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ENVIRONMENTAL PRODUCT DECLARATION

In Accordance with EN 15804+A2 & ISO 14025 / ISO 21930

Gebwell ltd.

Taurus Heat Pumps

80 EVI, 110 EVI, Inverter Pro

Registration number in RTS EPD:

RTS EPD 209_23

EcoPlatform reference number:

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GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Gebwell Ltd.
Address	Patruunapolku 5, 79100 Leppävirta
Website	https://gebwell.fi/en/

PRODUCT IDENTIFICATION

Product name	Taurus EVI and Taurus Inverter Pro Heat Pump
Declared unit	1 unit
Specific product name	Taurus 80 EVI, Taurus 110 EVI, Taurus Inverter Pro
Place(s) of production	Leppävirta, Finland

EPD INFORMATION

Construction products EPDs may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

EPD program operator	Building Information Foundation, RTS, Malminkatu 16 A 00100 Helsinki
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804 serves as the core PCR. RTS PCR 2020
EPD author	Natalia Pennanen, Anni Viitala, Granlund Oy, Malminkaari 21 00701 Helsinki
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
Verification date	21.3.2023
EPD verifier	Heini Koutonen, Nordic Offset Oy
RTS EPD number	RTS_209_23
ECO Platform nr.	-
Publishing date	29.3.2023
EPD valid until	29.3.2028

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Verified according to the requirements of EN 15804+A2 (product group rules)
Independent verification of the declaration, according to EN ISO 14025:2010
[X] External [ ] Internal
Third party verifier:

Heini Koutonen, Nordic Offset Oy

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PRODUCT INFORMATION

PRODUCT DESCRIPTION

This environmental declaration covers the environmental impacts of Taurus EVI and Taurus Inverter Pro heat pumps manufactured by Gebwell Ltd. in Leppävirta, Finland. The EPD contains three different products.

TAURUS 80 EVI

- 1300 x 700 x 1860 mm
- 743,5 kg

TAURUS 110 EVI

- 1300 x 700 x 1860 mm
- 745,9 kg

TAURUS INVERTER PRO

- 1300 x 700 x 1860 mm
- 861,1 kg

PRODUCT APPLICATION

Taurus EVI heat pump and Taurus Inverter Pro heat pump are used for heat large properties.

Taurus EVI Heat Pump

Taurus EVI is a tandem heat pump with two EVI compressors and a controller with IoT features for heating of large properties.

Taurus EVI Heat Pump is a choice for heating large properties. The heating output of the pump is high even at high condensation temperatures. The compressor recovers excess heat from the fluid line, which is then used to vaporise the refrigerant into the compressor's low-pressure block. Taking advantage of the high vaporisation temperature of the high temperature provides better efficiency. Economizer's performance improves at higher condensation temperatures.

Data from the IoT controller that is stored in the cloud service are used in system development. The data stored in the cloud service enables adjusting heating based on weather forecasts and learning the thermal capacity and the heating/cooling behaviour of a certain property, for example.

Furthermore, the cloud service enables remote updating of the controller software and monitoring and controlling the system online using a browser based Gebwell Smart Control Hub.

Taurus EVI heat pump comes in two capacities Taurus EVI 80 and Taurus EVI 110.

Taurus Inverter Pro heat pump

Taurus Inverter Pro is a highly efficient inverter heat pump intended for large properties.

The inverter-controlled Taurus Inverter Pro heat pump adapts to the heating requirements of the building and optimises heating output. As a result, the cost efficiency of heating is improved and living comfort increased.

Taurus Inverter Pro heat pump is rated 40 to 100 kW with continuous adjustment and modulation by 1%. The electronic expansion valve of the heat pump adapts to power changes of the inverter compressor, optimising the efficiency of the heat pump. The heat pump has a piston compressor, which is typically serviced instead of replacement.

Gebwell IoT heat pumps are characterised by system development based on the use of data from already installed IoT systems stored in the cloud service, and by a smart and learning controller. Among other things, IoT features include adjustments based on weather forecasts, and learning the thermal capacity and the heating/cooling behaviour of a certain property. In the future, IoT will enable proactive maintenance and adjustments according to weather forecasts, for example.

Thanks to IoT, the controller software of an IoT heat pump can be updated remotely and the system monitored and controlled online using the browser based Gebwell Smart Control Hub.

