# Zucchetti Centro Sistemi S.p.A.

# ENVIRONMENTAL PRODUCT DECLARATION

**PRODUCT NAME:**
**ZCS AZZURRO HV SMART 5K**

*Type of product: Modular high-voltage lithium-iron phosphate battery energy storage system*

**SITES**
**No. 8, Keji Avenue, Gaocheng Town, Yixing City, Wuxi City, Jiangsu Province, P.R.China**

**In accordance with ISO 14025 and EN 50693**

| | |
|---|---|
| Program Operator | EPDItaly |
| Publisher | EPDItaly |

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|---|---|
| Declaration number | EPDAzzurroZCS012_2024_rev1.0 |
| Registration Number | EPDITALY1231 |

| | |
|---|---|
| Release Date | 26/03/2026 |
| Valid until | 26/03/2031 |

# GENERAL INFORMATION

## EPD OWNER

| | |
|---|---|
| **Company Name** | Zucchetti Centro Sistemi S.p.A. (https://www.zcscompany.com/it/) |
| **Registered office** | Via Lungarno, 305 52028 Terranuova Bracciolini (AR) |
| **Contact for EPD information** | Samanta Marzielli<br>• e-mail: s.marzielli@zcscompany.com,<br>• Tel: 0559197422 |

## PROGRAM OPERATOR

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|---|---|
| **EPDItaly** | Via Gaetano De Castillia n° 10 - 20124 Milano, Italy |

## ABOUT THE EPD

| | |
|---|---|
| **Products Name** | ZCS AZZURRO HV SMART 5K |
| **Sites** | No. 8, Keji Avenue, Gaocheng Town, Yixing City, Wuxi City, Jiangsu Province, P.R.China |
| **Brief description and technical information of the products** | The ZCS Azzurro HV Smart 5K is a modular high-voltage lithium iron phosphate ($LiFePO_4$). Each module delivers 5.12 kWh of nominal capacity (4.61 kWh usable at 90 % depth of discharge) and can be stacked with up to eight additional units to scale total capacity according to system requirements. The unit features an integrated Battery Management System (BMS) and supports communication via RS485 and CAN-bus for monitoring and control. With an IP65 enclosure rating and a wide operating temperature range from -15 °C to +50 °C, it is suitable for indoor and protected outdoor installations, and operates effectively with up to 95 % relative humidity without condensation. The HV Smart 5K is compatible with hybrid inverters from the ZCS Azzurro range and complies with key international safety and quality standards such as IEC 62619, IEC 62040, CE, and UN38.3, offering up to a 10-year warranty for long-term reliability. |
| **Product application area** | The ZCS Azzurro HV Smart 5K is designed for residential photovoltaic installations with on-grid operation and short-term backup capability. |
| **CPC Code**<br>https://unstats.un.org/unsd/classifications/Econ | CPC 464 "Accumulators, primary cells and primary batteries, and parts thereof" |
| **LCA practitioner** | Ollum S.r.l. www.ollum.it |
| **LCA software** | ZCS LCA Tool v1.0 (10/03/2025), property of Zucchetti Centro Sistemi S.p.A., was adopted for a production site outside its original scope of application. |

## VERIFICATION INFORMATION

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|---|---|
| **PCR** | Core PCR: EPDItaly007 – PCR for Electronic and Electrical Products and Systems, REV. 3.2 Issue date 10.12.2025<br>Sub-category PCR: EPDItaly021 "Electronic and electrical products and systems - Energy Storage", (Rev. 5), 03/10/2024 |
| **EPDItaly Regulation** | Regulations of the EPDItaly Programme Revision 7.1. Issue date 05.09.2025. It can be found on the EPDItaly website: www.epditaly.it. |
| **Project Report LCA** | *Life Cycle Assessment Report:*<br>- LCA report - ZCS AZZURRO HV SMART 5K_Rev.2.0 of 16/03/2026 |
| **Independent Verification Statement** | The PCR review was performed by ICMQ S.p.A.<br>Independent verification of the declaration and data carried out in accordance with ISO 14025:2010.<br>☐ Internal ☑ External<br>Third-party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n° 10 - 20124 Milan, Italy. Accredited by Accredia |
| **Statement Comparability** | EPD related to the same category of products but belonging to different programmes may not be comparable. |
| **Statement Responsibility** | The EPD Owner relieves EPDItaly from any non-compliance with environmental legislation. The holder of the statement will be responsible for the information and supporting evidence. EPDItaly declines all responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment. |

