ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Sigma Zero
Swegon Group AB

EPD HUB, HUB-3655
Published on 17.07.2025, last updated on 17.07.2030

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.1 (5 Dec 2023) and JRC characterization factors EF 3.1.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Swegon Group AB
Address	JA Wettergrens gata 7, 421 30, Västra Frölunda, Sweden
Contact details	info@swegon.com
Website	https://www.swegon.com/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.1, 5 Dec 2023
Sector	Construction product
Category of EPD	Third party verified EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-B7, and modules C1-C4, D
EPD author	Dario Munari
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Imane Uald Lamkaddam as an authorized verifier for EPD Hub

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Sigma Zero
Additional labels	-
Product reference	-
Place(s) of raw material origin	Europe, Asia
Place of production	Cantarana, province of Venice, Italy
Place(s) of installation and use	Europe
Period for data	2024
Averaging in EPD	No grouping
Variation in GWP-fossil for A1-A3 (%)	-
A1-A3 Specific data (%)	1,19

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 Sigma Zero Hi HP 120
Declared unit mass[1]	662 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	3,51E+03
GWP-total, A1-A3 ($kgCO_2e$)	3,59E+03
Secondary material, inputs (%)	35,3
Secondary material, outputs (%)	78,5
Total energy use, A1-A3 (kWh)	14700
Net freshwater use, A1-A3 (m^3)	41,1

[1] The declared weight does not include the mass of water that fills the hydraulic connections, pumps and plate heat exchanger after installation.

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

People spend most of their time indoors, which is why we need a sound indoor climate for our health, well-being, and happiness. Swegon's ambition is to achieve the world's best indoor environment with the least possible impact on the external environment. Our business models, services, products, and systems are all designed to provide the right solution for each individual project. Swegon Group AB, owned by Investment AB Latour, listed on the Stockholm Stock Exchange, is a market leading supplier in the field of indoor environment, offering solutions for ventilation, heating, cooling and climate optimisation, as well as connected services and expert technical support. Swegon has subsidiaries and distributors all over the world and production plants in Europe, North America and India.

PRODUCT DESCRIPTION

The Sigma Zero is a series of high-efficiency water-to-water chillers and heat pumps, available in several configurations: chiller only (Hi), non-reversible heat pump (Hi OH), reversible heat pump on the refrigerant side (Hi HP), and on the water side (Hi HPW). All models are equipped with full inverter semi-hermetic reciprocating or scroll compressors and use natural refrigerant R290 (propane), with an ODP of 0 and GWP close to zero.

The units are compact and designed for high-efficiency performance with Eurovent certification. They incorporate a robust frame with panels coated in polyester powder for protection, and removable sections for maintenance access. The compressors, optimized for R290 operation, use inverter technology to match load demands and optimize seasonal energy efficiency. The heat exchangers are plate-type, ensuring reduced refrigerant charge and a high performance in both heating and cooling applications.

The Sigma Zero line employs low-noise components and optimized hydraulic flow paths. While these are water-cooled units and do not include fans, noise levels are minimized through design and component layout. Thermal overload protection and intelligent modulation further enhance acoustic comfort and operational reliability.

Each refrigerant circuit includes all essential components such as electronic expansion valves, shut-off valves, sight glasses, filters, and pressure safety devices. The units feature integrated safety systems with ATEX-certified leak sensors and are optionally available with the BlueThink controller for advanced regulation, remote monitoring, data logging, and compatibility with the Blueye® supervisory system.

The electrical panel offers IP54-rated protection and is built to comply with all applicable standards. Sigma Zero units are delivered pre-tested and pre-packaged for easy handling and installation. The range supports flexible applications, from water temperatures down to -10°C in chiller mode and up to 75°C in heat pump operation, ensuring excellent performance across a wide range of ambient and load conditions.

