitus I25L H/10 1P2L 2500A											
Resource use indicators		**All stages**	**Manufacturing**	**Distribution**	**Installation**	**Use**					**End of life**
Indicator	**Unit**	**Total**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3-B5**	**B6**	**B7**	**C1 - C4**
PERE	MJ	3.54E+05	7.01E+03	1.62E+01	4.88E+02	0.00E+00	3.31E+03	0.00E+00	3.43E+05	1.22E+01	4.48E+02
PERM	MJ	0.00E+00	8.38E+02	0.00E+00	-8.38E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.37E-01
PERT	MJ	3.54E+05	7.85E+03	1.62E+01	-3.50E+02	0.00E+00	3.31E+03	0.00E+00	3.43E+05	1.22E+01	4.48E+02
PENRE	MJ	2.64E+05	3.73E+04	1.08E+03	2.57E+02	0.00E+00	4.03E+03	0.00E+00	2.18E+05	3.11E+02	2.81E+03
PENRM	MJ	0.00E+00	9.93E+02	0.00E+00	-3.62E+02	0.00E+00	3.09E+00	0.00E+00	0.00E+00	0.00E+00	-6.35E+02
PENRT	MJ	2.64E+05	3.83E+04	1.08E+03	-1.05E+02	0.00E+00	4.03E+03	0.00E+00	2.18E+05	3.11E+02	2.18E+03
SM	kg	2.62E+01	2.62E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	7.23E-02	7.23E-02	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.20E+03	4.46E+01	1.58E-01	8.51E-02	0.00E+00	1.99E+01	0.00E+00	2.13E+03	1.43E-01	3.54E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

Results per functional unit - Infinitus I25L H/10 1P2L 2500A											
Waste indicators		**All stages**	**Manufacturing**	**Distribution**	**Installation**	**Use**					**End of life**
Indicator	**Unit**	**Total**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3-B5**	**B6**	**B7**	**C1 - C4**
HWD	kg	3.80E+00	2.61E+00	7.04E-03	5.13E-04	0.00E+00	3.57E-02	0.00E+00	1.10E+00	4.62E-03	4.68E-02
NHWD	kg	3.25E+03	3.06E+02	8.84E+01	5.13E+01	0.00E+00	5.37E+01	0.00E+00	2.48E+03	1.04E+00	2.79E+02
RWD	kg	6.20E-01	5.77E-02	3.16E-04	2.28E-04	0.00E+00	7.55E-03	0.00E+00	5.45E-01	2.02E-04	8.86E-03
Acronyms	HWD= Hazardous waste disposed; NHWD=Non-hazardous waste disposed; RWD= Radioactive waste disposed										

Results per functional unit - Infinitus I25L H/10 1P2L 2500A											
Output flow indicators		**All stages**	**Manufacturing**	**Distribution**	**Installation**	**Use**					**End of life**
Indicator	**Unit**	**Total**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3-B5**	**B6**	**B7**	**C1 - C4**
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	2.25E+02	2.06E+00	0.00E+00	2.45E+01	0.00E+00	1.40E+01	0.00E+00	0.00E+00	0.00E+00	1.85E+02
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	1.55E+02	3.46E-01	0.00E+00	4.65E+01	0.00E+00	1.52E+00	0.00E+00	0.00E+00	0.00E+00	1.06E+02
EET	MJ	3.14E+02	7.76E-01	0.00E+00	9.23E+01	0.00E+00	1.28E+01	0.00E+00	0.00E+00	0.00E+00	2.08E+02
Acronyms	CRU= Components for reuse; MFR= Materials for recycling; MER= Materials for energy recovery; EEE= Exported energy, electricity; EET= Exported energy, thermal										

Results per functional unit - Infinitus I25L H/10 1P2L 2500A											
Biogenic C content		**All stages**	**Manufacturing**	**Distribution**	**Installation**	**Use**					**End of life**
Indicator	**Unit**	**Total**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3-B5**	**B6**	**B7**	**C1 - C4**
Biogenic C content-product	kg	5.59E-03	5.59E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic C content-packaging	kg	3.17E+01	3.17E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional LCA results of the product(s)

To assess the environmental impacts of the SACE Infinitus I25L variants, this EPD applies the second option permitted by the PCR for multiple products: results are based on a representative product within a homogeneous product family. The SACE Infinitus product family meets the criteria for homogeneous product family; therefore, extrapolation follows the rules defined in EN 50693.

