

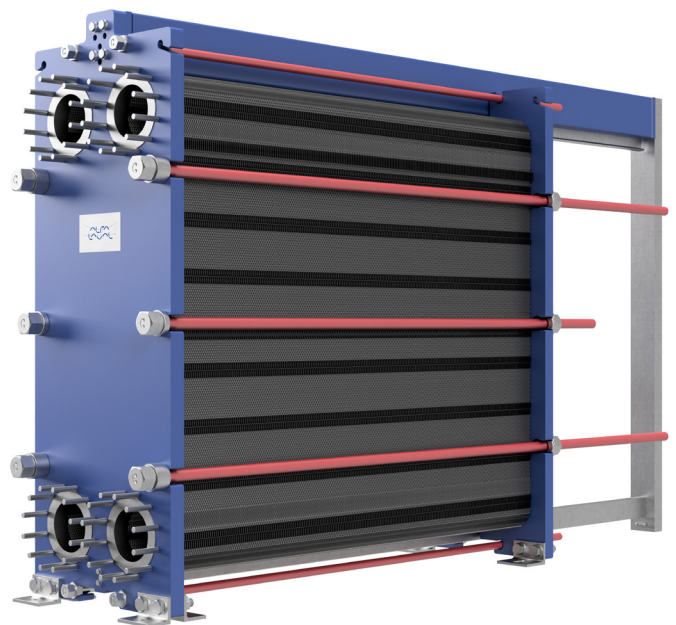


Environmental Product Declaration

In accordance with
ISO 14025:2006 for gasketed
plate heat exchanger (GPHE):

T21-BFM/AQ8T-BFM

From
Alfa Laval Technologies AB



| | |
|---------------------------------|---|
| Programme: | The International EPD® System, www.environdec.com |
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Programme information

Programme:

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EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Life Cycle Assessment (LCA):

LCA accountability: Katrin Molina-Besch & Marcus Wendin, Miljögiraff AB

| |
|---|
| <p>Product category rules (PCR): PCR 2010:08 for Other special- and general-purpose machinery and parts thereof; Product Category Classification: UN CPC 449, 44221 and 43935 PCR Version 4.0</p> |
| <p>PCR review was conducted by: Lars-Gunnar Lindfors, IVL Svenska Miljöinstitutet, lars-gunnar.lindfors@ivl.se</p> |
| <p>Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:</p> <p><input checked="" type="checkbox"/> EPD verification by individual verifier</p> |
| <p>Third-party verifier: Martyna Mikusinska Sweco Sverige AB Örebro Approved by: The International EPD® System</p> |
| <p>Procedure for follow-up of data during EPD validity involves third-party verifier:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> |

Company information

Owner of EPD:

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Name and location of production site:

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Description of the organization:

Alfa Laval is a leading global provider of first-rate products in the areas of heat transfer, separation and fluid handling. With these as its base, Alfa Laval aims to help enhance the productivity and competitiveness of its customers in various industries throughout the world. We define their challenges and deliver products and solutions that meet their requirements – mainly in energy, the environment, food and the marine industry.

Pioneering Positive Impact

The purpose of the Alfa Laval's sustainability strategy is to focus on those areas where Alfa Laval has the largest impact and wants to show leadership as a company. The strategy is divided into four main areas – caring, committed, circularity and climate. These areas reflect the environment, social and governance (ESG) issues that are most significant and where Alfa Laval can contribute most. Each area includes a vision that sets out the ambition.

For the different areas, Alfa Laval has also set long- and short-term targets which are followed up through relevant performance metrics to ensure continuous progress and to meet potential challenges through action. Where applicable, Alfa Laval will encompass the whole value chain in its ambitions including how the products and technologies we put on the market contribute to the sustainable transformation of business and society.

Climate – Net-zero emissions

Alfa Laval aims to achieve net-zero emissions in own operations and across the full value chain by latest 2050.

In focus

- Scope 1 emissions
- Scope 2 emissions
- Scope 3 emission

Caring – Safe inclusive culture

Alfa Laval promotes a safe, inclusive culture both within the company and in its relationships with external partners.

In focus

- Health & Safety
- Inclusion & Diversity
- Human rights

Committed – Ethical conduct

Alfa Laval is committed to honest, respectful and ethical conduct within its organization and in external business relationships.

