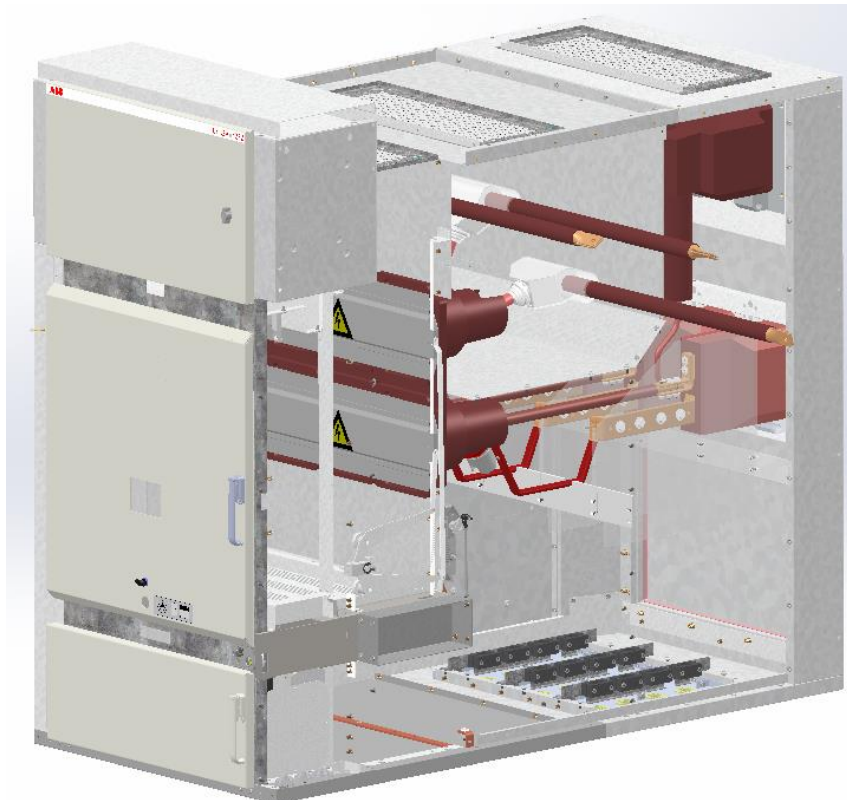


EPD



Environmental Product Declaration

Medium Voltage air-insulated switchgear UniGear ZS2 Incoming-outgoing feeder 36.12.25

Production site: Dilovası, 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-5973-5103-EN	ISSUE DATE 2024-02-05			
VALID TO 2029-02-05	STATUS Approved	SECURITY LEVEL Public		
OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 1YTW571780-401	REV. B	LANG. EN	PAGE 1/17

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 IF 36.12.25		
Product description	The UniGear ZS2 is the ABB mainline global switchgear in 36kV, 1250A, 25kA 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 IF 36.12.25 panel, including sub-components (Vacuum Circuit Breaker VD4/W 36kV 1250A 25 kA and 3 pcs Current transformer type TPU 70.41, 3 pcs Voltage transformers TJC 7.1) related accessories and packaging.		
CPC code	46211 - Electrical apparatus for switching or protecting electrical circuits, or for making connexions to or in electrical circuits, for a voltage exceeding 1000 V		
Independent verification	Independent verification of the declaration and data, according to ISO 14025:2010 <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. EPDIItaly007 – Electronic and Electrical Products and Systems, Rev. 3.0, 2023/01/13. EPDIItaly015 – 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 1YTW571780-403.		
EPD type	Specific product by a specific manufacturer		
EPD scope	Cradle-to-grave		
Product RSL	20 years		
Geographical representativeness	Manufacturing (suppliers): Global	Manufacturing (ABB): Turkiye	Downstream: Europe
Reference year	2022		
LCA software	SimaPro 9.5 (2023)		
LCI database	Ecoinvent v3.9.1 (2022)		
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.		
Liability	The owner of the declaration shall be liable for the underlying information and evidence. EPD-Norge shall not be liable with respect to manufacturer, life cycle assessment data, and evidence.		

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Sustainability at ABB

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

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

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



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General Information

The product declared in this Environmental Product Declaration is the UniGear ZS2 IF 36.12.25, including related accessories and packaging.