The extrapolation rules to calculate the impacts of the variants are reported in Annex I.

ABBREVIATIONS

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
SVHC	Substances of Very High Concern
ND	Not Declared
EC	Energy Consumption
TEC	Total Energy Consumption
LCA	Life Cycle Assessment
IEC	International Electrotechnical Commission

REFERENCES

- ISO 14040:2006/Amd 1:2020. Life cycle assessment. Environmental management. Principles and Framework. International Organization for Standardization. 2020
- ISO 14044:2006/Amd 1:2017/Amd 2:2020. Life cycle assessment. Environmental management. Requirements and guidelines. International Organization for Standardization. 2020
- ISO 14025:2006. Environmental labels and declarations — Type III environmental declarations — Principles and procedures. International Organization for Standardization. 2006
- EPD International, 2021. General Programme Instructions for the International EPD® System. Version 4.0, published on 2021-03-29 (www.environdec.com)
- EN 50693:2019: Product category rules for life cycle assessments of electronic and electrical products and systems
- EPD International, 2024. PCR 2024:06 v1.0.1 – PCR for Electronics and Electric Equipment, and Electronic Components (non-construction)
- EPD International, 2024. C-PCR-001 (to PCR 2024:06) v1.0.1 – Electrical Switchgear and Control Gear Solutions
- PEP ecopassport, 2023. PSR-0005-ed3.1-EN-2023 12 08, SPECIFIC RULES FOR Electrical switchgear and control gear Solutions
- PRé Consultants, Software SimaPro Craft v10.2.0.2, 2025 (www.simapro.com)
- ABB website. (https://new.abb.com/low-voltage/products/circuit-breakers/sace-infinitus-solid-state-circuit-breaker) [accessed 04-03-2025]
- Ecoinvent, 2023. Swiss Centre for Life Cycle Assessment, v3.10 (Home - ecoinvent).
- Carbon Minds, 2024. cm.chemicals 2024. Carbon Minds GmbH (https://www.carbon-minds.com/)
- UNI EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- 2B Srl, 2025. LCA of ABB SACE Infinitus I25L, produced by ABB S.p.A. in Frosinone, Italy

VERSION HISTORY

Original Version of the EPD, 2025-12-15

ANNEX I

The extrapolation rules are calculated based on the LCIA results of all the 18 configurations of the SACE Infinitus product family. A linear correlation between the LCIA impacts of the representative product and its variants is identified using parameters and coefficients reported below. Each environmental indicator for each life cycle stage is calculated using the following formulas.

- **Manufacturing stage**:

$$y = ax$$

where y = result to be calculated for a specific indicator
x = impact of the reference product for the manufacturing stage
a = manufacturing stage coefficient for the product configuration to be calculated

- **Distribution stage:**

$$y = ax + b$$

where y = result to be calculated for a specific indicator
x = product weight + packaging weight
a = slope
b = intercept

- **Installation stage:**

$$y = ax + b$$

where y = result to be calculated for a specific indicator
x = packaging weight
a = slope
b = intercept

- **Use stage:**

$$y = ax + b$$

where y = result to be calculated for a specific indicator
x = electricity consumption
a = slope
b = intercept

- **End of life stage:**

$$y = ax$$

where y = result to be calculated for a specific indicator
x = impact of the reference product for EoL stage
a = EoL stage coefficient for the product configuration to be calculated

The following table shows products included in the product family and considered in the extrapolation rules application.

