ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Titan Sky Hi HP R0
Swegon Group AB

EPD HUB, HUB-3208
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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+A2:2019 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

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	Titan Sky Hi HP R0
Additional labels	-
Product reference	-
Place of production	Cantarana, province of Venice, Italy
Period for data	2024
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3	-49,8% / +36,9%

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 Titan Sky Hi HP R0 of size 12.2
Declared unit mass[1]	1807 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	8,76E+03
GWP-total, A1-A3 ($kgCO_2e$)	8,69E+03
Secondary material, inputs (%)	36,4
Secondary material, outputs (%)	76,9
Total energy use, A1-A3 (kWh)	35000
Net freshwater use, A1-A3 (m^3)	102

[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 Titan SKY Hi HP R0 is a versatile range of high-efficiency reversible heat pumps designed for a wide range of applications. These units operate using natural refrigerant R290 (propane), which has a GWP of 0.02 and an ODP of 0. The product is optimized for high seasonal efficiency and stable thermodynamic regulation under varying load conditions.

The Titan SKY's structure is made of galvanized sheet-iron coated with polyester powder for weather resistance, with a load-bearing frame and removable sound-absorbing panels. Compressors are semi-hermetic reciprocating types, optimized for propane, with inverter modulation for precise load matching. Heat exchangers utilize finned pack coils to reduce weight and refrigerant charge.

Axial fans are directly coupled to electric motors with integrated thermal overload protection and feature optimized shrouds for efficiency and noise reduction. The fans are managed by a phase-cutting speed adjuster or electronically commutated motors to optimize operation and reduce noise during varying conditions.

The refrigerant circuits are equipped with components that include shut-off valves, charging valves, sight glasses, dehydrating filters, electronically-controlled thermostatic expansion valves, and pressure switches. Heat pump versions include additional components such as a 4-way reversing valve and liquid receiver. The refrigeration circuits are enclosed in compartments with ATEX certified leak sensors and extraction fans for safety.

The integrated BlueThink controller offers extensive functionality, including water temperature control, defrost management, remote monitoring, and fault logging via custom web interface. The electrical control panel, which features IP54 protection, adheres to regulatory standards to ensure reliable operation. The TITAN Sky is packaged for easy handling and includes versions with noise-reducing fans and optional hydraulic modules for enhanced system integration (pre-mounted hydraulic pump kit is included in this EPD). Each unit is factory-tested and available in other configurations (not featured in this EPD) to suit various operational needs.

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/titan-sky-r0/?unit=m3h

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	88,8	EU, Asia
Minerals	0	-
Fossil materials	11,2	EU, Asia
Bio-based materials	0	-

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 Titan Sky Hi HP R0 12.1
Mass per declared unit[2]	1807 kg
Functional unit	This unit provides a nominal heating or cooling capacity of 120kW over the course of 17 years, by consuming a total of 827 246 kWh of electrical energy, working on average for 2000 hours/year.
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	29,4

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).

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 through extensive testing, were used for modelling the use profile of the product (for SCOP, the *average* European climate profile was selected). Data regarding SEER and SCOP is available on the Swegon website and on the technical datasheet.

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.