The UniGear ZS2 IF 36.12.25 is an ABB mainline global switchgear in 36kV, 1250A, 25kA 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.

Technical information	
	UniGear ZS2 IF 36.12.25
Rated voltage [kV]	36
Impulse withstand voltage [kV]	170
Rated frequency [Hz]	50/60
Rated short time withstand current [kA 3s]	25
Peak withstand current [kA]	63
Internal arc withstand current [kA 1s]	31.5
Rated current of main busbars [A]	1600
Feeders Rated current [A]	1250

The UniGear ZS2 IF 36.12.25 is manufactured by the ABB Dilovası manufacturing site located in Kocaeli Turkiye

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

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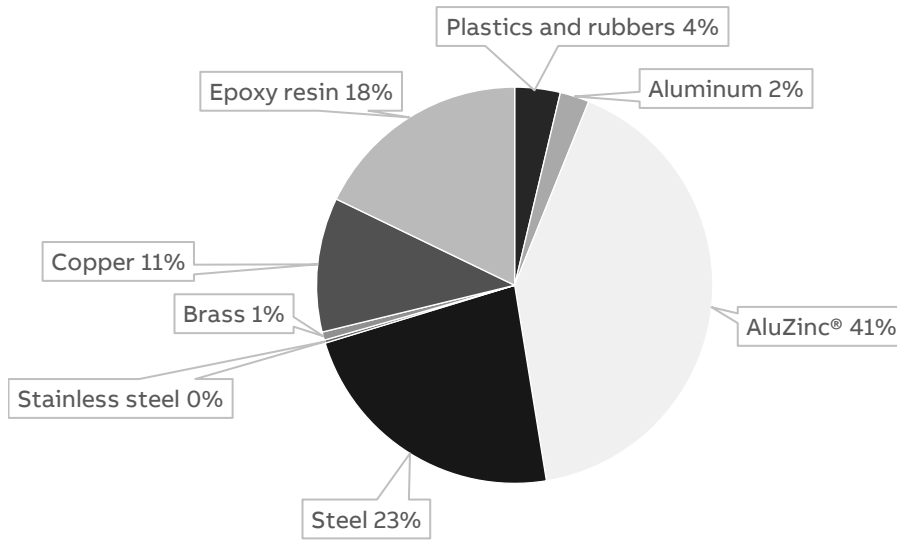
Constituent Materials

The UniGear ZS2 IF 36.12.25 weighs 1525.51 kg, and the constituent materials are presented below. Weights of VD4/W, 3 pcs of TPU 70.41 and 3 pcs of TJC 7.1 are included to bellow table.

Type	Material	Weight [kg]	Weight %
Plastics and rubbers	Polyester	3.46	0.226%
	ABS	0.01	0.001%
	Polycarbonate	14.75	0.967%
	Polypropylene	0.11	0.007%
	Polyethylene	3.37	0.221%
	Polyvinylchloride	0.01	0.001%
	Polyamide and glass filled polyamide	6.34	0.415%
	Polymers	13.17	0.863%
	Other plastics and rubbers	15.09	0.989%
Metal	Aluminum	36.25	2.376%
	AluZinc®	627.03	41.103%
	Steel	346.57	22.718%
	Stainless steel	3.76	0.246%
	Brass	10.15	0.666%
	Copper	166.31	10.902%
	Other metals	1.03	0.067%
Others	Ceramics	3.01	0.197%
	Cables	0.18	0.012%
	Others	4.36	0.286%
	Epoxy resin	270.58	17.737%
Total		1525.51	100.000%

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UniGear ZS2 IF 36.12.25



The packaging materials and accessories weighs 148.66 kg, and the constituent materials are presented below.

Description	Material	Weight [kg]	Weight %
Packaging box	Oriented Strand Board	190.00	73.71%
Plastic bag	Nylon	13.65	5.30%
Pallet	Wood	50.00	19.40%
Plastic stretch	Polyethylene low density	0.29	0.11%
Styrofoam	Polyethylene foam	2.50	0.97%
Corner part, Strip buckle	Steel	0.50	0.19%
Activated clay	Bentonite	0.56	0.22%
Packaging strip	Polyester	0.27	0.10%
Total		257.77	100%



