ENGINEERING TOMORROW

Environmental **Product Declaration**

Electric Expansion Valve

ETS 50

EPD issued	2023-01-10
EPD expires	2028-01-10
EPD author	Danfoss Climate Solutions
EPD type	Cradle-to-grave
Declared unit	One product over its Reference Service Life of 10 years
Products included	Electric Expansion Valve ETS 50 (code no. 034G1706)
Geographical scope	China
Mass	1,64 kg without packaging 2,05 kg with packaging
Dimensions (H×W×D)	205 x 126 x 60 mm without packaging 281 x 197 x 107 mm with packaging
Verification	[ ] External [X] Internal [] None
Produced to	Danfoss Product Category Rules (2022-09)
Verifier	Danfoss Power Electronics & Drives A/S

Disclaimer:

This EPD was prepared to the best of knowledge of Danfoss A/S. The life cycle assessment calculations were performed in accordance with ISO 14040 & 14044 and EN15804+A2.
All results were internally reviewed by independent experts. While this declaration has followed the guidance of ISO 14025, it has not been externally verified or registered by an EPD programme and therefore does not fully comply with the ISO 14025 standard.
This EPD has been published by Danfoss A/S on Danfoss Product Store and Danfoss Website. For questions, feedback or requests please contact your Danfoss sales representative.

Product Description

This Environmental Product Declaration (EPD) follows the Danfoss Product Category Rules (PCR) (2022-09-20). These rules provide a consistent framework for calculating and reporting the environmental performance of Danfoss' products and is aligned with relevant international standards, particularly ISO 14025:2006, EN 15804+A2:2019 and EN 50598-3:2015.

This document has been produced by Danfoss A/S following an internal verification process, but it is not a third-party verified document.

What is an EPD?

An EPD is a document used to communicate transparently, the quantified environmental impacts of a product over its lifecycle stages. This quantification is done by performing a Life Cycle Assessment (LCA) in line with a consistent set of rules known as a PCR (Product Category Rules).

An EPD provides:

- A product's carbon footprint together with other relevant environmental indicators, including air pollution, water use, energy consumption and waste, over its own life cycle (Modules A-C), as well as the expected benefits of reuse and recycling in reducing the impact of future products (Module D). See Table 1 for module descriptions.
- Environmental data allowing customers to calculate LCAs and produce EPDs for their own products.

Type of EPD

This EPD is of the type 'cradle-to-grave' and includes all relevant modules: production (A1-A3), shipping (A4) and installation (A5); operational energy use (B6); deconstruction (C1), waste collection and transport (C2), treatment (C3) and disposal (C4). It also includes potential net benefits to future products from recycling or reusing post-consumer waste (D). The codes in brackets are the module labels from EN 15804+A2. Modules concerning use, maintenance, repair, replacement, refurbishment (B1-B5) and operational water use (B7) are excluded, following the cut-off rules from EN 15804.

Table 1: Modules of the product's life cycle included in the EPD

Product stage			Installation		Use stage							End-of-life stage				Benefits
Raw materials	Transport	Manufacture	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-install.	Transport	Waste processing	Disposal	Benefits and loads outside system boundaries
A1	**A2**	**A3**	**A4**	**A5**	B1	B2	B3	B4	B5	**B6**	B7	**C1**	**C2**	**C3**	**C4**	**D**
X	**X**	**X**	**X**	**X**	MNR	MNR	MNR	MNR	MNR	**X**	MNR	**X**	**X**	**X**	**X**	**X**

(X = declared module; MNR = module not relevant)

Product Description

The product studied in this report is the ETS 50, an electric expansion valve for precise liquid injection in evaporators for air conditioning and refrigeration applications. The valve piston and linear positioning design is fully balanced, providing bi-flow feature as well as solenoid tight shut-off function in both flow directions. The valve design uses bi-polar drive providing very precise flow regulation.

The production location is Nordborg, Denmark. See more information about the product on Danfoss Product Store.

Reference Service Life

For the purpose of this EPD the reference service life (RSL) of the product is considered to be 10 years.