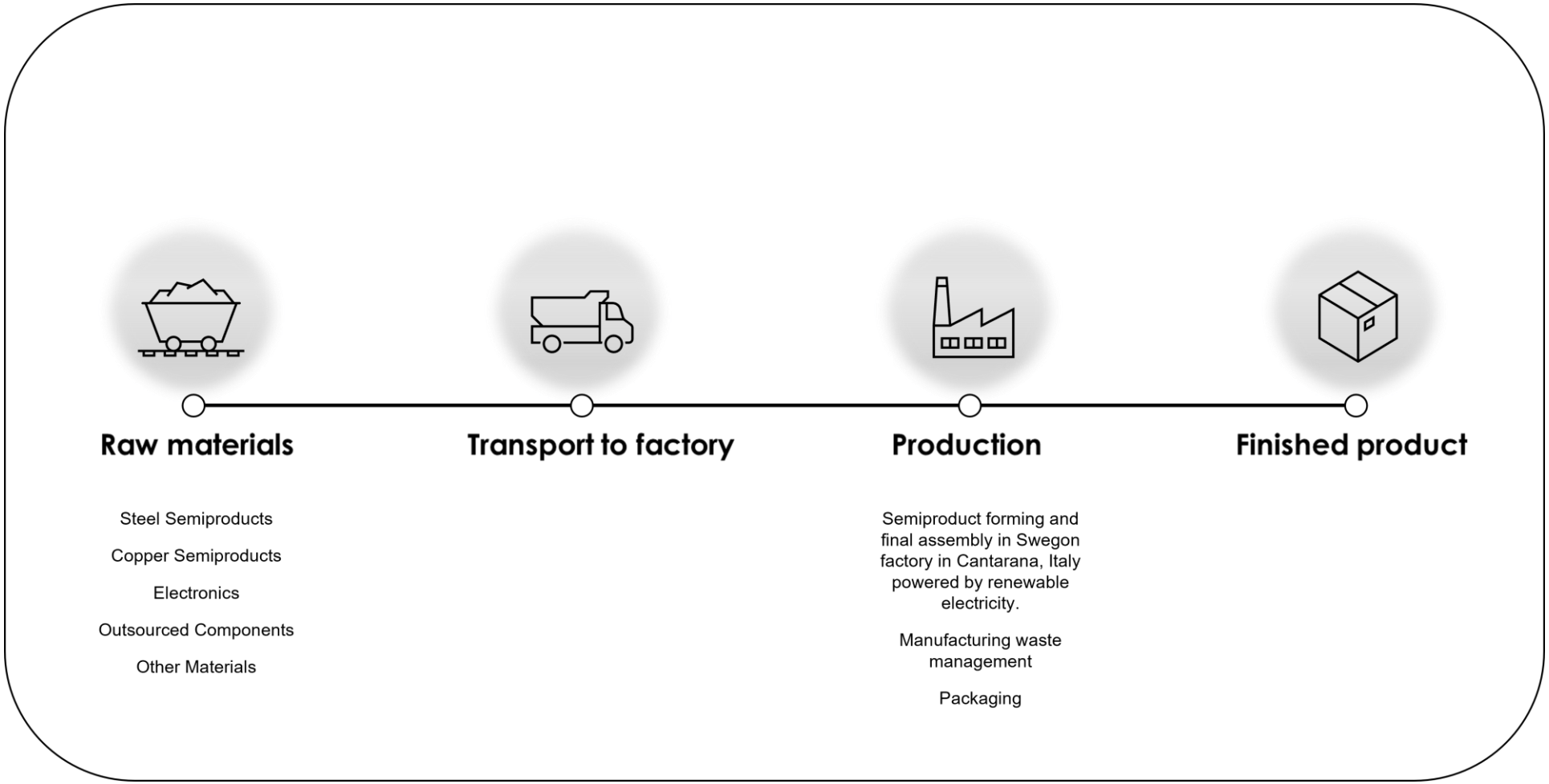
HVAC products are subject to country-specific regulations regarding their post-decommissioning processes (C3 and C4). For example, in the EU the European Commission directive 2012/19 requires every member country to comply with regulations for the EoL treatment of electrical and electronic products,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

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

AVERAGES AND VARIABILITY

Type of average	Multiple products
Averaging method	Representative product
Variation in GWP-fossil for A1-A3	-49,8% / +36,9%

Different sizes of this product are designed to share the same structure and only slightly vary in internal components (e.g. different compressor models made by the same manufacturer). They are also assembled in the same factory thus the tools and processes are identical. This EPD presents the results related to the size which sits in the middle of the line, to be used as a conservative approximation. For completeness, the variation in GWP of all included sizes is shown for both A1-A3 and B6 modules in a dedicated table in Annex 1.

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.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

