PRODUCT ENVIRONMENTAL PROFILE

AQUACIAT™ POWER ILD

Nominal cooling capacity : 160 - 1000 kW
Nominal heating capacity : 180 - 1075 kW

TABLE OF CONTENTS

1 – ECODESIGN MANUAL

1.1 – Commercial reference of the reference product

Reference product:	AQUACIAT™ POWER ILD 2000R
Options considered:	None
References covered:	AQUACIAT™ POWER ILD 0602R - AQUACIAT™ POWER ILD 0700R - AQUACIAT™ POWER ILD 0800R - AQUACIAT™ POWER ILD 0900R - AQUACIAT™ POWER ILD 1000R - AQUACIAT™ POWER ILD 1150R - AQUACIAT™ POWER ILD 1250R - AQUACIAT™ POWER ILD 1400R - AQUACIAT™ POWER ILD 1500R - AQUACIAT™ POWER ILD 1600R - AQUACIAT™ POWER ILD 1750R - AQUACIAT™ POWER ILD 2000R - AQUACIAT™ POWER ILD 2300R - AQUACIAT™ POWER ILD 2500R - AQUACIAT™ POWER ILD 2800R - AQUACIAT™ POWER ILD 3000R - AQUACIAT™ POWER ILD 3200R - AQUACIAT™ POWER ILD 3500R - AQUACIAT™ POWER ILD 4000R
Nominal capacity of the device:	528.7 kW
Product family:	Heat pump
Product category:	Reversible heat pump

1.2 – Functional Unit

“To produce 1 kW of heating or 1 kW of cooling according to the appropriate usage scenario defined in the EN 14825 standard and during the 22 years reference lifetime of the product.”

1.3 – Additional environmental information

The environmental impacts are calculated using a Life Cycle Analysis of the product in accordance with ISO standards 14040 and 14044. All the stages of the manufacture, distribution, installation (packaging end of life), maintenance and end of life of the product are included in this study.

1.4 - Manufacturing

- Production

The Life Cycle Analysis on which this Product Environmental Profile (PEP) is based was conducted with respect to the criteria set by PCR–ed4-EN-2021 09 06 and PSR-0013-ed3.0-EN-2023-06-06 for the PEP ecopassport® programm.

The environmental analysis was conducted for the whole of the following life cycle: production, distribution, installation, use and end of life. The following environmental declaration conforms to the cut rule that stipulates a precision of +/- 5% on the mass of the modelled product. For transport: if the origin of the components is known, the precise values are used. Otherwise, the unfavourable assumption indicated in the general rules (PCR) is used.

The product family is designed and assembled at a CARRIER site with the following certifications : ISO 14001 ; ISO 50001. The parts are manufactured in China, Europe and France.

- Energy model

Electricity Mix; Low voltage; 2018; France, FR (reference year: 2018)

1.5 - Distribution

- Production

Transportation from the production plant to the installation site is defined based on the product order book. The distribution scenario (destinations) is provided in the "1.11 Sales Scenarios" section of this document.

- Energy model

Electricity Mix; Low voltage; 2018; Europe, EU-27 (reference year: 2018)

1.6 - Installation

- Production

Installation operations are required for the products in this range; their flow and material consumption has been taken into account. Processing of the packaging and connection to the hydraulic system are taken into account at this stage. The refrigerant is charged during production, no additional refrigerant charging was considered in the installation stage. The unit is installed on the floor on a concrete slab. For the geographical representativeness of this step, please refer to the section "1.11 Sales scenarios".

- Energy model

Electricity Mix; Low voltage; 2018; Europe, EU-27 (reference year: 2018)

1.7 - Use

- Production

The standard scenario used to calculate the environmental impacts related to consumption of the product is defined in regulation no. 2016/2281. According to the NF EN 14825 standard, for a comfort application, the seasonal performances (SEER – Seasonal Energy Efficiency Ratio & SCOP – Seasonal COefficient of Performance) of the reversible heat pump are characterised by taking into account the operation time according to the load rate of the product after a typical heating/cooling season in Europe. An electric mix is used, this represents the customer countries as a proportion of the sales volumes. This scenario is specific to each product range and indicated in the « 1.11 Sales scenarios » section. The usage phase also takes into account the maintenance operations. The mandatory site inspections are scheduled annually. Components with a shorter service life than the product must be replaced, which means the environmental impact of production, distribution and processing of these maintenance components must be taken into account. Refrigerant leaks resulting in recharging, production, transport or processing are taken into account.
For the energy consumption calculation, the operation time for an reversible heat pump > 12 kW is 2666 hours/year.

