PRODUCT ENVIRONMENTAL PROFILE

R-32

AQUACIAT[POWER] LD

Nominal cooling capacity 170-940 kW

ErP READY 2021

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1. General Information

1.1 - Product description

Product family

Liquid chiller

Technical description

AQUACIAT POWER units are packaged machines supplied as standard with the following components:
- Hermetic SCROLL compressors
- Brazed plate condenser or evaporator water type heat exchanger
- Air-cooled exchanger, all-aluminium micro-channel condenser (LD) or evaporator with copper tube coil, aluminium fins (ILD) with axial fan motor assembly
- Electrical power and remote control cabinet:
  - 400 V-3 ph-50 Hz general power supply (+/-10%) + Earth
  - transformer fitted as standard on the machine for supplying the remote control circuit with 24 V
- Connect Touch electronic control module
- Casing for outdoor installation

Category

Thermodynamic generators with electric compression for room cooling.

Reference product

The most representative product in the studied range is the AQUACIAT POWER LD1100R with the high seasonal energy efficiency option.

1- .2 Functional unit

Producing 1 kW of cooling, based on the appropriate usage scenario defined in standard EN 14825 and throughout the product's reference service life (RSL).

The PEP was created using a cooling capacity value of 1 kW. The actual impact of the life cycle stages of the product when installed in a real-life situation should be calculated by the user of the PEP by multiplying the theoretical impact by the nominal cooling capacity in kW.

2. Environmental information

2.1 - Life cycle analysis methodology

Production

The Life Cycle Analysis on which this Product Environmental Profile (PEP) is based was conducted with respect to the criteria imposed by PCR–ed3FR-FR-2015 04 02 and PSR-0013-ed2.0-FR-2019 12 06 of the PEP ecopassport® programme

The environmental analysis was conducted for the whole of the following life cycle: production, distribution, installation, use and end of life.

Energy model

The origin of the electricity consumed by the production site is 100% hydraulic.

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 AQUACIAT^POWER LD product is designed on a CARRIER site which holds the following certifications: ISO 14001, ISO 50001.

Distribution

Energy model

No energy resources are used at this stage, since the transport models already include fuel.

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 description of each product.

Installation

Energy model

No energy resources are used at this stage, since the transport models already include fuel.

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.

Use

Energy model

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 performance (SEER – Seasonal Energy Efficiency Ratio) of the liquid chiller is characterised by taking into account the operation time according to the load rate of the product after a typical 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 "Sales scenario" 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 air-to-water chiller > 12 kW is 600 hrs/year.

End of life

The AQUACIAT^POWER LD range contains components (PCBs, LCD screen, batteries) that must be separated from the waste flow to optimise end-of-life processing. They are processed using the specific Eco'DEEE method.

CARRIER partners the Eco-systèmes pro collection organisation, which dismantles our machines in France at the end of their life.

Energy model

No energy resources are used at this stage, since the transport models already include fuel.

3. Reference product LD1100R

3.1 - Product description

In accordance with the documents that provide the framework for the life cycle analysis, the reference service life (RSL) was set on the basis of the target customers.

The environmental indicators are normalised to the functional unit by dividing by the machine capacity.

Capacity in heating mode: - SCOP: - Reference Service Life: 22 years

Capacity in cooling mode: 271.00 kW SEER: 4.99 Customer type: Residential sector collective housing/service sector

Fluid emission level: 0.53% of total load/year

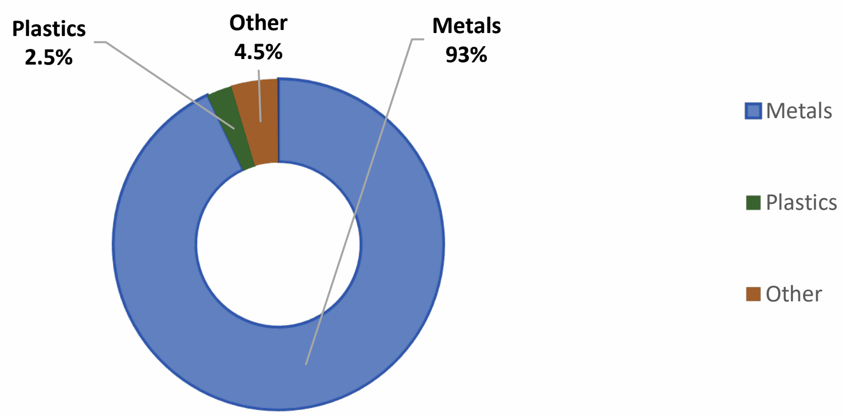
Fluid type: R32 (GWP = 675 tCO_2eq)