Further information can be found at https://www.swegon.com and on the product page https://www.swegon.com/products-and-services/cooling-and-heating-production/heating-and-cooling/watercooled-chiller-and-heat-pumps/sigma-zero/

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	91,3	EU, Asia
Minerals	0	
Fossil materials	8,7	EU, Asia
Bio-based materials	0	

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 Sigma Zero Hi HP 120
Mass per declared unit[2]	662 kg
Functional unit	This unit provides a nominal heating and cooling capacity of 120 kW over the course of 17 years, by consuming a total of 795 063 kWh of electrical energy
Reference service life	17

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	9,8

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

[2] The declared weight does not include the mass of water that fills the hydraulic connections, pumps and plate heat exchanger after installation.

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	x	x	MND	MND	MND	x	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

The reference product consists of one monobloc unit of the indicated size. The unit is manufactured in Cantarana di Cona (VE), Italy. The most relevant components were modelled based on primary data from the supplier, while some other less relevant components were modelled with proxy data. Transportation of raw material to the manufacturing site is accounted based both on actual distance and mode of transport and on generic datasets. For each unit packaging materials such as wood pallets, etc. is included. The manufacturing energy mix considered is based on 100% renewable electricity as proved by a green contract with the energy company (Enel).

The use of green energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc.), and its use is ensured throughout the validity period of this EPD.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

The chosen distance represents the weighted average of the shipping distance of all the units sold since it was launched on the European market.

For installation of the product (A5), virtually no ancillary materials are required, as the product only needs to be manually attached to the water and electricity connections of the building. The product needs to be unloaded from a truck and placed in the chosen site; conservative assumptions on time and fuel consumption have been used to model this process.

PRODUCT USE AND MAINTENANCE (B1-B7)

The impacts of refrigerant leakage, equipment maintenance and refrigerant refilling have been considered from average European data (3% yearly leakage rate). This is a very conservative assumption as the monobloc unit is thoroughly leak-tested with sensitive sniffers after assembly and should not be subject to any further modifications by the installer.

Partial refill is assumed for the refrigerant and the number of refilling is calculated as 1 time over the reference service life (RSL) of 17 years of the product. To model this, a trip of 100km (each way) for a technician over the RSL has been evaluated.

Energy consumption during the use phase has been calculated based on the European Commission Regulation (EU) 2013/811, implementing the directive of the European Commission 2009/125/ec ecodesign. SEER and SCOP parameters, obtained by extensive testing, were used for modelling the use profile for the product in the average European climate profile. Data regarding SEER and SCOP is available on the Swegon website.

PRODUCT END OF LIFE (C1-C4, D)

The End of Life (EoL) is the stage accounted for at the end of life of the product and of the refrigerant. The EoL of the product is modelled according to the PCR.

The decommissioning phase (C1) consists in the removal of the product prior to the decommissioning of the entire building. Given the absence of standardized practices across the industry, a conservative assumption has been adopted regarding energy consumption during this phase.

Transport of the decommissioned product to a waste management facility is modelled (C2), assuming transportation by truck to a processing centre.