List of variants included in the EPD	Product weight (kg)	Packaging weight (kg)	Electricity consumption during the use stage (kWh)
Infinitus I25L H/10 1P2L 2500A	321	69.7	100879.28
Infinitus I25L H/10 1P2L 2000A	321	69.7	88186.04
Infinitus I25L H/10 1P2L 1600A	321	69.7	79382.24
Infinitus I25L H/10 1P2L 1250A	321	69.7	71261.72
Infinitus I25L H/10 1P2L 1000A	321	69.7	67766.48
Infinitus I25L H/10 1P2L 800A	321	69.7	63272.60
Infinitus I25L V/10 1P2L 2500A	611	86.2	105898.76
Infinitus I25L V/10 1P2L 2000A	611	86.2	91405.34
Infinitus I25L V/10 1P2L 1600A	611	86.2	81445.22
Infinitus I25L V/10 1P2L 1250A	611	86.2	72523.16
Infinitus I25L V/10 1P2L 1000A	611	86.2	68568.02
Infinitus I25L V/10 1P2L 800A	611	86.2	63785.06
Infinitus I25L S/10 1P2L 2500A	263	69.7	99236.78
Infinitus I25L S/10 1P2L 2000A	263	69.7	87134.84
Infinitus I25L S/10 1P2L 1600A	263	69.7	78712.10
Infinitus I25L S/10 1P2L 1250A	263	69.7	70854.38
Infinitus I25L S/10 1P2L 1000A	263	69.7	67503.68
Infinitus I25L S/10 1P2L 800A	263	69.7	63101.78

The table above provides the packaging weight, product weight, and electricity consumption for all product variants. For the environmental impacts associated with each life cycle stage of the reference product, please refer to the “Environmental performance” section. The following tables report the linear coefficients (“a” or “a” and “b”) for each life cycle stage.

Manufacturing stage				
Indicator	**Unit**	**H configuration a**	**S configuration a**	**V configuration a**
GWP-GHG	kg CO_2 eq	1.00E+00	8.90E-01	1.58E+00
GWP-total	kg CO_2 eq	1.00E+00	8.86E-01	1.59E+00
GWP-fossil	kg CO_2 eq	1.00E+00	8.91E-01	1.61E+00
GWP-biogenic	kg CO_2 eq	1.00E+00	1.17E+00	6.35E-01
GWP-luluc	kg CO_2 eq	1.00E+00	9.39E-01	1.46E+00
ODP	kg CFC11 eq	1.00E+00	9.71E-01	1.17E+00
AP	mol H^+ eq	1.00E+00	9.53E-01	1.46E+00
EP-freshwater	kg P eq	1.00E+00	9.55E-01	1.45E+00
EP-marine	kg N eq	1.00E+00	9.35E-01	1.49E+00
EP-terrestrial	mol N eq	1.00E+00	9.41E-01	1.47E+00
POCP	kg NMVOC eq	1.00E+00	9.37E-01	1.49E+00
ADP-minerals&metals	kg Sb eq	1.00E+00	9.71E-01	1.36E+00
ADP-fossil	MJ	1.00E+00	9.04E-01	1.55E+00
WDP	m^3 depriv.	1.00E+00	9.45E-01	1.43E+00
PERE	MJ	1.00E+00	9.48E-01	1.42E+00
PERM	MJ	1.00E+00	1.00E+00	1.27E+00
PERT	MJ	1.00E+00	9.54E-01	1.40E+00
PENRE	MJ	1.00E+00	9.02E-01	1.56E+00
PENRM	MJ	1.00E+00	9.82E-01	1.05E+00
PENRT	MJ	1.00E+00	9.04E-01	1.54E+00
SM	kg	1.00E+00	9.97E-01	1.87E+00
RSF	MJ	1.00E+00	9.53E-01	1.71E+01
NRSF	MJ	1.00E+00	1.00E+00	1.00E+00
FW	m^3	1.00E+00	9.43E-01	1.45E+00
HWD	kg	1.00E+00	9.52E-01	1.42E+01
NHWD	kg	1.00E+00	8.93E-01	1.96E+00
RWD	kg	1.00E+00	9.43E-01	1.43E+00
CRU	kg	1.00E+00	1.00E+00	1.00E+00
MFR	kg	1.00E+00	9.89E-01	4.93E+00
MER	kg	1.00E+00	1.00E+00	1.00E+00
EEE	MJ	1.00E+00	9.97E-01	2.02E+00
EET	MJ	1.00E+00	9.95E-01	2.76E+00
Biogenic C content-product	kg	1.00E+00	1.00E+00	1.05E+00
Biogenic C content-packaging	kg	1.00E+00	9.62E-01	1.42E+00

