Zucchetti Centro Sistemi SpA

ENVIRONMENTAL PRODUCT DECLARATION

Hybrid Inverter

(AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS, AZZURRO 3PH HYD20000 ZSS)

No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, Guangdong Province, China

In accordance with ISO 14025 and EN 50693

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	EPDItaly-ZCS-002
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1 General information

1.1 Programme information

Programme:	EPDItaly
Address	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy
Website	www.epditaly.it
E-mail	info@epditaly.it
EPD Owner	Zucchetti Centro Sistemi SpA Via Lungarno 305 52029 Terranuova Bracciolini (AR) Italy zcs@pec.it
Manufacturer address	No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, Guangdong Province, China
Product code	AZZURRO 3PH HYD5000 ZSS AZZURRO 3PH HYD6000 ZSS AZZURRO 3PH HYD8000 ZSS AZZURRO 3PH HYD10000 ZSS AZZURRO 3PH HYD15000 ZSS AZZURRO 3PH HYD20000 ZSS
Functional unit	Functional unit is defined as one Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS) converting the variable DC voltage generated by a photovoltaic (PV) solar panel into a commercial frequency alternating current (AC), during a reference service life of 25 years.
CPC code	4612, "Electrical transformers, static converters and inductors"
Independent verification	Independent verification of the declaration and data, carried out according to ISO 14025: 2010. Internal ☑ External Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n ° 10 - 20124 Milan, Italy. Accredited by Accredia.
Comparability Statement	Environmental statements published within the same product category, but from different programs, may not be comparable.
Liability Statement	The EPD Owner releases EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence.

	EPDItaly disclaims any responsibility for the information, data and results provided by the EPD Owner for life cycle assessment.
Product category rules (PCR)	Core PCR: EPDItaly007 - PCR for Electronic and Electrical Products and Systems, (rev.3), January 2023 Sub-category PCR: EPDItaly032 “Power Inverter”, (Rev. 0), 22/12/2022
Other references	EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems Regulations of the EPDItaly Programme rev. 6.0 published on 2023/10/30
Product RSL description	25 years
LCA study	This EPD study is based on the LCA study described in the LCA report
EPD type	Product specific
EPD scope	Cradle to grave
Year of reported primary data	1 June 2023 to 31 March 2024, since the product is in production from 1 June 2023 in No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, Guangdong Province, China.
Technical support	Emily Zhao SGS China Co., Ltd A - 16/F, Century Yuhui Mansion, No. 73 Fucheng Road, Beijing, 100142, China

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

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 50693, 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 characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 50693 and ISO 14025.

1.2 Company information

Owner of the EPD: Zucchetti Centro Sistemi SpA

Description of the organisation:

Zucchetti Centro Sistemi (ZCS) was founded in 1985 from the entrepreneurial spirit of Cav. Lav. Fabrizio Bernini, today shareholder and CEO of the company. The entrepreneur's excellent ability to anticipate changes in the market over the years has allowed ZCS to transform itself from a small family business specialised in software into an international multi-business management company. In 2000, the company became part of the Zucchetti Spa group. The ZCS headquarters are located in Valdarno, in the heart of Tuscany and occupy three buildings (Building of Ideas, Building of Technology and Building of Innovation). It also has branches in Emilia (Parma), Sardinia (Sassari, Nuoro and Cagliari), Umbria (Perugia), as well as subsidiaries in the Tyrrhenian area of Tuscany, in Piedmont and Lombardy. Today, ZCS consists of five Business Units (software, automation, healthcare, robotics and energy

renewable) that meet the need to diversify and extend the know-how acquired in the design of management software to different and complementary areas, with the aim of providing technological excellence in the fields of IT, digitalisation and mechatronics.

As a technological pioneer, ZCS understands the potential of digital technologies and introduces them into its own products, solutions and internal processes. The ZCS brands speak the language of the future, they are aimed at different markets, and are linked by common digital factors such as the use of the Cloud, IoT (Internet of Things), Big Data and Artificial Intelligence. The added value lies in the ability to integrate digital innovations into machines, electronic devices and robots, transforming them into “intelligent” objects capable of interacting with humans and providing useful data and information to improve and simplify the everyday life of customers. Innovation is therefore culture: the courage to design and create products that did not exist until now, but that may represent a solution for tomorrow, while respecting the health and safety of people and the environment. Ideas and projects that are functional to all company divisions are developed independently inside the “Laboratory of Ideas (Idealab).” The real driving force behind the Research & Development Department, the lab was set up in 2005 and consists of 40 highly qualified researchers, mechanical and electronic engineers, IT experts and designers. Ideas are transformed into real innovations, combining know-how and creativity for the different market sectors, dedicated to health and safety, traceability, tracking and control, speed and mobility, environmental sustainability and energy saving.

Production site:

No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, Guangdong Province, China

1.3 Product information

Product name: Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Product identification: the Inverter type is string.

Product description:

The AZZURRO 3PH HYD5000~20000 ZSS is a grid-coupled PV and energy storing inverter which can also supply energy in stand-alone operation. The AZZURRO 3PH HYD5000~20000 ZSS has integrated energy management functions which cover a wide range of application scenarios.