3.2 - Component materials

Actual mass of the unit: 1565.00 kg

Total modelled mass: 1547.62 kg, i.e. a total of 98.89% of the total mass including the product, its packaging and the additional components supplied with the reference product.

PEP material category	Material	Mass (kg)
Metals	Steel	554.79
Metals	35% recycled steel	481.79
Metals	Aluminium	196.32
Metals	Copper	142.62
Metals	Cast iron	50.48
Metals	Zinc	12.30
Plastics	Polyurethane glue	12.01
Plastics	Polypropylene (PP)	11.74
Plastics	Ethylene propylene diene copolymer (EPDM)	9.92
Plastics	Polyamide 6.6 resin (PA6.6)	4.24
Plastics	Silicone rubber	1.07
Other	Refrigerant	24.4
Other	Solid wood for pallets	18.76
Other	Fibreglass	7.14
Other	Nitrile rubber	22.01
Other	Low-density polyethylene (LDPE) film	21.23
Miscellaneous	Miscellaneous	1.19
Total		1572.01



3.3 - Sales scenario

Sales of the AQUACIAT POWER LD product are distributed as follows:

Country name	**%**
Europe	100.00%

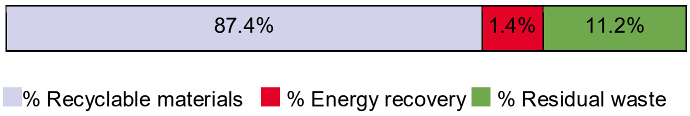
This distribution affects the distance travelled during the distribution phase and the electric mix used during the usage phase.

3.4 - Recyclability rate

% Recyclable materials	87.4%
% Energy recovery	1.4%
% Residual waste	11.2%

The products' recyclability potential was evaluated using the "Eco'DEEE method for calculating recyclability and recovery".

(Version V1, 20 Sep. 2008 presented to ADEME [French environment and energy management agency]).



3.5 - Environmental impacts

A life cycle analysis identifies a product's potential environmental impacts. CARRIER decided to conduct an in-depth analysis of each of its products to obtain accurate results.

Environmental impacts per kW corresponding to the functional unit

List of references in paragraph: 6.1 Environmental references and indicators

Reference	Total	Production	Distribution	Installation	Use	End of life
1	1.5341E+03	9.5338E+01	1.1980E+00	1.1471E-02	1.4251E+03	1.2427E+01
2	3.8060E-04	1.5683E-04	2.4274E-09	2.4469E-11	2.2376E-04	3.7639E-09
3	5.9711E+00	2.8538E-01	5.3834E-03	5.1452E-05	5.6800E+00	2.7741E-04
4	3.8057E-01	3.6183E-02	1.2371E-03	1.1825E-05	3.4307E-01	6.6942E-05
5	3.3277E-01	1.8713E-02	3.8253E-04	3.6611E-06	3.1365E-01	1.9709E-05
6	1.3913E-03	1.2625E-03	4.7953E-08	4.5877E-10	1.2876E-04	2.3530E-09
7	1.5804E+04	3.1584E+02	1.6835E+01	1.6102E-01	1.5471E+04	8.8450E-01
8	5.8854E+04	2.4383E+03	1.9705E+02	1.8850E+00	5.6206E+04	1.0183E+01
9	6.5903E+04	6.9525E+03	4.9118E+01	4.7213E-01	5.8898E+04	2.9097E+00
10	3.4964E+03	3.8582E+01	2.2579E-02	2.1599E-04	3.4578E+03	1.1839E-03
11	7.4538E+00	7.4538E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	3.5039E+03	4.6036E+01	2.2579E-02	2.1599E-04	3.4578E+03	1.1839E-03
13	2.4565E+04	8.0931E+02	1.6920E+01	1.6196E-01	2.3738E+04	9.0352E-01
14	1.4012E+01	1.3878E+01	0.0000E+00	0.0000E+00	1.3354E-01	0.0000E+00
15	2.4579E+04	8.2318E+02	1.6920E+01	1.6196E-01	2.3738E+04	9.0352E-01
16	9.7145E-01	9.5256E-01	0.0000E+00	0.0000E+00	1.8895E-02	0.0000E+00
17	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	4.9370E+03	2.6606E-01	1.0724E-04	7.7467E-05	4.9367E+03	-4.9611E-05
20	9.4120E+01	9.3324E+01	0.0000E+00	1.7711E-06	7.1249E-01	8.3607E-02
21	5.1023E+03	2.5901E+01	4.2574E-02	4.2383E-04	5.0764E+03	2.8171E-03
22	3.4091E+00	1.8814E-02	3.0323E-05	2.9170E-07	3.3903E+00	2.8639E-06
23	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
24	1.4613E-05	1.4613E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
25	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
26	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
27	2.8083E+04	8.6922E+02	1.6943E+01	1.6218E-01	2.7196E+04	9.0470E-01