Consumption of the device:
Consumption = 7298647.8 kWh
- consumption national = 7298647.8 kWh,
- consumption continental = 0 kWh,
- consumption world = 0 kWh.

- Energy model

For national mix, the chosen module is: Electricity Mix; Low voltage; 2018; France, FR (reference year: 2018)

1.8 – End of life

- Production

The Carrier group is a partner with the collection organization Eco-systèmes pro, which is in charge of dismantling our end-of-life machines in France. The product end of life follows the ESR data:
- stage 1: the equipment is collected with a truck transport.
- stage 2: decontamination, crushing then sorting of the various materials.
- stage 3: specific processing of the electronic components, electrical heaters, cables, bulbs and screens.
- stage 4: recycling of other materials, with a truck transport.
- stage 5: incineration without energy recovery of components with no re-use value, with a truck transport.
- stage 6: offloading of the rest of the material, with a truck transport.

- Energy model

Electricity Mix; Low voltage; 2018; France, FR (reference year: 2018)

1.9 - PEP ecopassport program hypothesis

The life cycle analysis was carried out according to the hypothesis and scenarios provided by the PEP ecopassport program.

This LCA follows the EF 3.0 method of the European Commission's "Joint Research Centre".

Activity area:	Collective residential / Tertiary
Expected lifetime:	22 years
Annual operating time in heating mode:	2066 hours
Eurovent operating time in heating mode:	-
Annual operating time in cooling mode:	600 hours
Annual operating time in cooling mode:	-
Annual operating time:	2666 hours
Average extracted air flow:	- m^3/h
Pressure loss Δp:	-
Momentary refrigerant leaks:	0.2%
Refill threshold:	90%
Number of engine changes during the life cycle:	0
Number of filter changes during the life cycle:	0

1.10 – Technical description of the device

The new generation of AQUACIATPOWER high-efficiency air-towater heat pumps and water chillers offers an optimal solution for all heating and cooling applications used for the Healthcare, Office, and Hotel sectors.

These units are designed for outdoor installation and require no special protection against adverse weather conditions.

AQUACIATPOWER is optimised for R-32, a fluid with a lowest GWP than R410a.

This range guarantees compliance with the most demanding requirements for increased seasonal energy efficiency (SEER and SCOP) and CO2 reduction to comply with the various applicable European directives and regulations.

TEWI (Total Equivalent Warming Impact):	Direct effect:	Indirect effect:
45582 tCO2 eq	45094 tCO2 eq	488 tCO2 eq
Calorific value of the device:	2 MJ/kg	
Maximum electrical input power:	237.8 kW	
Cooling capacity:	500 kW	SEER : 4.81
Heating capacity:	537 kW	SCOP : 3.96
Sensitive capacity:	- kW	
Refrigerant:	R32	GWP = 675
Liquid waste (condensates):	- m3	
Water consumption of the device:	0 m3	

1.11 – Sales scenarios

Sales of the device are distributed as follows:

Country name	Share in sales (%)	
France	100	%
Europe	0	%
World	0	%

This distribution affects the distance travelled during the phase and the electric mix used during the usage phase.

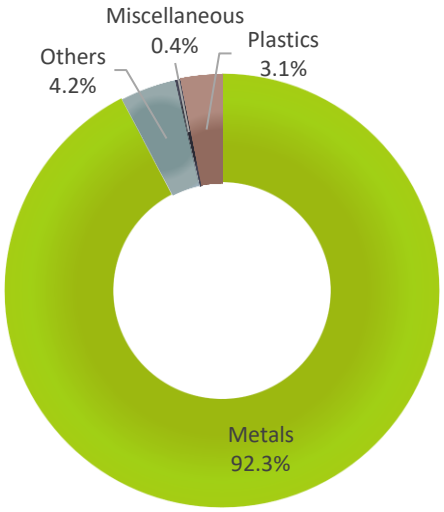
2 – COMPONENT MATERIALS

2.1 – Reference product

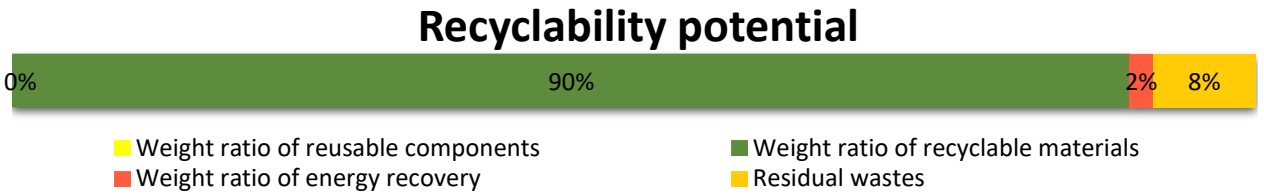
Modelled total weight:

Material PEP category	Material	Mass (kg)	Percentage
Metals	Galvanised steel	1588.65	45.6%
Metals	Copper	570.69	16.4%
Metals	Steel	292.29	8.4%
Metals	Stainless steel	268.61	7.7%
Metals	Aluminium	241.58	6.9%
Metals	Cast iron	126.17	3.6%
Plastics	Polypropylene (PP)	70.88	2.0%
Others	Refrigerant R32	70.00	2.0%
Metals	Ferrite	66.22	1.9%
Metals	Brass	64.28	1.8%
Others	Wood ; for palet	58.51	1.7%
Others	Paint	16.85	0.5%
Plastics	Polyamide 6.6 (PA 6.6)	15.75	0.5%
Plastics	Ethylene Propylene Diene rubber (EPDM)	14.56	0.4%
Plastics	Polyvinylchloride (PVC)	6.60	0.2%
Miscellaneous	Miscellaneous	13.65	0.4%
Total		3485.29	100.0%

2.2 – Component materials



Recyclability rate : 90%



The recyclability potential of the products has been assessed using the "Eco'WEEE recyclability and recovery calculation method"

3 – ENVIRONMENTAL IMPACTS

Per kW corresponding to the functional unit

Environmental indicators		Total	Manu facturing	Distribution	Installation	Use ∑ B1 à B7	End of life	Potential benefits Module D
Ozone depletion	kg.CFC-11 eq	3.55E-05	2.02E-05	0*	0*	1.46E-05	6.46E-07	-8.99E-07
Acidification (AP)	mole H^+ eq	6.12E+00	6.89E-01	2.68E-03	1.90E-03	5.34E+00	8.46E-02	-5.86E-01
Freshwater eutrophication	kg P eq	4.47E-02	5.29E-04	0*	0*	4.39E-02	2.86E-04	-4.84E-02
Marine aquatic eutrophication	kg N eq	8.27E-01	5.37E-02	1.26E-03	2.24E-04	7.35E-01	3.67E-02	-3.68E-02
Terrestrial eutrophication	mole N eq	1.13E+01	6.79E-01	1.38E-02	2.58E-03	1.06E+01	7.55E-02	-4.47E-01
Photochemical Ozone formation	kg NMVOC eq	2.41E+00	2.00E-01	3.48E-03	8.27E-04	2.18E+00	2.39E-02	-1.39E-01
Depletion of abiotic resources - elements	kg Sb eq	2.89E-03	2.39E-03	0*	0*	4.38E-04	6.01E-05	-1.85E-03
Depletion of abiotic resources - fossil fuels	MJ	1.79E+05	1.76E+03	0*	0*	1.77E+05	1.16E+02	-2.39E+02
Climate change - total	kg CO_2 eq.	1.03E+03	7.64E+01	4.24E-01	2.30E-01	9.28E+02	2.32E+01	-2.24E+01
Climate change - fossil fuels	kg CO_2 eq.	1.02E+03	7.54E+01	4.24E-01	1.75E-01	9.26E+02	2.27E+01	-2.17E+01
Climate change - biogenics	kg CO_2 eq.	3.83E+00	9.58E-01	0*	5.50E-02	2.38E+00	4.34E-01	-6.75E-01
Climate change - land use and land use transformation	kg CO_2 eq.	8.79E-06	8.17E-06	0*	0*	6.11E-07	0*	0.00E+00
Water requirement	m^3	7.00E+03	1.93E+02	0*	0*	7.98E+01	6.72E+03	-1.85E+04
Total use of primary energy during the life cycle	MJ	1.95E+05	1.80E+03	0*	0*	1.94E+05	1.36E+02	-2.98E+02
Emission of fine particles	incidence of diseases	2.13E-04	5.41E-06	2.18E-08	0*	2.07E-04	5.38E-07	-2.27E-06
Ionizing radiation, human health	kBq U235 eq	2.44E+04	4.46E+02	0*	0*	2.39E+04	0*	-4.34E+00
Ecotoxicity (fresh water)	CTUe	9.71E+03	1.91E+03	0*	0*	6.52E+03	1.28E+03	-3.78E+03
Human toxicity, carcinogenic effects	CTUh	2.88E-05	2.86E-05	0*	0*	1.54E-07	4.42E-08	-2.64E-07
Human toxicity, non-carcinogenic effects	CTUh	1.22E-05	4.98E-06	0*	0*	6.67E-06	5.49E-07	-5.92E-06
Impacts related to land use/soil quality	-	5.60E+01	2.42E+00	0*	0*	2.96E+01	2.40E+01	-8.35E+01
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ	1.64E+04	2.63E+01	0*	0*	1.64E+04	1.98E+01	-5.97E+01
Use of renewable primary energy resources used as raw materials	MJ	1.07E+01	1.07E+01	0*	0*	0*	0*	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.64E+04	3.70E+01	0*	0*	1.64E+04	1.98E+01	-5.97E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ	1.79E+05	1.74E+03	0*	0*	1.77E+05	1.16E+02	-2.39E+02
Use of non-renewable primary energy resources used as raw materials	MJ	2.05E+01	1.58E+01	0*	4.64E+00	0*	0*	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.79E+05	1.76E+03	0*	0*	1.77E+05	1.16E+02	-2.39E+02
Use of secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	1.70E+02	4.50E+00	0*	0*	1.86E+00	1.64E+02	-4.40E+02
Hazardous waste disposed of	kg	1.99E+02	1.85E+02	0*	0*	1.37E+01	0*	-4.25E-16
Non-hazardous waste disposed of	kg	1.09E+02	2.01E+01	1.49E-02	8.36E-02	8.87E+01	0*	-8.49E-16
Radioactive waste disposed of	kg	9.73E-02	6.00E-02	1.06E-05	0*	3.73E-02	0*	0.00E+00
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
Materials for recycling	kg	5.53E+00	1.14E-03	0*	3.43E-02	0*	5.50E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	3.66E-02	0*	0*	3.66E-02	0*	0*	0.00E+00

