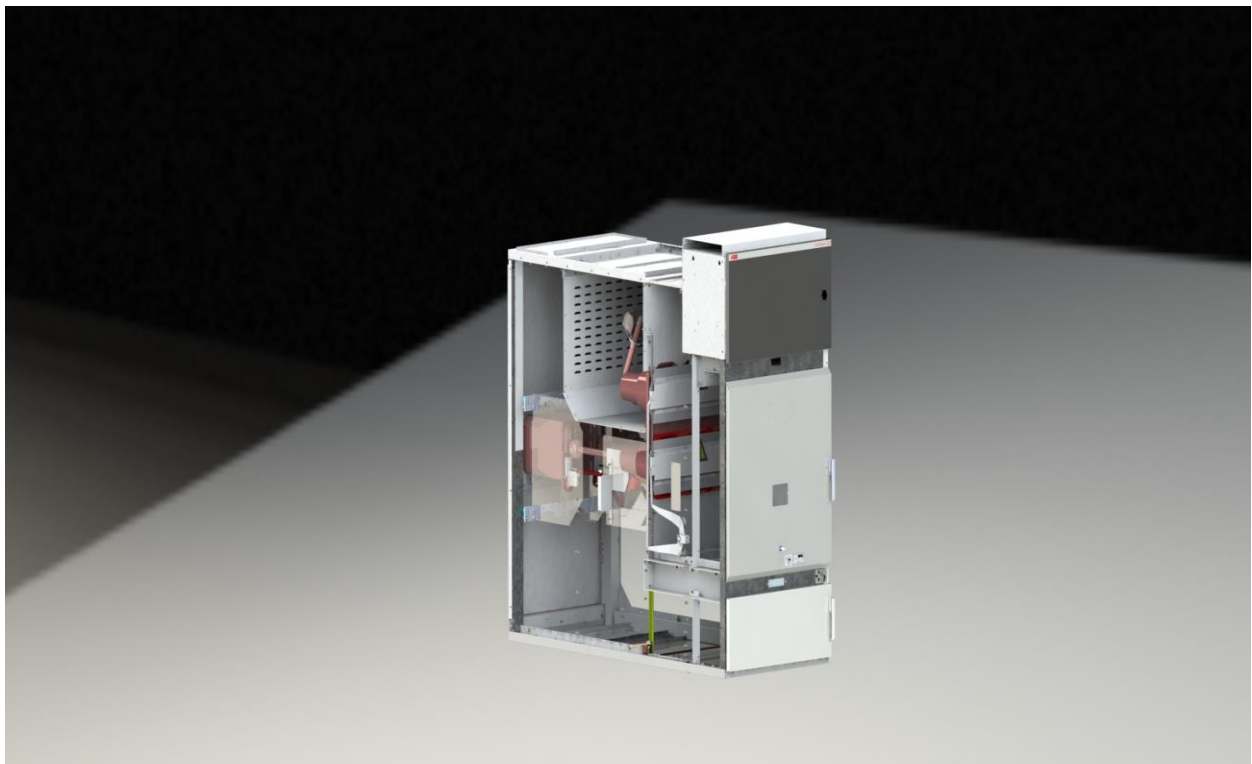


EPD

Environmental Product Declaration

Medium Voltage Air Insulated Switchgear UniGear ZS2 Bus Tie 36.12.32



Production site: Dilovasi, Kocaeli ,Turkiye



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-7279-6644-EN	ISSUE DATE 2024-08-15			
VALID TO 2029-08-15	STATUS Approved	SECURITY LEVEL Public		
OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 1YTW571780-407	REV. A	LANG. EN	PAGE 1/16