Reference	Use (B1)	Maintenance (B2)	Repair (B3)	Replacement (B4)	Refurbishment (B5)	Energy use during the usage stage (B6)*	Water use during the usage stage (B7)
1	8.9767E+01	1.0978E-01	0.0000E+00	1.3734E-01	0.0000E+00	1.3615E+03	0.0000E+00
2	1.3506E-04	2.2123E-10	0.0000E+00	7.6048E-09	0.0000E+00	8.8695E-05	0.0000E+00
3	3.1847E-06	5.0251E-04	0.0000E+00	1.5570E-04	0.0000E+00	5.6793E+00	0.0000E+00
4	7.3706E-07	1.1630E-04	0.0000E+00	4.0638E-05	0.0000E+00	3.4291E-01	0.0000E+00
5	1.4948E-03	3.6662E-05	0.0000E+00	4.8906E-05	0.0000E+00	3.1207E-01	0.0000E+00
6	1.0444E-05	4.3704E-09	0.0000E+00	4.0762E-09	0.0000E+00	1.1830E-04	0.0000E+00
7	1.3515E+01	1.5343E+00	0.0000E+00	1.1006E+00	0.0000E+00	1.5454E+04	0.0000E+00
8	1.7705E+00	1.7959E+01	0.0000E+00	4.5234E+00	0.0000E+00	5.6182E+04	0.0000E+00
9	2.6834E+02	5.2657E+00	0.0000E+00	2.3757E+01	0.0000E+00	5.8600E+04	0.0000E+00
10	1.3042E-05	2.0579E-03	0.0000E+00	2.3686E-03	0.0000E+00	3.4578E+03	0.0000E+00
11	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

12	1.3042E-05	2.0579E-03	0.0000E+00	2.3686E-03	0.0000E+00	3.4578E+03	0.0000E+00
13	9.7733E-03	1.5421E+00	0.0000E+00	1.0590E+00	0.0000E+00	2.3735E+04	0.0000E+00
14	0.0000E+00	0.0000E+00	0.0000E+00	1.3354E-01	0.0000E+00	0.0000E+00	0.0000E+00
15	9.7733E-03	1.5421E+00	0.0000E+00	1.1925E+00	0.0000E+00	2.3735E+04	0.0000E+00
16	0.0000E+00	0.0000E+00	0.0000E+00	1.8895E-02	0.0000E+00	0.0000E+00	0.0000E+00
17	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	6.1943E-08	9.7738E-06	0.0000E+00	3.4265E-04	0.0000E+00	4.9367E+03	0.0000E+00
20	0.0000E+00	0.0000E+00	0.0000E+00	2.6796E-03	0.0000E+00	7.0981E-01	0.0000E+00
21	2.4592E-05	3.8802E-03	0.0000E+00	1.0244E-02	0.0000E+00	5.0764E+03	0.0000E+00
22	1.7515E-08	2.7636E-06	0.0000E+00	3.1703E-06	0.0000E+00	3.3903E+00	0.0000E+00
23	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
24	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
25	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
26	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
27	9.7864E-03	1.5442E+00	0.0000E+00	1.1949E+00	0.0000E+00	2.7193E+04	0.0000E+00

The Life Cycle Analysis was conducted using EIME© v5.8.0 software. With its database version: CODDE-2018-11 * 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 CIAT representative.