# 1. THE COMPANY

Zucchetti Centro Sistemi Spa (ZCS), founded in 1985 in the heart of Tuscany, Italy, is a leader in technological innovation, specializing in software development, robotics, automation, and renewable energy solutions. Under the visionary leadership of its founder and current CEO, Fabrizio Bernini, the company has expanded its presence in international markets, offering solutions that integrate advanced technologies. In 2000, ZCS became part of the Zucchetti Group, a prominent Italian and European leader in Information and Communication Technology (ICT). This integration has bolstered ZCS's capabilities, enabling it to develop vertically-oriented, cloud-based solutions for businesses of all sizes, aiming to enhance efficiency and effectiveness in business processes.

ZCS operates through five main business units:

- **Software**: Developing cloud-based solutions to improve business process efficiency.
- **Healthcare**: Designing integrated IT systems for healthcare facilities, including analysis labs and hospital services.
- **Automation**: Creating systems for traceability and security across various industries.
- **Robotics**: Producing innovative robots for gardening and pool maintenance, such as the Ambrogio Robot, an eco-friendly, autonomous lawn mower.
- **Green Innovation**: Distributing energy-saving solutions, including smart photovoltaic inverters and storage systems, to promote energy independence in residential, commercial, and industrial settings.

The Green Innovation Division is at the forefront of ZCS's commitment to sustainable development. It focuses on designing and delivering advanced energy solutions, including photovoltaic inverters, intelligent energy storage systems, and electric vehicle charging stations. These innovations empower residential, commercial, and industrial sectors to reduce energy consumption and enhance energy independence.

The company's mission focuses on improving quality of life and supporting business development through intelligent, eco-friendly technology, combining creativity with technological innovation. ZCS is committed to sustainability, emphasizing economic, environmental, and social responsibility in its operations. With a strong emphasis on research and development, ZCS's Idealab incubates innovative ideas, transforming them into market-ready solutions. The company has received numerous awards and recognitions for its commitment to innovation and social responsibility, including the prestigious "Award of Awards for Innovation" and the knighthood title "Cavaliere del Lavoro" awarded to Fabrizio Bernini in 2017.

# 2. THE PRODUCT

The ZCS Azzurro HV Smart 5K is a modular high-voltage lithium iron phosphate ($LiFePO_4$) battery energy storage system designed for residential photovoltaic installations with on-grid operation and short-term backup capability. Each module delivers 5.12 kWh of nominal capacity (4.61 kWh usable at 90 % depth of discharge) and can be stacked with up to eight additional units to scale total capacity according to system requirements. The unit features an integrated Battery Management System (BMS) and supports communication via RS485 and CAN-bus for monitoring and control. With an IP65 enclosure rating and a wide operating temperature range from -15 °C to +50 °C, it is suitable for indoor and protected outdoor installations, and operates effectively with up to 95 % relative humidity without condensation. The HV Smart 5K is compatible with hybrid inverters from the ZCS Azzurro range and complies with key international safety and quality standards such as IEC 62619, IEC 62040, CE, and UN38.3, offering up to a 10-year warranty for long-term reliability.

| *Data* | Value |
|---|---|
| | **ZCS Azzurro HV Smart 5K** |
| *Technology* | Lithium Iron Phosphate |
| *Coupling* | DC |
| *Nominal useful battery capacity* | 5.12 kWh per module |
| *Nominal voltage* | 400 V |
| *Maximum Depth of Discharge* | 90% |
| *Operating cycles under standard conditions* | 6.000 |
| *Maximum number of modules in parallel* | 8 |
| *Certifications* | IEC/EN 61600-6-1, IEC 61600-6-3, IEC62619, IEC62040, CE, UN38.3 |

## 2.1. COMPOSITION

The battery, whose total weight is approximately 66 kg, is composed of different materials, including steel, aluminium and other metals for rigid parts that make up the structure and for the internal parts. There are also other materials like electronic components, plastics and others.