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ver-050924

EPD Owner	ABB Switzerland Ltd, Group Technology Management		
Organization No.	CHE-101.538.426		
Manufacturer name and address	ABB Elektrik A.S. Dilovasi Organize Sanayi Boelgesi, 4.Kisim D4009 Sokak No:11 Dilovasi Kocaeli Turkiye		
Company contact	Mandar Harshe– mandar.harshe@in.abb.com Global Product Manager		
Program operator	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway phone: +47 23 08 80 00, email: post@epd-norge.no		
Declared product	UniGear ZS2 36.12.32 BT		
Product description	The UniGear ZS2 is the ABB mainline global switchgear in 36kV, 1250A, 32 kA which are used in distribution of electric power in a variety of demanding applications such as on off - shore platforms, in container or in a cruise ships, in mines as well as in utility substations, power plants or chemical plants.		
Functional unit	The functional unit of this study is to distribute electric power at an internal resistance use rate of %100 and load rate of 53 %, during a service life of 20years in Europe.		
Reference flow	A single UniGear ZS2 BT 36.12.32 panel, including sub-components 3 pcs Current transformer type TPU 70.41 and 1 pc Circuit breaker type VD4/W 36.12.25		
Independent verification	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:		
Approved by	Håkon Hauan, CEO EPD-Norge		
	Signature: 		
Reference PCR	EN 50693:2019 – Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. EPDItaly007 – Electronic and Electrical Products and Systems, Rev. 3.0, 2023/01/13. EPDItaly015 – Electronic and Electrical Products and Systems – Switchboards, Rev. 1.5, 2022/02/23.		
Program instructions	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019, Version 3.0, 2019/04/24.		
LCA study	This EPD is based on the LCA study described in the LCA report 1YTW571780-405.		
EPD type	Specific product OR Specific product with extrapolation rules OR Average product		
EPD scope	Cradle-to-grave		
Product RSL	20 years		
Geographical representativeness	Manufacturing (suppliers): Global	Manufacturing (ABB): Turkiye	Downstream: Europe
Reference year	2023		
LCA software	SimaPro 9.5 (2023)		
LCI database	Ecoinvent v3.9.1 (2022)		
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.		
Liability	The owner of the declaration shall be liable for the underlying information and evidence. EPD-Norge shall not be liable with respect to manufacturer, life cycle assessment data, and evidence.		

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	2/16

Contents

Sustainability at ABB4

General Information5

Constituent Materials6

LCA Background Information8

Inventory Analysis10

Environmental Indicators13

Additional Environmental Information15

References16

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	3/16



Sustainability at ABB

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation, and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels.

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

Learn more on our website global.abb/group/en/sustainability or scan the QR code.



STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	4/16



General Information

This Environmental Product Declaration is a “specific product EPD”, and the declared product is the UniGear ZS2 BT 36.12.32, including related accessories and packaging.

The UniGear ZS2 BT 36.12.32 is an ABB mainline global switchgear in 36kV, 1250A, 32kA which are used in distribution of electric power in a variety of demanding applications such as on off - shore platforms, in container or in a cruise ships, in mines as well as in utility substations, power plants or chemical plants.

General technical specifications of the product are presented below.

	Description	UniGear ZS2 BT 36.12.32
Ratings	Rated voltage [kV]	36
	Rated current [A]	1250
	Rated short circuit breaking current [kA]	31.5
Components	Circuit Breaker	VD4/W p275 36kV 1250A 31.5kA
	Voltage Transformer	-
	Current Transformer	TPU 70.41 300-600//1A+CD

The UniGear ZS2 BT 36.12.32 is manufactured by ABB Dilovasi manufacturing site located in Kocaeli Türkiye. 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

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	5/16

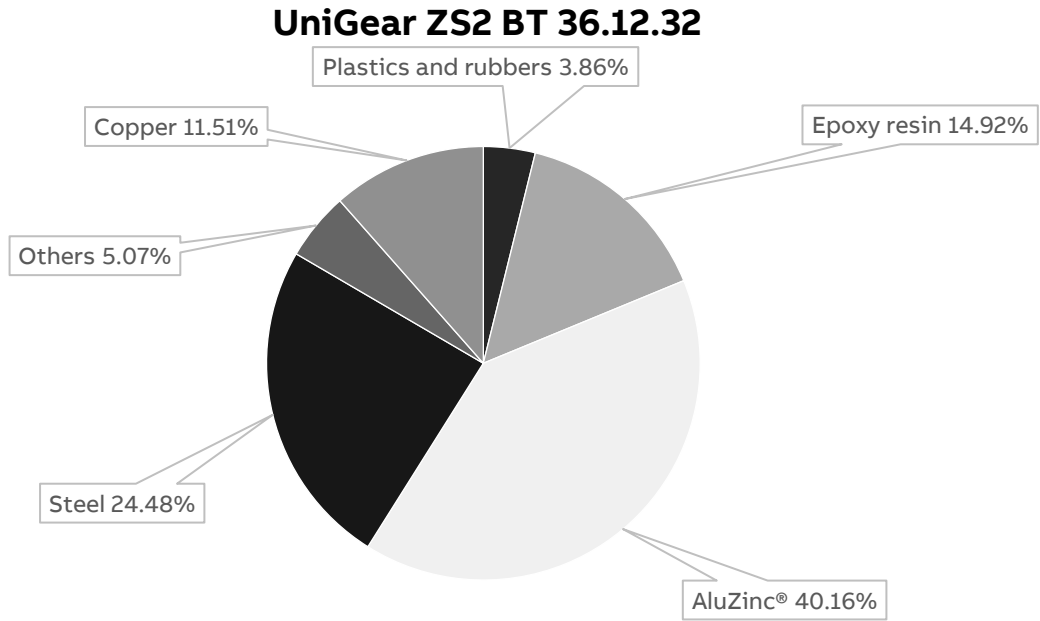


Constituent Materials

The constituent materials of ZS2 UniGear BT 36.12.32 are presented below. Weights of VD4/W 36.12.32, 3 pcs of TPU 70.41 are included to bellow table.