Distribution stage			
Indicator	**Unit**	**All configurations a**	**All configurations b**
GWP-GHG	kg CO_2 eq	1.93E-01	4.11E-08
GWP-total	kg CO_2 eq	1.93E-01	-1.03E-08
GWP-fossil	kg CO_2 eq	1.93E-01	-4.06E-09
GWP-biogenic	kg CO_2 eq	9.08E-05	4.99E-12
GWP-luluc	kg CO_2 eq	6.79E-05	8.68E-14
ODP	kg CFC11 eq	3.82E-09	3.73E-13
AP	mol H^+ eq	8.96E-04	1.17E-10
EP-freshwater	kg P eq	1.27E-05	1.03E-12
EP-marine	kg N eq	2.76E-04	-2.82E-11
EP-terrestrial	mol N eq	3.02E-03	-8.21E-10
POCP	kg NMVOC eq	1.19E-03	7.01E-11
ADP-minerals&metals	kg Sb eq	5.02E-07	6.10E-14
ADP-fossil	MJ	2.77E+00	5.69E-08
WDP	m^3 depriv.	1.29E-02	-2.49E-10
PERE	MJ	4.15E-02	-5.19E-09
PERM	MJ	0.00E+00	0.00E+00
PERT	MJ	4.15E-02	-5.19E-09
PENRE	MJ	2.77E+00	-3.99E-07
PENRM	MJ	0.00E+00	0.00E+00
PENRT	MJ	2.77E+00	-3.99E-07
SM	kg	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00
FW	m^3	4.05E-04	6.31E-11
HWD	kg	1.80E-05	4.77E-12
NHWD	kg	2.26E-01	5.40E-08
RWD	kg	8.08E-07	-1.08E-13
CRU	kg	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00
Biogenic C content-product	kg	0.00E+00	0.00E+00
Biogenic C content-packaging	kg	0.00E+00	0.00E+00

Installation stage			
Indicator	**Unit**	**All configurations a**	**All configurations b**
GWP-GHG	kg CO_2 eq	2.28E-01	1.81E+00
GWP-total	kg CO_2 eq	1.73E+00	-1.80E+01
GWP-fossil	kg CO_2 eq	1.89E-01	2.83E+00
GWP-biogenic	kg CO_2 eq	1.54E+00	-2.08E+01
GWP-luluc	kg CO_2 eq	9.02E-04	-3.29E-02
ODP	kg CFC11 eq	3.46E-09	-1.29E-07
AP	mol H^+ eq	5.93E-04	-1.35E-02
EP-freshwater	kg P eq	6.20E-05	-2.01E-03
EP-marine	kg N eq	3.92E-04	-8.87E-03
EP-terrestrial	mol N eq	2.16E-03	-6.15E-02
POCP	kg NMVOC eq	6.27E-04	-1.43E-02
ADP-minerals&metals	kg Sb eq	5.23E-07	-3.75E-06
ADP-fossil	MJ	1.92E+00	-4.83E+01
WDP	m^3 depriv.	1.21E-01	-1.90E+00
PERE	MJ	7.65E+00	-4.55E+01
PERM	MJ	-1.39E+01	1.28E+02
PERT	MJ	-6.21E+00	8.28E+01
PENRE	MJ	2.86E+00	5.71E+01
PENRM	MJ	-1.98E+00	-2.24E+02
PENRT	MJ	8.82E-01	-1.67E+02
SM	kg	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00
FW	m^3	2.01E-03	-5.49E-02
HWD	kg	1.05E-05	-2.17E-04
NHWD	kg	7.52E-01	-1.20E+00
RWD	kg	3.39E-06	-7.68E-06
CRU	kg	0.00E+00	0.00E+00
MFR	kg	3.73E-01	-1.51E+00
MER	kg	0.00E+00	0.00E+00
EEE	MJ	5.58E-01	7.59E+00
EET	MJ	1.12E+00	1.45E+01
Biogenic C content-product	kg	0.00E+00	0.00E+00
Biogenic C content-packaging	kg	0.00E+00	0.00E+00