| IEC62474 Classname | IEC62474 ID | % by weight of total ZCS Azzurro HV Smart 5K |
|---|---|---|
| Stainless steel | M-100 | 0,9 |
| Other ferrous alloys, non-stainless steels | M-119 | 35,3 |
| Alluminium and its alloys | M-120 | 5,1 |
| Copper and its alloys | M-121 | 0,2 |
| Other non-ferrous metals and alloys | M-149 | 0,0 |
| Glass | M-161 | 0,0 |
| Other inorganic materials | M-199 | 0,2 |
| PolyVinylChloride (PVC) | M-200 | 0,0 |
| PolyEthylene (PE) | M-204 | 0,2 |
| PolyCarbonate (PC) | M-204 | 0,5 |
| PolyAmide (PA) | M-208 | 0,0 |
| Other unfilled thermoplastics | M-249 | 0,3 |
| Epoxy resin (EP) | M-302 | 0,0 |
| Silicone | M-321 | 0,0 |
| Rubber | M-324 | 0,0 |
| Paper | M-341 | 0,0 |
| Cell | - | 49,4 |
| Electronic components | - | 8,0 |

No substance in the product greater than 0,10% by weight is present on the "List of Potentially Hazardous Substances" candidates for authorization under the REACH legislation.

Printed circuit boards used in this product weight 2,97 kg, and are modelled through the Ecoinvent 3.9 processes "Printed wiring board, surface mounted, unspecified, Pb free {GLO}| printed wiring board production, surface mounted, unspecified, Pb free | Cut-off, S" and "Mounting, surface mount technology, Pb-free solder {GLO}| mounting, surface mount technology, Pb-free solder | Cut-off, S".

## 2.2. REFERENCE SERVICE LIFE (RSL)

The reference service life of the products has been assumed to be 10 years.

# 3. SCOPE AND TYPE OF EPD

This is a product-specific EPD, compliant with ISO 14025 and EN 50693 standards, as part of the EPDItaly program, for the ZCS Azzurro HV Smart 5K. It is a battery and energy storage cabinet for residential photovoltaics integration. The study is based on a "cradle to grave" LCA methodology, in accordance with ISO 14040 and 14044 standards. The geographical scope of the data is referred to Italy as the products are mainly sold and used in Italy. The reference year is set at 2024, considering the current technological level. The results were generated using SimaPro 9.6 modeling software.

| Representativeness | Scope |
|---|---|
| Spatial | Italy |
| Year | 2024 |

## 3.1. FUNCTIONAL UNIT

The functional unit identified for the LCA study is a kWh of energy stored by the module.

## 3.2. PRINCIPLE OF MODULARITY AND ENVIRONMENTAL RESPONSIBILITY (PPP)

In the LCA study, the principle of modularity was adopted, which allows the product life cycle to be broken down into different phases, assigning specific environmental impacts to each of them. This approach facilitates a clear attribution of environmental responsibilities at every stage of the production process, ensuring greater transparency and traceability of data.

In addition, the PPP (Polluter Pays Principle) has been complied with, according to which the entity causing an environmental impact is also the one responsible for the related mitigation or repair costs. This principle ensures that environmental costs are not passed on to the community, but are correctly attributed to those who generated them, promoting greater responsibility and incentivizing the adoption of more sustainable practices throughout the supply chain

## 3.3. SYSTEM BOUNDARIES

The system boundary implemented in this LCA covered the entire product life cycle, i.e. from "cradle to grave", with the life cycle phases and geographical areas for all the main activities involved, grouped into five distinct modules: upstream, core and downstream, according to EN 50693. These modules have further been divided into sub-modules: manufacturing, distribution, installation, use and maintenance and end-of-life. In the context of life cycle analysis (LCA), the terms upstream, core, and downstream refer to different stages of a product's lifecycle:

- **Upstream:** It includes the initial stages of production, such as extracting raw materials, processing them, and transporting them to the production site. It therefore concerns everything that happens before the manufacture of the product.
- **Core:** This is the middle stage of the life cycle, which includes the production of the product itself, assembly, and manufacturing operations. It is the part of the process where the product is created or built.
- **Downstream:** Involves post-production stages, such as transportation to the customer, end-user use, and end-of-life disposal or recycling. It focuses on what happens to the product after it is made and distributed.