The Life Cycle Analysis was conducted using EIME software: EIME© v6.0.5. Whit its database version: CODDE-2023-02 * The results of this PEP represent the use of the product in countries with energy mixes of varying pollution levels, which significantly affects the product's environmental impact. To obtain the results that correspond to your product, please contact your Carrier representative.
The PEP was drawn up under the assumption 1 kW of heating or cooling power being supplied. The real impact of the stages of the life cycle of a product installed in an actual situation is calculated by the user of the PEP by multiplying the impact concerned by the total heating and cooling capacity in kW.
* represents less than 0.01% of the total life cycle of the reference flow

3 – ENVIRONMENTAL IMPACTS

Environmental indicators		Use B1	Maintenance B2	Repair B3	Replacement B4	Refurbishment B5	Operational energy use B6	Operational water use B7
Ozone depletion	kg.CFC-11 eq	0.00E+00	1.06E-06	0.00E+00	0.00E+00	0.00E+00	1.36E-05	0.00E+00
Acidification (AP)	mole H^+ eq	0.00E+00	1.36E-03	0.00E+00	0.00E+00	0.00E+00	5.34E+00	0.00E+00
Freshwater eutrophication	kg P eq	0.00E+00	2.91E-05	0.00E+00	0.00E+00	0.00E+00	4.39E-02	0.00E+00
Marine aquatic eutrophication	kg N eq	0.00E+00	1.80E-04	0.00E+00	0.00E+00	0.00E+00	7.35E-01	0.00E+00
Terrestrial eutrophication	mole N eq	0.00E+00	1.95E-03	0.00E+00	0.00E+00	0.00E+00	1.06E+01	0.00E+00
Photochemical Ozone formation	kg NMVOC eq	0.00E+00	5.64E-04	0.00E+00	0.00E+00	0.00E+00	2.18E+00	0.00E+00
Depletion of abiotic resources - elements	kg Sb eq	0.00E+00	1.16E-06	0.00E+00	0.00E+00	0.00E+00	4.36E-04	0.00E+00
Depletion of abiotic resources - fossil fuels	MJ	0.00E+00	5.57E-01	0.00E+00	0.00E+00	0.00E+00	1.77E+05	0.00E+00
Climate change - total	kg CO_2 eq.	5.88E+00	1.19E-01	0.00E+00	0.00E+00	0.00E+00	9.22E+02	0.00E+00
Climate change - fossil fuels	kg CO_2 eq.	5.88E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00	9.20E+02	0.00E+00
Climate change - biogenics	kg CO_2 eq.	0.00E+00	1.30E-03	0.00E+00	0.00E+00	0.00E+00	2.38E+00	0.00E+00
Climate change - land use and land use transformation	kg CO_2 eq.	0.00E+00	6.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water requirement	m^3	0.00E+00	1.29E+01	0.00E+00	0.00E+00	0.00E+00	6.68E+01	0.00E+00
Total use of primary energy during the life cycle	MJ	0.00E+00	6.12E-01	0.00E+00	0.00E+00	0.00E+00	1.94E+05	0.00E+00
Emission of fine particles	incidence of diseases	0.00E+00	1.40E-08	0.00E+00	0.00E+00	0.00E+00	2.07E-04	0.00E+00
Ionizing radiation, human health	kBq U235 eq	0.00E+00	6.75E-03	0.00E+00	0.00E+00	0.00E+00	2.39E+04	0.00E+00
Ecotoxicity (fresh water)	CTUe	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+03	0.00E+00