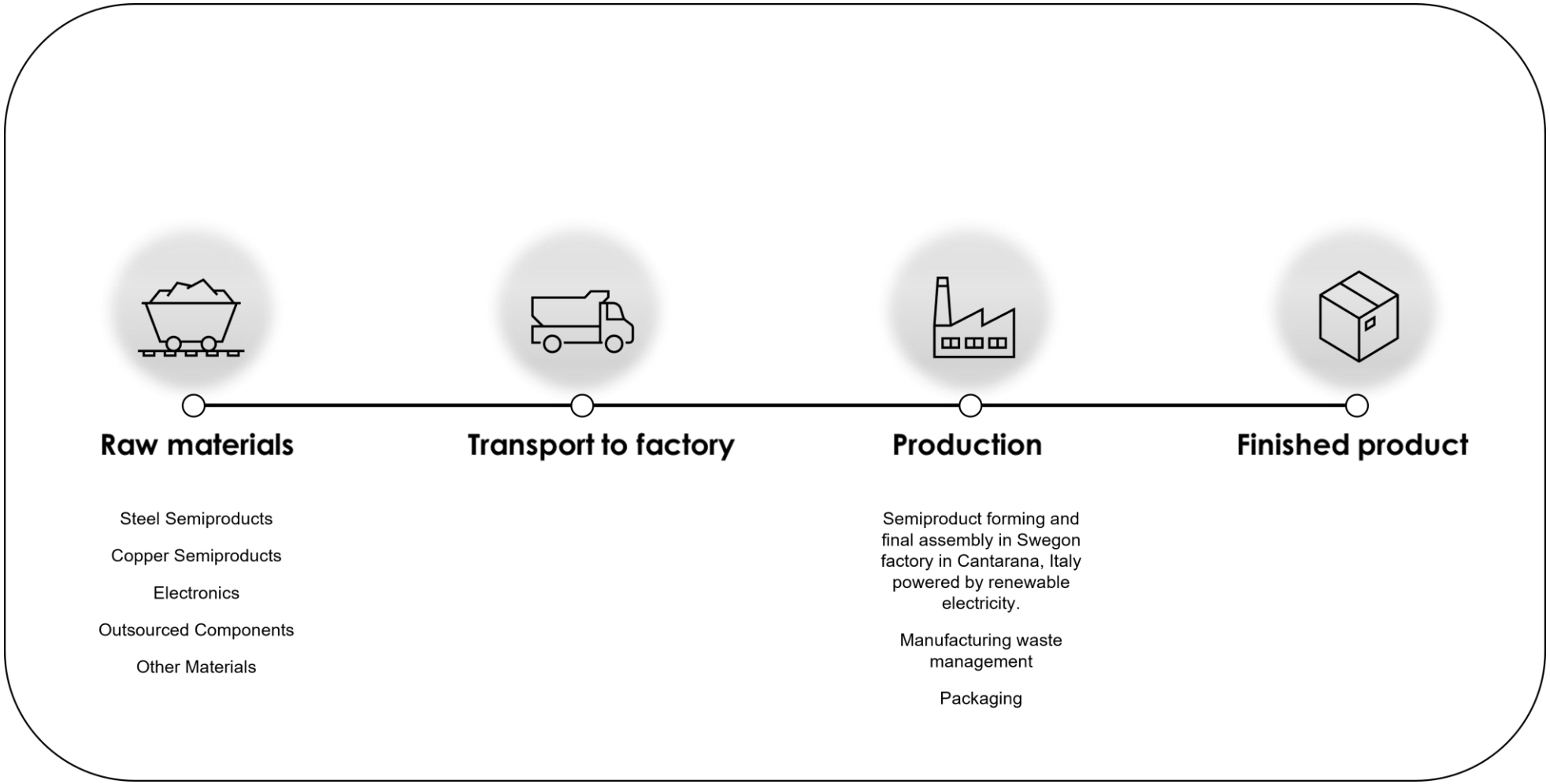
HVAC products are subject to country-specific regulations regarding their post-decommissioning processes (C3 and C4). For example, in the EU the European Commission directive 2012/19 requires every member country to comply with regulations for the EoL treatment of electrical and electronic products, including heating, cooling, and ventilation systems.

Since a specific scenario for every country cannot be accurately modelled, a generic scenario has been developed. This assumes that the product is manually disassembled by a specialized company, and the resulting waste is managed through typical waste management routes. The distribution percentages for recycling, landfilling, or incineration are derived from reports published by accredited sources, including the Bureau of International Recycling (BIR), the European Recycling Industries' Confederation (EuRIC), UNITAR, the International Copper Association, and VinylPlus.

The EoL scenario of the refrigerant is based on average European data. It is assumed that 80% of the refrigerant is recovered at EoL, while 20% is considered direct emissions. Of the recovered refrigerant, 100% is regenerated for reuse.