These three modules cover the entire life cycle of a product, from initial production to disposal. The product lifecycle and inventory analysis, which describe all the activities, simplified assumptions, and modeling scenarios used in LCA, have been covered exhaustively in the next section.

| Manufacturing | Distribution | Installation | Use and maintenance | End of Life |
|---|---|---|---|---|
| Upstream - Core | Downstream | Downstream | Downstream | Downstream |
| √ | √ | √ | √ | √ |

### 3.3.1. ALLOCATION RULES

Allocation of electricity consumption was based on the total annual electricity usage of the manufacturing facility. Since the plant operates two production lines (residential and industrial batteries), 80% of the total electricity consumption was assigned to the residential battery line according to the manufacturer's production data. This portion was then converted to a daily value and divided by the average daily production of residential batteries (approximately 300 units per day) to calculate the electricity consumption per unit. The resulting value was subsequently normalized to the functional unit of 1 kWh of battery capacity.

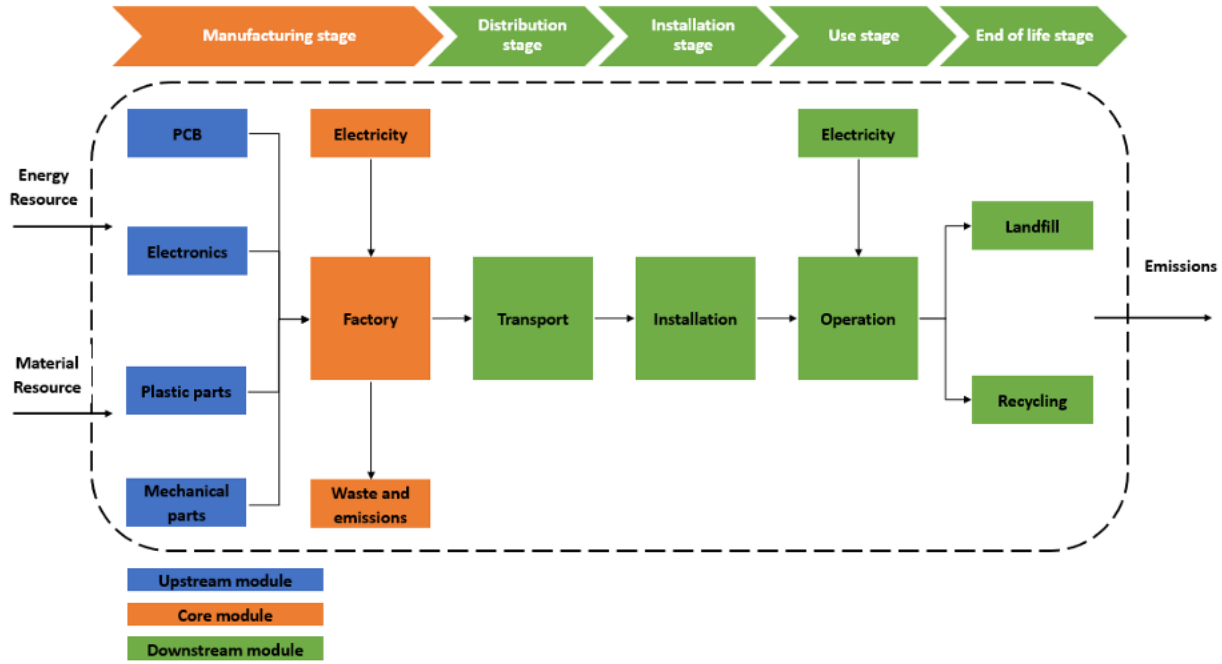
Waste flows were allocated according to the amount of each type of waste produced in the reference year and the total annual batteries production in pieces. The amount of each waste type is then divided by the annual batteries production in pieces and then normalized to the functional unit.

## 3.4. DATA QUALITY

The data used in the LCA study include both primary and secondary data. The primary data were obtained directly from Zucchetti Centro Sistemi S.p.A. and from the external manufacturing plant. This data is under the control and management of the company (e.g., bills, invoices, transport documents, weighing records). Secondary data comes from a variety of sources, including selected generic data from international databases; Proxy data: sourced from sources other than databases, used to create scenarios and fill in any information gaps. In the present study, secondary data were modeled using the Ecoinvent 3.9 database (2021), with citation of origin in the case of data from different sources.

# 4. LIFE CYCLE INVENTORY ANALYSIS (LCIA)

The Life Cycle Inventory (LCI) lists and quantifies all inflows and outflows at all declared life cycle stages of the product within the system boundary considered in relation to the scope of the study.