The DC output generated by the PV generator can be used for both grid feed-in and battery charging. The battery can supply the energy to the grid or the consumer. The emergency current supply mode (EPS) can provide inductive loads such as air conditioning systems or refrigerators with an automatic switchover time of less than 10 milliseconds, and a temporary overload of up to 10% is possible.

Intended use:

AZZURRO 3PH HYD5000~20000 ZSS inverters may only be used with photovoltaic modules which do not require one of the poles to be earthed. In normal operation, the operating current must not exceed the limits specified within the technical data.

Technical data:

Table 1: Key technological data of Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS,

AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Parameter	AZZURRO 3PH HYD5000 ZSS	AZZURRO 3PH HYD6000 ZSS	AZZURRO 3PH HYD8000 ZSS	AZZURRO 3PH HYD10000 ZSS	AZZURRO 3PH HYD15000 ZSS	AZZURRO 3PH HYD20000 ZSS
Dimension (mm)	587*515*261	587*515*261	587*515*261	587*515*261	587*515*261	587*515*261
Weight of product (kg)	32	32	32	39.5	39.5	39.5
Nominal PV input voltage (V)	600	600	600	600	600	600
Nominal PV input voltage (V)	3(N)~+PE,380/400/415					
Max AC output current (A)	8.3/8.0/7.6	10.0/9.6/9.2	13.3/12.8/12.2	16.7/15.9/15.3	25.0/23.9/22.9	33.3/31.9/30.6
Topology	triphase					
Max Efficiency (%)	98.0	98.0	98.0	98.2	98.2	98.2
European Efficiency (%)	97.5	97.5	97.5	97.7	97.7	97.7
Output rated AC active power (kW)	5	6	8	10	15	20

Geography: The products are manufactured in China and sold to Italy.

UN CPC code: 4612 “Electrical transformers, static converters and inductors”

Manufacturing process: The pictures below show the flow-chart of manufacturing process.

1	Panel processing	9	Processing on pallets	17	Lock crystal pressing block/Install power board/Install DC switch	25	T1 test
2	DC switch processing	10	Box processing A	18	Lock DC switch/set magnetic ring/lock power board	26	Aging test
3	Attachment processing	11	Box processing B	19	Tie inductor wires/patch cords	27	T2 test

4	Fan processing	12	Processing heat sink/Installing inductor/Installing chassis	20	QC Inspection 1	28	Packaging testing
5	Transistor processing	13	Locking heat sink/locking inductor	21	Lock inductor wire/screw/EMC shielding plate	29	Lock the upper cover and waterproof cover
6	Crystal pressing block/IGBT	14	Lock the left and right hooks/tripods	22	Lock AC line/shielding board/ground wire	30	Plug connection box plug/airtightness test
7	Transistor soldering A	15	Binding tape/lock shielding board	23	QC Inspection 2	31	Scan code association printing
8	Transistor soldering B	16	Brush ceramic tiles	24	Pressure resistance test/locking screw	32	Appearance inspection

2 Content information

Table 2-1: Content information of Hybrid Inverter (AZZURRO 3PH HYD5000~8000 ZSS)

Product components	**Material classes**	**Share [in %]**
Other ferrous alloys, non-stainless steels	M-199	8.77
Aluminium and its alloys	M-120	57.68
Silicone	M-321	0.02
Other elastomers	M-339	0.64
PC	M-204	0.09
PE	M-210	0.09
PolyAmide (PA)	M-208	0.06
PolyStyrene (PS)	M-203	0.17
PolyVinylChloride (PVC)	M-200	0.02
Other unfilled thermoplastics	M-249	0.87
Solder	M-126	0.15
Others	M-449	31.51
Packaging components	**Material classes**	**Share [in %]**
Packaging film	M-210	1.65
PE foam	M-210	13.11
Paper	M-341	1.15
Corrugated box	M-342	22.75
Wood	M-340	60.60
Packaging straps	M-209	0.60
Others	M-449	0.14

Table 2-2: Content information of Hybrid Inverter (AZZURRO 3PH HYD10000~20000 ZSS)

Product components	**Material classes**	**Share [in %]**
Other ferrous alloys, non-stainless steels	M-199	3.40
Aluminium and its alloys	M-120	55.61
Copper and its alloys	M-121	0.49
Silicone	M-321	0.05
Other elastomers	M-339	0.57
PC	M-204	0.65
PE	M-210	0.51
Solder	M-126	0.14
others	M-449	38.57
Packaging components	**Material classes**	**Share [in %]**
Packaging film	M-210	1.56
PE foam	M-210	13.34
Corrugated box	M-342	23.06
Wood	M-340	61.42
Packaging straps	M-209	0.61

3 LCA information

3.1 Overview

Functional unit: The functional unit (FU) is the product or system main function(s) quantified, to which the inputs and outputs are related to. According to PCR EPDItaly032, the functional unit is defined as one Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS) converting the variable DC voltage generated by a photovoltaic (PV) solar panel into a commercial frequency alternating current (AC), during a reference service life of 25 years.