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PRODUCT RAW MATERIAL COMPOSITION AND TECHNICAL INFORMATION

Product	Material	Product size (mm)	% of weight
Taurus 80 EVI	**Steel**	1300 x 700 x 1860 mm	81,8 %
	Copper		2,6 %
	Aluminium		1,9 %
	Cables		2,5 %
	Foam		5,4 %
	Cellular plastic		1,1 %
	Bitum matt		1,0 %
	Refrigerant		1,3 %
	Other materials		2,6 %
Taurus 110 EVI	**Steel**	1300 x 700 x 1860 mm	81,3 %
	Copper		2,6 %
	Aluminium		1,9 %
	Cables		2,5 %
	Foam		5,4 %
	Cellular plastic		1,3 %
	Bitum matt		1,0 %
	Refrigerant		1,3 %
	Other materials		2,8 %
Taurus Inverter PRO	**Steel**	1300 x 700 x 1860 mm	80 %
	Copper		3,8 %
	Aluminium		2,6 %
	Cables		2,9 %
	Plastics		1,0 %
	Foam		4,2 %
	Cellular plastic		1 %
	Bitum matt		1,1 %
	Refrigerant		2,6 %
	Other materials		1,5 %

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PACKAGING MATERIAL COMPOSITION AND TECHNICAL INFORMATION

Main packaging materials of 80 evi, 110 evi, inverter pro

Packaging material	
	% of weight
Wood pallet	90,4 %
Plastic film	7,2 %
Styrox	2,4 %
Total	8,3 kg

SUBSTANCES, REACH - VERY HIGH CONCERN

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

LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

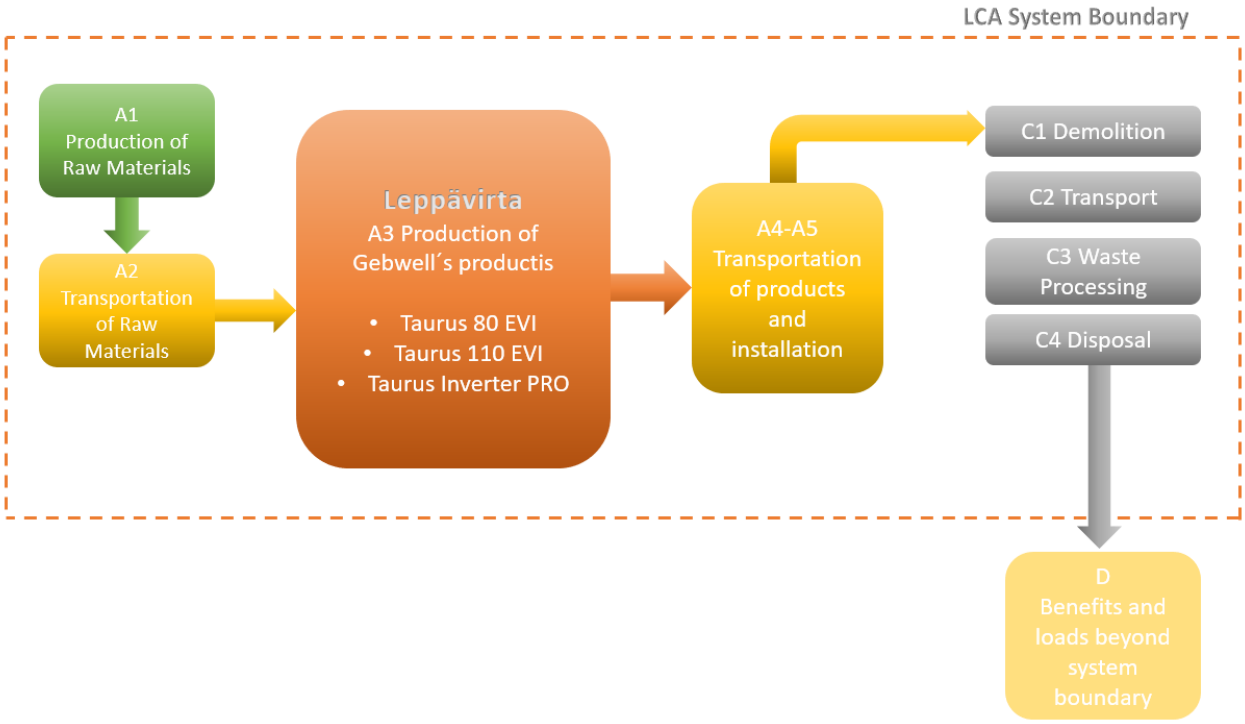
Period for data	1 year, 2021

DECLARED UNIT

Declared unit	1 unit of finished product
Mass per declared unit	Taurus 80 EVI 743,5 kg Taurus 110 EVI 745,9 kg Taurus Inverter PRO 861,1 kg