## 4.1. MANUFACTURING STAGE

The Life Cycle Study (LCA) includes both the "Upstream" phase, and the "Core" processes related to production. The Upstream phase includes the semi-finished products, the materials used in the production system and the manufacturing of the product by the external supplier in China (Wuxi City, Jiangsu Province).

It also includes the transportation of the raw materials and semi-finished products to the external manufacturing plant as well as the transportation of the final product from the Chinese manufacturer to Zucchetti Centro Sistemi premises, where the product is then shipped to the customer.

The core processes concern all the internal processes to which the product and its components are subjected within Zucchetti Centro Sistemi's plant. However, given that there is no manufacturing process taking place at Zucchetti Centro Sistemi's premises, the impacts considered in the core phase are related to the energy consumption of the building where the Green Innovation Division operates.

These data, extracted from the ERP and bills of the company, were entered into the SimaPro software to calculate the environmental impact of the production cycle of the product.

## 4.2. DISTRIBUTION STAGE

This stage includes the transportation of the product to the final customer. Based on the main country of shipment, in this case Italy, an assumed mean fixed value of 300 km has been chosen as distance to calculate the ton*km value. The transportation takes place only within the European Union and is assumed to be carried by truck, EURO 4, 16-32 ton.

## 4.3. INSTALLATION STAGE

This module calculates the environmental impacts associated with the installation of the product. In this case, the product is manually installed, so there is no impact associated with it, while the impact come from the discarding of the packaging. For the impact modeling of this phase, the treatment percentage guidelines from EN 56693 and EUROSTAT were used. The distance from the recycler is assumed to be 50 km, according to the relevant PCR.

## 4.4. USE & MAINTENANCE STAGE

This module analyses the environmental impacts associated with the use and maintenance of the product, by excluding energy carriers used in maintenance, such as spare parts and materials specified by the manufacturer, due to the lack of reliable data on failure times and maintenance frequencies. The analysis of emissions during the use phase of the module is based on the information available from the product data sheet and the formulas reported in the relevant PCR and c-PCR. In particular, the total energy consumption value (expressed in kWh per RSL) is calculated using this formula:

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

$$E_{use}\ [kWh] = \frac{P_{use} * 8760 * RSL}{1000}$$

$$E_{loss}\ [kWh] = \sum_{i=0}^{RSL} \frac{E_{useful\ i} * N_{cycles} * 365}{DC\ RTEi} * (1 - DC\ RTEi)$$

Applying the formulas for a reference service life (RSL) of 10 years, as reported by the corresponding c-PCR, the total energy consumption of the battery system is estimated at 2,450.89 kWh. The calculation considers the electricity consumed by the system auxiliaries, with a Puse of 3.54 W, and the energy available from each module. Each module is assumed to have a nominal useful capacity of 5.12 kWh at the time of installation, which decreases over time due to capacity degradation at an average annual rate of approximately 1.6%, based on available cycle-life data. As a result, the maximum energy dischargeable per module after 10 years (Euseful 10) is 4.42 kWh. A DC Round Trip Efficiency (DC RTEi) of 90% is applied, together with a nominal operating temperature of 25°C ±5°C, in line with PCR specifications.

To model this phase, a process from Ecoinvent describing the production of electric energy from photovoltaic (to which the inverter is connected, in this case in the "slanted-roof" configuration) has been used:

*"Electricity, low voltage {IT}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | Cut-off, S"*.

The emission factor (GWP) of this specific process is 0,0835 kg $CO_2$eq/kWh.

The relevant geographic area for the use phase is Italy.

## 4.5. END OF LIFE STAGE

This section examines product end-of-life, for which Zucchetti Centro Sistemi does not have primary data that can be used in the LCA study. End-of-life has been calculated according to the end-of-life scenarios outlined in the EN 50693 and EUROSTAT (the only exception is for batteries and electronic components, for which a specific process from Ecoinvent was directly applied), estimating a distance from the recycler of 50 km by truck, EURO 4, 16-32 ton. For the environmental impact of the different waste treatments, the EcoInvent database has been used.

# 5. RESULTS

In this section, the results of the study are presented, divided by different impact parameters and by the phases of the study that constituted the LCA.

