

Product Environmental Profile

**Toshiba Standard duct
RAV-HM801BTP-E (Indoor unit) +
RAV-GV801ATP-E (Outdoor unit)**

**Toshiba
Carrier Corporation**



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1.1 Commercial reference of the reference product

Reference product:	Standard duct RAV-HM801BTP-E + RAV-GV801ATP-E
Product family:	HVAC
Product sub-category:	Standard duct unit
Technology:	Air/Air (Reversible)
Type:	Electric-powered HVAC system for heating and cooling
Function:	Heating and/or cooling capacity
Operational Efficiency:	SCOP and/or SEER: SCOP: 4.13 / SEER: 5.2
Refrigerant:	R32
Homogeneous environmental family:	The reference device is part of a range comprising several sizes with identical functions meeting the same standards, identical technology, and manufacturing processes, and operating in a similar way.

1.2 References covered

Indoor unit	RAV-HM1101BTP-E	RAV-HM1401BTP-E	RAV-HM1601BTP-E	RAV-HM801BTP-E	RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-HM301SDTY-E	RAV-HM401SDTY-E
	RAV-HM561SDTY-E	RAV-HM561SDTY-E	RAV-HM801SDTY-E	RAV-HM801SDTY-E	RAV-HM901BTP-E	RAV-HM901BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E
	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E
	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E
	RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-HM801BTP-E	RAV-HM801BTP-E	RAV-HM1601BTP-E	RAV-HM1101BTP-E	RAV-HM1601BTP-E
	RAV-HM801BTP-E	-	-	-	-	-	-	-

Outdoor unit	RAV-GV1101ATP-E	RAV-GV1401ATP-E	RAV-GV1601AT(8)P-E	RAV-GV801ATP-E	RAV-GM561ATP-E	RAV-GV561ATP-E	RAV-GM302ATP-E
	RAV-GM562ATP-E	RAV-GP561ATW-E	RAV-GM802ATW-E	RAV-GP801ATW-E	RAV-GM901ATP-E	RAV-GM902ATW-E	RAV-GM1101ATP-E
	RAV-GV1101AT8P-E	RAV-GM1101AT8P-E	RAV-GM1102AT8W-E	RAV-GP1101AT8-E	RAV-GM1401ATP-E	RAV-GM1401ATP-E1	RAV-GM1402ATW-E
	RAV-GV1401AT8P-E	RAV-GM1401AT8P-E	RAV-GM1402AT8W-E	RAV-GV1601ATP-E	RAV-GV1601ATP-E1	RAV-GM1601ATP-E	RAV-GM1602ATW-E
	RAV-GM561ATP-E1	RAV-GM562ATP-E	RAV-GP561ATW-E	RAV-GM801ATP-E	RAV-GM802ATW-E	RAV-GP801ATW-E	RAV-GP1101AT-E
	RAV-GM1602AT8W-E	RAV-GM402ATP-E	RAV-GM1102ATW-E	RAV-GP1401AT-E1	RAV-GV1601AT8P-E1	RAV-GP1601AT8-E	-

1.3 Functional Unit

"To Produce 1 kW of heating or 1 kW of cooling, depending on the appropriate usage scenario defined in EN 14825 and during the product's 17-year reference lifetime.

Total energy output calculation for functional unit

$$Prev = (theating * Ph + tcooling * Pc) / (theating + tcooling) = 6.94 \text{ kW}$$

1.4 Declared Unit

"To produce heating or cooling thanks to the Toshiba standard duct unit of 6.94 kW (heating capacity 7.7 kW or cooling capacity 6.7 kW) according to the appropriate usage scenario and during the 17-year reference lifetime of the product"

1.5 Additional environmental information

The environmental impacts are assessed for the product, conducted in accordance with ISO standards 14040 and 14044 using One Click LCA V0.42. This analysis encompasses all stages of the product's lifecycle, including manufacturing, distribution, installation (including packaging end of life), maintenance, disposal and benefits and loads beyond the system boundary.

1.6 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-ed3.1-EN-2025 10 20 for the PEP ecopassport® Programme. The product's life cycle begins with the extraction and refining of raw materials, including metals, non-metals, plastics, electronics and packaging. These materials are processed into components through molding or machining and assembled into the final product using welding, soldering, or adhesion. Packaging materials are used for protection and transportation. The raw materials for the product were obtained from suppliers in China and Thailand. The materials are delivered to the manufacturing facility via road and sea transport. Primary data were provided by the manufacturer and represent all information for calendar year 2024. This stage is modelled based on the material weight and the distances from the supplier location to the manufacturing site, using the supplier list. Relevant regional electricity production datasets from Ecoinvent are employed to account for manufacturing energy consumption. Energy consumption data from the Thailand manufacturing facility is accounted for components and assemblies produced in-house for the boiler. For components obtained from external suppliers, generic Ecoinvent data is applied. During the manufacturing stage at the Thailand facility, waste is

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primarily generated from assembling product components and is accounted as per Toshiba. Manufacturing waste totals were provided by the manufacturer; however, because no documented breakdown of the treatment routes was available within the data scope, a conservative assumption has been applied. In alignment with ISO-based modelling practices, all manufacturing waste has been modelled as incinerated. The transport distance of 100 kilometers to the waste processing facility is considered, as recommended in PCR.

- Energy model

Market for electricity, medium voltage (reference product: electricity, medium voltage), Thailand; Ecoinvent v3.11.

1.7 Distribution



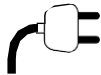
At this stage, all units are shipped from the manufacturing facility in Thailand to installation sites across the globe. Transportation impacts associated with the delivery of the final product to the installation site (A4 stage) include direct exhaust emissions from fuel combustion as well as upstream environmental impacts from fuel production. Transportation distances are considered as per PCR-ed4-EN-2021-09-06 guidelines.

1.8 Installation



No energy is required for the installation of the product at the site, as the process relies primarily on manual labor and does not involve any specialized procedures or equipment. The disposal of packaging materials is accounted for during the installation phase, including transportation over a distance of 100 kilometers to the waste processing and disposal facility. Packaging waste treatment is modeled in accordance with PCR-ed4-EN-2021-09-06.

1.9 Use



This stage encompasses all energy and materials related to product usage, maintenance, and the impact of operational energy use over the reference service life of 17 years. The use phase of Standard duct includes refrigerant waste (B1), maintenance (B2), operational energy use and atmospheric emissions (B6). The stages of repair (B3), replacement (B4), Refurbishment (B5), and water consumption (B7) are not applicable for this assessment as per PSR-0013-ed3.1-EN-2025 10 20 guidelines.

Refrigerant leakage during the use phase (B1) of the equipment is calculated in accordance with the guidelines outlined in PSR-0013-ed3.1-EN-2025 10 20. The formula from PSR-0013-ed3.1-EN-2025 10 20 is as below.

$$E_{fu} = Q_{fu} * DVR$$

E_{fu} = Momentary leakage = 0.34 kg

Q_{fu} = Amount of fugitive emissions in g or kg, = 0.02 kg

DVR = Reference service lifetime = 17 years.

The maintenance frequency for the SHRMA R32 is considered low. Refrigerant is refilled early by a technician, with the quantity determined according to the guidelines outlined in PSR-0013-ed3.1-EN-2025 10 20. Transportation of the refrigerant is also accounted for during this stage. By default, the refill threshold to be considered is 90% of the total load. The number of refills, N, is calculated as follows

$$n = 1 + \frac{1 - S_r}{T_{fu}}$$

$$N = ENT SUP [RLT/n]$$

Where:

- n = Refill interval = $1 + (1 - S_r) / T_{fu}$

- N = Total number of refills over the equipment's lifetime = ENT SUP [RLT / n]

According to the number of refills, the production of new refrigerant to be partial refill.

$$N * (1 - S_r) * C_t$$

S_r = refill threshold = 0.90

C_t = refrigerant charge = 1.40 kg

T_{fu} = Leakage rate = $E_{fu} / (DVR * C_t) = 1.85\%$

N = 2.13 ~ 2 (rounded off to nearest highest whole number)

Refrigerant refill = 0.28 kg

According to the breakdown of module B as defined in the product specific rules (PSR-0013-ed3.1-EN-2025 10 20), stages B3 (repair), B4 (replacement), and B5 (refurbishment) are not applicable to this assessment. Additionally, water consumption during the use phase is considered negligible, therefore, stage B7 (water use) is excluded from the evaluation.