LCA Background Information

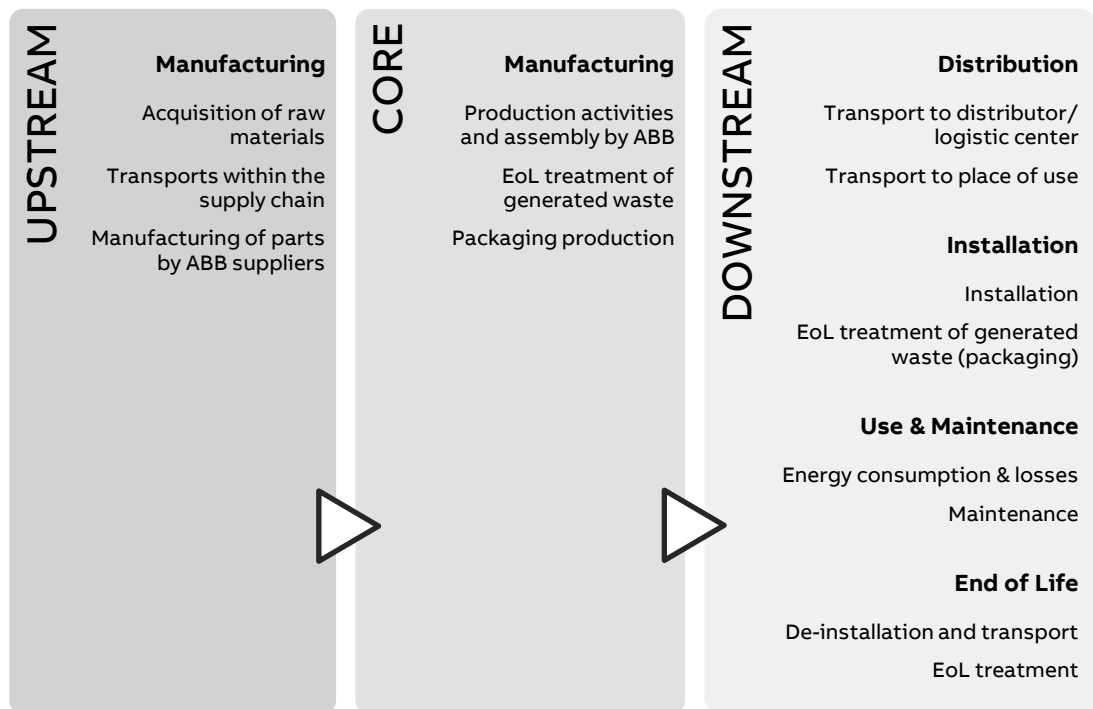
Functional Unit

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. The reference flow is a single UniGear ZS2 IF 36.12.25 device, including sub-components (Vacuum Circuit Breaker VD4/W 36kV 1250A 25 kA and 3 pcs Current transformer type TPU 70.41, 3 pcs Voltage transformers TJC 7.1) 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 of the UniGear ZS2 IF 36.12.25, an EEPS (Electronic and Electrical Products and Systems), is a “cradle-to-grave” analysis. The figure below shows the product life cycle stages and the information considered in the LCA.



In terms of exclusions from the system boundary, according to PCR EPDItaly007, capital goods such as machinery, tools, buildings, infrastructure, packaging for internal transports, and administrative activities, which cannot be allocated directly to the production of the reference product, are excluded.

Infrastructures, when present, such as in processes deriving from the ecoinvent database, have not been excluded. Scraps for metal working and plastic processes are also included when already defined in ecoinvent.

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Temporal and geographical boundaries

In terms of temporal boundaries, all primary data collected from ABB are from 2022, which is considered a representative production year. Secondary data are provided by ecoinvent v3.9.1 which was released in 2022.

In terms of geographical boundaries, the materials and components used in the production of the UniGear ZS2 IF 36.12.25 are globally sourced. The supply chains are often complex and can extend across multiple countries and continents. Therefore, materials AND/OR background processes with global representativeness are selected from ecoinvent. Thus, a conservative approach is adopted.

Data quality

Both primary and secondary data are used. The main sources for primary data are the bill of materials and technical drawings, while site specific foreground data are provided by ABB. Furthermore, information and data obtained from other LCA studies are also used.

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

Environmental impact indicators

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. In accordance with the PCR EPDIItaly007, the environmental impact indicators are determined by using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019.