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	8,27E+03	9,13E+01	1,40E+02	8,50E+03	2,56E+02	2,10E+02	8,44E-02	1,19E+01	MND	MND	MND	2,72E+05	MND	9,61E+01	1,62E+01	6,23E+02	3,03E+01	-3,33E+03
GWP – fossil	kg CO_2e	8,41E+03	9,12E+01	6,82E+01	8,57E+03	2,56E+02	1,02E+02	8,44E-02	1,19E+01	MND	MND	MND	2,71E+05	MND	9,60E+01	1,62E+01	6,22E+02	3,05E+01	-3,33E+03
GWP – biogenic	kg CO_2e	-1,79E+02	0,00E+00	7,18E+01	-1,07E+02	0,00E+00	1,08E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	-2,06E-01	-1,84E-01	0,00E+00
GWP – LULUC	kg CO_2e	3,20E+01	4,39E-02	1,57E-01	3,22E+01	1,14E-01	1,04E-02	0,00E+00	5,45E-03	MND	MND	MND	8,31E+02	MND	2,74E-02	7,19E-03	7,30E-01	2,27E-03	-1,35E+00
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	9,93E-05	1,34E-06	2,08E-06	1,03E-04	3,77E-06	1,41E-06	0,00E+00	3,40E-07	MND	MND	MND	4,99E-03	MND	1,49E-06	2,28E-07	4,14E-06	6,94E-08	-1,67E-05
Acidification potential	mol H^+e	1,03E+02	1,23E+00	6,56E-01	1,05E+02	8,72E-01	8,23E-01	0,00E+00	3,75E-02	MND	MND	MND	1,59E+03	MND	8,48E-01	5,42E-02	2,19E+01	2,76E-02	-3,07E+01
EP-freshwater[2)]	kg Pe	2,97E+01	5,43E-03	4,88E-02	2,97E+01	1,99E-02	3,23E-03	0,00E+00	1,19E-03	MND	MND	MND	2,52E+02	MND	8,11E-03	1,26E-03	1,01E+00	6,94E-03	-2,31E+01
EP-marine	kg Ne	1,83E+01	3,21E-01	1,09E-01	1,87E+01	2,87E-01	3,92E-01	0,00E+00	1,08E-02	MND	MND	MND	2,50E+02	MND	3,83E-01	1,76E-02	1,39E+00	1,04E-01	-1,08E+01
EP-terrestrial	mol Ne	2,35E+02	3,55E+00	1,05E+00	2,40E+02	3,12E+00	4,17E+00	0,00E+00	1,17E-01	MND	MND	MND	2,24E+03	MND	4,18E+00	1,91E-01	1,70E+01	1,06E-01	-1,53E+02
POCP ("smog")[3)]	kg NMVOCe	5,96E+01	1,06E+00	4,36E-01	6,11E+01	1,29E+00	1,25E+00	1,25E+00	5,83E-02	MND	MND	MND	7,37E+02	MND	1,25E+00	7,59E-02	5,77E+00	4,50E-02	-3,15E+01
ADP-minerals & metals[4)]	kg Sbe	1,15E+00	1,91E-04	5,78E-03	1,16E+00	7,13E-04	3,72E-05	0,00E+00	6,10E-05	MND	MND	MND	3,66E+00	MND	1,12E-04	5,24E-05	2,59E-01	6,81E-06	-1,88E-01
ADP-fossil resources	MJ	9,97E+04	1,24E+03	1,27E+03	1,02E+05	3,71E+03	1,20E+03	0,00E+00	2,50E+02	MND	MND	MND	6,30E+06	MND	1,32E+03	2,28E+02	6,58E+03	6,05E+01	-3,39E+04
Water use[5)]	m^3e depr.	3,79E+03	5,21E+00	2,18E+02	4,01E+03	1,83E+01	4,16E+00	0,00E+00	1,02E+00	MND	MND	MND	1,72E+05	MND	6,70E+00	1,07E+00	2,25E+02	7,02E-01	-3,48E+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, PEF