The product's operational energy use and environmental impact have been assessed over its service life of 17 years, with distribution to customers across global markets. Energy consumption during the operational phase is calculated using the formula specified in PSR-0013-ed3.1-EN-2025 10 20. The standard duct consumes energy during its use phase, and the typical scenario for calculating environmental impacts related to this energy consumption is defined in PSR-0013-ed3.1-EN-2025 10 20.

The energy consumption C_{tot} in the use stage is calculated in heating and cooling mode use as follow:

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$$C_{tot}(in kWh) = \left(\frac{P_h}{SCOP * \left(1 + \frac{Fregul}{100}\right)} * t_{heating} + \frac{P_c}{SEER} * t_{cooling} \right) * RLT$$

- Where:
- C_{tot} = total energy consumption = 49466.67 kWh
- P_h = Heating capacity of the equipment (per European eco-design standards) = 7 kW
- P_c = Cooling capacity of the equipment (per European eco-design standards) = 6.7 kW
- SCOP = Seasonal Coefficient of Performance for heating (EN 14825) = 4
- SEER = Seasonal Energy Efficiency Ratio for cooling (EN 14825) = 5.1
- $t_{heating}$ = Equivalent active mode hours in heating mode = 1400 hrs
- $t_{cooling}$ = Equivalent active mode hours in cooling mode = 350 hrs
- RLT = Reference lifetime of the equipment = 17 years
- F_{regul} = 4 (class VI) by default for heat pump x/water and 0 for heat pumps or air conditioners x/air
- Technology = Air/Air P <12kW

- Energy model

Market for electricity, low voltage (Reference product: electricity, low voltage), France; Ecoinvent v3.11.

1.10 End of life



The deconstruction phase mainly involves manual labor, which has minimal environmental impact as per EN 15804:2012+A2:2019. The standard duct is assumed to be transported by truck to a waste facility 1000 km away for dismantling. At the end of a product's life, materials are disposed of through recycling, landfill, or incineration, with rates sourced from PCR-ed4-EN-2021-09-06 and other credible references. Steel is efficiently managed, with 80% recycled and 20% landfilled. Aluminum follows with 70% recycling and 30% landfill, while copper is recycled at 60%, with the remaining 40% going to landfill. Other ferrous metals like cast iron also show strong recycling performance at 80%, with 20% landfilled. In contrast, polypropylene (PP), a commonly used plastic, has a lower recycling rate of 20%, with 40% landfilled and 40% incinerated without energy recovery. Rubber is not recycled and is split evenly between landfill and incineration (50% each). Printed Circuit Boards (PCBs), based on the PCB E-Scrap Market report, have a low recycling rate of 12.5%, with 87.5% ending up in landfill. Oil, as referenced in PCR-ed4-EN-2021-09-06 is entirely incinerated (100%) without energy recovery. Lastly, cardboard, according to Packaging Dive, is highly sustainable with 93% recycled and 7% incinerated, with no landfill disposal. This data underscores the need for improved recycling systems, especially for plastics and electronics, while highlighting the success of metal and packaging material recovery.

1.11 Benefits and loads beyond the system boundary D

Module D reports the potential environmental benefits and burdens occurring beyond the system boundary, in accordance with EN 15804+A2, PEP-PCR ed4 and PSR-0013-ed3.1.

Module D includes the substitution benefits resulting from the production of secondary materials obtained during end-of-life processing (C3) and the recycling of packaging waste from A5. Recycled metals such as steel, aluminium, copper and cast iron are assumed to replace equivalent quantities of virgin material production. Similarly, recycled fractions of plastics, PCB, and cardboard replace corresponding primary production.

Only the benefits from recycling and energy recovery are included. Materials that are landfilled or incinerated without energy recovery do not generate credits. Refrigerant recovery and destruction do not result in any Module D benefits.

The burdens associated with waste collection, transport, sorting, and processing up to the point of producing a secondary material are included in Modules C1–C4. Module D reports only the net 'avoided impacts' of substituting virgin materials or primary energy with these recovered outputs. Therefore, Module D represents potential benefits in a hypothetical future system and does not modify the primary life-cycle results of the assessed product.

1.12 Technical description of the device

The Toshiba RAV-HM801BTP-E + RAV-GV801ATP-E standard duct unit is designed with a compact profile, featuring a low overall height of just 275 mm, making it ideal for installations with limited ceiling space. It supports an external fresh air supply of up to 15% of the nominal airflow, enhancing indoor air quality. The unit includes an integrated drain pump capable of discharging up to 85 cm, ensuring efficient condensate removal. For user convenience, it can be equipped with an external receiver kit for infrared remote control and is compatible with all cable remote controls. An optional redundancy box is available for enhanced reliability, and the unit features an automatic restart function to resume operation after a power outage.

Outdoor unit	Unit	RAV-GV1101ATP-E	RAV-GV1401ATP-E	RAV-GV1601AT(8)P-E	RAV-GV801ATP-E (Ref)	RAV-GM561ATP-E	RAV-GV561ATP-E	RAV-GM302ATP-E
Indoor unit		RAV-HM1101BTP-E	RAV-HM1401BTP-E	RAV-HM1601BTP-E	RAV-HM801BTP-E (Ref)	RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-HM301SDTY-E
Indoor unit								
Cooling capacity	kW	9.5	11.5	14	6.7	9.5	5	5

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Cooling range (min. - max.)	kW	3.0 - 11.2	3.0 - 12.0	3.0 - 16.0	1.5 - 8.0	3.0 - 11.2	1.5 - 5.6	1.50 - 5.60
EER	W/W	3	2.45	2.73	2.82	3.06	2.73	3.13
SEER	W/W	5.1	5.1	5.3	5.2	5.3	5.28	5.28
Energy efficiency class	C	A	-	-	A	A	A	A
Outdoor unit								
Heating capacity	kW	10	12.1	16	7.7	10	5.3	5.3
Heating range (min. - max.)	kW	3.0 - 13.0	3.0 - 16.0	3.0 - 18.0	1.5 - 9.0	3.0 - 13.0	1.5 - 6.3	1.50 - 6.30
COP	W/W	3.3	3.03	3.41	3.32	3.4	3.27	3.79
SCOP	W/W	3.8	3.8	3.9	4.13	3.8	4.08	4.08
Energy efficiency class	H	A	-	-	A+	A	A+	A+
Mass	Kgs	85	97	104	69.32	63	59	44

Outdoor unit	Unit	RAV-GM402ATP-E	RAV-GM562ATP-E	RAV-GP561ATW-E	RAV-GM802ATW-E	RAV-GP801ATW-E	RAV-GM901ATP-E	RAV-GM902ATW-E
Indoor unit		RAV-HM401SDTY-E	RAV-HM561SDTY-E	RAV-HM561SDTY-E	RAV-HM801SDTY-E	RAV-HM801SDTY-E	RAV-HM901BTP-E	RAV-HM901BTP-E
Indoor unit								
Cooling capacity	kW	3.6	5	5	6.7	7.1	8	8
Cooling range (min. - max.)	kW	0.9 - 4.0	1.50 - 5.60	1.20 - 5.60	1.90 - 8.00	1.90 - 8.00	1.80 - 8.80	1.80 - 8.80
EER	W/W	3.87	2.69	3.24	3.1	3.83	3.5	3.5
SEER	W/W	6.03	5.8	6.15	5.63	6.68	7.5	7.5
Energy efficiency class	C	A+	A++	A++	A+	A++	A+	A+
Outdoor unit								
Heating capacity	kW	4	5.3	5.6	7.7	8	9	9
Heating range (min. - max.)	kW	0.8 - 5.0	1.50 - 6.30	0.90 - 7.00	1.60 - 9.00	1.30 - 11.30	160 - 9.90	160 - 9.90
COP	W/W	4.12	3.53	3.56	3.44	3.77	4.12	4.12
SCOP	W/W	4	4	4.23	4	4.27	4.6	4.6
Energy efficiency class	H	A+	A+	A+	A+	A+	A+	A+
Mass	Kgs	49	59	64	69	96	87	88