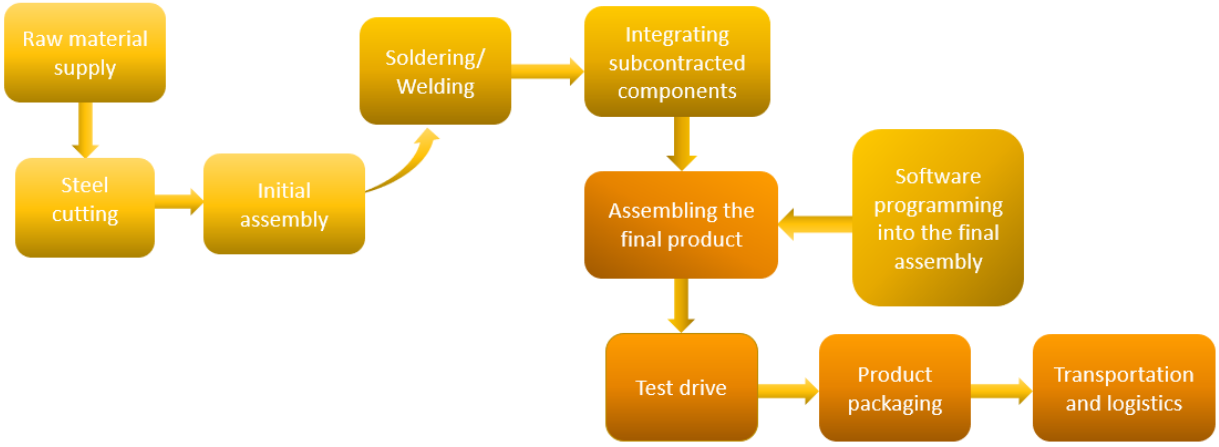
SYSTEM BOUNDARY

Studied system covers the following steps of life cycle according to EN 15804: **A1** Raw material supply**, A2** Transport, **A3** Manufacturing, **A4** Transportation of the product to construction site, **A5** Installation to building, **C1** Deconstruction, **C2** Transportation of end-of-life **C3** Waste processing and **C4** Disposal. In addition, the benefits and loads beyond the system boundary of stage **D** consist of product reuse, recovery and recycling. System boundary describing the system boundary and the input and output flows is shown below:



The end of waste point of the recycled steel raw material was assumed to be after scrap steel collection, sorting and preparation. Processing of scrap steel in steel production was considered to be part of next life cycle and included to the system boundaries of the studied product. End of waste point of the studied product is the step when material is used as fuel in an incineration plant or recycled material is handled in the collection and sorting plant. EOW point of the waste flows in A3-module is the step when materials are collected and handled in the sorting plant. EOW point of the packaging materials collected for recycling in A5 module is the point when materials are collected and handled in the sorting plant.

Production stage (A3) on the Gebwell´s production sites cover following manufacturing processes; raw material supply, steel cutting, welding and soldering components, assembly, software programming and packaging. After that, products will be transported to the client. The production processes of products are presented in following figure.



Studied system covers the following steps of life cycle according to EN 15804:

	Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage				Benefits and loads beyond the system boundary		
	Raw material supply	Transport	Manufacturing	Transport to building	Installation to building	Use/applications	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demoli	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
Included	X	X	X	X	x								X	X	X	X	X	X	X
Relevancy	R	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	R	R	R	R	R	R	R

Mandatory
Mandatory as per the RTS PCR section 6.2.1 rules and terms
Optional modules based on scenarios

The study does not omit any life cycle stages, processes or data needs that are mandatory according to EN 15804 and RTS PCR. The study excludes following life cycle stages which are optional according to EN 15804 and RTS PCR.

- B1 Use
- B2 Maintenance
- B3 Repairs
- B4 Replacement
- B5 Refurbishment
- B6 Operational energy use
- B7 Operational water us

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CUT-OFF CRITERIA

This study follows the cut-off criteria stated in RTS PCR and EN 15804 -standard. This study does not exclude anu modules or processes which represent more than 1 % of the emissions of studied life cycle stage. The study does not exclude any hazardous materials or substances.

Excluded processes and the criteria for exclusion are given in following table. Machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

Process excluded from study	Cut-off criteria	Quantified contribution from process
B1-B5, B7 use	Not mandatory according to the RTS instructions	-
A1-3	Electronic components	0,6%
A1-3	Other metals	0,1%
A1-3	Other plastics	0,06%

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation rules used are made according to the ISO14044:2006. Allocation is avoided when possible and when necessary, allocation is made based on physical shares and also avoiding double calculations. Allocation is required if the production process produces more than one product and the flows of materials, energy and waste cannot be separately measured for the studied product. Allocation used in generic data sources follow the requirements of the EN 15804 -standard. It should be noticed that the allocation method 'allocation, cut-off by classification' has been used for Ecoinvent 3.6 data, which complies with EN 15804. Avoiding allocation could not be avoided for following inputs as the information was only measured on factory process level.

- Electricity consumption and heat production: only measured on factory level
- Energy-, wood- metal, rubber-, cable-, and plastic waste: only measured on factory level
- Water use: only measured on factory level
- Welding gases: only measured on factory level

The inputs were allocated to studied product based on production volume (mass in kilograms).

According to EN 15804, flows leaving the system at the end-of-waste boundary of the product stage (A1-A3) are allocated as co-products. In this study, the recyclable metal scrap from cutting process is considered as a co-product. Scrap metal collected from the steel cutting process is sent for recycling, and environmental impacts from the product manufacturing and waste processing in A1-A3 modules are allocated for this co-product based on mass (kg).

KEY ASSUMPTIONS

A1 Raw Materials: Recycled content in steel raw materials: 20 -35 % based on industry estimations. (co2data.fi.)