Intended market

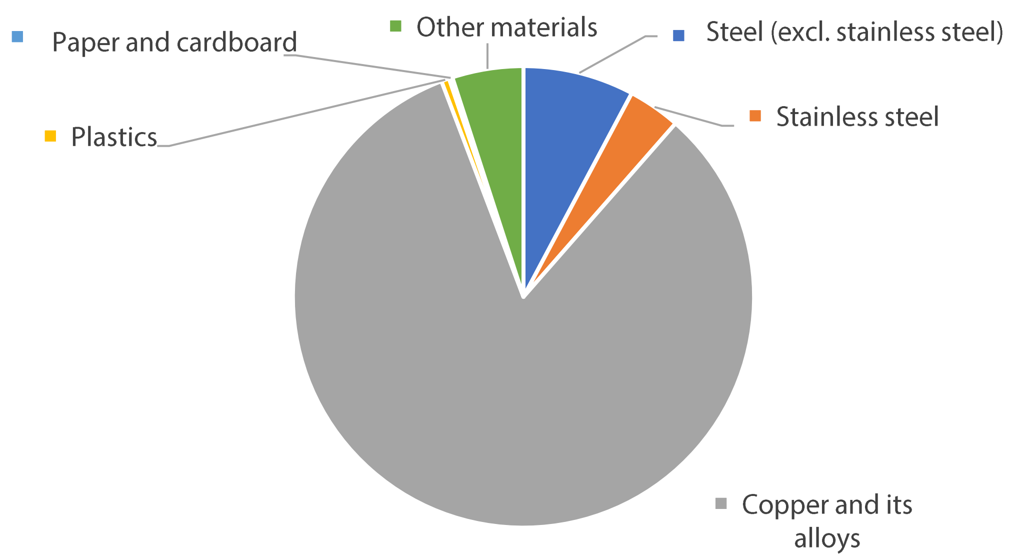
The intended market of this study is China, and the baseline scenario involves the distribution, installation, and end-of-life in China. With regards to the use stage and the end-of-life stage, this EPD is not representative of regions other than China.

Product Description

Table 2: Product composition

Material	Mass (kg)	(%)
Metals	**1,54**	**93,90%**
Steel (excl. stainless steel)	0,127	7,74%
Stainless steel	0,060	3,66%
Copper and its alloys	1,350	82,32%
Plastics	**0,00899**	**0,55%**
Polycarbonate (unreinforced)	0,00239	0,15%
Other reinforced thermoplastics	0,00104	0,06%
Other unreinforced thermoplastics	0,00556	0,34%
Natural materials	**0,004**	**0,24%**
Paper and cardboard	0,004	0,24%
Electrical/electronic	**0,0016**	**0,10%**
Circuit boards and electronic components	0,0016	0,10%
Other materials	**0,0814**	**4,96%**
Total product	**1,64**	**100%**

Figure 1: Material Composition Overview



Overview of LCA study

Data quality

Data quality of the selected datasets is generally assessed as good and very good in terms of geographical, time and technology representativeness and applicability. Background data is from GaBi database version 2022.