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	8,88E-04	6,62E-06	5,04E-06	9,00E-04	2,56E-05	2,33E-05	0,00E+00	6,55E-07	MND	MND	MND	5,68E-03	MND	2,32E-05	1,32E-06	8,82E-05	5,85E-07	-3,72E-04
Ionizing radiation[6]	kBq U235e	5,83E+02	9,12E-01	5,97E+00	5,90E+02	3,23E+00	6,53E-01	0,00E+00	3,30E-01	MND	MND	MND	1,74E+05	MND	4,32E+00	1,86E-01	3,45E+01	9,11E-02	-1,25E+02
Ecotoxicity (freshwater)	CTUe	3,79E+05	1,46E+02	9,54E+02	3,80E+05	5,25E+02	7,58E+01	1,38E-02	3,10E+01	MND	MND	MND	9,60E+05	MND	8,59E+01	3,57E+01	1,58E+04	1,26E+03	-2,56E+05
Human toxicity, cancer	CTUh	1,25E-05	1,67E-08	1,65E-07	1,27E-05	4,22E-08	1,06E-08	0,00E+00	2,41E-09	MND	MND	MND	9,15E-05	MND	1,13E-08	2,75E-09	2,70E-06	1,10E-08	1,31E-06
Human tox. non-cancer	CTUh	5,69E-04	6,30E-07	4,65E-06	5,75E-04	2,40E-06	2,25E-07	3,53E-09	1,02E-07	MND	MND	MND	4,75E-03	MND	2,50E-07	1,43E-07	2,63E-04	6,36E-07	2,64E-04
SQP[7]	-	7,44E+04	8,45E+02	1,02E+04	8,55E+04	3,73E+03	1,11E+02	0,00E+00	6,31E+01	MND	MND	MND	1,40E+06	MND	1,13E+02	1,46E+02	7,89E+03	1,30E+02	-2,83E+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	2,30E+04	1,45E+01	7,88E+02	2,38E+04	5,08E+01	-8,68E+02	0,00E+00	4,69E+00	MND	MND	MND	1,73E+06	MND	4,52E+01	3,13E+00	1,07E+03	-6,22E+02	-7,43E+03
Renew. PER as material	MJ	1,64E+03	0,00E+00	-6,29E+02	1,01E+03	0,00E+00	-9,43E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	-4,25E+01	-2,82E+01	0,00E+00
Total use of renew. PER	MJ	2,47E+04	1,45E+01	1,59E+02	2,48E+04	5,08E+01	-1,81E+03	0,00E+00	4,69E+00	MND	MND	MND	1,73E+06	MND	4,52E+01	3,13E+00	1,03E+03	-6,50E+02	-7,43E+03
Non-re. PER as energy	MJ	9,73E+04	1,24E+03	8,92E+02	9,94E+04	3,71E+03	8,96E+02	0,00E+00	1,57E+02	MND	MND	MND	6,30E+06	MND	1,32E+03	2,28E+02	6,00E+03	-8,00E+02	-3,35E+04
Non-re. PER as material	MJ	2,44E+03	0,00E+00	2,77E+02	2,72E+03	0,00E+00	-3,81E+02	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	-1,02E+03	-1,32E+03	0,00E+00
Total use of non-re. PER	MJ	9,97E+04	1,24E+03	1,17E+03	1,02E+05	3,71E+03	5,16E+02	0,00E+00	1,57E+02	MND	MND	MND	6,30E+06	MND	1,32E+03	2,28E+02	4,98E+03	-2,12E+03	-3,35E+04
Secondary materials	kg	6,61E+02	5,52E-01	4,42E+00	6,66E+02	1,58E+00	5,14E-01	0,00E+00	9,29E-02	MND	MND	MND	1,04E+03	MND	5,12E-01	1,02E-01	2,73E+02	2,48E-02	9,00E+02
Renew. secondary fuels	MJ	5,53E+01	4,83E-03	3,21E+01	8,74E+01	2,00E-02	1,46E-03	0,00E+00	1,05E-03	MND	MND	MND	8,32E+00	MND	1,46E-03	1,30E-03	2,12E-01	3,33E-04	-6,75E-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	8,72E+01	1,49E-01	4,96E+00	9,23E+01	5,48E-01	-2,31E-02	0,00E+00	2,83E-02	MND	MND	MND	5,44E+03	MND	1,97E-01	3,06E-02	8,06E+00	-2,46E-01	-4,13E+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	2,75E+03	1,94E+00	7,01E+00	2,76E+03	6,28E+00	1,60E+00	0,00E+00	3,33E-01	MND	MND	MND	1,59E+04	MND	1,66E+00	3,97E-01	1,14E+02	1,70E+01	-1,09E+03
Non-hazardous waste	kg	3,48E+04	3,31E+01	6,26E+02	3,55E+04	1,16E+02	1,98E+02	0,00E+00	7,24E+00	MND	MND	MND	1,23E+06	MND	4,48E+01	7,43E+00	6,82E+03	3,86E+02	1,42E+04
Radioactive waste	kg	1,45E-01	2,23E-04	1,52E-03	1,46E-01	7,91E-04	1,61E-04	0,00E+00	8,20E-05	MND	MND	MND	4,47E+01	MND	1,10E-03	4,56E-05	8,83E-03	2,23E-05	-3,01E-02

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	4,00E+01	4,00E+01	0,00E+00	2,57E+01	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	1,38E+03	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,65E+01	0,00E+00	0,00E+00	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	1,02E+01	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	1,99E+02	1,99E+02	0,00E+00	3,37E+02	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