C1 Deconstruction/demolition: According to waste handling companies, HVAC products are collected separately for recycling in the end-of-life stage. It can be assumed that there are no significant environmental impacts caused by demolition phase and hence it is not declared.

C2 Transportation: Transportation distance 75 km road driving by lorry (SYKE 2021)

C3-4 Waste processing and disposal: It was assumed that products are collected, and the materials are separated.

- Steel, copper, brass, cable, electronic components and aluminium to material recycling
- Plastics, rubber, non-cell foam, bitumen (70%) and polyurethane foam components to energy recovery
- Bitumen (30%) and Hazardous waste to final disposal
- **Module D:** covers the net benefits and loads arising from the reuse of products or the recycling or recovery of energy from end-of-waste state materials.
- Recovery: when a product is incinerated at its end-of-life and the produced heat is recovered, the benefits can include avoiding the production of energy.
    - Net calorific value as received of the construction waste was assumed to be 147,65 kWh/kg and efficiency of heat and power co-generation was 90 %.
- Recycling: Benefits from the recycling of steel, copper and aluminium materials were included to the assessment. Only share of virgin raw materials in the product composition were included to the module D.
    - Steel: Benefits from avoided primary steel production due to the recycling of steel at end of life was included.
    - Copper: Benefits from avoided primary copper production due to the recycling of copper at end of life was included.
    - Aluminium: Benefits from avoided primary aluminium production due to the recycling of aluminium at end of life was included.
    - Brass: Benefits from avoided primary brass production due to the recycling of brass at end of life was included.
    - Tin: Benefits from avoided primary tin production due to the recycling of tin at end of life was included.

It was assumed that 5 % of recyclable or recoverable materials end up as material loss.

VALIDATION OF DATA

The quality requirements for the life cycle assessment were set according to the EN ISO 14044 standard (4.2.3.6) and EN 15804 standard (6.3.7).

This LCA study follows the standard EN 15804:2012+A2:2019 and RTS PCR and no decisions are made based on the values.

PROCEDURED FOR COLLECTION PROCESS SPECIFIC DATA

Production specific data was collected directly from manufacturer's production plant. The data represents the production of the studied product at the plant from the materials transported to the facility and represents 1 year average. The data represents year 2021, which was the latest year with full year data. All gathered data was used without excluding categories in advance following the system boundaries set in earlier chapters.

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CRITERIA FOR CHOOSING THE GENERIC DATA

Generic data that was used for upstream and downstream processes represents complementary data from Ecoinvent 3.6 database.

The datasets were chosen to represent the studied system as closely as possible. When available supplier specific information was used for instance in form of EN 15804 EPDs or emissions profile of local energy supplier.

When supplier specific information was not available the information sources were chosen based on their technical and geographical representativeness. Only when country specific or European data has not been available has global level data been used (concerns mainly data from ecoinvent 3.6)

As up-to-date data as possible was chosen and no more than five-year-old for producer specific data and ten years for generic data was used.

ENVIRONMENTAL IMPACT DATA

TAURUS 80 EVI

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP – total	kg CO_2e	2,68E+03	2,31E+01	1,74E+01	0,00E+00	8,79E+00	2,60E+02	3,19E+01	-8,14E+02
GWP – fossil	kg CO_2e	2,74E+03	2,31E+01	8,90E-01	0,00E+00	8,78E+00	2,51E+02	-1,27E+02	-8,14E+02
GWP – biogenic	kg CO_2e	-2,71E+01	0,00E+00	1,65E+01	0,00E+00	0,00E+00	9,72E+00	4,91E-01	2,15E+00
GWP – LULUC	kg CO_2e	4,73E+00	6,98E-03	2,95E-04	0,00E+00	2,60E-03	3,71E-02	5,65E-03	-2,41E+00
Ozone depletion pot.	kg CFC_{-11}e	7,49E-03	5,46E-06	3,82E-08	0,00E+00	2,10E-06	6,10E-06	2,02E-06	-4,04E-05
Acidification potential	mol H^+e	3,27E+01	9,70E-02	1,70E-03	0,00E+00	3,70E-02	-6,25E+01	6,65E-02	-6,19E+00
EP-freshwater[3)]	kg Pe	2,27E-01	1,92E-04	1,12E-05	0,00E+00	7,10E-05	1,48E-03	8,12E-04	-4,45E-02
EP-marine	kg Ne	3,19E+00	2,93E-02	5,50E-04	0,00E+00	1,10E-02	1,27E-01	8,98E-03	-8,90E-01
EP-terrestrial	mol Ne	3,94E+01	3,24E-01	5,80E-03	0,00E+00	1,20E-01	1,33E+00	1,14E-01	-1,10E+01
POCP (“smog”)	kg NMVOCe	1,20E+01	1,01E-01	1,62E-03	0,00E+00	3,90E-02	3,53E-01	4,70E-02	-4,38E+00
ADP-minerals & metals	kg Sbe	3,71E-01	3,94E-04	4,18E-06	0,00E+00	1,50E-04	1,10E-03	1,12E-04	-8,88E-02
ADP-fossil resources	MJ	3,60E+04	3,59E+02	4,67E+00	0,00E+00	1,37E+02	5,52E+02	1,03E+02	-7,64E+03
Water use[2)]	m^3e depr.	1,14E+03	1,33E+00	1,02E-01	0,00E+00	5,10E-01	2,89E+01	3,69E+00	-4,18E+02