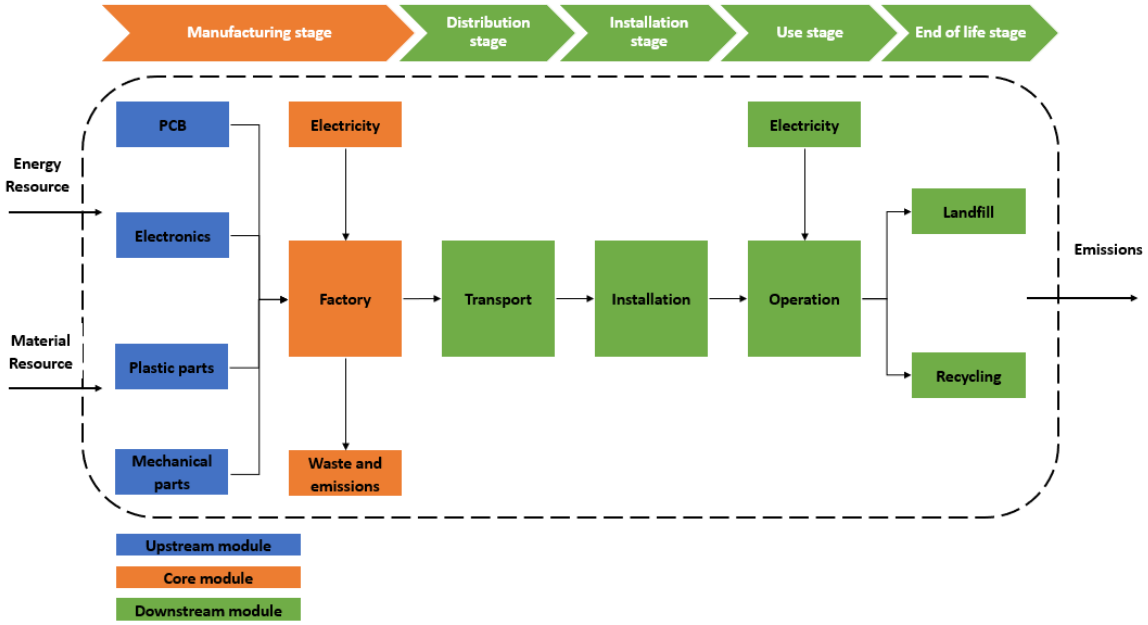
Reference flow: The reference flow describes all the needed flows to fulfil the functional unit.
The reference flow of AZZURRO 3PH HYD5000 ZSS Hybrid Inverter is one unit product (Net weight: 34.96 kg, gross weight: 48.63 kg);
The reference flow of AZZURRO 3PH HYD6000 ZSS Hybrid Inverter is one unit product (Net weight: 34.96 kg, gross weight: 48.63 kg);
The reference flow of AZZURRO 3PH HYD8000 ZSS Hybrid Inverter is one unit product (Net weight: 34.96 kg, gross weight: 48.63 kg);
The reference flow of AZZURRO 3PH HYD10000 ZSS Hybrid Inverter is one unit product (Net weight: 38.81 kg, gross weight: 52.30 kg);
The reference flow of AZZURRO 3PH HYD15000 ZSS Hybrid Inverter is one unit product (Net weight: 38.81 kg, gross weight: 52.30 kg);
The reference flow of AZZURRO 3PH HYD20000 ZSS Hybrid Inverter is one unit product (Net weight: 38.81 kg, gross weight: 52.30 kg).

Reference service life: 25 years

Time representativeness: The primary data used has been obtained from the production unit in China (Huizhou City, Guangdong Province) from 1 June 2023 to 31 March 2024, being representative of the products and the production process.

Database(s) and LCA software used: SimaPro® software v.9.5 developed by PRé Consultants was used to create the product system model. The ecoinvent database version 3.9.1 provided the life cycle background data for product system modelling.

System diagram: This EPD is from cradle to grave with Upstream module, core module and Downstream module. System diagram is as follow:



Declared life cycle stages:

Table 3: The declared life cycle stages of Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Module	**Upstream module**	**Core module**	**Downstream module**			
Stage	**Manufacturing**		**Distribution**	**Installation**	**Use and maintenance**	**End-of-life**
Supply chain processes	Extraction of raw materials and the production of semi-finished products and auxiliary items; Transport of raw materials to production unit.	Printed circuit board assembly and Hybrid Inverter assembling; Emissions to air; Treatment of hazardous waste; Transport of solid waste.	Hybrid Inverter transport to the operation site; Installation and packaging waste management; The replacement and the energy required by the Hybrid Inverter in the use and standby phase during 25 years (RSL); EoL, including collecting, transport of waste, material/energy recycling and disposal of non-recyclable fractions at sanitary landfill.			
Modules declared	x	x	x	x	x	x
Geography	CN	CN	Italy	Italy	Italy	Italy

All declared life cycle stages are marked with" X" in below. Modules not declared will be marked with MND.

Allocation processes: Allocation is required when more than one input is needed to produce a product and the products are co-produced with other products. The decision hierarchy applied for allocation of co-products was according to EN 50693. In this study, the consumption of materials from BOM and there is no need for materials allocation. There is no need for electricity consumption allocation. The electricity consumption of the production equipment is calculated by the theoretical formula: power × man-hour. The solid waste and emissions to air in manufacturing stage were estimated based on output from 1 June 2023 to 31 March 2024, and allocated to one unit product.