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

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	8,41E+03	9,08E+01	7,07E+01	8,57E+03	2,54E+02	1,03E+02	0,00E+00	1,18E+01	MND	MND	MND	2,71E+05	MND	9,56E+01	1,61E+01	6,21E+02	6,52E+01	-3,31E+03
Ozone depletion Pot.	kg CFC_{-11}e	9,15E-05	1,07E-06	1,77E-06	9,43E-05	3,01E-06	1,12E-06	0,00E+00	2,72E-07	MND	MND	MND	4,17E-03	MND	1,18E-06	1,82E-07	3,50E-06	5,59E-08	-1,49E-05
Acidification	kg SO_2e	8,18E+01	9,75E-01	5,51E-01	8,33E+01	6,66E-01	5,79E-01	0,00E+00	2,93E-02	MND	MND	MND	1,36E+03	MND	6,02E-01	4,15E-02	1,92E+01	2,04E-02	-1,98E+01
Eutrophication	kg PO_4^3e	1,96E+01	1,27E-01	1,16E+00	2,09E+01	1,62E-01	1,37E-01	0,00E+00	6,99E-03	MND	MND	MND	1,75E+02	MND	1,37E-01	1,01E-02	9,52E-01	6,26E-02	-7,70E+00
POCP (“smog”)	kg C_2H_4e	5,42E+00	5,41E-02	4,68E-02	5,52E+00	5,93E-02	4,38E-02	7,43E-01	2,75E-03	MND	MND	MND	7,39E+01	MND	4,45E-02	3,71E-03	1,18E+00	9,50E-03	-1,72E+00
ADP-elements	kg Sbe	1,15E+00	1,86E-04	5,77E-03	1,16E+00	6,95E-04	3,60E-05	0,00E+00	5,94E-05	MND	MND	MND	3,64E+00	MND	1,11E-04	5,12E-05	2,59E-01	6,03E-06	-1,87E-01
ADP-fossil	MJ	9,03E+04	1,23E+03	1,17E+03	9,27E+04	3,66E+03	1,19E+03	0,00E+00	2,44E+02	MND	MND	MND	3,23E+06	MND	1,24E+03	2,25E+02	6,07E+03	5,91E+01	-3,18E+04

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	4,16E-02	6,50E-05	4,20E-04	4,20E-02	2,32E-04	4,45E-05	0,00E+00	2,02E-05	MND	MND	MND	1,01E+01	MND	2,58E-04	1,36E-05	3,52E-03	6,36E-06	-7,70E-03
Radioactive waste, int/low	kg	1,03E-01	1,58E-04	1,10E-03	1,04E-01	5,59E-04	1,17E-04	0,00E+00	6,18E-05	MND	MND	MND	3,46E+01	MND	8,47E-04	3,21E-05	5,31E-03	1,60E-05	-2,24E-02

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	8,44E+03	9,13E+01	6,84E+01	8,60E+03	2,56E+02	1,02E+02	8,44E-02	1,19E+01	MND	MND	MND	2,72E+05	MND	9,61E+01	1,62E+01	6,23E+02	3,05E+01	-3,33E+03

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition, the characterisation factors for the flows - CH4 fossil, CH4 biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 1.2.5 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO2 is set to zero.

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
25.04.2025

ANNEX 1

PRODUCTS INCLUDED IN THIS EPD (SCALING COEFFICIENTS)

This EPD includes sizes 3.1, 5.1, 7.1, 8.1, 10.1, 12.2, 14.2, 17.2, 20.2 of the Titan Sky Hi HP R0 line. The averaging mode "reference product" was used, meaning that the impacts declared are related to size 12.2. This decision was taken in order to provide a more convenient, "all-included" declaration for the user.

To improve the usability of the EPD, this Annex provides an indication of the variation in results between the sizes. 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:

$$scaling\ coefficient = \frac{GWP_{fossil}\ of\ analyzed\ size}{GWP_{fossil}\ of\ size\ 12.2}$$

	3.1	5.1	7.1	8.1	10.1	14.2	17.2	20.2
Net Weight [kg]	1060	1244	1299	1431	1473	1923	2344	2424
A1-A3 scaling coefficient	0,502	0,619	0,642	0,745	0,763	1,05	1,33	1,37
GWP-fossil, A1-A3 [kg CO_2-eq]	4,40E+03	5,42E+03	5,62E+03	6,53E+03	6,69E+03	9,20E+03	1,17E+04	1,20E+04
B6 scaling coefficient	0,301	0,508	0,606	0,762	0,841	1,25	1,50	1,66
GWP-fossil, B6 [kg CO_2-eq]	8,15E+04	1,38E+05	1,64E+05	2,06E+05	2,28E+05	3,22E+05	4,07E+05	4,50E+05

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.

	3.1	**5.1**	**7.1**	**8.1**	**10.1**	**12.2**	**14.2**	**17.2**	**20.2**
GWP-fossil (module B6, renewable energy) [kg CO_2-eq]	8,96E+03	1,51E+04	1,80E+04	2,27E+04	2,50E+04	2,98E+04	3,54E+04	4,48E+04	4,95E+04
GWP savings (compared to average European grid mix)	90%	90%	90%	90%	90%	90%	90%	90%	90%