In focus

- Business principles
- Anti-Bribery, anti-corruption
- Whistleblowing

Circularity – Circular business

Alfa Laval is dedicated to safe-guarding the value of natural resources throughout its value chain.

In focus

- Efficient manufacturing
- Extending product life span
- Reuse/recycle

The product

Product name:

T21-BFM/AQ8T-BFM

Product identification:

T21-BFM/AQ8T-BFM is a gasketed plate heat exchanger (GPHE) optimized for 10 bar design pressure. The product contains channel plates and gaskets which are available in different materials. A specific customer duty determines what materials to use. This EPD is for a T21-BFM/AQ8T-BFM product with 397 stainless steel channel plates and 397 NBR-gaskets with glue free gasket attachment.

Product description:

Alfa Laval plate heat exchangers T21-BFM/AQ8T-BFM are used in virtually all types of industry to effectively heat or cool different fluids. A large selection of plate and gasket materials and types are available.

The functional performance of the declared heat exchangers is at least 1700 kW of cooling provided at most 7 °C during at least 30 years of service, in a water-to-water cooling application with a design pressure of 10 barg according to harmonized PED pressure vessel code EN 13445 edition 2021. The unit should be 3rd party certified according to AHRI (www.ahridirectory.org) and with design conditions as described in Table 1 below.

UN CPC code:

UN CPC 43911(heat exchange units)

Geographical scope:

Global

Table 1. Design conditions for the declared heat exchangers

| Side Unit | Flow rate kg/s | Inlet temp °C | Outlet temp °C | Allowed Pressure drop kPa |
|-----------|----------------|---------------|----------------|---------------------------|
| 1 | 58 | 14 | 7 | 50 |
| 2 | -- | 6 | 13 | 50 |

Machine description

Functions:

To transfer heat from one or several liquids to another (or several other) liquid(s).

Main components:

Frame plate
 Pressure plate
 Channel plates
 Gaskets
 Bars
 Tightening bolts

Replacement parts:

Gaskets

Size and dimension (length x width x height)

2083x755x2320 mm

Weight: 2541kg

Technical information

Functional performance:

The functional performance of the analysed heat exchanger is at least 1700 kW of cooling provided at most 7 °C during at least 30 years of service, in a water-to-water cooling application with a design pressure of 10 barg according to harmonized PED pressure vessel code EN 13445 edition 2021. The unit should be 3rd party certified according to AHRI and with design conditions as described in Table 1.

Replacement part consumption :

In water-to-water application (operating conditions as described under functional performance) gaskets are replaced every 15 years.

Chemical products consumption:

Cleaning solution based on phosphoric acid and neutralizing agent used for CIP cycles (see also use phase scenario).

LCA information

Declared unit:

One gasketed plate heat exchanger model T21-BFM/AQ8T-BFM, optimized for 10 bar design pressure according to harmonized PED pressure vessel code EN 13445 edition 2021, with 397 pc 0.4 stainless steel channel plates and NBR gaskets with glue free gasket attachment.

Expected product life:

30 years.

Description of system boundaries:

Cradle to grave and optional module D.

Geographical scope:

Upstream: Global; Core: Sweden; Downstream: Europe

Scenario for customer transport:

The final products are transported by road to customers on the European continent (82% of customers) or by sea and road transport to customers in the UK (2%) or outside Europe (16%).

Use phase scenario:

Replacement parts (operating conditions as described under functional performance): Gaskets are replaced after 15 years of use. CIP cycles are run in year 7 and year 22. Manual cleaning of plates after 15 years.

Product packaging:

Production of product packaging is included in upstream and end-of-life of product packaging is included in downstream.

End-of-life scenario:

Steel components: 85% recycling and 15% landfill

Plastic and rubber components: 100% incineration with energy recovery.

Compliant with:

This EPD follows the “Book-keeping“ LCA approach which is defined as attributional LCA.

In accordance with ISO14025, ISO 14040 – ISO 14044 and PCR 2010:08, version 4.0.

Cut-off rules:

The following procedure is followed for the exclusion of inputs and output:

- Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included

A screening and expert judgement showed that the following aspects contribute less than 1% and could be cut-off:

- Production of packaging of raw materials/components
- Minor consumables used in core process

Background data:

The data quality is considered good. All site-specific data for raw materials, energy and waste from the manufacturing process are from 2022 and have been represented with EPDs from suppliers or Ecoinvent datasets. All other environmental aspects have been represented by generic Ecoinvent data.