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Outdoor unit	Unit	RAV-GM1101ATP-E	RAV-GM1102ATW-E	RAV-GP1101AT-E	RAV-GV1101AT8P-E	RAV-GM1101AT8P-E	RAV-GM1102AT8W-E	RAV-GP1101AT8-E
Indoor unit		RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E
Indoor unit								
Cooling capacity	kW	9.5	9.5	10	9.5	9.5	9.5	10
Cooling range (min. - max.)	kW	3.0 - 11.	3.0 - 11.2	3.0 - 11.2	3.00 - 11.20	3.00 - 11.20	3.00 - 11.20	2.50 - 12.00
EER	W/W	3.31	3.65	3.65	3.06	3.06	3.71	3.88
SEER	W/W	6.15	6.4	6.4	5.3	5.3	6	6.1
Energy efficiency class	C	A+	A++	A++	A	A	A	A+
Outdoor unit								
Heating capacity	kW	11.2	11.2	11.2	10	10	11.2	11.2
Heating range (min. - max.)	kW	3.0 - 13.0	3.0 - 13.0	3.0 - 13.0	3.00 - 13.0	3.00 - 13.0	3.00 - 13.0	2.40 - 15.60
COP	W/W	3.82	3.85	3.85	3.4	3.4	3.9	4.06
SCOP	W/W	4.28	4	4	3.8	3.8	3.92	4.19
Energy efficiency class	H	A+	A+	A+	A	A	A	A+
Mass	Kgs	108	126	145	101	106	126	136

Outdoor unit	Unit	RAV-GM1401ATP-E	RAV-GM1401ATP-E1	RAV-GM1402ATW-E	RAV-GP1401AT-E1	RAV-GV1401AT8P-E	RAV-GM1401AT8P-E	RAV-GM1402AT8W-E
Indoor unit		RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E
Indoor unit								
Cooling capacity	kW	12.1	12.1	12.1	12.5	12.1	12.1	12.1
Cooling range (min. - max.)	kW	3.0 - 13.2	3.0 - 13.2	3.0 - 13.2	3.10 - 14.00	3.00 - 14.00		3.00 - 13.20
EER	W/W	2.74	2.74	3.02	3.5	2.47		3.07
SEER	W/W	5.36	5.36	6.15	6.77	5.1	5.36	5.87
Energy efficiency class	C	A	A	-	-	-	-	-
Outdoor unit								
Heating capacity	kW	13	13	13	14	12.3	13	13
Heating range (min. - max.)	kW	3.0 - 16.0	3.0 - 16.0	3.00 - 16.00	2.60 - 16.50	3.00 - 16.00		3.00 - 16.00
COP	W/W	3.61	3.61	3.66	3.86	3		3.71
SCOP	W/W	4.19	4.19	3.92	4.29	3.8	4.19	3.84
Energy efficiency class	H	A	A	-	-	-	-	-
Mass	Kgs	106	106	126	145	101	106	125

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Outdoor unit	Unit	RAV-GV1601ATP-E	RAV-GV1601ATP-E1	RAV-GM1601ATP-E	RAV-GM1602ATW-E	RAV-GV1601AT8P-E1	RAV-GM561ATP-E1	RAV-GM562ATP-E
Indoor unit		RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM561BTP-E	RAV-HM561BTP-E
Indoor unit								
Cooling capacity	kW	13	13	14	14	13	5	5
Cooling range (min. - max.)	kW	3.00 - 14.00	3.00 - 14.00		3.00 - 15.00	3.00 - 15.00		1.50 - 5.60
EER	W/W	2.41	2.41		2.66	2.41		2.73
SEER	W/W	4.9	4.9	5.3	5.9	4.9	5.28	5.8
Energy efficiency class	C	-	-					A+
Outdoor unit								
Heating capacity	kW	13.5	13.5	16	16	13.5	5.3	5.3
Heating range (min. - max.)	kW	3.00 - 18.00	3.00 - 18.00		3.00 - 17.00	3.00 - 18.00		
COP	W/W	3.38	3.38		3.38	3.38		3.27
SCOP	W/W	4.15	4.15	3.9	4.05	4.15	4.08	4.11
Energy efficiency class	H	-	-					A+
Mass	Kgs	105	105	136	129	104	63	63

Outdoor unit	Unit	RAV-GP561ATW-E	RAV-GM801ATP-E	RAV-GM802ATW-E	RAV-GP801ATW-E	RAV-GM1602AT8W-E	RAV-GP1601AT8-E
Indoor unit		RAV-HM561BTP-E	RAV-HM801BTP-E	RAV-HM801BTP-E	RAV-HM801BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E
Indoor unit							
Cooling capacity	kW	5	6.7	6.7	7.1	14	14
Cooling range (min. - max.)	kW	1.50 - 5.60	1.90 - 8.00	1.90 - 8.00	1.90 - 8.00	3.00 - 15.00	2.60 - 16.00
EER	W/W	2.73	3.32	3.32	4.36	2.72	3.12
SEER	W/W	5.8	6.37	6.37	7.86	5.8	5.81
Energy efficiency class	C	A+	A++	A++	A++	-	
Outdoor unit							
Heating capacity	kW	5.3	7.7	7.7	8	16	16
Heating range (min. - max.)	kW		1.360 - 9.00	1.360 - 9.00	1.30 - 11.30	3.00 - 18.00	2.40 - 19.00
COP	W/W	3.27	3.77	3.77	4.32	3.43	3.5
SCOP	W/W	4.11	4.3	4.3	4.85	3.96	3.96
Energy efficiency class	H	A+	A+	A+	A++	-	-
Mass	Kgs	68	74	78	105	128	135

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1.13 Sales scenarios

Sales of the device are distributed as follows:

Region name	Shares in Sales (%)	
France	100	%

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

2.1 Reference product

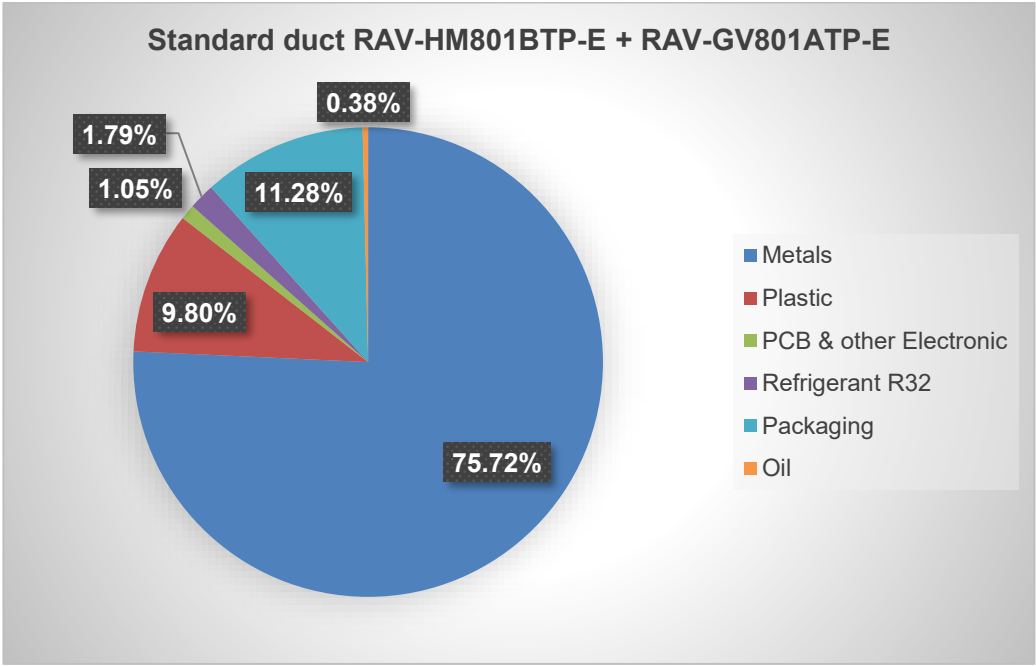
Modelled total weight with other necessary details:

PEP Category		Material Category	Weight in [kg]	Weight in [%]	Overall Percentage, %	Post-consumer material, weight-%	Biogenic material, kg C / declared unit	Biogenic material, kg C / functional unit
Metals		Steel	44.58	57.02%	75.72%	0.00	0.00	0.00
		Aluminum	7.06	9.03%		0.00	0.00	0.00
		Cast Iron	1.39	1.78%		0.00	0.00	0.00
		Copper	5.19	6.64%		0.00	0.00	0.00
		Magnet	0.34	0.43%		0.00	0.00	0.00
		Stainless Steel	0.64	0.82%		0.00	0.00	0.00
Plastics		Plastics	7.65	9.79%	9.80%	0.00	0.00	0.00
Others	Packaging	Paper, Cardboard	8.82	11.28%	14.49%	0.00	4.41	0.59
	Electronic	PCB and other Electronic	0.82	1.04%		0.00	0.00	0.00
	Oil	Oil	0.29	0.37%		0.00	0.00	0.00
	Miscellaneous	Miscellaneous	1.40	1.79%		0.00	0.00	0.00
Total			78.18	100.00%	100.00%	0.00	4.41	0.59

**1 kg biogenic carbon is equivalent to 44/12 kg of CO₂ (EN 16449:2014)

2 – CONSTITUENT MATERIALS

2.2 Constituent materials



3 – ENVIRONMENTAL IMPACTS

3.1 LCA impacts per Functional Unit

The impact results presented below were obtained using the methods defined in PCR-ed4-EN-2021-09-06 and PSR-0013-ed3.1-EN-2025 10 20. The results have been developed considering the supply of 1 kW of heating and hot water production. The real impact of the life cycle stages of the installed product in a real situation is to be calculated by the user of the result by multiplying the impact considered by the total heating capacity in kW.

CORE ENVIRONMENTAL IMPACT INDICATORS – EF 3.1

Impact Category	Unit	Total	Manufacturing	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	
GWP – total ¹	kg CO ₂ eq/FU	7.59E+02	7.02E+01	3.86E+00	2.45E+00	6.61E+02	3.78E+01	3.36E-01	MND	MND	MND	6.22E+02	0.00E+00	2.21E+01	0.00E+00	2.20E-01	5.13E+00	1.67E+01	-3.52E+01
GWP – fossil	kg CO ₂ eq/FU	7.59E+02	7.23E+01	3.86E+00	5.58E-02	6.61E+02	3.78E+01	3.36E-01	MND	MND	MND	6.22E+02	0.00E+00	2.21E+01	0.00E+00	2.20E-01	5.12E+00	1.67E+01	-3.50E+01
GWP – biogenic	kg CO ₂ eq/FU	0.00E+00	-2.39E+00	-1.25E-19	2.39E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP – LULUC	kg CO ₂ eq/FU	8.60E-01	2.16E-01	1.79E-03	2.81E-05	6.23E-01	0.00E+00	1.70E-04	MND	MND	MND	6.22E-01	0.00E+00	1.95E-02	0.00E+00	7.91E-05	1.93E-02	6.79E-05	-6.21E-02
Ozone depletion pot.	kg CFC-11eq/FU	2.29E-05	7.55E-07	6.47E-08	6.70E-10	2.20E-05	0.00E+00	2.03E-09	MND	MND	MND	2.20E-05	0.00E+00	7.23E-08	0.00E+00	4.38E-09	6.70E-08	9.14E-10	-2.22E-07
Acidification potential	mol H ⁺ eq/FU	5.54E+00	1.11E+00	6.79E-02	1.73E-04	4.34E+00	0.00E+00	1.70E-03	MND	MND	MND	4.34E+00	0.00E+00	2.37E-02	0.00E+00	4.58E-04	2.28E-02	4.97E-04	-5.20E-01
EP-freshwater ²	kg Peq/FU	3.69E-01	1.05E-01	1.82E-04	1.02E-05	2.61E-01	0.00E+00	1.87E-05	MND	MND	MND	2.61E-01	0.00E+00	2.79E-03	0.00E+00	1.48E-05	2.75E-03	2.39E-05	-4.27E-02
EP-marine	kg Neq/FU	1.01E+00	1.63E-01	1.69E-02	9.15E-05	8.27E-01	0.00E+00	3.37E-04	MND	MND	MND	8.27E-01	0.00E+00	5.56E-03	0.00E+00	1.10E-04	5.20E-03	2.51E-04	-7.38E-02
EP-terrestrial	mol Neq/FU	8.41E+00	1.31E+00	1.87E-01	4.64E-04	6.86E+00	0.00E+00	3.72E-03	MND	MND	MND	6.86E+00	0.00E+00	5.01E-02	0.00E+00	1.19E-03	4.68E-02	2.09E-03	-5.66E-01
POCP ("smog") ³	kg NMVOCeq/FU	2.82E+00	3.95E-01	5.40E-02	2.03E-04	2.35E+00	0.00E+00	1.28E-03	MND	MND	MND	2.35E+00	0.00E+00	1.66E-02	0.00E+00	7.62E-04	1.53E-02	6.05E-04	-1.71E-01
ADP-minerals & metals ⁴	kg Sbeq/FU	4.18E-02	1.18E-02	7.69E-06	3.63E-07	3.00E-02	0.00E+00	1.10E-06	MND	MND	MND	3.00E-02	0.00E+00	2.69E-05	0.00E+00	7.33E-07	2.58E-05	3.76E-07	-4.24E-03
ADP-fossil resources	MJ/FU	8.18E+04	8.65E+02	5.03E+01	5.62E-01	8.08E+04	0.00E+00	5.99E+00	MND	MND	MND	8.08E+04	0.00E+00	7.74E+01	0.00E+00	3.10E+00	7.35E+01	7.87E-01	-3.85E+02
Water use ⁵	m ³ e depr/FU	1.05E+03	2.62E+01	1.92E-01	1.35E-02	1.02E+03	0.00E+00	2.61E-02	MND	MND	MND	1.02E+03	0.00E+00	3.83E+00	0.00E+00	1.54E-02	3.73E+00	8.70E-02	-9.84E+00

MND abbreviation stands for Module Not Declared

1. GWP = Global Warming Potential

2. EP = Eutrophication potential. Required characterization 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. EF 3.1 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 – EF 3.1

Impact Category	Unit	Total	Manufacturing	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	
Particulate matter	Incidence /FU	4.75E-05	7.18E-06	1.87E-07	3.10E-09	3.96E-05	0.00E+00	1.35E-08	MND	MND	MND	3.96E-05	0.00E+00	4.69E-07	0.00E+00	1.63E-08	4.35E-07	1.74E-08	-3.03E-06
Ionizing radiation ⁶	kBq U235eq/FU	3.62E+03	4.01E+00	4.24E-02	3.11E-03	3.62E+03	0.00E+00	3.36E-03	MND	MND	MND	3.62E+03	0.00E+00	1.35E+00	0.00E+00	3.99E-03	1.34E+00	1.66E-03	-2.22E+00
Ecotoxicity (freshwater)	CTUeq/FU	1.96E+04	1.22E+04	5.10E+00	4.76E+00	4.42E+03	1.74E-03	3.20E-01	MND	MND	MND	4.42E+03	0.00E+00	2.95E+03	0.00E+00	4.12E-01	1.83E+02	2.77E+03	-4.09E+03
Human toxicity, cancer	CTUh/FU	6.65E-07	1.21E-07	7.45E-10	2.81E-11	5.25E-07	0.00E+00	1.57E-10	MND	MND	MND	5.24E-07	0.00E+00	1.86E-08	0.00E+00	3.70E-11	1.82E-08	3.63E-10	-5.49E-08
Human tox. non-cancer	CTUh/FU	3.46E-05	8.13E-06	2.13E-08	1.22E-09	2.64E-05	4.12E-11	1.17E-09	MND	MND	MND	2.64E-05	0.00E+00	8.68E-08	0.00E+00	1.96E-09	7.42E-08	1.07E-08	-3.47E-06
SQP ⁷	- /FU	5.61E+03	6.20E+02	1.63E+01	3.72E-01	4.89E+03	0.00E+00	7.68E-01	MND	MND	MND	4.88E+03	0.00E+00	9.32E+01	0.00E+00	1.87E+00	9.01E+01	1.31E+00	-2.78E+02