Use stage			
Indicator	**Unit**	**All configurations a**	**All configurations b**
GWP-GHG	kg CO_2 eq	1.45E-01	4.77E+02
GWP-total	kg CO_2 eq	1.45E-01	4.77E+02
GWP-fossil	kg CO_2 eq	1.45E-01	4.74E+02
GWP-biogenic	kg CO_2 eq	2.49E-13	3.27E+00
GWP-luluc	kg CO_2 eq	1.33E-04	3.87E-01
ODP	kg CFC11 eq	4.92E-09	1.08E-05
AP	mol H^+ eq	5.43E-04	2.04E+00
EP-freshwater	kg P eq	5.52E-05	1.67E-01
EP-marine	kg N eq	9.33E-05	3.73E-01
EP-terrestrial	mol N eq	1.04E-03	4.01E+00
POCP	kg NMVOC eq	3.28E-04	1.32E+00
ADP-minerals&metals	kg Sb eq	4.17E-06	1.08E-02
ADP-fossil	MJ	2.16E+00	6.45E+03
WDP	m^3 depriv.	4.29E-02	1.37E+02
PERE	MJ	3.40E+00	6.57E+03
PERM	MJ	0.00E+00	0.00E+00
PERT	MJ	3.40E+00	6.57E+03
PENRE	MJ	2.16E+00	6.43E+03
PENRM	MJ	0.00E+00	1.07E-14
PENRT	MJ	2.16E+00	6.43E+03
SM	kg	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00
FW	m^3	2.11E-02	4.03E+01
HWD	kg	1.09E-05	5.08E-02
NHWD	kg	2.45E-02	8.40E+01
RWD	kg	5.40E-06	1.29E-02
CRU	kg	0.00E+00	0.00E+00
MFR	kg	2.30E-35	1.40E+01
MER	kg	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	1.52E+00
EET	MJ	0.00E+00	1.28E+01
Biogenic C content-product	kg	0.00E+00	0.00E+00
Biogenic C content-packaging	kg	0.00E+00	0.00E+00