Foreground data - primary:

Weight and composition of product and product packaging, EPD for steel in channel and end plates from main supplier, steel in frame and pressure plate from 2nd biggest supplier, aluminium in carrying bar, suppliers' location for inbound transports and to regionalize generic production data for major product components, energy consumption, consumables and waste of manufacturing processes. Information about share of customer geographic markets.

Data quality declaration:

- Time period for specific data in Core: 2022
- System model of generic data: Allocation, cut-off by classification (Ecoinvent 3.10)
- Percentage of proxy data (GWP total): less than 2%

Electricity data:

Electricity consumption in the Core module is represented by Swedish hydro power (100%) modelled with data from Ecoinvent 3.10., certificate from electricity producer is included in LCA report.

Allocation:

Allocation in specific data is done based on total area of channel plates produced in Lund factory in 2022.

Impact Assessment methods:

Potential environmental impacts are calculated with EN 15804 method as implemented in SimaPro 9.5. The chosen indicators follow the methods of the default list of environmental performance indicators (version 2 and characterization factors based on EF 3.1). Resource use values are calculated from Cumulative Energy Demand V1.11.

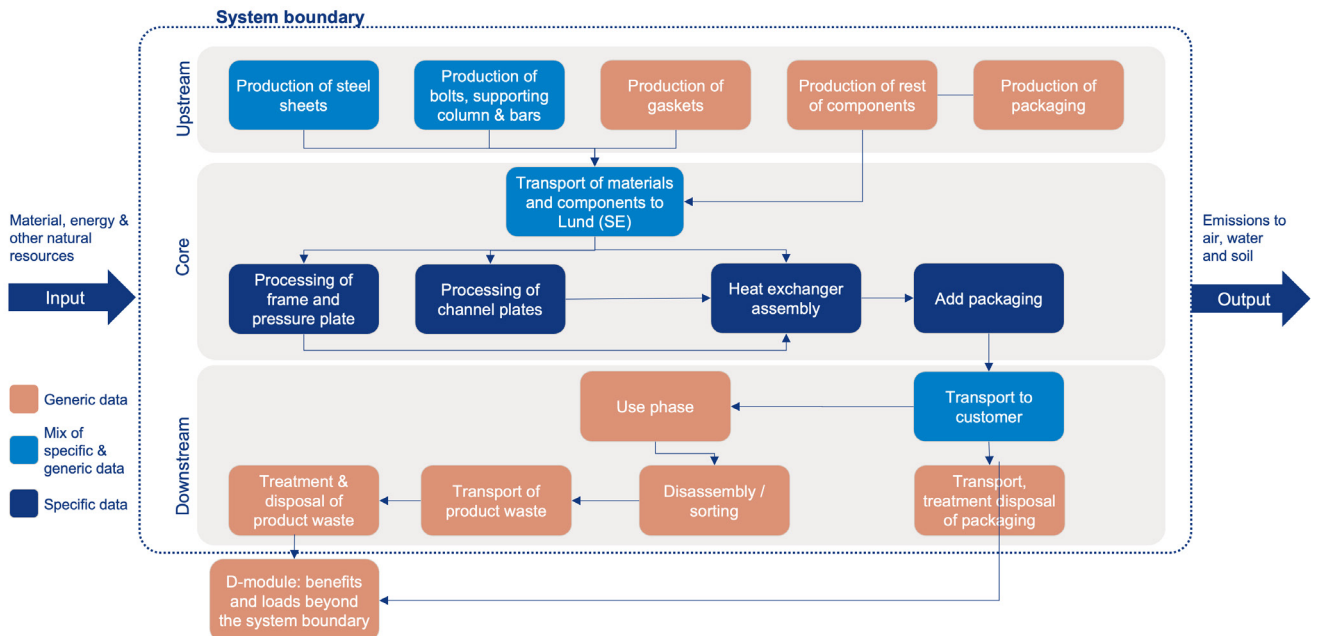
Based on LCA Report:

Miljögraff LCA Report 1480 GPHE (Miljögraff, 2024).