MND abbreviation stands for Module Not Declared

6. EF 3.1 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.

3 – ENVIRONMENTAL IMPACTS

USE OF NATURAL RESOURCES

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Renew. PER as energy ⁸	MJ/FU	8.62E+03	8.31E+01	6.17E-01	-2.05E+01	8.55E+03	0.00E+00	1.01E+00	MND	MND	MND	8.54E+03	0.00E+00	8.64E+00	0.00E+00	5.43E-02	8.54E+00	3.93E-02	-3.31E+01
Renew. PER as material	MJ/FU	3.27E+01	3.78E+01	0.00E+00	-2.10E+01	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	1.60E+01	0.00E+00	0.00E+00	1.60E+01	0.00E+00	-4.31E-01
Total use of renew. PER	MJ/FU	8.65E+03	1.21E+02	6.17E-01	-4.15E+01	8.55E+03	0.00E+00	1.01E+00	MND	MND	MND	8.54E+03	0.00E+00	2.46E+01	0.00E+00	5.43E-02	2.45E+01	3.93E-02	-3.36E+01
Non-re. PER as energy	MJ/FU	8.17E+04	8.18E+02	5.03E+01	5.62E-01	8.08E+04	0.00E+00	5.99E+00	MND	MND	MND	8.08E+04	0.00E+00	2.86E+01	0.00E+00	3.10E+00	5.23E+01	-2.68E+01	-3.78E+02
Non-re. PER as material	MJ/FU	1.66E+01	7.07E+00	0.00E+00	-1.71E-01	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	9.74E+00	0.00E+00	0.00E+00	9.74E+00	0.00E+00	-4.18E+01
Total use of non-re. PER	MJ/FU	8.18E+04	8.26E+02	5.03E+01	3.90E-01	8.08E+04	0.00E+00	5.99E+00	MND	MND	MND	8.08E+04	0.00E+00	3.84E+01	0.00E+00	3.10E+00	6.21E+01	-2.68E+01	-4.19E+02
Secondary materials	kg/FU	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ/FU	2.54E-01	2.09E-01	1.66E-04	5.14E-06	4.35E-02	0.00E+00	8.99E-06	MND	MND	MND	4.35E-02	0.00E+00	8.87E-04	0.00E+00	1.82E-05	8.49E-04	1.97E-05	-1.33E-01
Non-ren. secondary fuels	MJ/FU	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	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 /FU	2.54E+01	6.59E-01	5.03E-03	3.53E-05	2.46E+01	0.00E+00	1.73E-03	MND	MND	MND	2.46E+01	0.00E+00	9.60E-02	0.00E+00	4.22E-04	9.51E-02	4.91E-04	-2.48E-01

MND abbreviation stands for Module Not Declared

8) PER abbreviation stands for primary energy resources

END OF LIFE – WASTE

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Hazardous waste	kg/FU	6.75E+01	1.38E+01	6.96E-02	4.57E-03	5.01E+01	0.00E+00	4.76E-03	MND	MND	MND	5.01E+01	0.00E+00	3.44E+00	0.00E+00	4.51E-03	3.04E+00	3.96E-01	-1.01E+01
Non-hazardous waste	kg/FU	1.80E+03	4.14E+02	1.20E+00	3.00E-01	1.37E+03	0.00E+00	1.02E-01	MND	MND	MND	1.37E+03	0.00E+00	1.44E+01	0.00E+00	9.51E-02	1.29E+01	1.46E+00	-1.87E+02
Radioactive waste	kg/FU	1.04E+00	2.91E-03	1.05E-05	7.93E-07	1.04E+00	0.00E+00	8.63E-05	MND	MND	MND	1.04E+00	0.00E+00	3.46E-04	0.00E+00	9.93E-07	3.44E-04	4.14E-07	-1.18E-03

MND abbreviation stands for Module Not Declared

END OF LIFE – OUTPUT FLOWS

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Components for re-use	kg/FU	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	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/FU	8.19E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	7.03E+00	0.00E+00	0.00E+00	7.03E+00	0.00E+00	0.00E+00
Materials for energy rec	kg/FU	5.45E-01	0.00E+00	0.00E+00	6.34E-02	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	4.81E-01	0.00E+00	0.00E+00	0.00E+00	4.81E-01	0.00E+00
Exported energy	MJ/FU	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

MND abbreviation stands for Module Not Declared

ENVIRONMENTAL IMPACTS – TRACI 2.1

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ eq/FU	7.44E+02	7.18E+01	3.80E+00	1.25E-01	6.49E+02	3.31E+01	1.34E-01	MND	MND	MND	6.15E+02	0.00E+00	2.02E+01	0.00E+00	2.16E-01	5.10E+00	1.48E+01	-3.50E+01
Ozone Depletion	kg CFC-11eq/FU	2.37E-05	8.36E-07	6.82E-08	7.09E-10	2.28E-05	0.00E+00	2.15E-09	MND	MND	MND	2.28E-05	0.00E+00	7.62E-08	0.00E+00	4.63E-09	7.06E-08	9.64E-10	-2.49E-07
Acidification	kg SO ₂ eq/FU	4.49E+00	8.83E-01	5.76E-02	1.53E-04	3.53E+00	0.00E+00	5.65E-04	MND	MND	MND	3.53E+00	0.00E+00	2.00E-02	0.00E+00	3.90E-04	1.92E-02	4.88E-04	-4.18E-01
Eutrophication	kg Neq/FU	5.28E-01	1.70E-01	2.46E-03	1.36E-04	3.52E-01	0.00E+00	7.05E-05	MND	MND	MND	3.52E-01	0.00E+00	4.08E-03	0.00E+00	5.27E-05	3.90E-03	1.19E-04	-6.76E-02
POCP ("smog")	kg O ₃ eq/FU	4.61E+01	6.51E+00	1.10E+00	2.61E-03	3.82E+01	0.00E+00	1.41E-02	MND	MND	MND	3.82E+01	0.00E+00	2.90E-01	0.00E+00	8.34E-03	2.69E-01	1.22E-02	-2.93E+00
ADP-fossil	MJ/FU	8.09E+04	3.73E+01	5.04E+01	3.40E-01	8.08E+04	0.00E+00	1.87E+00	MND	MND	MND	8.08E+04	0.00E+00	-6.80E+00	0.00E+00	3.10E+00	-1.01E+01	2.05E-01	0.00E+00

MND abbreviation stands for Module Not Declared

3 – ENVIRONMENTAL IMPACTS

3.2 LCA impacts per Declared Unit

In the scope of building Life Cycle Analysis, the environmental impacts of the entire product over its reference service life should be considered, not the principal results of the PEP which correspond to the functional unit of the product. It is therefore necessary to multiply the principal results of the PEP by the FU Factor of the reference product, and if necessary, apply the extrapolation rules.