End of Life stage				
Indicator	**Unit**	**H configuration a**	**S configuration a**	**V configuration a**
GWP-GHG	kg CO_2 eq	1.00E+00	8.77E-01	1.17E+00
GWP-total	kg CO_2 eq	1.00E+00	8.77E-01	1.17E+00
GWP-fossil	kg CO_2 eq	1.00E+00	8.77E-01	1.17E+00
GWP-biogenic	kg CO_2 eq	1.00E+00	8.02E-01	1.16E+00
GWP-luluc	kg CO_2 eq	1.00E+00	8.36E-01	1.23E+00
ODP	kg CFC11 eq	1.00E+00	8.26E-01	1.25E+00
AP	mol H^+ eq	1.00E+00	9.39E-01	1.37E+00
EP-freshwater	kg P eq	1.00E+00	9.19E-01	1.34E+00
EP-marine	kg N eq	1.00E+00	9.11E-01	1.25E+00
EP-terrestrial	mol N eq	1.00E+00	9.02E-01	1.32E+00
POCP	kg NMVOC eq	1.00E+00	9.00E-01	1.33E+00
ADP-minerals&metals	kg Sb eq	1.00E+00	9.55E-01	1.38E+00
ADP-fossil	MJ	1.00E+00	8.29E-01	1.24E+00
WDP	m^3 depriv.	1.00E+00	8.74E-01	1.26E+00
PERE	MJ	1.00E+00	8.51E-01	1.25E+00
PERM	MJ	1.00E+00	1.00E+00	1.05E+00
PERT	MJ	1.00E+00	8.51E-01	1.25E+00
PENRE	MJ	1.00E+00	8.55E-01	1.20E+00
PENRM	MJ	1.00E+00	9.72E-01	1.02E+00
PENRT	MJ	1.00E+00	8.21E-01	1.26E+00
SM	kg	1.00E+00	1.00E+00	1.00E+00
RSF	MJ	1.00E+00	1.00E+00	1.00E+00
NRSF	MJ	1.00E+00	1.00E+00	1.00E+00
FW	m^3	1.00E+00	8.57E-01	1.25E+00
HWD	kg	1.00E+00	9.77E-01	1.04E+00
NHWD	kg	1.00E+00	7.81E-01	1.93E+00
RWD	kg	1.00E+00	8.07E-01	1.19E+00
CRU	kg	1.00E+00	1.00E+00	1.00E+00
MFR	kg	1.00E+00	7.55E-01	1.11E+00
MER	kg	1.00E+00	1.00E+00	1.00E+00
EEE	MJ	1.00E+00	9.89E-01	1.01E+00
EET	MJ	1.00E+00	9.89E-01	1.01E+00
Biogenic C content-product	kg	1.00E+00	1.00E+00	1.00E+00
Biogenic C content-packaging	kg	1.00E+00	1.00E+00	1.00E+00

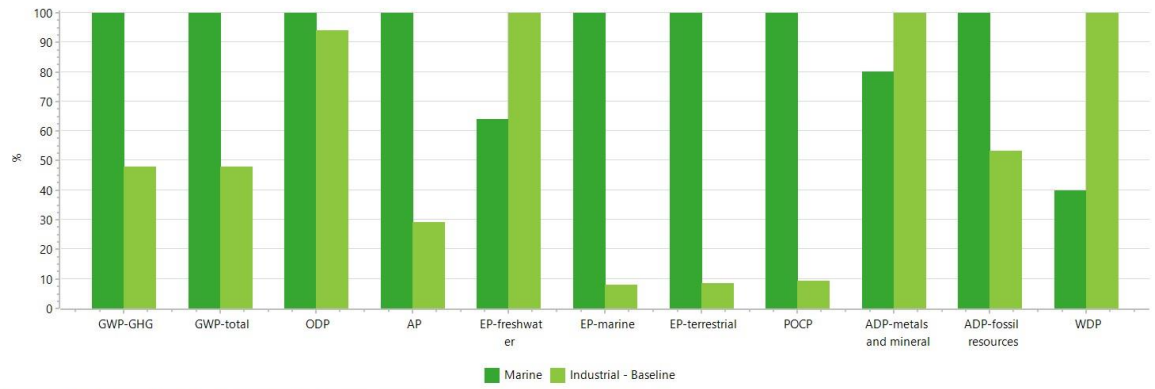
ANNEX II

SACE Infinitus is used in various applications—marine, smart transportation, smart buildings, and renewable energy—corresponding to different usage scenarios (marine and industrial) and use rates (30% and 50%). A sensitivity analysis is conducted to assess how environmental impacts vary with these parameters. Given the global market of SACE Infinitus, a second sensitivity analysis was performed to evaluate to evaluate how the geographical representativeness affect the overall environmental results.