Environmental impacts were calculated using the EN 15804 + A2, Cumulative Energy Demand (LHV), Selected LCI results, additional, and EDIP 2003 methodologies, as indicated in the SimaPro Methods library. These methodologies are used to calculate environmental impact categories, resource use and waste produced, as required by the PCR: EPDItaly007-PCR for electronic and electrical products and systems (Stand-alone) – Rev 3.2.

## 5.1. ENVIRONMENTAL IMPACTS

***ZCS Azzurro HV Smart 5K***

| | | | | *Upstream - Core* | *Downstream* | | | |
|---|---|---|---|---|---|---|---|---|
| ***Impact indicators**** | **Nomenclatures** | **Unit** | **Total** | **Manufacturing** | **Distribution** | **Installation** | **Use & Maintenance** | **End of Life** |
| *Global warming Potential - Total* | GWP - Total | kg CO2 eq | 3,29E+02 | 2,87E+02 | 8,10E-01 | 7,78E-02 | 4,00E+01 | 2,41E-01 |
| *Global warming Potential - Fossil* | GWP - Fossil | kg CO2 eq | 3,24E+02 | 2,84E+02 | 7,37E-04 | 3,65E-02 | 3,98E+01 | 1,12E-01 |
| *Global warming Potential – Biogenic*** | GWP - Biogenic | kg CO2 eq | 3,40E+00 | 2,27E+00 | 8,09E-01 | 4,12E-02 | 1,36E-01 | 1,50E-01 |
| *Global warming Potential - Land use and LU change* | GWP - Luluc | kg CO2 eq | 8,16E-01 | 7,40E-01 | 3,96E-04 | 7,36E-06 | 7,50E-02 | 2,34E-04 |
| *Ozone depletion Potential* | ODP | kg CFC11 eq | 6,20E-04 | 1,29E-05 | 1,77E-08 | 3,49E-10 | 2,51E-06 | 6,04E-04 |
| *Acidification Potential* | AP | mol H+ eq | 3,74E+00 | 3,43E+00 | 3,35E-03 | 6,94E-05 | 2,99E-01 | 6,04E-04 |
| *Eutrophication Potential, freshwater* | EP - freshwater | kg P eq | 2,33E-01 | 2,08E-01 | 5,70E-05 | 1,14E-06 | 2,45E-02 | 2,25E-04 |
| *Eutrophication Potential, marine* | EP - marine | kg N eq | 4,71E-01 | 4,21E-01 | 1,28E-03 | 2,94E-05 | 4,58E-02 | 3,32E-03 |
| *Eutrophication Potential, terrestrial* | EP - terrestrial | mol N eq | 7,93E+00 | 7,43E+00 | 1,36E-02 | 2,90E-04 | 4,79E-01 | 4,03E-03 |
| *Photochemical ozone formation Potential* | POCP | kg NMVOC eq | 1,69E+00 | 1,52E+00 | 4,90E-03 | 9,94E-05 | 1,70E-01 | 1,27E-03 |
| *Resource use Potential, minerals and metals**** | ADP - minerals&metals | kg Sb eq | 9,15E-02 | 8,91E-02 | 2,62E-06 | 4,85E-08 | 2,41E-03 | 6,40E-07 |
| *Resource use Potential, fossil**** | ADP - fossil | MJ | 4,06E+03 | 3,55E+03 | 1,15E+01 | 2,14E-01 | 4,98E+02 | 1,99E+00 |
| *Water deprivation Potentia***I* | WDP | m3 depriv. | 8,21E+01 | 5,31E+01 | 4,71E-02 | 1,53E-03 | 2,88E+01 | 1,96E-01 |

*The applied characterization factors are associated with the EF 3.1 method.
**For the GWP-biogenic indicator, it was assumed that carbon uptake is fully emitted at the disposal point, even though degradation may occur over a more extended period within the 100-year timeframe of GWP analysis. Consequently, the biogenic carbon contents of the vegetable oil and paper within the product, as well as the wood composing the packaging (captured throughout their value chains, i.e., - 1 kg CO2 eq), were manually adjusted to be 100% emitted during the installation phase (for wood packaging) and end-of-life phase (for the vegetal oil and paper), resulting in +1 kg CO2 eq.
*** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