The net benefits and loads beyond the system boundaries are also included in the EPD. The net benefits and loads beyond the system boundaries are calculated using formulas described in Annex D of the EN 15804.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass. The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	No allocation
Ancillary materials	No allocation
Manufacturing energy and waste	No allocation

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

This EPD is product and factory specific.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	3,31E+03	2,71E+01	1,51E+02	3,49E+03	1,24E+02	1,34E+02	4,43E-02	1,13E+00	MND	MND	MND	5,80E+05	MND	9,50E+01	5,74E+00	2,97E+02	3,46E+01	-9,15E+02
GWP – fossil	kg CO_2e	3,44E+03	2,71E+01	4,33E+01	3,51E+03	1,24E+02	9,76E+01	4,43E-02	1,13E+00	MND	MND	MND	5,78E+05	MND	9,49E+01	5,74E+00	2,96E+02	2,38E+01	-9,13E+02
GWP – biogenic	kg CO_2e	-1,39E+02	5,27E-03	1,08E+02	-3,08E+01	2,61E-02	3,59E+01	0,00E+00	7,49E-04	MND	MND	MND	8,71E+02	MND	1,64E-02	1,26E-03	4,94E-01	1,07E+01	-1,00E+00
GWP – LULUC	kg CO_2e	8,84E+00	1,27E-02	8,30E-02	8,94E+00	4,66E-02	9,73E-03	0,00E+00	7,72E-04	MND	MND	MND	1,15E+03	MND	1,88E-02	2,54E-03	3,68E-01	1,19E-03	-6,18E-01
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	5,13E-05	4,09E-07	1,43E-06	5,32E-05	2,49E-06	1,39E-06	0,00E+00	7,43E-08	MND	MND	MND	4,00E-03	MND	1,41E-06	8,09E-08	1,96E-06	3,11E-08	-6,04E-06
Acidification potential	mol H^+e	4,62E+01	3,01E-01	5,00E-01	4,70E+01	4,00E-01	8,17E-01	0,00E+00	4,55E-03	MND	MND	MND	2,99E+03	MND	8,38E-01	1,92E-02	1,09E+01	1,36E-02	-8,78E+00
EP-freshwater[2)]	kg Pe	1,44E+01	1,71E-03	3,85E-02	1,44E+01	8,36E-03	2,83E-03	0,00E+00	2,09E-04	MND	MND	MND	2,62E+02	MND	4,78E-03	4,46E-04	5,05E-01	4,77E-03	-1,10E+01
EP-marine	kg Ne	8,30E+00	8,02E-02	7,17E-02	8,45E+00	1,36E-01	3,83E-01	0,00E+00	9,49E-04	MND	MND	MND	5,68E+02	MND	3,82E-01	6,23E-03	6,57E-01	6,55E-02	-4,49E+00
EP-terrestrial	mol Ne	1,09E+02	8,86E-01	6,73E-01	1,10E+02	1,48E+00	4,15E+00	0,00E+00	1,00E-02	MND	MND	MND	5,75E+03	MND	4,18E+00	6,78E-02	8,12E+00	4,99E-02	-6,61E+01
POCP ("smog")[3)]	kg NMVOCe	2,71E+01	2,73E-01	2,69E-01	2,76E+01	6,52E-01	1,24E+00	6,57E-01	7,58E-03	MND	MND	MND	1,72E+03	MND	1,25E+00	2,69E-02	2,78E+00	2,26E-02	-1,28E+01
ADP-minerals & metals[4)]	kg Sbe	5,99E-01	6,14E-05	5,05E-03	6,04E-01	3,42E-04	3,46E-05	0,00E+00	8,93E-06	MND	MND	MND	3,30E+00	MND	5,98E-05	1,84E-05	1,30E-01	3,96E-06	-9,27E-02
ADP-fossil resources	MJ	4,29E+04	3,74E+02	7,93E+02	4,41E+04	1,79E+03	1,19E+03	0,00E+00	5,77E+01	MND	MND	MND	7,48E+06	MND	1,24E+03	8,09E+01	3,20E+03	2,69E+01	-9,69E+03
Water use[5)]	m^3e depr.	1,46E+03	1,64E+00	1,84E+02	1,64E+03	9,19E+00	3,45E+00	0,00E+00	1,27E-01	MND	MND	MND	1,46E+05	MND	4,16E+00	3,79E-01	1,13E+02	4,62E-01	-1,42E+02