4. Extrapolation to the other sizes in the range

All the studied sizes of the AQUACIAT POWER LD from 0602R to 1400R are equipped with the "High seasonal energy efficiency" option. The studied ranges of the 1600R to 3520R are equipped with the "High nominal energy efficiency" option.

4.1 - Extrapolation scenario

The mass extrapolation coefficient in the **manufacturing phase** is calculated using the mean capacity, as well as the formula below to obtain:

$$\frac{mass\ of\ product\ considered - total\ mass\ of\ EEE\ components\ (kg)}{total\ mass\ of\ reference\ product\ including\ packaging\ but\ excluding\ EEE\ components\ (kg)} \times \frac{Capacity\ of\ reference\ product\ (kW)}{Capacity\ of\ product\ considered\ (kW)}$$

Equation 1: Formula for calculating the mass coefficient in the manufacturing phase

Production	Mass coefficient	Mass (kg)
LD0602R	1.35	1165
LD0650R	1.29	1212
LD0750R	1.16	1212
LD0900R	1.16	1332
LD1100R	1.00	**1362**
LD1200R	1.15	1779
LD1350R	1.06	1825
LD1400R	1.04	1982
LD1600R	0.98	2030
LD1750R	1.09	2444
LD1800R	1.03	2466
LD2000R	0.97	2654
LD2200R	0.97	2963
LD2400R	0.95	3196
LD2650R	0.89	3196
LD2800R	0.96	3704
LD2950R	0.93	3704
LD3200R	0.90	3942
LD3500R	0.82	3942

For the **distribution phase**, the total mass of the product including packaging has been used for the calculations.
The mass extrapolation coefficient in the distribution phase is calculated using the mean capacity, as well as the formula below to obtain:

$$\frac{\boldsymbol{mass\ of\ product\ considered\ (kg)}}{\boldsymbol{total\ mass\ of\ reference\ product\ (kg)}} \times \frac{\boldsymbol{Capacity\ of\ reference\ product\ (kW)}}{\boldsymbol{Capacity\ of\ product\ considered\ (kW)}}$$

Equation 2: Formula for calculating the mass coefficient in the distribution phase

Distribution	Mass coefficient	Mass (kg)
LD0602R	1.37	1363
LD0650R	1.31	1410
LD0750R	1.17	1410
LD0900R	1.17	1534
LD1100R	1.00	**1565**
LD1200R	1.13	2009
LD1350R	1.04	2055
LD1400R	1.02	2219
LD1600R	0.96	2267
LD1750R	1.05	2707
LD1800R	0.99	2729
LD2000R	0.93	2928
LD2200R	0.93	3265
LD2400R	0.91	3511
LD2650R	0.85	3511
LD2800R	0.91	4046
LD2950R	0.88	4046
LD3200R	0.86	4296
LD3500R	0.78	4296

For the **installation phase**, only the mass of the packaging was used for the calculations.
The mass extrapolation coefficient in the installation phase is calculated using the mean capacity, as well as the formula below to obtain:

$$\frac{mass\ of\ packaging\ of\ product\ considered\ (kg)}{mass\ of\ packaging\ of\ the\ reference\ product\ (kg)} \times \frac{Capacity\ of\ the\ reference\ product\ (kW)}{Capacity\ of\ the\ product\ considered\ (kW)}$$

Equation 3: Formula for calculating the mass coefficient in the installation phase

Installation	Mass coefficient	Mass (kg)
LD0602R	1.58	30
LD0650R	1.40	29
LD0750R	1.26	29
LD0900R	1.15	29
LD1100R	1.00	**30**
LD1200R	1.29	44
LD1350R	1.17	44
LD1400R	1.05	44
LD1600R	0.97	44
LD1750R	1.19	59
LD1800R	1.11	59
LD2000R	0.98	59
LD2200R	1.10	74
LD2400R	1.00	74
LD2650R	0.93	74
LD2800R	1.03	88
LD2950R	1.00	88
LD3200R	0.91	88
LD3500R	0.83	88