Type	Material	Weight [kg]	Weight %
Metals	Aluminum	32.31	2.76%
	AluZinc®	470.46	40.16%
	Steel	286.77	24.48%
	Stainless Steel	3.23	0.28%
	Brass	9.47	0.81%
	Copper	134.85	11.51%
	Other metals	1.03	0.09%
Plastics And rubbers	ABS	4.08	0.35%
	Polycarbonate	16.74	1.43%
	Polypropylene	0.15	0.01%
	Polyethylene	4.04	0.35%
	Rubber	2.21	0.19%
	Polyester	11.82	1.01%
	Polyamide	6.10	0.52%
Others	Epoxy resin	174.76	14.92%
	Cables	0.03	0.003%
	Others	13.13	1.13%
Total		1171.6	100

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	6/16



The constituent materials of the packaging and accessories are presented below. Both primary packaging (unit) and secondary packaging (bulk) are considered, and 1 pc is assumed per pallet.

	Description	Material	Weight [kg]	Weight %
Unit (1st)	Activated clay	Bentonite	0.99	0.84 %
	Styrofoam	Polyethylene foam	2.00	1.70 %
	Plastic stretch	Polyethylene low density	3.00	2.55 %
	Packaging strip	Polyester	1.00	0.85 %
	Plastic bag	Nylon	11.30	9.62 %
	Subtotal			18.29
Bulk (2nd)	Pallet	Wood	45.00	38.30 %
	Corner part, Strip buckle	Steel	0.20	0.17 %
	Packaging box	Oriented Strand Board	54.00	45.96 %
	Subtotal			99.20
Total			117.49	100.00 %

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	7/16



LCA Background Information

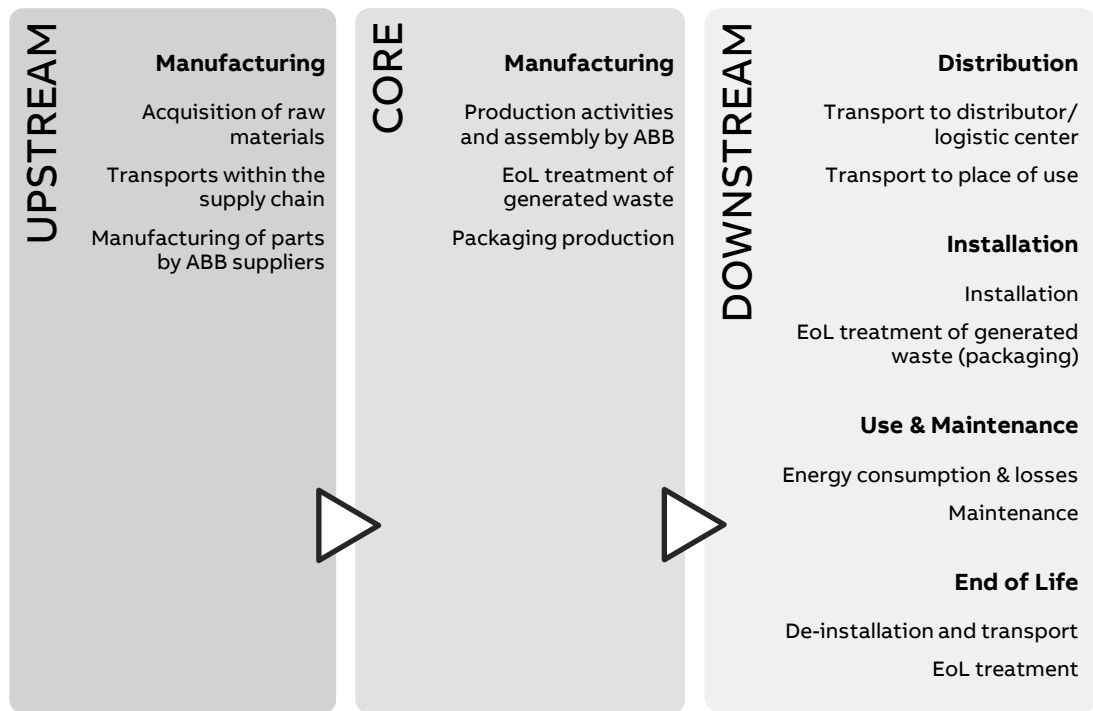
Functional Unit

The functional unit of this study is to distribute electric power at an internal resistance use rate of 100% and load rate of 53 %, during a service life of 20 years in Europe. The reference flow is a single UniGear ZS2 BT 36.12.32 device, including related accessories and packaging.

