



ZincFive

Product Environmental Profile (PEP)



BC 2 UPS Battery Cabinet ZF-38A6BS022KB1UF000

High power battery immediate power
solution (IPS) for back-up power in
mission critical applications



General Information

Reference Product

ZincFive Model BC 2 UPS Battery Cabinet with 38 model ZF 13-80 HSF nickel-zinc (NiZn) battery modules

Model: ZF-38A6BS022KB1UF000

Product Category: Other equipment – active product

Description of Product

The BC 2 UPS Battery Cabinet is an immediate power solution (IPS) that utilizes nickel-zinc (NiZn) chemistry to provide high power, energy dense battery back-up in a safe, reliable, and sustainable design. The product easily integrates into various Uninterruptible Power Supply (UPS) models used in mission critical infrastructure such as data centers. Due to nickel-zinc's characteristics, the BC 2 UPS Battery Cabinet provides a lower total cost of ownership (TCO) due to small footprint, superior safety (no potential for thermal runaway), high reliability, and sustainability. The BC 2 UPS Battery Cabinet is compliant with all industry standards and is an excellent choice for indoor installations where critical power infrastructure is required.

System Boundary

The system boundary of this PEP is cradle-to-grave. The analysis includes the following modules:

Manufacturing: A1-A3

Distribution: A4

Installation: A5

Use : B1 -B7

End-of-life cycle: C1-C4

Loads and Benefits: D

Range of Products

The products in the range of this PEP are BC 2 UPS Cabinets with 36, 37, 38, or 39 model ZF 13-80 HSF NiZn battery modules.

Model Number	# of HSF Batteries	Power Rating* (kw)	Weight (kg) No Packaging	Weight (kg) Packaged	Dimension (m) (W x L x H)
ZF-36A6BS022KB1UF000	36	252	843.3	903.8	0.5 x 0.9 x 2.1
ZF-37A6BS022KB1UF000	37	259	858.5	919.1	
ZF-38A6BS022KB1UF000	38	266	873.8	934.3	
ZF-39A6BS022KB1UF000	39	273	889.0	949.5	

*Rated power at five (5) minute backup time

Functional Unit

Functional Unit: To provide 266 kW for five (5) minutes for a reference lifetime of ten (10) years for use in UPS applications.

Declared Unit: One (1) BC 2 UPS Battery Cabinet that ensures 266 kW of power for five (5) minutes for a reference service lifetime of ten (10) years when integrated into a UPS.



Constituent Materials

Declared Product Mass

The mass of the BC 2 UPS Battery Cabinet declared product is 934.3 kg, including the product and its packaging.

Table of Key Materials Components

	Weight (kg)	Percentage%	Notes
Plastics			
Polystyrene	0.1	<0.1%	Packaging material
Polyethylene	0.1	<0.1%	Packaging material
Metals			
Steel	250.9	26.9%	Cabinet and packaging materials
Copper	36.4	3.90%	Wiring and busbars
Aluminum	1.59	0.17%	Heatsink
Other			
Batteries	578.8	62.0%	38 x NiZn batteries - Model HSF
Wood	54.4	5.82%	Packaging material
Electronics	6.56	0.70%	BMS + other electronics
Cardboard	5.40	0.58%	Packaging material
Total	934.3	100%	

Plastics: <0.1%

Metals: 30.9%

Other: 69.1%

Substance Assessment

The products in the range of this PEP are designed in conformity with the requirements of the following standards and regulations:

- RoHS Directive 2011/65/EU and its amendment directives, including Commission Delegated Directive 2015/863
- EU REACH Regulation 1907/2006 article 33 (SVHC) (Jan 2022 - 223 Substances)
- EU Battery Regulation 2023/1542 (July 2023)
- Waste Framework Directive 2008/98/EC (SCIP) (223 Substances)
- EU REACH Regulation 1907/2006 article 67 (Restriction) (Jan 2021)
- EU POP Regulation 2019/1021 (Aug 2020)
- WEEE Directive 2012/19/EU



Additional Information

Manufacturing

The reference product is assembled by ZincFive at a factory in Oregon, United States. The batteries are assembled by ZincFive at a factory in Changsha, China.

Distribution

The product is suitably packaged for distribution from the United States to Europe by ocean-going vessel.

Installation

Installation at the customer site is largely a manual process with electricity consumed to test the proper functioning of the product upon commissioning into service.

Use

The BC 2 UPS Battery Cabinet is an on-demand, back-up battery system used infrequently over its lifetime. However, when back-up power is required, the product requires a reliable response to ensure continuity of operations in mission critical applications. Therefore, the standard use case for the declared product includes twenty-four (24) partial discharges per year over the entire reference service life to ensure the health of the batteries, in addition to constant monitoring by the Battery Management System (BMS). Additionally, the model assumes two (2) full discharges per year to provide backup power in situations where grid power is disrupted.