CORE ENVIRONMENTAL IMPACT INDICATORS – EF 3.1

Impact Category	Unit	Total	Manufact- uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
GWP – total ¹	kg CO ₂ eq	5.27E+03	4.87E+02	2.68E+01	1.70E+01	4.58E+03	2.62E+02	2.33E+00	MND	MND	MND	4.32E+03	0.00E+00	1.53E+02	0.00E+00	1.53E+00	3.56E+01	1.16E+02	-2.44E+02
GWP – fossil	kg CO ₂ eq	5.27E+03	5.02E+02	2.68E+01	3.87E-01	4.58E+03	2.62E+02	2.33E+00	MND	MND	MND	4.32E+03	0.00E+00	1.53E+02	0.00E+00	1.53E+00	3.55E+01	1.16E+02	-2.43E+02
GWP – biogenic	kg CO ₂ eq	0.00E+00	-1.66E+01	-8.67E-19	1.66E+01	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP – LULUC	kg CO ₂ eq	5.97E+00	1.50E+00	1.24E-02	1.95E-04	4.32E+00	0.00E+00	1.18E-03	MND	MND	MND	4.32E+00	0.00E+00	1.35E-01	0.00E+00	5.49E-04	1.34E-01	4.71E-04	-4.31E-01
Ozone depletion pot.	kg CFC-11eq	1.59E-04	5.24E-06	4.49E-07	4.65E-09	1.53E-04	0.00E+00	1.41E-08	MND	MND	MND	1.53E-04	0.00E+00	5.02E-07	0.00E+00	3.04E-08	4.65E-07	6.34E-09	-1.54E-06
Acidification potential	mol H ⁺ eq	3.84E+01	7.70E+00	4.71E-01	1.20E-03	3.01E+01	0.00E+00	1.18E-02	MND	MND	MND	3.01E+01	0.00E+00	1.65E-01	0.00E+00	3.18E-03	1.58E-01	3.45E-03	-3.61E+00
EP- freshwater ²	kg P eq	2.56E+00	7.29E-01	1.26E-03	7.10E-05	1.81E+00	0.00E+00	1.30E-04	MND	MND	MND	1.81E+00	0.00E+00	1.94E-02	0.00E+00	1.03E-04	1.91E-02	1.66E-04	-2.96E-01
EP-marine	kg N eq	7.03E+00	1.13E+00	1.17E-01	6.35E-04	5.74E+00	0.00E+00	2.34E-03	MND	MND	MND	5.74E+00	0.00E+00	3.86E-02	0.00E+00	7.64E-04	3.61E-02	1.74E-03	-5.12E-01
EP-terrestrial	mol N eq	5.84E+01	9.10E+00	1.30E+00	3.22E-03	4.76E+01	0.00E+00	2.58E-02	MND	MND	MND	4.76E+01	0.00E+00	3.48E-01	0.00E+00	8.24E-03	3.25E-01	1.45E-02	-3.93E+00
POCP ("smog") ³	kg NMVOC eq	1.95E+01	2.74E+00	3.75E-01	1.41E-03	1.63E+01	0.00E+00	8.90E-03	MND	MND	MND	1.63E+01	0.00E+00	1.15E-01	0.00E+00	5.29E-03	1.06E-01	4.20E-03	-1.19E+00
ADP-minerals & metals ⁴	kg Sb eq	2.90E-01	8.19E-02	5.34E-05	2.52E-06	2.08E-01	0.00E+00	7.63E-06	MND	MND	MND	2.08E-01	0.00E+00	1.87E-04	0.00E+00	5.09E-06	1.79E-04	2.61E-06	-2.94E-02
ADP-fossil resources	MJ	5.68E+05	6.00E+03	3.49E+02	3.90E+00	5.61E+05	0.00E+00	4.16E+01	MND	MND	MND	5.61E+05	0.00E+00	5.37E+02	0.00E+00	2.15E+01	5.10E+02	5.46E+00	-2.67E+03
Water use ⁵	m ³ e depr.	7.32E+03	1.82E+02	1.33E+00	9.39E-02	7.11E+03	0.00E+00	1.81E-01	MND	MND	MND	7.11E+03	0.00E+00	2.66E+01	0.00E+00	1.07E-01	2.59E+01	6.04E-01	-6.83E+01

MND abbreviation stands for Module Not Declared

1. GWP = Global Warming Potential

2. EP = Eutrophication potential. Required characterization 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. EF 3.1 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 – EF 3.1

Impact Category	Unit	Total	Manufact- uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Particulate matter	Incidence	3.29E-04	4.98E-05	1.30E-06	2.15E-08	2.75E-04	0.00E+00	9.36E-08	MND	MND	MND	2.75E-04	0.00E+00	3.25E-06	0.00E+00	1.13E-07	3.02E-06	1.21E-07	-2.10E-05
Ionizing radiation ⁶	kBq U235 eq	2.51E+04	2.78E+01	2.94E-01	2.16E-02	2.51E+04	0.00E+00	2.33E-02	MND	MND	MND	2.51E+04	0.00E+00	9.37E+00	0.00E+00	2.77E-02	9.33E+00	1.15E-02	-1.54E+01
Ecotoxicity (freshwater)	CTUeq	1.36E+05	8.48E+04	3.54E+01	3.30E+01	3.07E+04	1.21E-02	2.22E+00	MND	MND	MND	3.07E+04	0.00E+00	2.05E+04	0.00E+00	2.86E+00	1.27E+03	1.92E+04	-2.84E+04
Human toxicity, cancer	CTUh	4.62E-06	8.43E-07	5.17E-09	1.95E-10	3.64E-06	0.00E+00	1.09E-09	MND	MND	MND	3.64E-06	0.00E+00	1.29E-07	0.00E+00	2.57E-10	1.26E-07	2.52E-09	-3.81E-07
Human tox. non-cancer	CTUh	2.40E-04	5.64E-05	1.48E-07	8.48E-09	1.83E-04	2.86E-10	8.14E-09	MND	MND	MND	1.83E-04	0.00E+00	6.03E-07	0.00E+00	1.36E-08	5.15E-07	7.40E-08	-2.41E-05
SQP ⁷	-	3.90E+04	4.30E+03	1.13E+02	2.58E+00	3.39E+04	0.00E+00	5.33E+00	MND	MND	MND	3.39E+04	0.00E+00	6.47E+02	0.00E+00	1.30E+01	6.25E+02	9.11E+00	-1.93E+03

MND abbreviation stands for Module Not Declared

6. EF 3.1 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

3 – ENVIRONMENTAL IMPACTS

USE OF NATURAL RESOURCES

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Renew. PER as energy ⁸	MJ	5.98E+04	5.77E+02	4.28E+00	-1.42E+02	5.93E+04	0.00E+00	7.03E+00	MND	MND	MND	5.93E+04	0.00E+00	6.00E+01	0.00E+00	3.77E-01	5.93E+01	2.73E-01	-2.30E+02
Renew. PER as material	MJ	2.27E+02	2.62E+02	0.00E+00	-1.46E+02	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	1.11E+02	0.00E+00	0.00E+00	1.11E+02	0.00E+00	-2.99E+00
Total use of renew. PER	MJ	6.00E+04	8.39E+02	4.28E+00	-2.88E+02	5.93E+04	0.00E+00	7.03E+00	MND	MND	MND	5.93E+04	0.00E+00	1.71E+02	0.00E+00	3.77E-01	1.70E+02	2.73E-01	-2.33E+02
Non-re. PER as energy	MJ	5.67E+05	5.68E+03	3.49E+02	3.90E+00	5.61E+05	0.00E+00	4.16E+01	MND	MND	MND	5.61E+05	0.00E+00	1.99E+02	0.00E+00	2.15E+01	3.63E+02	-1.86E+02	-2.62E+03
Non-re. PER as material	MJ	1.16E+02	4.91E+01	0.00E+00	-1.19E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	6.76E+01	0.00E+00	0.00E+00	6.76E+01	0.00E+00	-2.90E+02
Total use of non-re. PER	MJ	5.67E+05	5.73E+03	3.49E+02	2.71E+00	5.61E+05	0.00E+00	4.16E+01	MND	MND	MND	5.61E+05	0.00E+00	2.67E+02	0.00E+00	2.15E+01	4.31E+02	-1.86E+02	-2.91E+03
Secondary materials	kg	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ	1.76E+00	1.45E+00	1.15E-03	3.57E-05	3.02E-01	0.00E+00	6.24E-05	MND	MND	MND	3.02E-01	0.00E+00	6.15E-03	0.00E+00	1.26E-04	5.89E-03	1.37E-04	-9.20E-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	MND	MND	MND	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	1.76E+02	4.57E+00	3.49E-02	2.45E-04	1.71E+02	0.00E+00	1.20E-02	MND	MND	MND	1.71E+02	0.00E+00	6.66E-01	0.00E+00	2.93E-03	6.60E-01	3.41E-03	-1.72E+00