Cut-off rules and considerations: According to EN 50693 4.2.3.3, based on established LCA practice, the cut-off criteria are set to a maximum of 5% of the overall environmental impact of the analyzed product system given by its life cycle impact assessment (LCIA) results. In accordance with the cut-off rule, flows less than 1% of the total inventory were excluded, i.e.:

- construction of company plants and processing machinery (with a life of more than three years);
- long-term emissions (occurring beyond 100 years);
- staff travel and home-work transfers;
- research and development activities;
- some components of the kit of the products under study, such as: sensors, remote control and other operating tools; trays and other moving parts of the structures moved by the engines;
- the materials necessary for cleaning the production equipment/machinery;
- power consumption of auxiliary equipment.

Calculation methodologies: In this study, EN 15804+A2:2019 method is selected as Impact assessment method. The EN 15804 standard covers Environmental Product Declarations (EPDs) of Construction Products. The 2019 EN 15804+A2 revision of this standard has aligned their methodology with the EF 3.0 method, except for their approach on biogenic carbon. According to the EN 15804, biogenic carbon emissions cause the same amount of Climate Change as fossil carbon, but can be neutralized by removing this carbon from the atmosphere. Temporary and permanent carbon storage is not allowed therefore the 15804 standard provides a set of requirements to prevent its accounting.

Principles: According to EN 50693, the principles of "Polluter pays" and "Modularity" were followed in this study:
Polluter pays: Processes of waste processing shall be assigned to the product system that generates the waste until the end-of-waste state is reached;
Modularity: Where processes influence the product's environmental performance during its life cycle, they shall be assigned to the information module of the life cycle stage where they occur; all environmental aspects and impacts are declared in the life cycle stage where they appear.

3.2 Raw material acquisition stage (Upstream module)

At this stage, the materials and components are manufactured by supplies, and transported to the production unit in China (Huizhou City, Guangdong Province).
The Hybrid Inverter can be divided into 4 parts: PCB, electronics, plastic parts and mechanical parts. Because the production unit has no financial control or operational control over the supplies manufacturing materials above,

Upstream production data for materials refer to Ecoinvent database.

The mode of transportation of materials is by lorry and assumed was EURO 4, 7.5-16 t.

3.3 Manufacturing and assembling stage (Core module)

The production unit is responsible for Printed circuit board assembly, Hybrid Inverter assembling, testing and packaging. The electricity consumed in production unit comes from grid during 1 June 2023 to 31 March 2024. Waste is divided into ordinary solid waste and hazardous waste. Solid waste for recycling and hazardous waste for incineration in production process are entrusted to a third party, and trucked by EURO 4, 7.5-16t lorry. Air pollutants are discharged up to standard after being treated by factories, and pollutants were obtained from factory monitoring.

3.4 Distribution stage (Downstream module)

The distance between the production unit in China and the port of departure is 72.2 km by lorry. The distance between the port of departure and the port of arrival is 14704.88 km. The logistics of the product from the port of arrival to the installation site is difficult to determine, 300 km by lorry was adopted according to PCR EPDItaly032.

Table 4: The transport way and its distances of Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Name	Description	Value	Unit
Transport	Ship	14704.88	km
Transport	Lorry, EURO4, 16-32t	72.2+300=372.2	km

3.5 Installation stage (Downstream module)

The transport and End-of-life of packaging waste is taken into account in this stage. The transport distance of packaging materials from installation site to the treatment plant is assumed to be 50 km. The End-of-life scenario of packaging materials was used according to EN 50693.

3.6 Use and Maintenance stage (Downstream module)

The AZZURRO 3PH HYD10000~20000 ZSS (AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS) Hybrid Inverter requires to replace one unit of fan (0.8 kg) in use and maintenance stage during the service life. The AZZURRO 3PH HYD5000~8000 ZSS (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS) Hybrid Inverter requires to no replacement in use and maintenance stage during the service life. The energy required by the Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS) in the use and standby phase during its entire reference service life was considered. The following formula be used to calculate the electricity consumed during the product's service life:

$$E_{tot}\ [kWh] = E_{use} + E_{standby}$$

Where:

- E_{tot} is the total energy consumed by the Hybrid Inverter
- E_{use} is energy losses during the operation of Hybrid Inverter.
- $E_{standby}$ is the energy required by the Hybrid Inverter during standby.

The energy losses during the operation of Hybrid Inverter calculation formula is as follows:

$$E_{use}\,[kWh] = Output\ rated\ AC\ active\ power \times average\ local\ annual\ sunshine \times (1 - average\ energy\ efficiency) \times RSL$$

Where:

- E_{use} is the power used by the inverter.
- Output rated AC active power is the degree of the active power during a Demand Period in kW (kilowatts)
- RSL is the service life of the product, assumed to be 25 years
- Average Energy Efficiency form data sheet.
- Average local annual sunshine is the number of average annual sunshine in Country where the inverter is installed (in this report is in Italy); it is expressed in hours per year.

The energy required by the Hybrid Inverter during standby calculation formula is as follows:

$$E_{standby}[kWh] = \frac{P_{standby} \times (8760 - \text{average local annual sunshine}) \times RSL}{1000}$$

Where:

- $E_{standby}$ is the energy required by the Hybrid Inverter during standby, it is expressed in W (watts).
- 8760 is the number of hours in a year.
- 1000 is the conversion factor that allows the energy consumed in kWh over the product's service life to be expressed.