1)GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) 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 experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO_4e.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Renew. PER as energy	MJ	7,54E+03	4,52E+00	3,45E-01	0,00E+00	1,72E+00	5,10E+01	5,84E+00	-1,29E+03
Renew. PER as material	MJ	1,87E+02	0,00E+00	-1,68E+02	0,00E+00	0,00E+00	-1,94E+01	0,00E+00	0,00E+00
Total use of renew. PER	MJ	7,72E+03	4,52E+00	-1,67E+02	0,00E+00	1,72E+00	3,16E+01	5,84E+00	-1,29E+03
Non-re. PER as energy	MJ	3,39E+04	3,59E+02	4,67E+00	0,00E+00	1,37E+02	5,52E+02	1,03E+02	-7,64E+03
Non-re. PER as material	MJ	1,78E+03	0,00E+00	-3,74E+01	0,00E+00	0,00E+00	-1,71E+03	0,00E+00	0,00E+00
Total use of non-re. PER	MJ	3,56E+04	3,59E+02	-3,27E+01	0,00E+00	1,37E+02	-1,16E+03	1,03E+02	-7,64E+03
Secondary materials	kg	3,38E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,65E+02
Renew. 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
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
Use of net fresh water	m^3	2,67E+01	7,48E-02	2,35E-03	0,00E+00	2,80E-02	9,11E-01	8,48E-02	-6,88E+00

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	2,93E+02	3,54E-01	2,53E-02	0,00E+00	1,30E-01	0,00E+00	4,85E+00	-3,14E+02
Non-hazardous waste	kg	1,35E+04	3,86E+01	8,90E-01	0,00E+00	1,47E+01	0,00E+00	7,41E+00	-3,33E+03
Radioactive waste	kg	3,46E-01	2,43E-03	2,32E-05	0,00E+00	9,40E-04	0,00E+00	2,63E-04	-1,07E-02

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	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
Materials for recycling	kg	9,52E+01	0,00E+00	1,62E+01	0,00E+00	0,00E+00	6,73E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	4,74E+01	0,00E+00	4,00E-01	0,00E+00	0,00E+00	5,95E+01	1,05E+01	0,00E+00
Exported energy	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

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BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 kg
Biogenic carbon content in accompanying packaging	3,37 kg

NOTE 1 kg biogenic carbon is equivalent to 44/12 kg of CO2.

TAURUS 110 EVI

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP – total	kg CO_2e	2,71E+03	2,32E+01	1,74E+01	0,00E+00	8,81E+00	2,61E+02	3,34E+01	-8,62E+02
GWP – fossil	kg CO_2e	2,77E+03	2,32E+01	8,90E-01	0,00E+00	8,81E+00	2,50E+02	-1,30E+02	-8,62E+02
GWP – biogenic	kg CO_2e	-2,86E+01	0,00E+00	1,65E+01	0,00E+00	0,00E+00	1,12E+01	5,00E-01	2,52E+00
GWP – LULUC	kg CO_2e	4,81E+00	6,98E-03	2,95E-04	0,00E+00	2,70E-03	3,65E-02	5,86E-03	-2,50E+00
Ozone depletion pot.	kg $CFC_{-11}e$	7,80E-03	5,46E-06	3,82E-08	0,00E+00	2,10E-06	5,70E-06	2,12E-06	-4,37E-05
Acidification potential	mol H^+e	3,28E+01	9,70E-02	1,70E-03	0,00E+00	3,70E-02	-6,26E+01	6,87E-02	-6,52E+00
EP-freshwater[3)]	kg Pe	2,35E-01	1,92E-04	1,12E-05	0,00E+00	7,20E-05	1,49E-03	8,32E-04	-5,55E-02
EP-marine	kg Ne	3,23E+00	2,93E-02	5,50E-04	0,00E+00	1,10E-02	1,25E-01	9,34E-03	-9,46E-01
EP-terrestrial	mol Ne	3,99E+01	3,24E-01	5,80E-03	0,00E+00	1,20E-01	1,32E+00	1,15E-01	-1,17E+01
POCP ("smog")	kg NMVOCe	1,21E+01	1,01E-01	1,62E-03	0,00E+00	4,00E-02	3,48E-01	4,92E-02	-4,56E+00
ADP-minerals & metals	kg Sbe	3,98E-01	3,94E-04	4,18E-06	0,00E+00	1,50E-04	1,09E-03	1,13E-04	-1,16E-01
ADP-fossil resources	MJ	3,66E+04	3,60E+02	4,67E+00	0,00E+00	1,37E+02	5,31E+02	1,06E+02	-8,27E+03
Water use[2)]	m^3e depr.	1,14E+03	1,34E+00	1,02E-01	0,00E+00	5,10E-01	2,95E+01	3,80E+00	-4,30E+02

1)GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) 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 experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO_4e.