The energy coefficients in the **usage phase** are calculated using the consumption values, as well as the formula below to obtain:

$$\frac{C\ of\ the\ product\ considered\ (kWh)}{C\ of\ the\ reference\ product\ (kWh)} \times \frac{Capacity\ of\ the\ reference\ product\ (kW)}{Capacity\ of\ the\ product\ considered\ (kW)}$$

Equation 4: Formula for calculating the energy coefficient in the usage phase

Use	Energy coefficient	C [KWh] over 22 years
LD0602R	0.99	473987
LD0650R	0.96	500690
LD0750R	0.98	568447
LD0900R	0.97	616721
LD1100R	1.00	**753095**
LD1200R	0.92	787907
LD1350R	0.94	887811
LD1400R	0.92	968854
LD1600R	0.94	1067953
LD1750R	0.91	1130707
LD1800R	0.92	1225165
LD2000R	0.92	1388671
LD2200R	0.91	1543385
LD2400R	0.90	1663698
LD2650R	0.92	1821040
LD2800R	0.90	1938514
LD2950R	0.91	2000153
LD3200R	0.91	2201689
LD3500R	0.93	2476621

Calculation of the total energy consumption level of the unit over 22 years:

$$Ctot(kWh) = \left(\frac{Machine\ capacity\ machine}{SEER}\right) * Annual\ operation\ time * Service\ life\ of\ the\ machine$$

With:

- Annual operation time = 600 hours
- Machine Service Life = 22 years

For the **end-of-life phase**, the mass of the packaging was subtracted from the total mass of the product.
The mass extrapolation coefficient in the end-of-life phase is calculated using the mean capacity, as well as the formula below to obtain:

$$\frac{\textit{mass of product considered, excluding packaging } (kg)}{\textit{mass of reference product, excluding packaging } (kg)} \times \frac{\textit{Capacity of the reference product } (kW)}{\textit{Capacity of the product considered } (kW)}$$

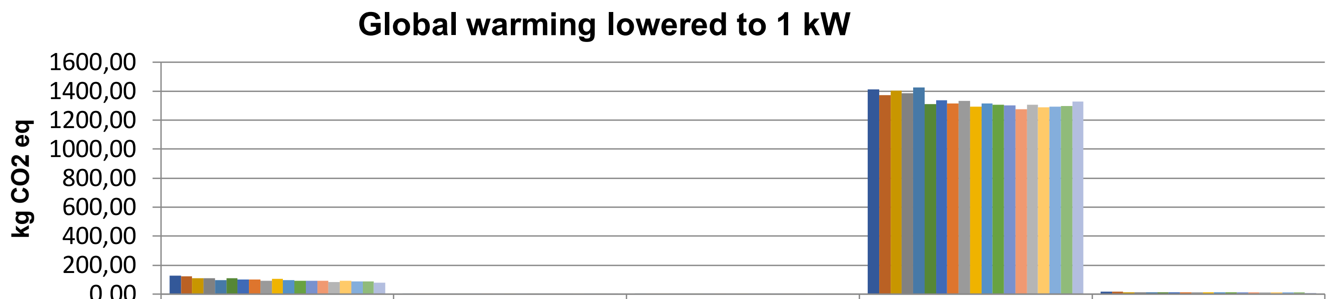
Equation 5: Formula for calculating the mass coefficient in the end-of-life phase

End of life	Mass coefficient	Mass (kg)
LD0602R	1.37	1333
LD0650R	1.30	1381
LD0750R	1.17	1381
LD0900R	1.17	1505
LD1100R	1.00	**1535**
LD1200R	1.13	1965
LD1350R	1.04	2011
LD1400R	1.02	2175
LD1600R	0.95	2223
LD1750R	1.04	2648
LD1800R	0.99	2670
LD2000R	0.93	2869
LD2200R	0.93	3191
LD2400R	0.91	3437
LD2650R	0.85	3437
LD2800R	0.91	3958
LD2950R	0.88	3958
LD3200R	0.85	4208
LD3500R	0.78	4208

5. Representative graphics

5.1 - Graphic representing global warming lowered to 1 kW

Global warming: The process of global warming occurs when CO_2 (a greenhouse gas) emitted into the air collects and absorbs solar radiation from sunlight thereby warming the atmosphere.