Table 5: The parameter used in Use and Maintenance stage of one unit of Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS, AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Parameter	AZZURRO 3PH HYD5000 ZSS	AZZURRO 3PH HYD6000 ZSS	AZZURRO 3PH HYD8000 ZSS	AZZURRO 3PH HYD10000 ZSS	AZZURRO 3PH HYD15000 ZSS	AZZURRO 3PH HYD20000 ZSS
Energy Efficiency (%)	97.5	97.5	97.5	97.7	97.7	97.7
Average annual sunshine (h)	2232	2232	2232	2232	2232	2232
AC power (kW)	5	6	8	10	15	20
$P_{standby}$ (W)	15	15	15	15	15	15
E_{use} (kWh)	6975	8370	11160	12834	19251	25668
$E_{standby}$ (kWh)	2448	2448	2448	2448	2448	2448
E_{tot} (kWh)	9423	10818	13608	15282	21699	28116

3.7 End of life stage (Downstream module)

The material recovery rate, energy recovery rete and disposal rete of PCB, electronics, plastic parts and mechanical parts is in line with EN 50693 Annex G. The disposal way of materials was assumed as 100% sanitary landfill. The transport distances from Installation site to the disassembly facility was assumed as 50 km.

4 Environmental impacts

4.1 Potential environmental impact

Table 6-1: The environmental impact of AZZURRO 3PH HYD5000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	3.218E+03	1.596E+03	3.359E+00	1.090E+01	2.157E+01	1.574E+03	1.243E+01
GWP-fossil	kg CO_2 eq	3.117E+03	1.614E+03	3.373E+00	1.089E+01	3.923E-01	1.486E+03	3.064E+00
GWP-biogenic	kg CO_2 eq	9.609E+01	-2.118E+01	-1.672E-02	1.935E-03	2.118E+01	8.674E+01	9.364E+00
GWP-luluc	kg CO_2 eq	4.465E+00	3.178E+00	2.102E-03	7.355E-03	2.367E-04	1.272E+00	4.237E-03
ODP	kg CFC11 eq	1.573E-04	9.766E-05	1.113E-08	1.801E-07	5.070E-09	5.946E-05	2.629E-08
AP	mol H+ eq	1.840E+01	1.079E+01	1.903E-02	2.306E-01	2.084E-03	7.351E+00	1.441E-02
EP-freshwater	kg P eq	2.971E-01	2.417E-01	7.037E-05	5.702E-05	5.105E-06	5.512E-02	1.563E-04
EP-marine	kg N eq	3.052E+00	1.853E+00	3.441E-03	5.935E-02	1.006E-02	1.111E+00	1.582E-02
EP-terrestrial	mol N eq	3.482E+01	2.090E+01	3.799E-02	6.555E-01	5.636E-03	1.318E+01	3.421E-02
POCP	kg NMVOC eq	1.234E+01	6.978E+00	1.091E-02	1.820E-01	5.050E-03	5.148E+00	1.272E-02
ADP-minerals&metals	kg Sb eq	3.833E-01	3.509E-01	1.921E-05	1.799E-05	8.694E-07	3.234E-02	1.836E-05
ADP-fossil	MJ	4.094E+04	1.992E+04	3.802E+01	1.373E+02	4.276E+00	2.081E+04	3.420E+01
WDP	m^3 depriv.	1.390E+03	2.823E+02	4.172E-01	4.088E-01	9.133E-02	1.106E+03	5.631E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 6-2: The environmental impact of AZZURRO 3PH HYD6000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	3.325E+03	1.596E+03	3.359E+00	1.090E+01	2.157E+01	1.681E+03	1.243E+01
GWP-fossil	kg CO_2 eq	3.224E+03	1.614E+03	3.373E+00	1.089E+01	3.923E-01	1.592E+03	3.064E+00
GWP-biogenic	kg CO_2 eq	9.661E+01	-2.118E+01	-1.672E-02	1.935E-03	2.118E+01	8.727E+01	9.364E+00
GWP-luluc	kg CO_2 eq	4.678E+00	3.178E+00	2.102E-03	7.355E-03	2.367E-04	1.486E+00	4.237E-03
ODP	kg CFC11 eq	1.648E-04	9.766E-05	1.113E-08	1.801E-07	5.070E-09	6.695E-05	2.629E-08
AP	mol H+ eq	1.908E+01	1.079E+01	1.903E-02	2.306E-01	2.084E-03	8.025E+00	1.441E-02
EP-freshwater	kg P eq	3.040E-01	2.417E-01	7.037E-05	5.702E-05	5.105E-06	6.195E-02	1.563E-04
EP-marine	kg N eq	3.160E+00	1.853E+00	3.441E-03	5.935E-02	1.006E-02	1.218E+00	1.582E-02
EP-terrestrial	mol N eq	3.606E+01	2.090E+01	3.799E-02	6.555E-01	5.636E-03	1.443E+01	3.421E-02
POCP	kg NMVOC eq	1.278E+01	6.978E+00	1.091E-02	1.820E-01	5.050E-03	5.596E+00	1.272E-02
ADP-minerals&metals	kg Sb eq	3.876E-01	3.509E-01	1.921E-05	1.799E-05	8.694E-07	3.667E-02	1.836E-05
ADP-fossil	MJ	4.221E+04	1.992E+04	3.802E+01	1.373E+02	4.276E+00	2.208E+04	3.420E+01
WDP	m^3 depriv.	1.492E+03	2.823E+02	4.172E-01	4.088E-01	9.133E-02	1.209E+03	5.631E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 6-3: The environmental impact of AZZURRO 3PH HYD8000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	3.540E+03	1.596E+03	3.359E+00	1.090E+01	2.157E+01	1.895E+03	1.243E+01