Allocation rules

The utility consumption and waste generation at the ABB manufacturing site is allocated to the production of one UniGear ZS2 IF 36.12.25 by using allocation rules.

Natural gas : allocated by surface areas of AIS (Air insulated switchgear) production related buildings.

Water : allocated by surface areas of AIS (Air insulated switchgear) production related buildings and allocated per AIS production employees

Electricity : allocated by surface areas of AIS (Air insulated switchgear) production related buildings

Wastes : allocated by surface areas of AIS (Air insulated switchgear) production related buildings

For the end-of-life allocation, the “Polluter Pays” principle is adopted according to what is defined in the CEN/TR 16970 standard, as required by the PCR EPDIItaly007. This means, waste treatment processes are allocated to the product system that generates the waste until the end-of-waste state is reached. The environmental burdens of recycling and energy recovery processes are therefore allocated to the product system that generates the waste, while the product system that uses the exported energy and recycled materials receives it burden-free. However, the potential benefits and avoided loads from recovery and recycling processes are not considered because it is not required by EPDIItaly007.

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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, s 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.

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Inventory Analysis

Manufacturing stage

As presented in chapter Constituent Materials, AluZinc® sheet and steel are the most frequently used materials, followed by epoxy resin and copper.

Using the ecoinvent database, the steels are mainly modelled with *Steel, low-alloyed {GLO} market for* and the epoxy is mainly modelled with ecoinvent material *Epoxy resin, liquid {RoW} market for epoxy resin, liquid | Cut-off, S* and copper is modelled with ecoinvent material *Copper, cathode {GLO} market for copper, cathode | Cut-off, S*. To account for the production activities of metal and plastic parts, Metal working, average and Injection molding are the most frequently used processes. Surface treatments are also included, and the most common surface treatments are ecoinvent process *Zinc coat, coils {GLO} market for zinc coat, coils | Cut-off, S*.

Supply chain transports are added as far as data is available between ABB, the suppliers, and sub-suppliers. Only primary suppliers are considered. The rest of the transports are assumed to already be included in ecoinvent's "market for"-processes.

For the ABB manufacturing site, which is considered in the core manufacturing stage, utility consumption and waste generation are allocated to the production of one UniGear ZS2 IF 36.12.25 according to the defined allocation rules. The packaging materials and accessories associated with the product are also considered in the core manufacturing stage.

Distribution

The transport distance from the ABB manufacturing site to the site of installation is assumed to be 300 km over land, as suggested by the PCR EPDItaly012 and EPDItaly015, as the actual distance is unknown. The selected ecoinvent process is *transport, freight, lorry 16-32 metric ton, EURO4 {RER}*.

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.

The end-of-life scenario for packaging materials is based on *Packaging waste by waste management operations* by Eurostat (2020), which is representative for Europe. A transport distance of 100 km by lorry is assumed as actual location of disposal is unknown.

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 EPDItaly015:

$$E_{use}[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000} = \frac{297.58 \text{ W} * 8760 \text{ hours} * 20 \text{ years} * 100 \%}{1000} = 62955 \text{ kWh}$$

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

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

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_{VT} = Total losses of voltage transformer
- 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 ZS1 panel and accommodated current transformer

Because this product is sold globally and is not limited to any specific country, the latest energy mix of the European Union is adopted as suggested by the standard EN 50693. The emission factor of the energy mix is presented below.

Energy mix	Source	Amount	Unit
Electricity, medium voltage {RER} market group for electricity, medium voltage Cut-off, S	Ecoinvent v3.9.1	0.362	kg CO ₂ -eq./kWh

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

End of life

Decommissioning of the product only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the product.

The end-of-life scenario for the product is based on IEC/TR 62635 (Annex D.3), which is representative for Europe. A conservative approach is adopted by using the rates given for materials that go through a separation process and this includes the losses in the separation processes. A transport distance of 100 km by lorry is assumed as actual location of disposal is unknown.