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USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Renew. PER as energy	MJ	7,62E+03	4,54E+00	3,45E-01	0,00E+00	1,73E+00	4,94E+01	6,01E+00	-1,36E+03
Renew. PER as material	MJ	1,90E+02	0,00E+00	-1,68E+02	0,00E+00	0,00E+00	-2,21E+01	0,00E+00	0,00E+00
Total use of renew. PER	MJ	7,81E+03	4,54E+00	-1,67E+02	0,00E+00	1,73E+00	2,73E+01	6,01E+00	-1,36E+03
Non-re. PER as energy	MJ	3,44E+04	3,60E+02	4,67E+00	0,00E+00	1,37E+02	5,31E+02	1,06E+02	-8,27E+03
Non-re. PER as material	MJ	1,88E+03	0,00E+00	-3,74E+01	0,00E+00	0,00E+00	-1,82E+03	0,00E+00	0,00E+00
Total use of non-re. PER	MJ	3,63E+04	3,60E+02	-3,27E+01	0,00E+00	1,37E+02	-1,29E+03	1,06E+02	-8,27E+03
Secondary materials	kg	3,34E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,64E+02
Renew. secondary fuels	MJ	1,00E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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
Use of net fresh water	m^3	2,75E+01	7,48E-02	2,35E-03	0,00E+00	2,90E-02	9,20E-01	8,72E-02	-7,62E+00

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	2,95E+02	3,54E-01	2,53E-02	0,00E+00	1,30E-01	0,00E+00	5,00E+00	-3,18E+02
Non-hazardous waste	kg	1,37E+04	3,87E+01	8,90E-01	0,00E+00	1,47E+01	0,00E+00	7,85E+00	-3,64E+03
Radioactive waste	kg	3,47E-01	2,43E-03	2,32E-05	0,00E+00	9,40E-04	0,00E+00	2,73E-04	-1,23E-02

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	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
Materials for recycling	kg	9,50E+01	0,00E+00	1,62E+01	0,00E+00	0,00E+00	6,72E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	4,76E+01	0,00E+00	4,00E-01	0,00E+00	0,00E+00	6,27E+01	0,00E+00	0,00E+00
Exported energy	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

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BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 kg
Biogenic carbon content in accompanying packaging	3,37 kg

NOTE 1 kg biogenic carbon is equivalent to 44/12 kg of CO2.

TAURUS INVERTER PRO

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP – total	kg CO_2e	3,25E+03	2,67E+01	1,74E+01	0,00E+00	1,02E+01	3,12E+02	6,74E+01	-9,29E+02
GWP – fossil	kg CO_2e	3,33E+03	2,67E+01	8,90E-01	0,00E+00	1,02E+01	3,02E+02	-2,98E+02	-9,27E+02
GWP – biogenic	kg CO_2e	-2,60E+01	0,00E+00	1,65E+01	0,00E+00	0,00E+00	9,55E+00	-6,73E-02	2,09E+00
GWP – LULUC	kg CO_2e	6,05E+00	8,08E-03	2,95E-04	0,00E+00	3,10E-03	4,32E-02	1,31E-02	-3,76E+00
Ozone depletion pot.	kg $CFC_{-11}e$	1,71E-02	6,26E-06	3,82E-08	0,00E+00	2,40E-06	6,75E-06	4,63E-06	-5,07E-05
Acidification potential	mol H^+e	4,47E+01	1,11E-01	1,70E-03	0,00E+00	4,30E-02	-8,47E+01	1,52E-01	-7,55E+00
EP-freshwater[3)]	kg Pe	3,19E-01	2,22E-04	1,12E-05	0,00E+00	8,30E-05	1,69E-03	1,80E-03	-4,81E-02
EP-marine	kg Ne	3,98E+00	3,33E-02	5,50E-04	0,00E+00	1,30E-02	1,36E-01	1,96E-02	-1,05E+00
EP-terrestrial	mol Ne	5,08E+01	3,74E-01	5,80E-03	0,00E+00	1,40E-01	1,43E+00	2,46E-01	-1,29E+01
POCP ("smog")	kg NMVOCe	1,55E+01	1,21E-01	1,62E-03	0,00E+00	4,60E-02	3,87E-01	1,02E-01	-5,00E+00
ADP-minerals & metals	kg Sbe	5,04E-01	4,54E-04	4,18E-06	0,00E+00	1,70E-04	1,23E-03	2,54E-04	-1,10E-01
ADP-fossil resources	MJ	4,25E+04	4,15E+02	4,67E+00	0,00E+00	1,58E+02	6,22E+02	2,30E+02	-8,96E+03
Water use[2)]	m^3e depr.	1,40E+03	1,54E+00	1,02E-01	0,00E+00	5,90E-01	3,57E+01	8,20E+00	-4,83E+02

1)GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) 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 experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO_4e.