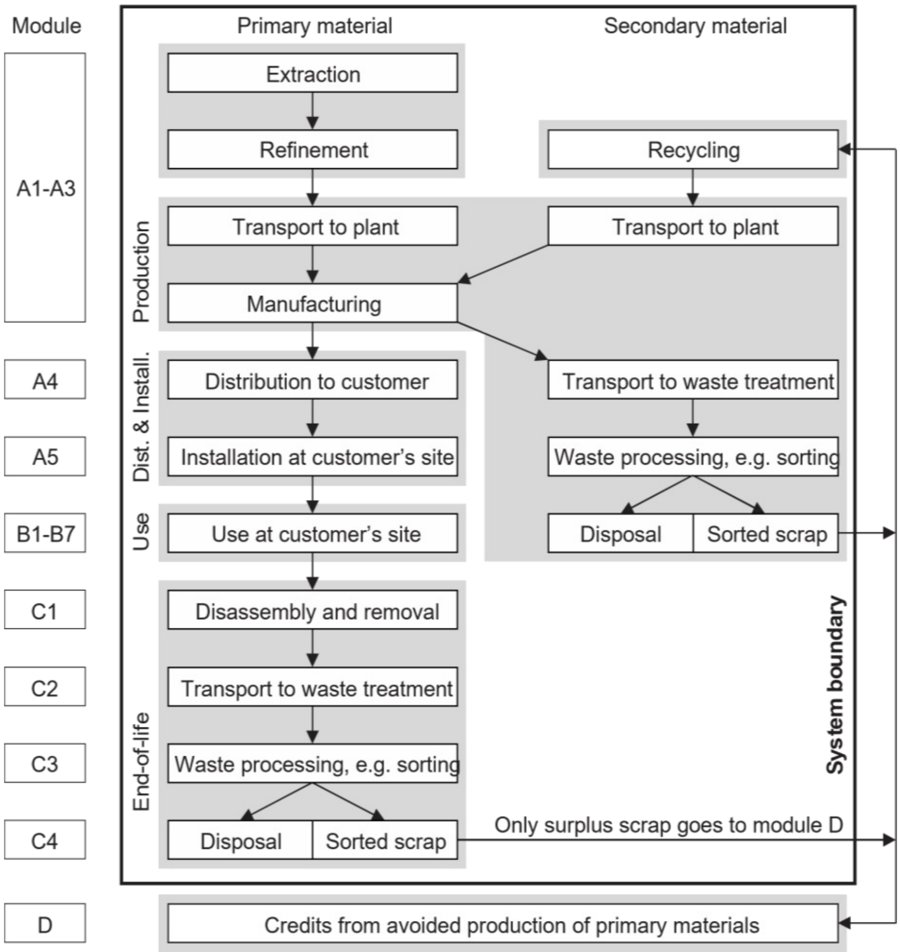
Allocation and cut-off criteria

The allocation is made in accordance with the provisions of EN 15804+A2. All major raw materials and all the essential energy are included. All hazardous materials and substances are considered in the inventory. Data sets within the system boundary are complete and fulfil the criteria for the exclusion of inputs and output criteria.

System boundaries

The results in this EPD are split into life cycle modules following EN 15804 (Figure 2): production (A1-A3), distribution (A4), use (B6) and the end of the product's life (C1-C4). Module D represents environmental benefits and loads that occur beyond the system boundary (i.e., in future products).

Figure 2: Modular structure used in this EPD (following EN 15804+A2)



Overview of LCA study

Product and packaging manufacture (A1-A3)

Final manufacturing occurs in Nordborg, Denmark. The facility is certified according to IATF 16949, ISO 14001, ISO 45001 and ISO 9001. Where waste generated on-site is recyclable, it is separated and recycled. For further information, see here. The product is shipped in the packaging described in Table 3 below. All packaging materials can be safely recycled or incinerated if appropriate local facilities are available.

Table 3: Packaging materials

Packaging material	Mass (kg)
Paper and cardboard	0,415*
Polyethylene	0,001
Total packaging	**0,416**

** Includes also sub-assembly packaging between production facilities*

Table 4: Biogenic carbon content in product and packaging

	Total (excluding recycling)
Biogenic carbon content in product [kg]	1,72E-03
Biogenic carbon content in accompanying packaging [kg]	1,78E-01

Note: 1 kg biogenic carbon is equivalent to 44/12 kg of CO_2.

Shipping and installation (A4-A5)

Distribution is assumed to occur to customers in China as highest quantity of this product is sold there. A distance of 8440 km by plane and 1500 km by truck is assumed between the factory and the final customer. The assumption is based on sales data, with reference to the year 2021.

Module A5 includes disposal of packaging materials only. The product is assumed to be installed by hand. Energy use in handheld tools during installation is not included as it falls below the cut-off criteria in the Product Core Rules.