The reference service life of ten (10) years is consistent with the warranty terms for the BC 2 UPS Battery Cabinet. The expected lifetime is greater than fifteen (15) years.

End-of-Life Cycle

The recyclability potential of the reference product is 81.7%, assuming proper dismantling of the batteries from the cabinet upon deinstallation of the product and the subsequent shipment of cabinet parts and batteries to qualified metal scrap and battery recyclers.

Module D

The credits associated with Module D relate to recycled materials at the End-of-Life Cycle. All credits associated with this module relate to the avoidance of producing comparable material, using factors such as comparable materials purity or value as a basis for credits.



Environmental Impact

Life Cycle Assessment Methodology

The Life Cycle Assessment on which this Product Environmental Profile (PEP) is based was carried out in compliance with the criteria of PCR-ed4-EN-2021 09 06 and PSR-0005-ed3.1-EN 12 08 of the ecopassport® PEP Program. All calculations of the environmental impacts were performed in accordance with ISO 140044/44 and EN15804 + A2 (EF 3.1) covering the entire lifecycle of the product, i.e., “Cradle-to-Grave” analysis. The lifecycle modeling was conducted using the commercial software Life Cycle Assessment For Experts (LCA FE), v.10.9, with datasets from the Managed LCA Content (MLC, 2024.2), both provided by Sphera Solutions, Inc.

Manufacturing

The declared product is assembled in a contract manufacturing plant in Oregon, United States with batteries produced in Changsha, China. The production of the reference product and the batteries were considered in the model, in addition to the treatment of production waste and the final packaging of the reference product.

The inbound transportation of raw materials was considered in the model.

The energy models used were based upon the regions of production.
For the reference product assembly: United States. For the battery assembly: China.

Distribution

Distribution of the product in its packaging from ZincFive’s last logistics platform to the installation place in Europe is considered as per the PCR rules.

Installation

The product is installed in any country in Europe. The treatment of packaging waste is considered at average European values. The energy model used in the model: Europe.

Use

The reference service life is ten (10) years. The energy model used in the model: Europe.

The energy consumed by the BMS (average 28 W continuously) and the energy losses associated with the standard use case of the BC 2 UPS Battery Cabinet represent the most significant uses of electricity in the system. The declared product consumes 4,155 kWh of electricity over the reference service life.

End-of-Life

Declared product is recycled according to guidelines of the PCR, with manual dismantling, transportation, recycling operations, and disposal covered. Based upon the PCR rules, 58.8% of the materials in the declared product are recycled in this analysis. The energy models used for electricity and thermal energy: Europe.

Module D

The declared product components are recycled or disposed of according to the PCR. For product components disposed of via incineration, thermal and electricity credits are taken at average European values.

The life cycle impact assessment (LCIA) results are presented below, including impact categories, resource use indicators, waste and output flows, carbon emissions and removal, and additional environmental indicators for the declared product (BC 2 UPS Battery Cabinet with 38 batteries).

MANDATORY INDICATORS

Environmental Impact Indicators	Units	Manufacturing	Distribution	Installation	Utilization								End of Life	Total (excl D)	Benefits / Loads
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B1-B7	C1-C4		D
Climate Change - total	kg CO2 eq.	7.11E+03	3.01E+02	7.83E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+03	0.00E+00	1.20E+03	7.17E+02	9.41E+03	-2.08E+03
Climate Change - fossil fuels	kg CO2 eq.	7.08E+03	3.00E+02	7.15E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E+03	0.00E+00	1.19E+03	7.14E+02	9.29E+03	-2.07E+03
Climate Change - biogenics	kg CO2 eq.	2.66E+01	-8.61E-01	7.11E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E+01	0.00E+00	1.07E+01	2.09E+00	1.10E+02	7.07E-01
Climate Change - land use and land use transformation	kg CO2 eq.	7.03E+00	1.86E+00	1.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.46E+00	1.05E+01	-3.38E+00
Ozone depletion	kg CFC 11 eq.	3.06E-08	4.26E-11	5.72E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E-08	0.00E+00	2.70E-08	6.31E-09	6.40E-08	-3.84E-09
Acidification (AP)	Mole H+ eq.	1.92E+02	3.77E+00	2.36E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E+00	0.00E+00	2.29E+00	3.41E+00	2.02E+02	-1.12E+02
Freshwater eutrophication	kg P eq.	1.63E-02	6.26E-04	6.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-03	0.00E+00	4.96E-03	2.54E-03	2.50E-02	-4.13E-03
Marine aquatic eutrophication	kg N eq.	7.33E+00	1.64E+00	1.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-01	0.00E+00	5.74E-01	1.37E+00	1.09E+01	-1.84E+00
Terrestrial eutrophication	Mole of N eq.	7.69E+01	1.80E+01	9.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+00	0.00E+00	6.00E+00	1.50E+01	1.16E+02	-1.95E+01
Photochemical ozone formation	kg NMVOC eq.	3.03E+01	4.25E+00	2.94E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E+00	0.00E+00	1.52E+00	3.65E+00	3.97E+01	-1.19E+01
Abiotic resource depletion - metals and minerals	kg Sb eq.	5.93E-01	3.22E-05	5.74E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E-04	0.00E+00	2.23E-04	8.03E-05	5.94E-01	-2.85E-01
Abiotic resource depletion - fossils	MJ	9.49E+04	3.76E+03	8.72E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E+04	0.00E+00	2.49E+04	9.79E+03	1.34E+05	-2.68E+04
Water requirement	m3 eq	2.37E+03	3.83E+00	6.06E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E+02	0.00E+00	3.24E+02	7.16E+01	2.77E+03	-4.54E+02