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USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Renew. PER as energy	MJ	8,80E+03	5,23E+00	3,45E-01	0,00E+00	1,99E+00	5,76E+01	1,30E+01	-1,73E+03
Renew. PER as material	MJ	1,85E+02	0,00E+00	-1,68E+02	0,00E+00	0,00E+00	-1,73E+01	0,00E+00	0,00E+00
Total use of renew. PER	MJ	8,98E+03	5,23E+00	-1,67E+02	0,00E+00	1,99E+00	4,02E+01	1,30E+01	-1,73E+03
Non-re. PER as energy	MJ	4,00E+04	4,15E+02	4,67E+00	0,00E+00	1,58E+02	6,22E+02	2,30E+02	-8,96E+03
Non-re. PER as material	MJ	1,76E+03	0,00E+00	-3,74E+01	0,00E+00	0,00E+00	-1,69E+03	0,00E+00	0,00E+00
Total use of non-re. PER	MJ	4,18E+04	4,15E+02	-3,27E+01	0,00E+00	1,58E+02	-1,06E+03	2,30E+02	-8,96E+03
Secondary materials	kg	3,86E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,91E+02
Renew. 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
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
Use of net fresh water	m^3	3,21E+01	8,68E-02	2,35E-03	0,00E+00	3,30E-02	1,10E+00	1,84E-01	-8,00E+00

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	3,53E+02	4,04E-01	2,53E-02	0,00E+00	1,50E-01	0,00E+00	1,08E+01	-3,63E+02
Non-hazardous waste	kg	1,94E+04	4,47E+01	8,90E-01	0,00E+00	1,70E+01	0,00E+00	1,55E+01	-3,87E+03
Radioactive waste	kg	3,90E-01	2,83E-03	2,32E-05	0,00E+00	1,10E-03	0,00E+00	5,95E-04	-1,56E-02

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	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
Materials for recycling	kg	1,02E+02	0,00E+00	1,62E+01	0,00E+00	0,00E+00	7,78E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	5,39E+01	0,00E+00	4,00E-01	0,00E+00	0,00E+00	6,32E+01	0,00E+00	0,00E+00
Exported energy	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

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BIOGENIC CARBON CONTENT

Product’s biogenic carbon content at the factory gate

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 kg
Biogenic carbon content in accompanying packaging	3,37 kg

NOTE 1 kg biogenic carbon is equivalent to 44/12 kg of CO2.

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SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Energy type	Object	GWP value	Data quality	Representativeness
Electricity	Electricity data quality and CO_2 emission kg CO_2 eq. / kWh	0.24 kg CO2e / kWh	Market for electricity, medium voltage (Reference product: electricity, medium voltage) EN15804+A1, EN15804+A2, Finland, 2019. EcoInvent 3.6. The shares have been calculated based on statistics from 2016: IEA World Energy Statistics and Balances.	The processes included in the data set are well representative for the geography (Finland)
District heat	District heat, Finnish average	0.18 kg CO2e / kWh	LCA study based on District heating statistics 2019 and Ecoinvent 3.3, OneClickLCA Ltd (2021) Finland	The processes included in the data set are representative for the geography (Finland)

Transportation scenario

Parameter	Value
Fuel type and consumption of vehicle used for transport	Truck: diesel, maximum load capacity 34 t. Specific transport emissions 0,064 kg CO_2 equiv. / tn x km
Distance (km)	Average transport distance 338 km
Capacity utilization (%)	100 % for truck
Density of transported products (kg/m³)	Density varies depending on the mass and size of the product type
Volume capacity utilization factor	1

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Installation of the product in the building

The masses of the packaging materials of products are shown on page 6.

Parameter	Unit
Ancillary materials for installation (specified by material)	Disposable gloves (not included in the analysis because of their insignificant usage amount)
Water use	0 m3
Other resource use	0 kWh (energy use is insignificant)
Quantitative description of energy type (regional mix) and consumption during the installation process	
Waste materials generated by product installation	Packaging materials: Styrox 0,2 kg Polyethylene (PE) 0, 6 kg Wood pallet 7,5 kg

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End-of-life scenario; Taurus 80 EVI and Taurus 110 EVI