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3,58E-04	2,12E-06	3,15E-06	3,63E-04	1,23E-05	2,32E-05	0,00E+00	4,80E-08	MND	MND	MND	2,57E-02	MND	2,33E-05	4,73E-07	4,17E-05	2,83E-07	-1,41E-04
Ionizing radiation[6]	kBq U235e	2,55E+02	2,96E-01	3,84E+00	2,60E+02	2,16E+00	5,70E-01	0,00E+00	3,85E-02	MND	MND	MND	7,87E+04	MND	1,18E+00	6,62E-02	1,74E+01	5,26E-02	-3,20E+01
Ecotoxicity (freshwater)	CTUe	1,88E+05	4,57E+01	7,63E+02	1,89E+05	2,12E+02	6,99E+01	7,23E-03	3,52E+00	MND	MND	MND	1,54E+06	MND	7,77E+01	1,26E+01	7,94E+03	4,44E+02	-1,26E+05
Human toxicity, cancer	CTUh	5,25E-06	4,86E-09	8,77E-08	5,34E-06	2,04E-08	9,89E-09	0,00E+00	3,10E-10	MND	MND	MND	1,03E-04	MND	1,01E-08	9,71E-10	1,35E-06	5,80E-09	7,86E-07
Human tox. non-cancer	CTUh	2,79E-04	2,02E-07	3,97E-06	2,83E-04	1,17E-06	1,79E-07	1,85E-09	1,04E-08	MND	MND	MND	5,55E-03	MND	1,93E-07	5,09E-08	1,32E-04	3,39E-07	1,23E-04
SQP[7]	-	3,89E+04	2,79E+02	4,28E+03	4,34E+04	1,81E+03	9,34E+01	0,00E+00	3,31E+00	MND	MND	MND	1,35E+06	MND	9,38E+01	5,33E+01	3,93E+03	5,19E+01	-1,18E+04

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8]	MJ	9,35E+03	4,63E+00	8,00E+02	1,02E+04	2,92E+01	-2,84E+02	0,00E+00	7,14E-01	MND	MND	MND	1,13E+06	MND	1,69E+01	1,11E+00	5,38E+02	-4,05E+02	-3,30E+03
Renew. PER as material	MJ	1,29E+03	0,00E+00	-9,43E+02	3,45E+02	0,00E+00	-3,14E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	-1,11E+01	-1,95E+01	0,00E+00
Total use of renew. PER	MJ	1,06E+04	4,63E+00	-1,43E+02	1,05E+04	2,92E+01	-5,99E+02	0,00E+00	7,14E-01	MND	MND	MND	1,13E+06	MND	1,69E+01	1,11E+00	5,27E+02	-4,24E+02	-3,30E+03
Non-re. PER as energy	MJ	4,17E+04	3,74E+02	5,60E+02	4,26E+04	1,79E+03	9,84E+02	0,00E+00	1,13E+01	MND	MND	MND	7,48E+06	MND	1,24E+03	8,09E+01	3,08E+03	-5,20E+02	-9,47E+03
Non-re. PER as material	MJ	1,27E+03	0,00E+00	1,50E+02	1,42E+03	0,00E+00	-2,33E+02	0,00E+00	4,64E+01	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	-3,75E+02	-8,58E+02	-7,49E+00
Total use of non-re. PER	MJ	4,30E+04	3,74E+02	7,10E+02	4,40E+04	1,79E+03	7,51E+02	0,00E+00	5,77E+01	MND	MND	MND	7,48E+06	MND	1,24E+03	8,09E+01	2,71E+03	-1,38E+03	-9,48E+03
Secondary materials	kg	2,34E+02	1,65E-01	1,92E+00	2,36E+02	7,77E-01	5,01E-01	0,00E+00	9,57E-03	MND	MND	MND	1,07E+03	MND	4,99E-01	3,60E-02	1,36E+02	1,36E-02	3,56E+02
Renew. secondary fuels	MJ	4,34E+01	1,60E-03	1,08E+01	5,42E+01	9,80E-03	1,37E-03	0,00E+00	1,27E-04	MND	MND	MND	6,78E+00	MND	1,34E-03	4,59E-04	1,06E-01	1,67E-04	-2,97E-01
Non-ren. secondary fuels	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	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	3,68E+01	4,72E-02	4,20E+00	4,11E+01	2,65E-01	4,29E-02	0,00E+00	3,49E-03	MND	MND	MND	4,08E+03	MND	1,12E-01	1,09E-02	4,07E+00	-1,54E-01	-1,57E+01