MND abbreviation stands for Module Not Declared

8. PER abbreviation stands for primary energy resources

END OF LIFE – WASTE

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Hazardous waste	kg	4.68E+02	9.59E+01	4.83E-01	3.17E-02	3.48E+02	0.00E+00	3.30E-02	MND	MND	MND	3.48E+02	0.00E+00	2.39E+01	0.00E+00	3.13E-02	2.11E+01	2.75E+00	-7.01E+01
Non-hazardous waste	kg	1.25E+04	2.87E+03	8.33E+00	2.08E+00	9.54E+03	0.00E+00	7.08E-01	MND	MND	MND	9.54E+03	0.00E+00	1.00E+02	0.00E+00	6.60E-01	8.94E+01	1.01E+01	-1.30E+03
Radioactive waste	kg	7.23E+00	2.02E-02	7.27E-05	5.50E-06	7.21E+00	0.00E+00	5.99E-04	MND	MND	MND	7.21E+00	0.00E+00	2.40E-03	0.00E+00	6.89E-06	2.39E-03	2.87E-06	-8.16E-03

MND abbreviation stands for Module Not Declared

END OF LIFE – OUTPUT FLOWS

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			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	MND	MND	MND	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	5.68E+01	0.00E+00	0.00E+00	8.03E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	4.88E+01	0.00E+00	0.00E+00	4.88E+01	0.00E+00	0.00E+00
Materials for energy rec	kg	3.78E+00	0.00E+00	0.00E+00	4.40E-01	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	0.00E+00	3.34E+00	0.00E+00	0.00E+00	0.00E+00	3.34E+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	MND	MND	MND	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 abbreviation stands for Module Not Declared

ENVIRONMENTAL IMPACTS – TRACI 2.1

Impact Category	Unit	Total	Manufact-uring	Distribution & Installation		B1-B7	Use							C1-C4	End of Life				Benefits and Loads
			A1-A3	A4	A5		B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ eq	5.17E+03	4.98E+02	2.64E+01	8.67E-01	4.50E+03	2.30E+02	9.33E-01	MND	MND	MND	4.27E+03	0.00E+00	1.40E+02	0.00E+00	1.50E+00	3.54E+01	1.03E+02	-2.43E+02
Ozone Depletion	kg CFC-11eq	1.65E-04	5.80E-06	4.73E-07	4.92E-09	1.58E-04	0.00E+00	1.49E-08	MND	MND	MND	1.58E-04	0.00E+00	5.29E-07	0.00E+00	3.21E-08	4.90E-07	6.69E-09	-1.73E-06
Acidification	kg SO ₂ eq	3.12E+01	6.13E+00	4.00E-01	1.06E-03	2.45E+01	0.00E+00	3.92E-03	MND	MND	MND	2.45E+01	0.00E+00	1.39E-01	0.00E+00	2.71E-03	1.33E-01	3.39E-03	-2.90E+00
Eutrophication	kg N eq	3.67E+00	1.18E+00	1.71E-02	9.41E-04	2.44E+00	0.00E+00	4.89E-04	MND	MND	MND	2.44E+00	0.00E+00	2.83E-02	0.00E+00	3.66E-04	2.71E-02	8.29E-04	-4.69E-01
POCP ("smog")	kg O ₃ eq	3.20E+02	4.52E+01	7.63E+00	1.81E-02	2.65E+02	0.00E+00	9.76E-02	MND	MND	MND	2.65E+02	0.00E+00	2.01E+00	0.00E+00	5.79E-02	1.87E+00	8.47E-02	-2.03E+01
ADP-fossil	MJ	5.62E+05	2.59E+02	3.50E+02	2.36E+00	5.61E+05	0.00E+00	1.30E+01	MND	MND	MND	5.61E+05	0.00E+00	-4.72E+01	0.00E+00	2.15E+01	-7.01E+01	1.42E+00	0.00E+00

MND abbreviation stands for Module Not Declared

4 – EXTRAPOLATION TO OTHER SIZES IN THE RANGE

4.1 Extrapolation Coefficient

The products mentioned in the LCA report, belong to the same homogeneous environmental family as the reference product. The group of products shall have the following characteristics:

- Same main functionality,
- Same product standards,
- Similar manufacturing technology: same type of materials and manufacturing processes.

The extrapolation coefficients for similar commercial references are as follows

Outdoor unit		RAV- GV1101ATP-E	RAV- GV1401ATP-E	RAV- GV1601AT(8)P-E	RAV-GM561ATP-E	RAV- GV561ATP-E	RAV-GV801ATP-E- Ref
Stages/Models/Indoor unit		RAV- HM1101BTP-E	RAV- HM1401BTP-E	RAV- HM1601BTP-E	RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-HM801BTP-E- Ref
Functional Unit	Manufacturing stage	0.85	0.79	0.74	1.23	1.16	1.00
	Distribution stage	0.85	0.79	0.74	1.23	1.16	1.00
	Installation stage	0.71	0.58	0.52	1.34	1.34	1.00
	B1 Stage	0.52	0.43	0.33	2.08	2.08	1.00
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	1.00	1.21	0.89	0.94	0.94	1.00
	C stage	0.86	0.82	0.77	1.22	1.14	1.00
	D stage	0.85	0.79	0.74	1.23	1.16	1.00
Declared Unit	Manufacturing stage	1.20	1.35	1.44	0.92	0.87	1.00
	Distribution stage	1.20	1.35	1.44	0.92	0.87	1.00
	Installation stage	0.82	0.71	0.67	1.10	1.17	1.00
	B1 Stage	0.74	0.74	0.64	1.56	1.56	1.00
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	1.42	2.08	1.72	0.70	0.70	1.00
	C stage	1.23	1.40	1.50	0.91	0.85	1.00
	D stage	1.20	1.35	1.44	0.92	0.87	1.00

Outdoor unit		RAV- GM302ATP-E	RAV- GM402ATP-E	RAV- GM562ATP-E	RAV- GP561ATW-E	RAV- GM802ATW-E	RAV- GP801ATW-E	RAV- GM901ATP-E	RAV- GM902ATW-E	RAV- GM1101ATP-E
Stages/Models/Indoor unit		RAV- HM301SDTY-E	RAV- HM401SDTY-E	RAV- HM561SDTY-E	RAV- HM561SDTY-E	RAV- HM801SDTY-E	RAV- HM801SDTY-E	RAV- HM901BTP-E	RAV- HM901BTP-E	RAV- HM1101BTP-E
Functional Unit	Manufacturing stage	1.81	1.38	1.16	1.25	1.00	1.27	1.03	1.04	1.00
	Distribution stage	1.81	1.38	1.16	1.25	1.00	1.27	1.03	1.04	1.00
	Installation stage	2.68	1.86	1.34	1.34	1.00	0.94	0.84	0.84	0.67
	B1 Stage	6.25	2.90	2.08	1.39	0.74	1.02	0.59	0.62	0.45
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.83	0.76	0.73	0.72	0.79	0.71	0.68	0.68	0.75
	C stage	1.70	1.32	1.14	1.24	1.00	1.31	1.05	1.06	1.04
	D stage	1.81	1.38	1.16	1.25	1.00	1.27	1.03	1.04	1.00
Declared Unit	Manufacturing stage	0.68	0.74	0.87	0.93	1.00	1.34	1.23	1.24	1.49
	Distribution stage	0.68	0.74	0.87	0.93	1.00	1.34	1.23	1.24	1.49
	Installation stage	1.58	1.41	1.17	1.08	1.00	0.72	0.80	0.79	0.64
	B1 Stage	2.33	1.56	1.56	1.04	0.74	1.08	0.70	0.74	0.67
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.31	0.41	0.54	0.54	0.79	0.76	0.81	0.81	1.11
	C stage	0.63	0.71	0.85	0.92	1.00	1.38	1.26	1.27	1.56
	D stage	0.68	0.74	0.87	0.93	1.00	1.34	1.23	1.24	1.49