GWP-fossil	kg CO_2 eq	3.437E+03	1.614E+03	3.373E+00	1.089E+01	3.923E-01	1.805E+03	3.064E+00
GWP-biogenic	kg CO_2 eq	9.766E+01	-2.118E+01	-1.672E-02	1.935E-03	2.118E+01	8.831E+01	9.364E+00
GWP-luluc	kg CO_2 eq	5.105E+00	3.178E+00	2.102E-03	7.355E-03	2.367E-04	1.912E+00	4.237E-03
ODP	kg CFC11 eq	1.798E-04	9.766E-05	1.113E-08	1.801E-07	5.070E-09	8.193E-05	2.629E-08
AP	mol H+ eq	2.043E+01	1.079E+01	1.903E-02	2.306E-01	2.084E-03	9.373E+00	1.441E-02
EP-freshwater	kg P eq	3.176E-01	2.417E-01	7.037E-05	5.702E-05	5.105E-06	7.562E-02	1.563E-04
EP-marine	kg N eq	3.374E+00	1.853E+00	3.441E-03	5.935E-02	1.006E-02	1.433E+00	1.582E-02
EP-terrestrial	mol N eq	3.854E+01	2.090E+01	3.799E-02	6.555E-01	5.636E-03	1.691E+01	3.421E-02
POCP	kg NMVOC eq	1.368E+01	6.978E+00	1.091E-02	1.820E-01	5.050E-03	6.490E+00	1.272E-02
ADP-minerals&metals	kg Sb eq	3.963E-01	3.509E-01	1.921E-05	1.799E-05	8.694E-07	4.534E-02	1.836E-05
ADP-fossil	MJ	4.476E+04	1.992E+04	3.802E+01	1.373E+02	4.276E+00	2.463E+04	3.420E+01
WDP	m^3 depriv.	1.697E+03	2.823E+02	4.172E-01	4.088E-01	9.133E-02	1.414E+03	5.631E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 6-4: The environmental impact of AZZURRO 3PH HYD10000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	3.813E+03	1.718E+03	7.916E+00	1.172E+01	2.128E+01	2.036E+03	1.737E+01
GWP-fossil	kg CO_2 eq	3.704E+03	1.735E+03	7.951E+00	1.171E+01	3.869E-01	1.945E+03	3.663E+00
GWP-biogenic	kg CO_2 eq	1.026E+02	-2.089E+01	-3.983E-02	2.081E-03	2.089E+01	8.897E+01	1.370E+01
GWP-luluc	kg CO_2 eq	5.630E+00	3.421E+00	4.983E-03	7.910E-03	2.331E-04	2.191E+00	4.858E-03
ODP	kg CFC11 eq	1.945E-04	1.029E-04	2.283E-08	1.937E-07	4.995E-09	9.131E-05	3.075E-08
AP	mol H+ eq	2.291E+01	1.231E+01	4.517E-02	2.480E-01	2.053E-03	1.029E+01	1.681E-02
EP-freshwater	kg P eq	3.342E-01	2.486E-01	1.661E-04	6.133E-05	4.937E-06	8.518E-02	1.950E-04
EP-marine	kg N eq	3.713E+00	2.032E+00	8.164E-03	6.383E-02	9.903E-03	1.577E+00	2.226E-02
EP-terrestrial	mol N eq	4.260E+01	2.319E+01	9.013E-02	7.049E-01	5.551E-03	1.857E+01	4.008E-02
POCP	kg NMVOC eq	1.536E+01	8.025E+00	2.517E-02	1.957E-01	4.975E-03	7.092E+00	1.557E-02
ADP-minerals&metals	kg Sb eq	4.523E-01	3.991E-01	4.560E-05	1.935E-05	8.563E-07	5.306E-02	2.099E-05
ADP-fossil	MJ	4.818E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	2.634E+04	3.965E+01
WDP	m^3 depriv.	1.858E+03	3.167E+02	9.848E-01	4.396E-01	8.996E-02	1.540E+03	6.710E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 6-5: The environmental impact of AZZURRO 3PH HYD15000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	4.306E+03	1.718E+03	7.916E+00	1.172E+01	2.128E+01	2.530E+03	1.737E+01
GWP-fossil	kg CO_2 eq	4.194E+03	1.735E+03	7.951E+00	1.171E+01	3.869E-01	2.435E+03	3.663E+00
GWP-biogenic	kg CO_2 eq	1.050E+02	-2.089E+01	-3.983E-02	2.081E-03	2.089E+01	9.137E+01	1.370E+01
GWP-luluc	kg CO_2 eq	6.611E+00	3.421E+00	4.983E-03	7.910E-03	2.331E-04	3.172E+00	4.858E-03
ODP	kg CFC11 eq	2.289E-04	1.029E-04	2.283E-08	1.937E-07	4.995E-09	1.258E-04	3.075E-08
AP	mol H+ eq	2.601E+01	1.231E+01	4.517E-02	2.480E-01	2.053E-03	1.339E+01	1.681E-02
EP-freshwater	kg P eq	3.657E-01	2.486E-01	1.661E-04	6.133E-05	4.937E-06	1.166E-01	1.950E-04
EP-marine	kg N eq	4.207E+00	2.032E+00	8.164E-03	6.383E-02	9.903E-03	2.071E+00	2.226E-02
EP-terrestrial	mol N eq	4.831E+01	2.319E+01	9.013E-02	7.049E-01	5.551E-03	2.429E+01	4.008E-02
POCP	kg NMVOC eq	1.742E+01	8.025E+00	2.517E-02	1.957E-01	4.975E-03	9.150E+00	1.557E-02
ADP-minerals&metals	kg Sb eq	4.722E-01	3.991E-01	4.560E-05	1.935E-05	8.563E-07	7.300E-02	2.099E-05
ADP-fossil	MJ	5.404E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	3.220E+04	3.965E+01
WDP	m^3 depriv.	2.330E+03	3.167E+02	9.848E-01	4.396E-01	8.996E-02	2.011E+03	6.710E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 6-6: The environmental impact of AZZURRO 3PH HYD20000 ZSS