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

System Boundaries

The life cycle assessment is a “cradle-to-grave” analysis, and the system boundaries are defined according to EN 50693, as required by the PCR EPDItaly007. 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), CAD-files, technical drawings, and site-specific foreground data provided by ABB.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	8/16

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 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 EPDItaly015, the cut-off criteria can be set to a maximum of 2 % of the overall environmental impacts. In this LCA, connectors, auxiliary switch, label, handle have been excluded as their weights are negligible. Process black oxide and phosphate conversion coating have also been excluded due to the model complexity and unavailability of data..

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	9/16



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 and district heating is considered, which is procured by the ABB manufacturing site through Guarantees of Origins (GO's). However, due to the lack of life cycle based residual mix data, other electricity mixes in the LCA are not calculated with residual mix.

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 EPDIItaly012/015, 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 / Assumption

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 ceramics (e.g., bentonite)

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	10/16

Use

The use stage considers the reference power consumption over the reference service life of 20 years as defined in the functional unit. This is calculated using the following formula, according to PCR EPDIItaly015:

$$E_{use} [kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000} = \frac{197.82 \text{ W} * 8760 \text{ hours} * 20 \text{ years} * 100 \%}{1000} = 34658 \text{ kWh}$$

$$P_{use} = R \cdot I^2 \cdot n_{poles} + \Delta P_{CT} \cdot n_{poles}$$

$$\Delta P_{CT} [W] = \Delta P_F + \Delta P_{Jp}$$

$$\Delta P_{CT} [W] = 3.905 + 2.49 = 6.395$$

$$P_{use} = 59.54 * 3 + 6.395 * 3 = 197.82$$

$$I = I_n \left(\frac{I_r}{I_{rCT}} \right)$$

Where:

- E_{use} = Total energy use over the reference service life
- R = Internal resistance
- P_{use} = Reference power consumption in watts
- ΔP_{CT} = Total losses of current transformer (Nominal primary current and resistance effect was excluded) in watts
- ΔP_F = Losses in all magnetic cores of CT in watts
- ΔP_{Jp} = Joule losses in primary and secondary coils of CT (Nominal primary current and resistance effect was excluded) in watts
- ΔP_{Jp} = Joule losses in primary coil (due to nominal primary current and resistance) in watts
- RSL = Reference Service Life in years
- α = Use time rate
- 8760 is the number of hours in a year
- 1000 is the conversion factor from W to kW
- n_{poles} = Number of poles
- I_n = Rated current of the functional unit
- R = Internal resistance, average resistance of three phases(Ω)
- $\left(\frac{I_r}{I_{rCT}} \right)$ = Average ratio between rated current of the ZS2 panel and accommodated current transformer

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

Maintenance is not considered because the consumed energy is negligible from the environmental impacts point of view.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	11/16

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
Product End-of-Life	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. Also, due to the transformer containing parts difficult to process through separation, these are all modelled as 100 % waste to landfill to represent the typical waste streams within Europe.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	12/16



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.