Resource Use Indicators & Secondary Materials, Water, & Energy Resource Indicators	Units	Manufacturing	Distribution	Installation	Utilization								End of Life	Total (excl D)	Benefits / Loads
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B1-B7	C1-C4		D
Use of renewable primary energy (PERE)	MJ	2.22E+04	1.56E+02	8.30E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+04	0.00E+00	1.80E+04	3.95E+03	4.51E+04	-4.75E+03
Primary energy resources used as raw materials (PERM)	MJ	9.47E+02	0.00E+00	-7.91E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E+02	0.00E+00
Total use of renewable primary energy resources (PERT)	MJ	2.31E+04	1.56E+02	3.89E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+04	0.00E+00	1.80E+04	3.95E+03	4.53E+04	-4.75E+03
Use of non-renewable primary energy (PENRE)	MJ	9.14E+04	3.76E+03	9.56E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E+04	0.00E+00	2.49E+04	9.79E+03	1.30E+05	-2.68E+04
Non-renewable primary energy resources used as raw materials (PENRM)	MJ	3.55E+03	0.00E+00	-8.37E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.54E+03	0.00E+00
Total use of non-renewable primary energy resources (PENRT)	MJ	9.49E+04	3.76E+03	8.72E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E+04	0.00E+00	2.49E+04	9.79E+03	1.34E+05	-2.68E+04
Input of secondary material (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water (FW)	m3	6.67E+01	2.12E-01	1.55E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+01	0.00E+00	1.37E+01	3.08E+00	8.39E+01	-1.69E+01

Waste category & Output Flow Indicators	Units	Manufacturing	Distribution	Installation	Utilization								End of Life	Total (excl D)	Benefits / Loads
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B1-B7	C1-C4		D
Hazardous waste disposed (HWD)	kg	1.05E-02	3.72E-07	7.61E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-05	0.00E+00	3.60E-05	8.24E-06	1.05E-02	-7.01E-06
Non-hazardous waste disposed (NHWD)	kg	2.00E+03	3.84E-01	2.59E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E+01	0.00E+00	2.06E+01	2.10E+02	2.25E+03	-6.79E+02
Radioactive waste disposed (RWD)	kg	2.86E+00	9.27E-03	8.08E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.98E+00	0.00E+00	3.98E+00	7.24E-01	7.58E+00	-1.07E+00
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for Recycling (MFR)	kg	8.49E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.25E+02	6.10E+02	0.00E+00
Material for Energy Recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electrical energy (EEE)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy (EET)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other Indicators	Units	Manufacturing	Distribution	Installation	Utilization								End of Life	Total (excl D)	Benefits / Loads
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B1-B7	C1-C4		D
Biogenic carbon content in product	kg	3.78E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E+00	0.00E+00
Biogenic carbon content in packaging	kg	3.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E+01	0.00E+00