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	4.799E+03	1.718E+03	7.916E+00	1.172E+01	2.128E+01	3.023E+03	1.737E+01
GWP-fossil	kg CO_2 eq	4.684E+03	1.735E+03	7.951E+00	1.171E+01	3.869E-01	2.925E+03	3.663E+00
GWP-biogenic	kg CO_2 eq	1.074E+02	-2.089E+01	-3.983E-02	2.081E-03	2.089E+01	9.377E+01	1.370E+01
GWP-luluc	kg CO_2 eq	7.592E+00	3.421E+00	4.983E-03	7.910E-03	2.331E-04	4.153E+00	4.858E-03
ODP	kg CFC11 eq	2.634E-04	1.029E-04	2.283E-08	1.937E-07	4.995E-09	1.602E-04	3.075E-08
AP	mol H+ eq	2.910E+01	1.231E+01	4.517E-02	2.480E-01	2.053E-03	1.649E+01	1.681E-02
EP-freshwater	kg P eq	3.971E-01	2.486E-01	1.661E-04	6.133E-05	4.937E-06	1.481E-01	1.950E-04
EP-marine	kg N eq	4.701E+00	2.032E+00	8.164E-03	6.383E-02	9.903E-03	2.565E+00	2.226E-02
EP-terrestrial	mol N eq	5.403E+01	2.319E+01	9.013E-02	7.049E-01	5.551E-03	3.000E+01	4.008E-02
POCP	kg NMVOC eq	1.947E+01	8.025E+00	2.517E-02	1.957E-01	4.975E-03	1.121E+01	1.557E-02
ADP-minerals&metals	kg Sb eq	4.922E-01	3.991E-01	4.560E-05	1.935E-05	8.563E-07	9.293E-02	2.099E-05
ADP-fossil	MJ	5.990E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	3.806E+04	3.965E+01
WDP	m^3 depriv.	2.801E+03	3.167E+02	9.848E-01	4.396E-01	8.996E-02	2.482E+03	6.710E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

4.2 Use of resources

Table 7-1: The use of resources of AZZURRO 3PH HYD5000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	3.515E+04	2.291E+03	8.081E+00	1.354E+00	1.557E-01	3.285E+04	3.472E+00
PERM	MJ, lower calorific value	2.301E+02	2.301E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	3.538E+04	2.521E+03	8.081E+00	1.354E+00	1.557E-01	3.285E+04	3.472E+00
PENRE	MJ, lower calorific value	4.082E+04	1.980E+04	3.802E+01	1.373E+02	4.276E+00	2.081E+04	3.420E+01
PENRM	MJ, lower calorific value	1.188E+02	1.188E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.094E+04	1.991E+04	3.802E+01	1.373E+02	4.276E+00	2.081E+04	3.420E+01
FW	cubic metres	4.592E+01	1.189E+01	1.010E-02	1.405E-02	2.447E-03	3.398E+01	1.898E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-2: The use of resources of AZZURRO 3PH HYD6000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	4.076E+04	2.291E+03	8.081E+00	1.354E+00	1.557E-01	3.846E+04	3.472E+00
PERM	MJ, lower calorific value	2.301E+02	2.301E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	4.099E+04	2.521E+03	8.081E+00	1.354E+00	1.557E-01	3.846E+04	3.472E+00
PENRE	MJ, lower calorific value	4.209E+04	1.980E+04	3.802E+01	1.373E+02	4.276E+00	2.208E+04	3.420E+01
PENRM	MJ, lower calorific value	1.188E+02	1.188E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.221E+04	1.991E+04	3.802E+01	1.373E+02	4.276E+00	2.208E+04	3.420E+01
FW	cubic metres	4.949E+01	1.189E+01	1.010E-02	1.405E-02	2.447E-03	3.755E+01	1.898E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-3: The use of resources of 1 kWh AZZURRO 3PH HYD8000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	5.198E+04	2.291E+03	8.081E+00	1.354E+00	1.557E-01	4.968E+04	3.472E+00
PERM	MJ, lower calorific value	2.301E+02	2.301E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	5.221E+04	2.521E+03	8.081E+00	1.354E+00	1.557E-01	4.968E+04	3.472E+00
PENRE	MJ, lower calorific value	4.464E+04	1.980E+04	3.802E+01	1.373E+02	4.276E+00	2.463E+04	3.420E+01
PENRM	MJ, lower calorific value	1.188E+02	1.188E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.476E+04	1.991E+04	3.802E+01	1.373E+02	4.276E+00	2.463E+04	3.420E+01
FW	cubic metres	5.663E+01	1.189E+01	1.010E-02	1.405E-02	2.447E-03	4.469E+01	1.898E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-4: The use of resources of AZZURRO 3PH HYD10000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	5.892E+04	2.470E+03	1.920E+01	1.456E+00	1.533E-01	5.642E+04	3.975E+00
PERM	MJ, lower calorific value	2.270E+02	2.270E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	5.915E+04	2.697E+03	1.920E+01	1.456E+00	1.533E-01	5.642E+04	3.975E+00
PENRE	MJ, lower calorific value	4.806E+04	2.143E+04	9.013E+01	1.477E+02	4.212E+00	2.634E+04	3.965E+01
PENRM	MJ, lower calorific value	1.234E+02	1.234E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.818E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	2.634E+04	3.965E+01
FW	cubic metres	6.196E+01	1.283E+01	2.383E-02	1.511E-02	2.410E-03	4.907E+01	2.234E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-5: The use of resources of AZZURRO 3PH HYD15000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	8.472E+04	2.470E+03	1.920E+01	1.456E+00	1.533E-01	8.223E+04	3.975E+00
PERM	MJ, lower calorific value	2.270E+02	2.270E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	8.495E+04	2.697E+03	1.920E+01	1.456E+00	1.533E-01	8.223E+04	3.975E+00
PENRE	MJ, lower calorific value	5.391E+04	2.143E+04	9.013E+01	1.477E+02	4.212E+00	3.220E+04	3.965E+01
PENRM	MJ, lower calorific value	1.234E+02	1.234E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	5.404E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	3.220E+04	3.965E+01
FW	cubic metres	7.839E+01	1.283E+01	2.383E-02	1.511E-02	2.410E-03	6.549E+01	2.234E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-6: The use of resources of AZZURRO 3PH HYD20000 ZSS