Human toxicity, carcinogenic effects	CTUh	0.00E+00	4.14E-11	0.00E+00	0.00E+00	0.00E+00	1.54E-07	0.00E+00
Human toxicity, non-carcinogenic effects	CTUh	0.00E+00	2.96E-09	0.00E+00	0.00E+00	0.00E+00	6.66E-06	0.00E+00
Impacts related to land use/soil quality	-	0.00E+00	1.76E-01	0.00E+00	0.00E+00	0.00E+00	2.94E+01	0.00E+00
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ	0.00E+00	5.43E-02	0.00E+00	0.00E+00	0.00E+00	1.64E+04	0.00E+00
Use of renewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	0.00E+00	5.43E-02	0.00E+00	0.00E+00	0.00E+00	1.64E+04	0.00E+00
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ	0.00E+00	5.57E-01	0.00E+00	0.00E+00	0.00E+00	1.77E+05	0.00E+00
Use of non-renewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	0.00E+00	5.57E-01	0.00E+00	0.00E+00	0.00E+00	1.77E+05	0.00E+00
Use of secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	0.00E+00	3.01E-01	0.00E+00	0.00E+00	0.00E+00	1.56E+00	0.00E+00
Hazardous waste disposed of	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+01	0.00E+00
Non-hazardous waste disposed of	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.87E+01	0.00E+00
Radioactive waste disposed of	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-02	0.00E+00
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
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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

The Life Cycle Analysis was conducted using EIME software: EIME© v6.0.5. Whit its database version: CODDE-2023-02 * The results of this PEP represent the use of the product in countries with energy mixes of varying pollution levels, which significantly affects the product's environmental impact. To obtain the results that correspond to your product, please contact your Carrier representative.
As part of the life cycle analysis of buildings, the environmental impacts of the use stage must be declared according to modules B1 to B7 (B1: use; B2: maintenance; B3: repair; B4: replacement; B5: rehabilitation; B6: energy use; B7: water use).

3 – ENVIRONMENTAL IMPACTS

Per kW corresponding to the functional unit

Environmental indicators		
Biogenic carbon content of the product	kg of C.	8.26E-02
Biogenic carbon content of the associated packaging	kg of C.	2.52E+01

The Life Cycle Analysis was conducted using EIME software: EIME© v6.0.5. Whit its database version: CODDE-2023-02 * The results of this PEP represent the use of the product in countries with energy mixes of varying pollution levels, which significantly affects the product's environmental impact. To obtain the results that correspond to your product, please contact your Carrier representative.
The -1/+1 valuation methodology was applied to determine biogenic carbon content.