UniGear ZS2 BT 36.12.32

Impact category	Unit	Total	Cradle-to-grave					
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO ₂ eq.	1.84E+04	5.44E+03	2.74E+01	7.24E+01	1.23E+02	1.25E+04	2.15E+02
GWP – fossil	kg CO ₂ eq.	1.78E+04	5.35E+03	1.71E+02	7.23E+01	2.54E+01	1.21E+04	1.42E+02
GWP – biogenic	kg CO ₂ eq.	4.26E+02	-4.44E+01	-1.45E+02	6.58E-02	9.74E+01	4.45E+02	7.30E+01
GWP – luluc	kg CO ₂ eq.	1.62E+02	1.32E+02	4.78E-01	3.53E-02	6.45E-03	3.02E+01	1.40E-01
ODP	kg CFC-11 eq.	3.82E-04	1.59E-04	2.83E-06	1.58E-06	2.18E-07	2.17E-04	1.32E-06
AP	mol H+ eq.	1.80E+02	1.18E+02	9.42E-01	2.99E-01	5.72E-02	6.05E+01	5.33E-01
EP – freshwater	kg P eq.	2.03E+01	9.26E+00	4.23E-02	5.09E-03	1.75E-03	1.10E+01	3.74E-02
EP – marine	kg N eq.	2.39E+01	1.23E+01	2.52E-01	1.14E-01	2.45E-01	1.08E+01	2.30E-01
EP – terrestrial	mol N eq.	2.24E+02	1.25E+02	1.91E+00	1.22E+00	2.29E-01	9.49E+01	1.44E+00
POCP	kg NMVOC eq.	7.44E+01	4.21E+01	7.53E-01	4.38E-01	8.36E-02	3.06E+01	4.51E-01
ADP – minerals and metals	kg Sb eq.	1.41E+00	1.38E+00	2.57E-03	2.34E-04	3.52E-05	2.40E-02	9.21E-04
ADP – fossil	MJ, net calorific value	3.52E+05	6.90E+04	2.84E+03	1.03E+03	1.58E+02	2.78E+05	1.29E+03
WDP	m ³ eq.	5.23E+03	2.25E+03	1.23E+02	4.19E+00	2.12E+00	2.84E+03	1.76E+01

GWP-fossil: Global Warming Potential fossil; GWP-biogenic: Global Warming Potential biogenic; GWP-luluc: Global Warming Potential land use and land use change; ODP: Depletion potential of the stratospheric ozone layer; AP: Acidification potential; EP-freshwater: Eutrophication potential-freshwater compartment; EP-marine: Eutrophication potential-marine compartment; EP-terrestrial: Eutrophication potential-accumulated exceedance; POCP: Formation potential of tropospheric ozone; ADP-minerals & metals: Abiotic Depletion for non-fossil resources potential; ADP-fossil: Abiotic Depletion for fossil resources potential; WDP: Water deprivation potential.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	13/16

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	3.49E+05	6.68E+04	2.45E+03	1.03E+03	1.58E+02	2.77E+05	1.29E+03
PERE	MJ, low cal. value	6.85E+04	1.39E+04	1.23E+03	1.60E+01	3.79E+00	5.33E+04	1.22E+02
PENRM	MJ, low cal. value	2.74E+03	2.35E+03	3.90E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	2.47E+03	1.09E+03	1.38E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	3.52E+05	6.92E+04	2.84E+03	1.03E+03	1.58E+02	2.77E+05	1.29E+03
PERT	MJ, low cal. value	7.10E+04	1.49E+04	2.61E+03	1.60E+01	3.79E+00	5.33E+04	1.22E+02
FW	m ³	2.87E+02	6.59E+01	3.07E+00	1.47E-01	6.17E-02	2.17E+02	6.50E-01
MS	kg	2.97E+02	2.94E+02	2.92E+00	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	1.31E+00	9.38E-01	4.71E-03	6.57E-03	8.96E-04	3.51E-01	4.87E-03
NHWD	kg	2.91E+03	1.68E+03	1.65E+01	5.04E+01	2.05E+02	7.61E+02	1.97E+02
RWD	kg	2.12E+00	9.39E-02	2.30E-03	3.35E-04	7.47E-05	2.02E+00	2.46E-03
MER	kg	1.29E+02	1.33E+01	5.60E-02	0.00E+00	5.38E+01	0.00E+00	6.15E+01
MFR	kg	1.02E+03	9.36E+01	1.81E+01	0.00E+00	6.71E+01	0.00E+00	8.38E+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	5.13E+02	4.51E+01	2.45E-01	0.00E+00	2.34E+02	0.00E+00	2.34E+02
EEE	MJ	2.84E+02	2.44E+01	1.36E-01	0.00E+00	1.30E+02	0.00E+00	1.30E+02

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.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	14/16



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 presented below. The result is representative for Europe according to IEC/TR 62635.

Recyclability potential	
Reference product	71.53 %

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 representative for Europe according to Eurostat (2021).

Recyclability potential	
Packaging materials	57.09 %

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

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

Energy mix	Source	Amount	Unit
<i>ABB_TR_Electricity, medium voltage [TR] market for electricity, medium voltage wind 2023 Cut-off</i>	Ecoinvent v3.9.1	0,02	kg CO ₂ -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: <http://new.abb.com/contacts/form>.

Indoor environment

The product meets the requirements for low emissions.

Carbon footprint

Carbon footprint has not been worked out for the product.

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	1YTW571780-407	A	EN	15/16



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