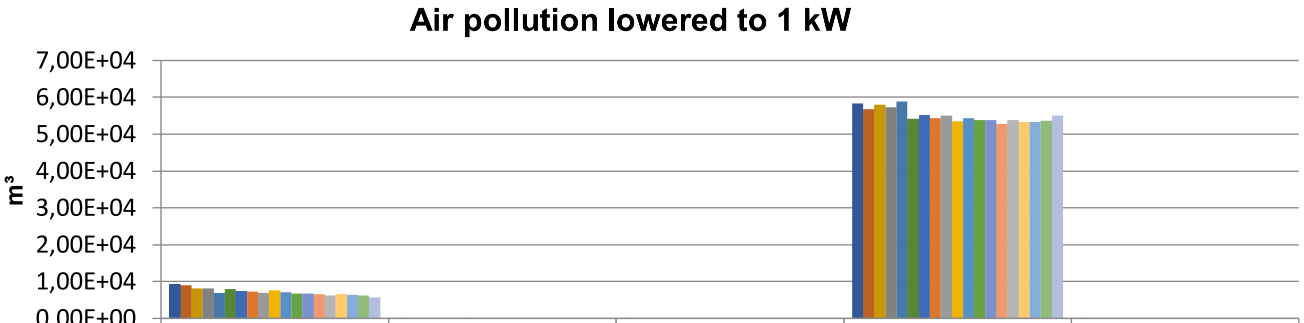


	Production	Distribution	Installation	Use	End of life
LD0602R	128,43	1,64	0,02	1413,20	17,00
LD0650R	122,90	1,56	0,02	1373,07	16,20
LD0750R	110,49	1,41	0,01	1401,50	14,57
LD0900R	110,78	1,40	0,01	1387,14	14,48
LD1100R	95,30	1,20	0,01	1425,10	12,43
LD1200R	109,52	1,35	0,01	1311,87	14,00
LD1350R	101,48	1,25	0,01	1335,15	12,94
LD1400R	99,43	1,22	0,01	1314,41	12,62
LD1600R	93,66	1,14	0,01	1332,52	11,87
LD1750R	103,44	1,25	0,01	1294,31	12,97
LD1800R	97,83	1,18	0,01	1314,41	12,25
LD2000R	92,17	1,11	0,01	1304,28	11,53
LD2200R	92,41	1,11	0,01	1301,77	11,51
LD2400R	90,72	1,09	0,01	1277,21	11,29
LD2650R	84,64	1,02	0,01	1304,28	10,53
LD2800R	91,10	1,09	0,01	1289,38	11,26
LD2950R	88,46	1,06	0,01	1291,84	10,94
LD3200R	86,02	1,03	0,01	1299,28	10,62
LD3500R	78,27	0,93	0,01	1329,91	9,67

5.2 – Graphic representing air pollution lowered to 1 kW

Air pollution: An indicator which is used to quantify the impact of the product on outdoor air quality.

The number of m^3 represents the volume of air which would be required to dilute the pollution generated so that this fell within the environmental regulatory thresholds.



	Production	Distribution	Installation	Use	End of life
LD0602R	9,37E+03	6,74E+01	7,44E-01	5,84E+04	3,98E+00
LD0650R	8,97E+03	6,41E+01	6,61E-01	5,67E+04	3,79E+00
LD0750R	8,06E+03	5,77E+01	5,95E-01	5,79E+04	3,41E+00
LD0900R	8,08E+03	5,72E+01	5,42E-01	5,73E+04	3,39E+00
LD1100R	6,95E+03	4,91E+01	4,72E-01	5,89E+04	2,91E+00
LD1200R	7,99E+03	5,55E+01	6,09E-01	5,42E+04	3,28E+00
LD1350R	7,40E+03	5,13E+01	5,50E-01	5,52E+04	3,03E+00
LD1400R	7,25E+03	4,99E+01	4,96E-01	5,43E+04	2,96E+00
LD1600R	6,83E+03	4,69E+01	4,57E-01	5,51E+04	2,78E+00
LD1750R	7,55E+03	5,14E+01	5,62E-01	5,35E+04	3,04E+00
LD1800R	7,14E+03	4,86E+01	5,26E-01	5,43E+04	2,87E+00
LD2000R	6,72E+03	4,56E+01	4,61E-01	5,39E+04	2,70E+00
LD2200R	6,74E+03	4,57E+01	5,19E-01	5,38E+04	2,70E+00
LD2400R	6,62E+03	4,47E+01	4,72E-01	5,28E+04	2,64E+00
LD2650R	6,17E+03	4,17E+01	4,41E-01	5,39E+04	2,47E+00
LD2800R	6,65E+03	4,46E+01	4,87E-01	5,33E+04	2,64E+00
LD2950R	6,45E+03	4,33E+01	4,73E-01	5,34E+04	2,56E+00
LD3200R	6,28E+03	4,20E+01	4,32E-01	5,37E+04	2,49E+00
LD3500R	5,71E+03	3,83E+01	3,93E-01	5,50E+04	2,26E+00