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Environmental Indicators

UniGear ZS2 IF 36.12.25

Impact category	Unit	Total	Cradle-to-gate					
			UPSTREAM	CORE	Cradle-to-grave			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO ₂ eq.	3.02E+04	6.88E+03	-5.64E+01	1.00E+02	2.40E+02	2.28E+04	2.37E+02
GWP – fossil	kg CO ₂ eq.	2.91E+04	6.63E+03	3.09E+02	1.00E+02	5.02E+01	2.19E+04	1.58E+02
GWP – biogenic	kg CO ₂ eq.	6.50E+02	-6.05E+01	-3.66E+02	9.11E-02	1.90E+02	8.08E+02	7.87E+01
GWP – luluc	kg CO ₂ eq.	3.68E+02	3.13E+02	5.26E-01	4.89E-02	1.44E-02	5.48E+01	1.63E-01
ODP	kg CFC-11 eq.	6.06E-04	2.03E-04	5.79E-06	2.19E-06	4.61E-07	3.94E-04	1.51E-06
AP	mol H+ eq.	2.59E+02	1.45E+02	2.41E+00	4.14E-01	1.21E-01	1.10E+02	6.17E-01
EP – freshwater	kg P eq.	3.15E+01	1.13E+01	1.45E-01	7.05E-03	3.85E-03	2.00E+01	4.31E-02
EP – marine	kg N eq.	3.98E+01	1.88E+01	4.96E-01	1.58E-01	4.92E-01	1.95E+01	2.56E-01
EP – terrestrial	mol N eq.	3.51E+02	1.70E+02	4.81E+00	1.69E+00	4.78E-01	1.72E+02	1.67E+00
POCP	kg NMVOC eq.	1.18E+02	5.90E+01	1.76E+00	6.06E-01	1.74E-01	5.56E+01	5.22E-01
ADP – minerals and metals	kg Sb eq.	1.74E+00	1.68E+00	1.32E-02	3.23E-04	8.01E-05	4.36E-02	1.08E-03
ADP – fossil	MJ, net calorific value	5.97E+05	8.53E+04	4.59E+03	1.43E+03	3.36E+02	5.04E+05	1.49E+03
WDP	m ³ eq.	8.07E+03	2.78E+03	1.06E+02	5.79E+00	4.86E+00	5.15E+03	1.97E+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.

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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	5.95E+05	8.29E+04	4.57E+03	1.43E+03	3.36E+02	5.04E+05	1.49E+03
PERE	MJ, low cal. value	1.22E+05	2.22E+04	2.99E+03	2.21E+01	8.81E+00	9.68E+04	1.43E+02
PENRM	MJ, low cal. value	2.82E+03	2.80E+03	1.72E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	4.86E+03	1.45E+03	3.40E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	5.97E+05	8.57E+04	4.59E+03	1.43E+03	3.36E+02	5.04E+05	1.49E+03
PERT	MJ, low cal. value	1.27E+05	2.36E+04	6.39E+03	2.21E+01	8.81E+00	9.68E+04	1.43E+02
FW	m ³	4.80E+02	8.21E+01	3.02E+00	2.03E-01	1.42E-01	3.94E+02	7.38E-01
MS	kg	3.83E+02	3.74E+02	8.78E+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.

Waste production indicators	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
HWD	kg	1.97E+00	1.30E+00	1.07E-02	9.09E-03	1.88E-03	6.38E-01	5.64E-03
NHWD	kg	4.29E+03	2.14E+03	5.15E+01	6.98E+01	4.34E+02	1.38E+03	2.18E+02
RWD	kg	3.79E+00	1.16E-01	5.09E-03	4.64E-04	1.74E-04	3.67E+00	2.89E-03
MER	kg	1.80E+02	1.47E+01	5.70E-02	0.00E+00	1.04E+02	0.00E+00	6.13E+01
MFR	kg	1.27E+03	1.10E+02	2.21E+01	0.00E+00	1.38E+02	0.00E+00	1.00E+03
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	7.25E+02	4.94E+01	2.48E-01	0.00E+00	4.42E+02	0.00E+00	2.33E+02
EEE	MJ	4.02E+02	2.64E+01	1.38E-01	0.00E+00	2.46E+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.

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Additional Environmental Information

Recyclability potential

The recyclability potential of the UniGear ZS2 IF 36.12.25 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 65 %.

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

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

Energy mix	Data source	Amount	Unit
ABB_Electricity mix Turkey factory {TR}_Hydropower100%_2022 S_SMP_V1	Ecoinvent v3.9.1	0.0121	kg CO ₂ -eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list.

Indoor environment

The product meets the requirements for low emissions.

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