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	9,52E+02	5,89E-01	5,10E+00	9,57E+02	2,60E+00	1,45E+00	0,00E+00	6,16E-02	MND	MND	MND	5,02E+04	MND	1,73E+00	1,40E-01	5,71E+01	6,75E+00	-3,34E+02
Non-hazardous waste	kg	1,43E+04	1,03E+01	4,76E+02	1,48E+04	5,20E+01	8,24E+01	0,00E+00	1,07E+00	MND	MND	MND	1,27E+06	MND	2,84E+01	2,63E+00	3,41E+03	2,30E+02	6,54E+03
Radioactive waste	kg	6,42E-02	7,26E-05	9,76E-04	6,53E-02	5,35E-04	1,40E-04	0,00E+00	9,36E-06	MND	MND	MND	1,92E+01	MND	2,88E-04	1,62E-05	4,44E-03	1,29E-05	-7,78E-03

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	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	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	3,10E+01	3,10E+01	0,00E+00	9,40E+00	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	5,17E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	3,10E+01	3,10E+01	0,00E+00	9,90E+00	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	2,42E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	3,17E+02	3,17E+02	0,00E+00	1,45E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	1,17E+01	0,00E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	4,80E+01	4,80E+01	0,00E+00	2,19E+01	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	1,77E+00	0,00E+00	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	2,69E+02	2,69E+02	0,00E+00	1,23E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	9,95E+00	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	3,44E+03	2,70E+01	4,53E+01	3,51E+03	1,23E+02	9,77E+01	0,00E+00	1,11E+00	MND	MND	MND	5,76E+05	MND	9,44E+01	5,71E+00	2,95E+02	4,64E+01	-9,08E+02
Ozone depletion Pot.	kg CFC_{-11}e	4,84E-05	3,26E-07	1,23E-06	5,00E-05	1,98E-06	1,10E-06	0,00E+00	5,97E-08	MND	MND	MND	3,42E-03	MND	1,12E-06	6,46E-08	1,66E-06	2,53E-08	-5,25E-06
Acidification	kg SO_2e	3,65E+01	2,38E-01	4,26E-01	3,71E+01	3,03E-01	5,75E-01	0,00E+00	3,74E-03	MND	MND	MND	2,49E+03	MND	5,93E-01	1,47E-02	9,58E+00	1,00E-02	-4,35E+00
Eutrophication	kg PO_4^3e	9,52E+00	3,28E-02	5,14E-01	1,01E+01	7,67E-02	1,35E-01	0,00E+00	6,43E-04	MND	MND	MND	2,91E+02	MND	1,36E-01	3,57E-03	4,66E-01	3,97E-02	-3,47E+00
POCP (“smog”)	kg C_2H_4e	2,37E+00	1,38E-02	3,08E-02	2,42E+00	2,85E-02	4,32E-02	3,89E-01	3,33E-04	MND	MND	MND	1,36E+02	MND	4,40E-02	1,31E-03	5,93E-01	5,79E-03	-4,61E-01
ADP-elements	kg Sbe	5,98E-01	6,00E-05	5,04E-03	6,03E-01	3,34E-04	3,35E-05	0,00E+00	8,74E-06	MND	MND	MND	3,28E+00	MND	5,88E-05	1,80E-05	1,29E-01	3,34E-06	-9,22E-02
ADP-fossil	MJ	3,88E+04	3,70E+02	7,29E+02	3,99E+04	1,76E+03	1,18E+03	0,00E+00	5,71E+01	MND	MND	MND	6,22E+06	MND	1,22E+03	7,98E+01	2,94E+03	2,60E+01	-9,15E+03