4 – EXTRAPOLATION TO THE OTHER SIZES IN THE RANGE

	Capacity kW	Manufacturing	Distribution	Installation	B1	B6	End of life	Module D
AQUACIAT™ POWER ILD 0602R	174.8	1.385	1.385	1.520	2.587	1.081	1.383	1.385
AQUACIAT™ POWER ILD 0700R	193.4	1.257	1.257	1.374	2.339	1.093	1.255	1.257
AQUACIAT™ POWER ILD 0800R	232.0	1.184	1.184	1.145	2.015	1.062	1.185	1.184
AQUACIAT™ POWER ILD 0900R	251.5	1.109	1.109	1.056	1.859	1.058	1.110	1.109
AQUACIAT™ POWER ILD 1000R	270.3	1.035	1.035	0.983	1.730	1.055	1.036	1.035
AQUACIAT™ POWER ILD 1150R	313.6	1.178	1.178	1.268	1.540	1.019	1.177	1.178
AQUACIAT™ POWER ILD 1250R	333.3	1.135	1.135	1.193	1.449	1.020	1.134	1.135
AQUACIAT™ POWER ILD 1400R	381.4	1.079	1.079	1.043	1.306	1.010	1.080	1.079
AQUACIAT™ POWER ILD 1500R	400.4	1.030	1.030	0.993	1.244	1.008	1.031	1.030
AQUACIAT™ POWER ILD 1600R	434.7	1.120	1.120	1.216	1.181	1.008	1.118	1.120
AQUACIAT™ POWER ILD 1750R	460.7	1.065	1.065	1.148	1.114	1.017	1.064	1.065
REF **AQUACIAT™ POWER ILD 2000R**	**528.7**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
AQUACIAT™ POWER ILD 2300R	628.0	1.178	1.178	1.353	0.890	1.019	1.175	1.178
AQUACIAT™ POWER ILD 2500R	667.4	1.135	1.135	1.273	0.838	1.020	1.133	1.135
AQUACIAT™ POWER ILD 2800R	762.5	1.081	1.081	1.114	0.773	1.010	1.080	1.081
AQUACIAT™ POWER ILD 3000R	800.5	1.032	1.032	1.061	0.737	1.008	1.031	1.032
AQUACIAT™ POWER ILD 3200R	869.9	1.120	1.120	1.279	0.713	1.008	1.118	1.120
AQUACIAT™ POWER ILD 3500R	922.2	1.065	1.065	1.206	0.673	1.017	1.063	1.065
AQUACIAT™ POWER ILD 4000R	1057.9	1.000	1.000	1.052	0.615	1.000	0.999	1.000

Extrapolation coefficients are given for the environmental impact of the functional unit, i.e. the emission of 1 kW of heating or cooling power. For each stage of the life cycle, the environmental impacts of the product concerned are calculated by multiplying the impacts of the declaration corresponding to the reference product by the extrapolation coefficient. The "Total" column should be calculated by adding the environmental impacts of each stage of the life cycle.

5 - GLOSSARY

The set of indicators used in this study is: Indicators for PEF EF 3.0 (Compliance: PEP ed.4, EN15804+A2) v2.0

5.1 – The mandatory indicators are:

- **GWP (Global Warming Potential):** This indicator is used to calculate the global warming potential caused by emissions in the air contributing to the greenhouse effect. It is expressed in kg CO_2 eq. The calculation methodology comes from the IPCC (International Panel of Climate Change, US, 2007), and we used a 100-year horizon. (IPCC 2007 method via CML, GWP 100).
- **ODP (Ozone Depletion):** This indicator is used to calculate the contribution of atmospheric emissions to the depletion of the stratospheric ozone layer. It is expressed in kg CFC-11 eq. The calculation methodology comes from the WMO (World Meteorological Organization, CML 2012).
- **A (Acidification for soil and water):** This indicator is used to calculate the acidification of the soil and water. It is expressed in kg SO_2-eq. The calculation methodology was developed by Huijbregts (CML, 2012).
- **EP (Eutrophication):** This indicator is used to calculate the eutrophication (enrichment with nutrients) of oceans and lakes by effluent. It is expressed in kg PO_4^{3-}eq. Eutrophication of water courses results from excessive enrichment with nutrient molecules (organic molecules) in the environment. Phosphorus, nitrogen, carbon and potassium allow the development of algae and aquatic species that can lead to a reduction in the oxygen level and an unbalanced biocoenosis. The calculation methodology was developed by Heijungs et al. 1992 (CML, 2012).
- **POCP (Photochemical Oxidation):** This indicator, expressed in kg C_2H_4-eq, is used to calculate the amount of ozone produced in the troposphere due to the action of solar radiation on oxidising gas emissions (known as summer smog; see summer peak ozone levels). The calculation methodology was developed by Jenkin & Hayman - Derwent et al. (CML, 2012).
- **ADPe (Depletion of Abiotic Resources - Elements):** This indicator is used to calculate the depletion of non-renewable mineral resources by taking into account the extent of natural reserves. It is expressed in equivalents of kilograms of antimony (kg Sb-eq). The calculation methodology was developed by Oers et al. (CML, 2012).
- **EP (Total use of primary energy):** This indicator is used to calculate the primary energy consumption during the life cycle of the product. It is expressed in MJ.
- **NUFW (Net use of fresh water):** This indicator represents the net consumption of fresh water used for the system. It is expressed in m^3. In EIME, fresh water is broken down into river, lake, underground and surface water, as well as water of unspecified origin. Water extracted and discharged into these environments with the same quality level is not covered by this indicator.
- **ADPf (Depletion of Abiotic Resources - Fossil Fuels):** This indicator is used to calculate the consumption of non-renewable fossil fuel resources. It is expressed in equivalents of kilograms of antimony (kg eq Sb). The calculation methodology was developed by Oers et al. (CML, 2012).
- **WP (Water Pollution):** this indicator, expressed as a critical volume (m^3), is used to calculate water pollution by taking into account the authorised effluent concentration limits. The methodology comes from the DHUP (French directorate of housing, urbanism and landscape) based on the recommendations of the AIMCC (French construction industry trade association).
- **AP (Air Pollution):** this indicator, expressed as a critical volume (m^3), is used to calculate ambient air pollution (troposphere) by taking into account the authorised concentration limits for atmospheric emissions. The methodology comes from the DHUP (French directorate of housing, urbanism and landscape) based on the recommendations of the AIMCC (French construction industry trade association).
- **Module B1 - Border for products installed during use:** it corresponds to the impacts and aspects of normal (i.e. expected) conditions of use of building construction products, materials and components, excluding those related to water and energy consumption, which are processed in modules B6 and B7. Module B1 also includes the impacts and aspects related to fugitive refrigerant emissions.
- **Module B2 – Border for maintenance:** it must include the production and transportation of construction products and materials, components and ancillary products used for maintenance; all cleaning processes for the interior and exterior of the building; all maintenance processes for the functional and technical performance of the building structure and the building-integrated technical systems, as well as the aesthetic qualities of the components inside and outside the building.
- **Module B3 – Border for repair:** it must include any repair process for building components carried out during the use phase of the building.
- **Module B4 – Border for replacement:** it must include the following as part of the planned replacement of building components based on their expected lifespan.
- **Module B5 – Border for refurbishment:** it corresponds to any major planned modification of the structure, layout and / or technical systems of the building, generally following a change / adjustment of its intended use / function.
- **Module B6 – Border for operational energy use:** it includes the impacts and aspects of the energy requirement during the operation phase according to the "service categories" described in the standard relating to the energy performance of buildings (EPB), EN ISO 52000-1.
- **Module B7 – Border for operational water use:** it must include all the water consumed and its treatment (before and after consumption) during the normal operation of the building (are excluded from module B7 maintenance, repair, replacement and rehabilitation of water supply systems and equipment. water).
- **Module D - Border for the benefits and charges outside the system border:** it quantifies the environmental benefits or charges resulting from the following re-use, recycling and energy recovery from the net flows of materials leaving the system boundary; and services exported outside the border of the system.

Registration number: **CIAT-00007-V02.01-EN**	Drafting rules: **« PEP-PCR-ed4-EN-2021 09 06 »** **Supplemented by « PSR-0013-ed3.0-EN-2023-06-06 »**
Vérifier accreditation number: **VH18**	Information and reference documents: **www.pep-ecopassport.org**
Date of issue: **9-2023**	Validity period: **5 years**
Independent verification of the declaration and data, in compliance with ISO 14025: 2006	
Internal : ☐	**External :** ☒
The PCR review was conducted by a panel of experts chaired by Julie ORGELET (DDemain)	
PEP are compliant with XP C08-100-1 :2016 or EN 50693 :2019 **The elements of the present PEP cannot be compared with elements from another program.**	
Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations"	

Yohann BARBAT - ✉ Yohann.Barbat@carrier.com - ☎ +(33)4 72 25 21 10 Manufacturer - 1 Route de Thil, 01120 Montluel, France