6. Glossary

6.1 - Additional data

Model	Cooling capacity (kW)	Mass of refrigerant (kg)
LD0602R	172	19.2
LD0650R	187	22
LD0750R	208	22
LD0900R	228	23.7
LD1100R	**271**	**24.4**
LD1200R	308	32.5
LD1350R	341	33.3
LD1400R	378	37.9
LD1600R	411	40.4
LD1750R	448	46.8
LD1800R	478	46.9
LD2000R	546	50.2
LD2200R	608	47.3
LD2400R	668	50.2
LD2650R	716	55
LD2800R	771	60
LD2950R	794	60
LD3200R	869	60
LD3500R	955	60

This study used the Indicators for PEP ecopassport® - PCR 3 - 2015.

6.2 - Environmental references and indicators

Reference	Indicator	Unit
1	Global warming *	kg.equivalent.CO_2
2	Depletion of the ozone layer *	kg.equivalent.CFC11
3	Acidification of soil and water *	kg.equivalent.SO2
4	Eutrophication of water *	kg.equivalent.P04 3-
5	Photochemical ozone creation *	kg.equivalent.C2H4
6	Depletion of abiotic resources *	kg.equivalent.Sb
7	Depletion of abiotic resources - fossil fuels	MJ
8	Water pollution	m3
9	Air pollution	m3
10	Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ
11	Use of renewable primary energy resources as raw materials	MJ
12	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ
13	Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ
14	Use of non-renewable primary energy resources as raw materials	MJ
15	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ
16	Use of secondary materials	kg
17	Use of renewable secondary fuels	MJ
18	Use of non-renewable secondary fuels	MJ
19	Net use of fresh water *	m3
20	Hazardous waste disposed	kg
21	Non-hazardous waste disposed	kg
22	Radioactive waste disposed	kg
23	Components for reuse	kg
24	Materials for recycling	kg
25	Materials for energy recovery	kg
26	Exported energy	MJ per energy carrier
27	Life cycle total use of primary energy *	MJ

* Mandatory indicators

6.3 - Mandatory indicators

- **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. In accordance with F-Gas regulation. (Regulation 517/2014).
- **ODP (Ozone Depletion):** this indicator is used to calculate the contribution to depletion of the stratospheric ozone layer by atmospheric emissions. It is expressed in kg CFC-11 eq. The calculation methodology comes from the WMO (World Meteorological Organization, CML 2012).
- **A (Acidification of 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 PO_{43-} 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 eq Sb). The calculation methodology was developed by Oers et al. (CML, 2012).
- **EP (Total use of primary energy):** total use of primary energy during the life cycle (in MJ).
- **NUFW (Net use of fresh water):** This indicator represents the net consumption of fresh water used for the system (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.