OPTIONAL INDICATORS

Optional Indicators	Units	Manufacturing	Distribution	Installation	Utilization								End of Life	Total (excl D)	Benefits / Loads
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B1-B7	C1-C4		D
Particulate matter	Disease incidences	1.46E-03	8.56E-05	1.89E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-05	0.00E+00	1.92E-05	6.76E-05	1.64E-03	-7.64E-04
Ionising radiation, human health	kBq U235 eq.	2.42E+02	9.37E-01	1.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.54E+02	0.00E+00	6.54E+02	1.14E+02	1.01E+03	-8.72E+01
Ecotoxicity, freshwater	CTUe	2.09E+05	2.87E+03	5.27E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.23E+03	0.00E+00	7.23E+03	3.83E+03	2.23E+05	-1.60E+05
Human toxicity, cancer	CTUh	-1.20E-04	5.14E-08	1.99E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.06E-07	0.00E+00	4.06E-07	1.61E-07	-1.19E-04	-2.72E-04
Human toxicity, non-cancer	CTUh	3.66E-04	1.55E-06	8.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.22E-06	0.00E+00	6.22E-06	5.66E-06	3.80E-04	-5.87E-05
Land Use	Pt	2.86E+04	7.80E+02	2.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E+04	0.00E+00	1.06E+04	2.92E+03	4.29E+04	-5.66E+03



Extrapolation Rules

Range of Products

The extrapolation coefficients are given for the environmental impact of the declared product. For each stage of the lifecycle, the environmental impacts of the product in consideration are calculated by multiplying the impacts of the declared product by the extrapolation coefficient.

The extrapolation rules below (from manufacturing to module D) are applicable at the product level. The factor considers the differences in the number of batteries and associated changes in the weights of the batteries, and the fully packaged product between the product in consideration and the declared product as follows:

Manufacturing Stage [A1-A3]

The change in mass of the HSF-type batteries as a part of the overall mass of the system is the main driver for the manufacturing stage. The extrapolation rule for this stage is:

$$A \times \frac{MB_{pc}}{MB_{rp}} + (1 - A) \times \frac{M_{pc}}{M_{rp}}$$

where,

A = the weight percentage of batteries in the product in consideration (fully packaged)

MB_{pc} = the mass of the batteries in the product in consideration

MB_{rp} = the mass of the batteries in the reference product

M_{pc} = the mass of product in consideration (fully packaged)

M_{rp} = the mass of the reference product (fully packaged)

Distribution Stage [A4]

The total mass of the packaged product is the main driver for the distribution stage. The extrapolation rule for this stage is:

$$\frac{M_{pc}}{M_{rp}}$$

where,

M_{pc} = the mass of product in consideration (fully packaged)

M_{rp} = the mass of the reference product (fully packaged)

Installation Stage [A5]

The extrapolation coefficient for the installation stage is 1, as the same amount of energy is assumed to be used regardless of the number of batteries in the system.

Usage Stage [B6]

The extrapolation rule for the usage stage is:

$$\frac{248.3 + 4.24 \times NB_{pc}}{248.3 + 4.24 \times NB_{pr}}$$

where,

NB_{pc} = the number of HSF-type batteries in product consideration

NB_{rp} = the number of HSF-type batteries in the reference product

End-of-Life [C1-C4]

The extrapolation rules for the end-of-life stage follow those of the manufacturing stage.

Module D

The extrapolation rules for the end-of-life stage follow those of the manufacturing stage.

	BC 2 Product Family by Model Number			
Declared Product Information	ZF-36A6BS022KB1UF000	ZF-37A6BS022KB1UF000	ZF-38A6BS022KB1UF000	ZF-39A6BS022KB1UF000
# of HSF batteries	36	37	38	39
Declared Product Extrapolation Coefficients				
Manufacturing [A1-A3]	0.96	0.98	1.00	1.02
Distribution [A4]	0.97	0.98	1.00	1.02
Installation [A5]	1.00	1.00	1.00	1.00
Usage [B6]	0.98	0.99	1.00	1.01
End-of-Life [C1-C4]	0.96	0.98	1.00	1.02
Module D	0.96	0.98	1.00	1.02

Registration number: Z5BC--00101-V01.01-EN	Drafting rules: PCR-ed4-EN-2021 09 06 Supplemented by: PSR-0005-ed3.1-EN-2023 12 08
Verifier accreditation number: VH42	Information and reference documents: www.pep-ecopassport.org
Date of issue: 05-2025	Validity period: 5 years
Independent verification of the declaration and data in compliance with ISO 14025: 2006	
Internal: ☐	External: ☒
The PCR review was conducted by a panel of experts chaired by Matteo Simonetto (TUV)	
PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019 or NF E38-500 :2022	
The components of the present PEP may not be compared with components from any other program.	
Document complies with ISO 14025:2006 "Environmental labels and declarations. Type III environmental declarations"	
	

Declaration Holder: ZincFive, Inc.

Contact Information: esg-info-request@zincfive.com

20170 SW 112th Avenue

Tualatin, Oregon, 97062 United States

Phone: +1.503.399.3517

www.zincfive.com

Published by ZincFive, Inc.

©2025 – ZincFive – All rights reserved