ENVIRONMENTAL IMPACTS – ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Radioactive waste, high	kg	1,89E-02	2,09E-05	2,77E-04	1,92E-02	1,37E-04	3,96E-05	0,00E+00	2,65E-06	MND	MND	MND	5,45E+00	MND	8,21E-05	4,82E-06	1,77E-03	3,67E-06	-1,80E-03
Radioactive waste, int/low	kg	4,54E-02	5,17E-05	6,98E-04	4,61E-02	3,98E-04	1,01E-04	0,00E+00	6,71E-06	MND	MND	MND	1,38E+01	MND	2,06E-04	1,14E-05	2,68E-03	9,24E-06	-5,98E-03

THIRD-PARTY VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online

This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Imane Uald Lamkaddam as an authorized verifier for EPD Hub Limited
17.07.2025

ANNEX 1

PRODUCTS INCLUDED IN THIS EPD (SCALING COEFFICIENTS)

The Sigma Zero line includes sizes 25, 40, 45, 50, 70, 80, 100, 120, 140, 170, 200, 250 and 290. **In this EPD, the declared impacts relate to size 120**, which sits in the middle of the line. Provided below is a scaling table that allows the user of this EPD to scale the result tables to all the other sizes. This will provide a more convenient, "all-included" declaration for the user.

The following table shows the **GWP-fossil** values for modules A1-A3 and B6 obtained by modelling individually each size, along with a reference declared net weight for each size (excluding the weight of water in the water lines and heat exchangers during operation).

The **scaling formula** employed in this table is:

$$scaling\ coefficient = \frac{GWP_{fossil}\ of\ analyzed\ size}{GWP_{fossil}\ of\ reference\ size}$$

Furthermore, the main results table of this EPD are related to the **Hi HP version**.

All variants virtually share the same internal components[3]; the differences in functioning arise mostly from controls and software optimizations. The table in **Annex 3** also allows to correlate and extrapolate the results to **all the other versions** of the product.

Size of "Hi HP"	25	40	45	50	70	80	100	120	140	170	200	250	290
Net Weight [kg]	273	287	298	384	425	593	604	662	687	997	1023	1142	1201
A1-A3 scaling coefficient	0,439	0,473	0,499	0,581	0,658	0,875	0,917	1,000	1,068	1,470	1,564	1,741	1,895
GWP-fossil, A1-A3 [kg CO_2-eq]	1,54E+03	1,66E+03	1,75E+03	2,04E+03	2,31E+03	3,07E+03	3,22E+03	3,51E+03	3,75E+03	5,16E+03	5,49E+03	6,11E+03	6,65E+03
B6 scaling coefficient	0,199	0,261	0,299	0,299	0,538	0,721	0,872	1,000	1,204	1,438	1,730	1,990	2,388
GWP-fossil, B6 [kg CO_2-eq]	1,15E+05	1,51E+05	1,73E+05	1,73E+05	3,11E+05	4,17E+05	5,04E+05	5,78E+05	6,96E+05	8,31E+05	1,00E+06	1,15E+06	1,38E+06

[3] There may be a few minor components that differ, but the very slight differences fall below cutoff

ANNEX 2

USE PHASE WITH 100% RENEWABLE ENERGY

Since vapor compression cycles are designed to fulfil heating and cooling requirements using electricity, they allow to avoid combustion processes. This means that the entire life cycle of the product can theoretically be entirely fuelled by renewable energy sources, which is the main advantage of such products in terms of sustainability.