6.4 - Optional indicators

- **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).
- **REP (Use of renewable primary energy excluding renewable primary energy resources used as raw materials)** in MJ.
- **REM (Use of renewable primary energy used as raw materials):** in MJ.
- **RE (Total use of renewable primary energy resources):** primary energy and primary energy resources used as raw materials (in MJ).
- **NREP (Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials)** in MJ.
- **NREM (Use of non-renewable primary energy used as raw materials):** in MJ.
- **NRE (Total use of non-renewable primary energy resources):** (primary energy and primary energy resources used as raw materials) (in MJ).
- **USM (Use of Secondary Materials):** This indicator represents the amount of secondary material used for the system (in kg). This indicator increases if a material has a recycled content other than zero. For example, the use of 1 kg of 80% recycled plastic will add 0.8 kg to this indicator.
- **URSF (Use of renewable secondary fuels):** in MJ.
- **URSF (Use of non-renewable secondary fuels):** in MJ.
- **HWD (Hazardous Waste Disposed):** The results of this indicator correspond to the weight of hazardous waste expressed in kilograms. This indicator, which is a flow indicator, does not introduce the concept of relativity between the various contributors. For example, at equal weight, toxic waste from the chemical industry has the same impact as red sludge. The objective of this indicator is to identify the amount of waste generated and understand the issues affecting its treatment.
- **NHWD (Non-Hazardous Waste Disposed):** The results of this indicator correspond to the weight of non-hazardous waste expressed in kilograms. This indicator, which is a flow indicator, does not introduce the concept of relativity between the various contributors. For example. at equal weight, untreated sludge has the same impact as concrete. The objective of this indicator is to identify the amount of waste generated and understand the issues affecting its treatment
- **RWD (Radioactive Waste Disposed):** The results of this indicator correspond to the weight of radioactive waste expressed in kilograms. This indicator, which is a flow indicator, does not introduce the concept of relativity between the various contributors. For example, at equal weight, uranium has the same impact as plutonium. The objective of this indicator is to identify the amount of waste generated and understand the issues affecting its treatment.
- **CRU (Components For Reuse):** This indicator represents the amount of components intended for reuse (in kg). In EIME, this indicator increases if a component is used and the "Reuse" box is checked.
- **MRE (Materials For Recycling):** This indicator represents the amount of materials sent for recycling at end of life, where the "end-of-waste" status is reached. This indicator, expressed in kilograms, only takes into account the amount intended for recycling and not the associated impacts, in accordance with the stocks method.
- **MER (Materials for Energy Recovery):** These materials are identified by an energy recovery efficiency of over 60%, in line with existing regulations. This indicator, expressed in kilograms, only takes into account the amount intended for energy recovery and not the associated impacts, in accordance with the stocks method.
- **EE (Exported Energy):** Exported energy is the energy generated form burning waste and from landfill (in MJ).

6.5 - Glossary

- **LCI (Life Cycle Inventory):** This document references all the life stages of a product (production, distribution, installation, use and end of life). This inventory contains the product composition (materials, weights, processes, provenances, recycled proportion of materials, energy consumption for the assembly, etc.), the predicted sales destinations, the installation processes, the usage scenario and the end of life scenario.
- **LCA (Life Cycle Analysis):** Process used to compile the LCI. It results in the creation of an environmental report.
- **PCR (Product Category Rules):** Documents providing the rules for the LCA for a specific product category. These rules are general and supported by PSRs.
- **PSR (Product Specific Rules):** Documents containing the specific rules for creating an LCA. This document supports the PCR. The EIME methodology applies a weighting of 1 for each indicator, with all indicators considered together and equally critical. An eco-design process involves reducing them all to a minimum and avoiding the transfer of pollution.

Registration no.: **CIAT-00005-VO1.01-EN**	Drafting rule: **"PCR–ed3-FR-2015 04 02" supplemented by "PSR-0013-ed2.0-FR-2019 12 06"**
Auditor authorisation no.: **VH18**	Information and references: **www.pep-ecopassport.org**
Created: 06/2020	Valid for: **5 years**
Audit independent of the declaration and data in accordance with ISO 14025:2010 Internal ☐ External ☒	
In accordance with ISO 14025: 2006 type III environmental declarations	
Critical review of the PCR conducted by a panel of experts led by Philippe Osset (SOLINNEN)	
The PEPs comply with standard XP C08-100-1:2016-12 The elements of the PEP cannot be compared with elements from another programme	
Document compliant with standard ISO 14025:2010 "Environmental labels and declarations. Type III declarations"	

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04.72.25.21.21 CARRIER SCS
Route de Thil, 01120 Montluel, FRANCE
Order No.: **0-20-1749** – The manufacturer reserves the right to change any product specifications without notice
Manufacturer: CARRIER SCS

Printed in the European Union