			Taurus 80 EVI	Taurus 110 EVI
		Material	Mass	Mass
Process flow	Size(mm)			
Collection process specified by type	kg collected separately		743,5 kg	745,9 kg
	kg collected with mixed construction waste			
Recovery system specified by type	kg for reuse			
	kg for recycling	Other Steel	275,66 kg	276,44 kg
		Hot rolled-, Cold rolled- and, Stainless steel	332,2 kg	329,62 kg
		Copper	19,48 kg	19,36 kg
		Aluminium	14,10 kg	14,10 kg
		Brass	3,47 kg	3,31 kg
		Cable	18,90 kg	18,56 kg
		Electronic components	1,75 kg	3,11 kg
	kg for energy recovery	Plastics	5,40 kg	5,46 kg
		PVC	0,29 kg	0,75 kg
		Polyurethane (PUR)	0,39 kg	0,39 kg
		Rubber	3,86 kg	3,86 kg
		Bitum	4,16 kg	4,84 kg
		Polyurethane press grid foam	40,44 kg	40,42 kg
		Non-cell foam	7,89 kg	9,59 kg
		Cardboard	3,2 kg	3,2 kg
Disposal specified by type	kg material for final deposition	Refrigrient	9,5 kg	9,8 kg
		Oil	0,98 kg	0,98 kg
		Bitum	1,78 kg	2,07 kg
Assumptions for scenario development	units as appropriate	Waste materials are transported 75 km by truck to recycling facility with a truck capacity utilization of 45%		

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End-of-life scenario; Taurus Inverter PRO

			Taurus Inverter PRO
		Material	Mass
Process flow	Size(mm)		
Collection process specified by type	kg collected separately		861,1 kg
	kg collected with mixed construction waste		
Recovery system specified by type	kg for reuse		
	kg for recycling	Other Steel	274,56 kg
		Hot rolled-, Cold rolled- and, Stainless steel	411,47 kg
		Copper	33,02 kg
		Aluminium	22,38 kg
		Brass	1,40 kg
		Cable	24,17 kg
		Electronic components	2 kg
		Tin	0,15 kg
	kg for energy recovery	Plastics	7,95 kg
		Polyurethane (PUR)	0,39 kg
		Rubber	3,89 kg
		Bitum	6,53 kg
		Polyurethane press grid foam	35,76 kg
		Non-cell foam	7,90 kg
		Cardboard	3,2 kg
Disposal specified by type	kg material for final deposition	Refrigrient	22 kg
		Oil	1,47 kg
		Bitum	2,80 kg
Assumptions for scenario development	units as appropriate	Waste materials are transported 75 km by truck to recycling facility with a truck capacity utilization of 45%	

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1 ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.
2 ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
3 ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.
4 Ecoinvent database v3.6 (2019)
5 EN 15804:2012+A2:2019 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.
6 EPD Background Report
7 Emissions database for construction, Finnish Environmental Institute, 2021. Available at: https://co2data.fi/
8 Helsinki Region Environmental Services HSY, Announcement, received 5/2022.

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ANNEX 1: EPD RESULTS BY RTS PCR REQUIREMENTS

TAURUS 80 EVI

Impact category	Unit	A1-A3	A4	A5	C2	C3	D
Global Warming Potential total	kg CO2e/kg	3,61E+00	3,11E-02	2,34E-02	1,18E-02	3,50E-01	-1,09E+00
Abiotic depletion potential (ADP-elements) for non fossil resources	kg Sbe/kg	4,99E-04	5,30E-07	5,62E-09	2,02E-07	1,47E-06	-1,19E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources (+A2)	MJ/kg	4,84E+01	4,83E-01	6,28E-03	1,84E-01	7,43E-01	-1,03E+01
Water use	m3e depr./kg	1,53E+00	1,79E-03	1,37E-04	6,86E-04	3,89E-02	-5,63E-01
Biogenic carbon content in product	kg C/kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of secondary materials	kg/kg	4,54E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,56E-01

TAURUS 110 EVI

Impact category	Unit	A1-A3	A4	A5	C2	C3	D
Global Warming Potential total	kg CO2e/kg	3,63E+00	3,11E-02	2,33E-02	1,18E-02	3,51E-01	-1,16E+00
Abiotic depletion potential (ADP-elements) for non fossil resources	kg Sbe/kg	5,33E-04	5,28E-07	5,60E-09	2,01E-07	1,46E-06	-1,55E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources (+A2)	MJ/kg	4,90E+01	4,83E-01	6,26E-03	1,84E-01	7,12E-01	-1,11E+01
Water use	m3e depr./kg	1,53E+00	1,80E-03	1,37E-04	6,84E-04	3,96E-02	-5,76E-01
Biogenic carbon content in product	kg C/kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of secondary materials	kg/kg	4,48E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,54E-01

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TAURUS INVERTER PRO

Impact category	Unit	A1-A3	A4	A5	C2	C3	D
Global Warming Potential total	kg CO2e/kg	3,78E+00	3,10E-02	2,02E-02	1,18E-02	3,62E-01	-1,08E+00
Abiotic depletion potential (ADP-elements) for non fossil resources	kg Sbe/kg	5,85E-04	5,27E-07	4,85E-09	1,97E-07	1,43E-06	-1,28E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources (+A2)	MJ/kg	4,93E+01	4,82E-01	5,42E-03	1,84E-01	7,22E-01	-1,04E+01
Water use	m3e depr./kg	1,63E+00	1,79E-03	1,18E-04	6,85E-04	4,14E-02	-5,61E-01
Biogenic carbon content in product	kg C/kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of secondary materials	kg/kg	4,49E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,38E-01