Software & database:

SimaPro 9.6.1 with Ecoinvent 3.10

System diagram:



Content declaration

| Product components | [kg/DU] | % | Post consumer material (weight-%) | Renewable material (weight-%) |
|--|---|-----|-----------------------------------|-------------------------------|
| Steel | 2423 | 95% | 0* | 0 |
| Rubber | 71.5 | 3% | 0 | 0 |
| Aluminium | 31.1 | 1% | 0 | 0 |
| Plastics | 15.1 | ≤1% | 0 | 0 |
| Brass | 0.216 | ≤1% | 0 | 0 |
| TOTAL | 2541 | | | |
| Packaging (distribution packaging) | | | | |
| Wooden pallet (for land and sea transport) | 167 | | 0 | 100 |
| Wood case (for sea transport) | 307 | | 0 | 100 |
| TOTAL PACKAGING | 167kg (land transport) or 474kg (sea transport) | | | 100 |

*Percentage of post-consumer material is unknown since the recycled content provided by suppliers is a mixture of pre-consumer and post-consumer material.

The product does not contain any dangerous substances from the candidate list of SVHC for Authorization, in quantities that exceed the limits for registration with the European Chemicals Agency.

Results of the environmental performance indicators

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Impact category indicators:

| Parameter | | Unit | Upstream | Core | Down-stream | Total | D-module |
|---|----------------------------------|-------------|-----------|----------|-------------|----------|-----------|
| Global warming potential (GWP) | Fossil | kg CO2 eq | 1.02E+04 | 9.96E+01 | 1.92E+03 | 1.22E+04 | -1.14E+03 |
| | Biogenic | kg CO2 eq | -2.06E+02 | 1.57E+02 | 2.92E+02 | 2.43E+02 | -7.03E+01 |
| | Land use and land transformation | kg CO2 eq | 1.10E+01 | 1.82E+01 | 2.80E+01 | 5.72E+01 | -5.03E-01 |
| | TOTAL | kg CO2 eq | 9.98E+03 | 2.75E+02 | 2.24E+03 | 1.25E+04 | -1.21E+03 |
| Ozone layer depletion (ODP) | | kg CFC11 eq | 2.00E-04 | 2.05E-06 | 5.39E-05 | 2.56E-04 | -8.87E-06 |
| Acidification potential (AP) | | mol H+ eq | 5.45E+01 | 1.05E+00 | 1.11E+01 | 6.67E+01 | -4.92E+00 |
| Eutrophication potential (EP) | Aquatic freshwater | kg P eq | 5.12E-01 | 4.36E-03 | 4.48E-02 | 5.62E-01 | -6.55E-02 |
| | Aquatic marine | kg N eq | 1.01E+01 | 1.84E-01 | 2.38E+00 | 1.27E+01 | -9.29E-01 |
| | Aquatic terrestrial | mol N eq | 1.22E+02 | 2.26E+00 | 2.32E+01 | 1.47E+02 | -1.08E+01 |
| Photochemical oxidant creation potential (POCP) | | kg NMVOC eq | 3.82E+01 | 1.36E+00 | 8.32E+00 | 4.79E+01 | -3.63E+00 |
| Abiotic depletion potential (ADP) | Metals and minerals ¹ | kg Sb eq | 1.02E+00 | 6.80E-03 | 1.88E-02 | 1.05E+00 | -2.19E-04 |
| | Fossil resources ¹ | MJ | 1.36E+05 | 1.03E+03 | 2.14E+04 | 1.59E+05 | -1.39E+04 |
| Water deprivation potential (WDP) ¹ | | m3 depriv. | 3.23E+03 | 7.88E+01 | 9.37E+02 | 4.24E+03 | 9.94E+00 |

¹ The results of the environmental impact indicators for ADPE, ADPF, WDP shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Resource use indicators:

| Parameter | | Unit | Upstream | Core | Down-stream | Total | D-module |
|--|-------------------------|-------------------------|----------|----------|-------------|-----------|-----------|
| Primary energy resources – Renewable | Use as energy carrier | MJ, net calorific value | 1.69E+04 | 9.01E+03 | 2.03E+03 | 2.79E+04 | -1.67E+03 |
| | Used as raw materials | MJ, net calorific value | 4.22E+03 | 0.00E+00 | -4.22E+03 | 0.00E+00 | 0.00E+00 |
| | TOTAL | MJ, net calorific value | 2.11E+04 | 9.01E+03 | -2.19E+03 | 2.79E+04 | -1.67E+03 |
| Primary energy resources – Non-renewable | Use as energy carrier | MJ, net calorific value | 1.39E+05 | 1.10E+03 | 2.56E+04 | 1.66E+05 | -1.47E+04 |
| | Used as raw materials | MJ, net calorific value | 2.76E+03 | 0.00E+00 | -2.76E+03 | 0.00E+00 | 0.00E+00 |
| | TOTAL | MJ, net calorific value | 1.42E+05 | 1.10E+03 | 2.29E+04 | 1.66E+05 | -1.47E+04 |
| Secondary material (optional) | kg | 1.83E+03 | 0.00E+00 | 0.00E+00 | 1.83E+03 | 0.00E+00 | |
| Renewable secondary fuels (optional) | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | |
| Non-renewable secondary fuels (optional) | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | |
| Net use of fresh water (optional) | m ³ | 5.58E+01 | 6.94E-01 | 2.00E+01 | 7.66E+01 | -3.90E+00 | |

Waste indicators:

| Parameter | Unit | Upstream | Core | Down-stream | Total | D-module |
|------------------------------|------|----------|----------|-------------|----------|----------|
| Hazardous waste disposed | kg | 2.39E+01 | 0.00E+00 | 0.00E+00 | 2.39E+01 | 0.00E+00 |
| Non-hazardous waste disposed | kg | 6.18E+02 | 0.00E+00 | 0.00E+00 | 6.18E+02 | 0.00E+00 |
| Radioactive waste disposed | kg | 2.44E-01 | 0.00E+00 | 0.00E+00 | 2.44E-01 | 0.00E+00 |

Output flow indicators:

| Parameter | Unit | Upstream | Core | Down-stream | Total | D-module |
|-------------------------------|-----------------------|----------|----------|-------------|----------|----------|
| Components for reuse | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0,00E+00 |
| Material for recycling | kg | 2.11E+02 | 5.19E+02 | 2.09E+03 | 2.82E+03 | 0,00E+00 |
| Materials for energy recovery | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy, electricity | MJ per energy carrier | 0.00E+00 | 0.00E+00 | 1.68E+03 | 1.68E+03 | 0.00E+00 |
| Exported energy, thermal | MJ per energy carrier | 0.00E+00 | 0.00E+00 | 3.91E+03 | 3.91E+03 | 0.00E+00 |

Other environmental performance indicators:

The following other environmental indicator results are declared to provide Alfa Laval's customers with all indicator results of the EF 3.1 method.

| Parameter | Unit | Upstream | Core | Down-stream | Total | D-module |
|---|--------------|----------|----------|-------------|----------|-----------|
| Particulate Matter (PM) | disease inc. | 6.68E-04 | 1.01E-05 | 1.11E-04 | 7.89E-04 | -8.98E-05 |
| Ionizing Radiation (IR) ² | kBq U-235 eq | 2.84E+02 | 1.39E+00 | 2.69E+01 | 3.12E+02 | -2.55E+01 |
| Ecotoxicity Potential – Freshwater (ETP-FW) ³ | CTUe | 1.80E+05 | 1.68E+03 | 1.37E+04 | 1.95E+05 | -7.58E+04 |
| Human Toxicity Potential – Cancer (HTP-C) ³ | CTUh | 3.96E-04 | 7.75E-07 | 1.16E-05 | 4.09E-04 | -2.86E-04 |
| Human Toxicity Potential – Non-Cancer (HTP-NC) ³ | CTUh | 1.76E-04 | 6.43E-06 | 2.36E-05 | 2.06E-04 | -2.75E-06 |
| Land use, SQP | Pt | 8.41E+04 | 3.34E+03 | 1.73E+04 | 1.05E+05 | -6.10E+03 |

² The impact category for IR 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 ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

³ The results of the environmental impact indicators for ETP-FW, HTP-C, and HTP-NC shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

References

- EPD International. (2022). PCR 2010:08: Product Category Rules for Other special- and general-purpose machinery and parts thereof. Version 4.0.
- EPD International. (2021). General Programme Instructions for the International EPD® System. Version 4.0.
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- SimaPro 9.5. SimaPro LCA Package, Pré Consultants, the Netherlands, www.pre-sustainability.com