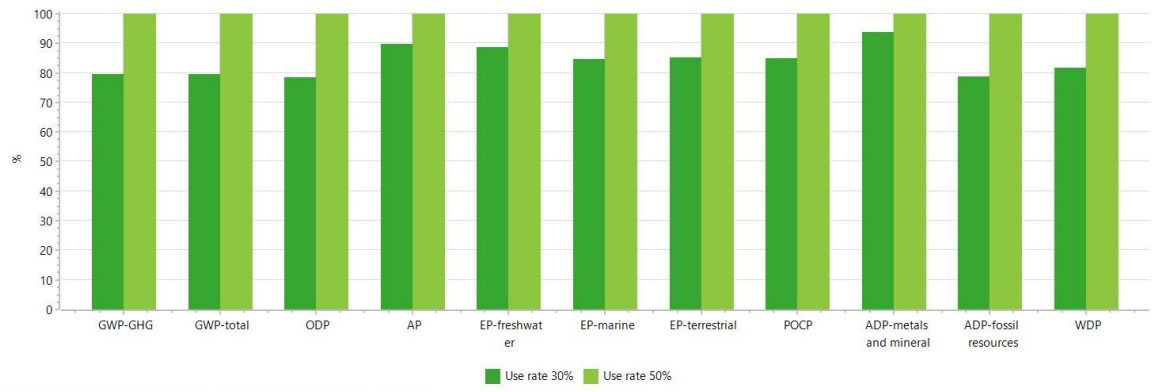
The marine scenario considers diesel-electric generators on ships, while the industrial scenario uses country-specific electricity mixes. The geographical analysis includes: Canada, China, Denmark, Finland, Iceland, Japan, Netherlands, Norway, Europe (RER), USA, Sweden, and Korea.

In the figures below are presented the results of the sensibility analysis:

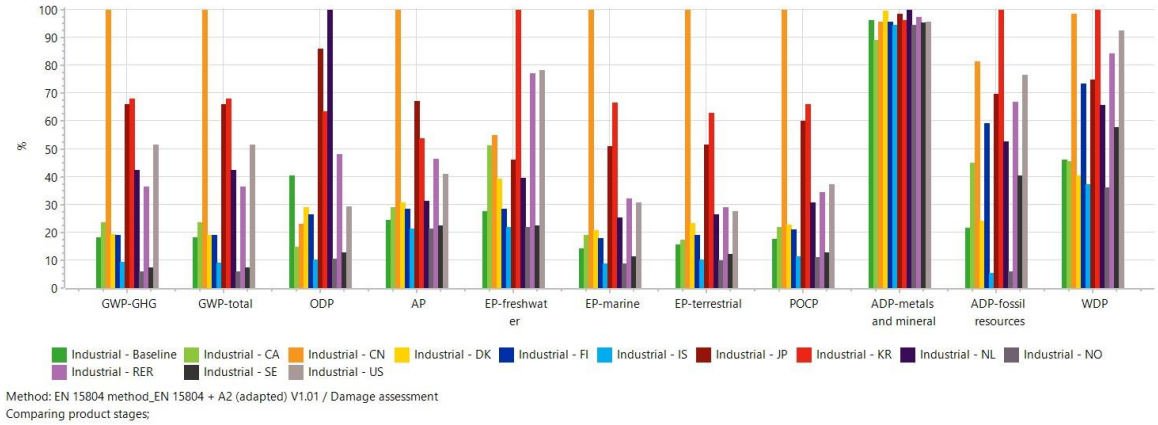
- marine vs industrial scenario;
- 30% vs 50% use rate;
- electricity mix variation.



The first sensibility analysis shows that the industrial scenario has lower impacts than the marine one in categories such as GWP, ODP, marine and terrestrial eutrophication, and ADP – fossil.



The scenario with a 50% use rate shows a higher overall life cycle impact compared to the 30% use rate scenario, with an average increase of approximately 30% across the different impact categories.



The last analysis highlights that electricity mix significantly affects environmental impacts. The Chinese mix yields the highest impacts in most categories; the Korean mix is highest for EP–freshwater, ADP–fossil, and WDP; the Netherlands mix shows the highest for ODP and ADP–minerals.

The sensitivity analyses conducted have shown that variations in the usage scenario (application, use rate, sales destination) substantially influence environmental impacts. Incorporating these variables is essential for a robust and accurate life cycle assessment.