## 5.2. USE OF RESOURCES

***ZCS Azzurro HV Smart 5K***

| | | | | *Upstream - Core* | *Downstream* | | | |
|---|---|---|---|---|---|---|---|---|
| ***Parameter*** | **Nomenclatures** | **Unit** | **Total** | **Manufacturing** | **Distribution** | **Installation** | **Use & Maintenance** | **End of Life** |
| *Renewable primary energy as energy carrier* | PERE | MJ | 2,31E+03 | 3,86E+02 | 1,79E-01 | 3,46E-03 | 1,93E+03 | 1,93E+03 |
| *Renewable primary energy resource as material utilization* | PERM | MJ | 1,97E+01 | 1,97E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Total use of renewable primary energy resources* | PERT | MJ | 2,33E+03 | 4,05E+02 | 1,79E-01 | 3,46E-03 | 1,93E+03 | 1,93E+03 |
| *Non-renewable primary energy as energy carrier* | PENRE | MJ | 4,05E+03 | 3,54E+03 | 1,15E+01 | 4,81E-01 | 4,98E+02 | 4,98E+02 |
| *Non-renewable primary energy as material utilization* | PENRM | MJ | 8,58E+00 | 8,58E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Total use of non-renewable primary energy resources* | PENRT | MJ | 4,06E+03 | 3,55E+03 | 1,15E+01 | 4,81E-01 | 4,98E+02 | 4,98E+02 |
| *Use of secondary material* | SM | Kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Use of renewable secondary fuels* | RSF | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Use of non-renewable secondary fuels* | NRSF | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Net use of fresh water* | FW | m3 | 3,67E+00 | 2,31E+00 | 1,65E-03 | 5,37E-05 | 1,07E+00 | 1,07E+00 |

## 5.3. WASTE AND OUTPUT FLOWS

***ZCS Azzurro HV Smart 5K***

| | | | | *Upstream - Core* | *Downstream* | | | |
|---|---|---|---|---|---|---|---|---|
| ***Parameter/indicator*** | **Nomenclatures** | **Unit** | **Total** | **Manufacturing** | **Distribution** | **Installation** | **Use & Maintenance** | **End of Life** |
| *Hazardous waste disposed* | HWD | Kg | 9,60E-01 | 2,43E-01 | 2,86E-04 | 4,20E-04 | 3,70E-01 | 3,46E-01 |
| *Non-hazardous waste disposed* | NHWD | Kg | 4,78E+01 | 4,05E+01 | 5,64E-01 | 1,52E-02 | 5,97E+00 | 6,99E-01 |
| *Radioactive waste disposed* | RWD | Kg | 7,47E-03 | 6,51E-03 | 3,75E-06 | 7,03E-08 | 8,99E-04 | 5,82E-05 |
| *Components for re-use* | CRU | Kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Materials for recycling* | MFR | Kg | 5,72E+00 | 0,00E+00 | 0,00E+00 | 1,51E+00 | 0,00E+00 | 4,21E+00 |
| *Materials for energy recovery* | MER | Kg | 9,96E-02 | 0,00E+00 | 0,00E+00 | 2,48E-02 | 0,00E+00 | 7,48E-02 |
| *Exported thermal energy* | EET | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| *Exported electricity energy* | EEE | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

# BIBLIOGRAPHY


1. Core PCR: EPDItaly007 – PCR for Electronic and Electrical Products and Systems, REV. 3.2 Issue date 10.12.2025
2. Sub-category PCR: EPDItaly021 "Electronic and electrical products and systems - Energy Storage", (Rev. 5), 03.10.2024
3. ISO 14040:2006 'Principles and framework' which contains the principles and framework for life cycle assessment and a description of the structure of an LCA analysis
4. ISO 14044:2006 "Requirements and guidelines" which is the main support for the practical application of a life cycle study.
5. UNI EN ISO 14025 :2010, Environmental labels and declarations – Type III environmental declarations – Principles and procedures (ISO 14025 :2006)
6. EN 50693:2019 "*Product category rules for life cycle assessments of electronic and electrical products and systems*"
7. Regulations of the EPDItaly Programme Revision 7.1 Issue date 05.09.2025
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9. Special Waste Report, 2023 Edition, ISPRA - https://www.isprambiente.gov.it/it/pubblicazioni/rapporti/rapporto-rifiuti-speciali-edizione-2023
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