4 – EXTRAPOLATION TO OTHER SIZES IN THE RANGE

Outdoor unit		RAV-GM1102ATW-E	RAV-GP1101AT-E	RAV-GV1101AT8P-E	RAV-GM1101AT8P-E	RAV-GM1102AT8W-E	RAV-GP1101AT8-E	RAV-GM1401ATP-E	RAV-GM1401ATP-E1	RAV-GM1402ATW-E
Stages/Models/Indoor unit		RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1101BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-HM1401BTP-E
Functional Unit	Manufacturing stage	1.22	1.32	0.99	1.04	1.22	1.24	0.81	0.81	0.96
	Distribution stage	1.22	1.32	0.99	1.04	1.22	1.24	0.81	0.81	0.96
	Installation stage	0.71	0.67	0.71	0.71	0.71	0.67	0.55	0.55	0.55
	B1 Stage	0.41	0.30	0.58	0.47	0.41	0.36	0.37	0.37	0.32
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.79	0.70	0.77	0.78	0.81	0.73	0.72	0.72	0.75
	C stage	1.28	1.40	1.03	1.08	1.28	1.31	0.85	0.85	1.01
	D stage	1.22	1.32	0.99	1.04	1.22	1.24	0.81	0.81	0.96
Declared Unit	Manufacturing stage	1.73	1.97	1.41	1.47	1.73	1.85	1.47	1.47	1.73
	Distribution stage	1.73	1.97	1.41	1.47	1.73	1.85	1.47	1.47	1.73
	Installation stage	0.55	0.48	0.69	0.65	0.55	0.51	0.65	0.65	0.55
	B1 Stage	0.58	0.45	0.82	0.67	0.58	0.54	0.67	0.67	0.58
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	1.12	1.04	1.09	1.10	1.15	1.09	1.30	1.30	1.35
	C stage	1.82	2.09	1.46	1.53	1.82	1.96	1.53	1.53	1.82
	D stage	1.73	1.97	1.41	1.47	1.73	1.85	1.47	1.47	1.73

Outdoor unit		RAV-GP1401AT-E1	RAV-GV1401AT8P-E	RAV-HM1401BTP-E	RAV-GM1402AT8W-E	RAV-GV1601ATP-E	RAV-GV1601ATP-E1	RAV-GM1601ATP-E	RAV-GM1602ATW-E	RAV-GV1601AT8P-E1
Stages/Models/Indoor unit		RAV-HM1401BTP-E	RAV-HM1401BTP-E	RAV-GM1401AT8P-E	RAV-HM1401BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E
Functional Unit	Manufacturing stage	1.06	0.78	0.81	0.95	0.75	0.75	0.96	0.84	0.74
	Distribution stage	1.06	0.78	0.81	0.95	0.75	0.75	0.96	0.84	0.74
	Installation stage	0.54	0.55	0.55	0.55	0.52	0.52	0.52	0.48	0.52
	B1 Stage	0.24	0.41	0.37	0.32	0.33	0.33	0.30	0.28	0.33
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.71	0.75	0.72	0.76	0.71	0.71	0.71	0.77	0.71
	C stage	1.12	0.81	0.85	1.00	0.78	0.78	1.01	0.89	0.77
	D stage	1.06	0.78	0.81	0.95	0.75	0.75	0.96	0.84	0.74
Declared Unit	Manufacturing stage	1.97	1.41	1.47	1.71	1.46	1.46	1.85	1.76	1.44
	Distribution stage	1.97	1.41	1.47	1.71	1.46	1.46	1.85	1.76	1.44
	Installation stage	0.48	0.69	0.65	0.55	0.66	0.66	0.51	0.54	0.67
	B1 Stage	0.45	0.74	0.67	0.58	0.64	0.64	0.58	0.58	0.64
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	1.32	1.35	1.30	1.38	1.38	1.38	1.38	1.61	1.38
	C stage	2.09	1.46	1.53	1.80	1.51	1.51	1.96	1.86	1.50
	D stage	1.97	1.41	1.47	1.71	1.46	1.46	1.85	1.76	1.44

4 – EXTRAPOLATION TO OTHER SIZES IN THE RANGE

Outdoor unit		RAV-GM561ATP-E1	RAV-GM562ATP-E	RAV-HM561BTP-E	RAV-GM801ATP-E	RAV-GM802ATW-E	RAV-GP801ATW-E	RAV-GM1602AT8W-E	RAV-GP1601AT8-E
Stages/Models/Indoor unit		RAV-HM561BTP-E	RAV-HM561BTP-E	RAV-GP561ATW-E	RAV-HM801BTP-E	RAV-HM801BTP-E	RAV-HM801BTP-E	RAV-HM1601BTP-E	RAV-HM1601BTP-E
Functional Unit	Manufacturing stage	1.23	1.23	1.32	1.06	1.11	1.37	0.84	0.88
	Distribution stage	1.23	1.23	1.32	1.06	1.11	1.37	0.84	0.88
	Installation stage	1.34	1.34	1.34	1.00	1.00	0.94	0.48	0.48
	B1 Stage	2.08	2.08	1.39	1.08	0.74	1.02	0.28	0.26
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.94	0.71	0.73	0.73	0.73	0.63	0.81	0.81
	C stage	1.22	1.22	1.31	1.07	1.13	1.43	0.88	0.93
	D stage	1.23	1.23	1.32	1.06	1.11	1.37	0.84	0.88
Declared Unit	Manufacturing stage	0.92	0.92	0.98	1.06	1.11	1.46	1.75	1.84
	Distribution stage	0.92	0.92	0.98	1.06	1.11	1.46	1.75	1.84
	Installation stage	1.10	1.10	1.02	0.94	0.89	0.66	0.54	0.51
	B1 Stage	1.56	1.56	1.04	1.08	0.74	1.08	0.58	0.54
	B2 stage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	B6 stage	0.70	0.53	0.54	0.73	0.73	0.66	1.68	1.68
	C stage	0.91	0.91	0.98	1.07	1.13	1.51	1.85	1.95
	D stage	0.92	0.92	0.98	1.06	1.11	1.46	1.75	1.84

The extrapolation coefficients are given for the environmental impact of the functional unit, i.e., the emission of 1 kW of cooling capacity. For each stage of the life cycle, the environmental impacts of the product in question are calculated by multiplying the impacts of the declaration corresponding to the reference product by the extrapolation coefficient.

5 – DECLARATION AND CONTACT INFORMATION

5.1 Declaration

Registration number: TACE-00006-V01.01-EN	Drafting rules: « PEP-PCR-ed4-EN-2021 09 06 » Supplemented by « PSR-0013-ed3.1-EN-2025 10 20»
Vérifier accreditation number: VH42	Information and reference documents: www.pep-ecopassport.org
Date of issue: 07-2026	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 NF C08-100-1:2016 and EN 50693 :2019 or NF E38-500:2022	
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"	



5.2 Contact information

The illustrations in this document are provided for information only and do not form part of any sales offer or contact.
The manufacturer reserves the right to change any product specifications without notice.

PEP Owner

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5.3 References

1. EN 14511 – Air Conditioners, Heat Pumps, and Chillers Performance Standard.
2. EN 14825 – Seasonal Performance and Part-Load Testing Standard.
3. EN 15804+A2 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.
4. EN 16147--Heat pumps with electrically driven compressors.
5. F-Gas-European regulation n° 517/2014 relating to fluorinated greenhouse gases.
6. ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations Principles and procedures.
7. ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
8. ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
9. ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.
10. PCR-ed4-EN-2021 09 06; Product Category Rules for Electrical, Electronic and HVAC-R Products.
11. PSR-0013-ed3.1-EN-2025 10 20; SPECIFIC RULES FOR THERMODYNAMIC GENERATORS WITH ELECTRIC COMPRESSION FOR SPACE HEATING AND/OR COOLING AND/OR THE PRODUCTION OF DOMESTIC HOT WATER.
12. Regulation (EU) 1516/2007- REGULATION (EC) No 1516/2007 OF THE COMMISSION dated 19 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council.
13. Regulation (EU) No. 813/2013- REGULATION (EU) No. 813/2013 of the Commission dated 2 August 2013 in application of Directive 2009/125/EC of the European Parliament.