In this EPD the impacts related to the electricity consumed during the use phase (module B6) are based on the average European electricity mix related to the year 2024. This conservative assumption is represents a "worst case scenario", as the European grid is increasingly supplied by renewables as the years go by and will certainly see a reduction in environmental impacts throughout the RSL of the product compared to current levels.

This Annex serves as a "lower boundary" for the environmental impacts related to the use phase of the product for Life Cycle Assessment purposes. In reality this itself is a conservative estimation, since during the RSL the impacts related to renewable energy generation will decrease with time. The renewable electricity model was created with Ecoinvent 3.10.1, based on data from IEA, Eurelectric, Wind Europe, Statista for generation mix and CEER for losses.

Size of "Hi HP"	25	40	45	50	70	80	100	120	140	170	200	250	290
GWP-fossil (module B6, renewable energy) [kg CO_2-eq]	1,26E+04	1,66E+04	1,90E+04	1,90E+04	3,42E+04	4,59E+04	5,54E+04	6,36E+04	7,65E+04	9,14E+04	1,10E+05	1,26E+05	1,52E+05
GWP savings (compared to average European grid mix)	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%	≈90%

ANNEX 3

DIFFERENT VERSIONS OF THE PRODUCT (EXTRA B6 SCENARIOS)

The SIGMA Zero is available in four variants:

1. "**Hi**": chiller
2. "**Hi OH**": non-reversible heat pump
3. "**Hi HP**": reversible heat pump on the refrigerant side
4. "**Hi HPW**": reversible heat pump on the water side

All variants virtually share the same internal components[4]; the differences in functioning arise mostly from controls and software optimizations. Therefore, users of this EPD can refer to the main results tables and annex 1 for all life cycle modules, except for B6 (use-phase energy consumption).

This annex enables users to **extrapolate the impact indicators related to the use phase to other variants** by multiplying the B6 impact indicators in the main results by the scaling factors provided in the table.

These scaling factors are justified by the fact that the only flow present in B6 is electrical energy: changing the SIGMA Zero variant only affects the absolute quantity of electricity consumed during the use-phase scenario, and the resulting impacts are directly proportional to this change.

The **scaling formula** employed for every size in the table below is:

$$B6\ scaling\ coefficient_{(chosen\ size)} = \frac{B6_{(analyzed\ version)}}{B6_{(HP\ version)}}$$

Which can be used to **extrapolate the results for all impact indicators**:

$$\boldsymbol{B6_{(chosen\ size\ and\ version)} = B6_{(corresp.size\ of\ HP)} \cdot B6\ scaling\ coeff.}$$

Reference size of "Hi HP", "Hi OH" and "Hi HPW"		25	40	45	50	70	80	100	120	140	170	200	250	290
Corresponding size of "Hi"		20	30	35	40	50	75	90	110	130	150	180	220	260
B6 scaling coeff.	Hi	0,184	0,241	0,235	0,270	0,265	0,250	0,247	0,257	0,255	0,258	0,251	0,253	0,257
	Hi OH	0,791	0,739	0,735	0,745	0,732	0,741	0,741	0,736	0,734	0,736	0,735	0,736	0,734
	Hi HPW	0,931	0,938	0,930	0,948	0,951	0,961	0,960	0,969	0,969	0,970	0,974	0,970	0,975

[4] There may be a few minor components that differ, but the very slight differences fall below cutoff