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	1.105E+05	2.470E+03	1.920E+01	1.456E+00	1.533E-01	1.080E+05	3.975E+00
PERM	MJ, lower calorific value	2.270E+02	2.270E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	1.108E+05	2.697E+03	1.920E+01	1.456E+00	1.533E-01	1.080E+05	3.975E+00
PENRE	MJ, lower calorific value	5.977E+04	2.143E+04	9.013E+01	1.477E+02	4.212E+00	3.806E+04	3.965E+01
PENRM	MJ, lower calorific value	1.234E+02	1.234E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	5.990E+04	2.156E+04	9.013E+01	1.477E+02	4.212E+00	3.806E+04	3.965E+01
FW	cubic metres	9.481E+01	1.283E+01	2.383E-02	1.511E-02	2.410E-03	8.192E+01	2.234E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable 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; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

4.3 Waste production and output flows

Table 8-1: The waste production and output flows of one unit of Hybrid Inverter (AZZURRO 3PH HYD5000 ZSS, AZZURRO 3PH HYD6000 ZSS, AZZURRO 3PH HYD8000 ZSS)

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
HWD	kg	1.638E-02	0.000E+00	1.638E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NHWD	kg	2.427E+01	0.000E+00	0.000E+00	0.000E+00	6.846E+00	0.000E+00	1.742E+01
RWD	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	1.722E+01	0.000E+00	1.204E-02	0.000E+00	0.000E+00	0.000E+00	1.721E+01
MER	kg	7.152E+00	0.000E+00	0.000E+00	0.000E+00	6.827E+00	0.000E+00	3.250E-01
CRU	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ETE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EEE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; ETE = Exported thermal energy

Table 8-2: The waste production and output flows of one unit of Hybrid Inverter (AZZURRO 3PH HYD10000 ZSS, AZZURRO 3PH HYD15000 ZSS and AZZURRO 3PH HYD20000 ZSS)

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
HWD	kg	1.638E-02	0.000E+00	1.638E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NHWD	kg	2.830E+01	0.000E+00	0.000E+00	0.000E+00	6.744E+00	0.000E+00	2.155E+01
RWD	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	1.692E+01	0.000E+00	1.204E-02	0.000E+00	0.000E+00	0.000E+00	1.691E+01
MER	kg	7.092E+00	0.000E+00	0.000E+00	0.000E+00	6.744E+00	0.000E+00	3.473E-01
CRU	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ETE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EEE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

5 Reference

- ISO 14044:2006: Environmental management — Life cycle assessment — Requirements and guidelines
- ISO 14040:2006: Environmental management — Life cycle assessment — Principles and framework
- ISO 14025:2006: Environmental labels and declarations — Type III environmental declarations — Principles and procedures
- EN 15804:2012+A2:2019/AC:2021: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products
- EN 50693:2019: Product category rules for life cycle assessments of electronic and electrical products and systems
- PCR EPDItaly 007: Electronic and Electrical Products and Systems, (rev.3), January 2023
- Sub-category PCR: EPDItaly032 “Power Inverter”, (Rev. 0), 22/12/2022
- Regulations of the EPDItaly Programme rev. 6.0 published on 2023/10/30
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- ISO 14044:2006/Amd 2:2020: Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2
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