Use phase (B1-B6)

To set up a relevant scenario, the calculation takes into account the total number of cycles that the valve is expected to withstand over the full lifetime. This corresponds to 165.000 cycles, which should be equivalent to 10 years of valve utilization. Extreme utilization of the product would translate into a quicker wear-out of the valve (life time would be less than 10 years), but still within the estimated maximum full cycles (165.000 cycles).

During the normal operation of the valve, the energy consumption can be split into two main categories.

The first one relates to the energy used during the active mode. The “active mode” corresponds to the operation in which there is an active change in the valve opening degree. The valve requires acceleration before the stepper motor can shift position at full speed, as well as the excitation at the end of the movement to ensure that the valve reaches and holds the correct position.

Overview of LCA study

The "active mode" energy consumption is calculated using the nominal power as well as the time in which the valve will operate in this mode. Nominal power is set at 5,5 W, while the utilization time is calculated based on the duration of a full cycles (from 0% opening degree (OD) to 100% OD, and then again to 0% OD, including acceleration and excitation as well). This is estimated to take approximately 17,2 s. By considering the total estimated maximum number of full cycles, it translates into approximately 789 hours. The energy consumption due to active mode in the full life cycle is expected to be equal to 4,34 kWh.

The second component called "idle mode" relates to the energy that the valve needs to hold the position after it has reached the correct setting, while the controller does not give any signal to move. The calculation of energy consumption due to the holding current is based on two main parameters: holding current power, and utilization time. The holding current power is set to be 10% of the nominal power (10% of 5,5 W equal 1,1 W), while the utilization time over the lifetime is set at 28.961 hours. This number is calculated considering in the indirect cycle where the valve is working, the main compressor is expected to be running approximately 2.920 hours a year, translating in a total of 29.200 hours over the lifetime of 10 years. Considering that the valve will be in active mode for 789 hours, the remaining 28.411 hours will be spent in idle mode. This is then translated into a total energy consumption of 31,3 kWh over the full life cycle.

Table 5: CO2 emissions per use phase

	ETS 50
Use [kg]	2,89E01
Active mode [kg]	3,52E00
Idle mode [kg]	2,54E01

The major limitation of the impact calculations for the use phase is that the electricity grid mix in use is assumed to remain at the same carbon intensity over time. Following the plans for the decarbonization of the grid across China, the environmental impacts are expected to decrease over time within the course of the next 10 years. However, as decarbonization will occur in the future and as the pace of decarbonization is uncertain, the use of the emission intensity of today's grid should prove to be a "worst-case", conservative assumption.

Overview of LCA study

End of life (C1-C4)

The standard end-of-life procedure from EN 50598-3 has been applied:

- Manual dismantling is used to separable recyclable bulk materials, such as bulk metals and bulk plastics.
- Shredding is used for the remaining parts, such as printed circuit board assemblies.
- Ferrous metals, non-ferrous metals and bulk plastics are recovered through recycling.
- The remaining materials go to either energy recovery or landfill.

In line with EN 15804+A2, only the 'net scrap' (i.e., the leftover recyclable materials remaining after inputs of recycled content required in the manufacturing phase are first satisfied) is used to calculate the benefits and loads beyond the system boundary (Module D).

Two scenarios are examined for the end-of-life.

1. Recycling scenario with 100% of the product sent to recycling at the end-of-life, excluding fractions that cannot be recycled or incinerated (e.g., glass reinforcing in glass-filled plastics) and are sent to landfill (C3.1, C4.1, D.1).
This scenario illustrates best case performance. It assumes a 100% collection rate and best available recycling technologies. Under this scenario electrical cables, and all metals, flat glass and unreinforced plastics found within the body and chassis of the product are recycled. Printed circuit board assemblies are incinerated, and the copper and precious metals (gold, silver, palladium, and platinum) are recycled.

2. Landfill scenario with 100% of the product sent to landfill (C3.2, C4.2, D.2).
This scenario assumes that the whole product, including its packaging, is landfilled. It is designed to represent a poor end of-life-route where valuable resources are lost.

Benefits and loads beyond the system boundary (D)

Module D considers the net benefit of recycling the product, taking account of losses in the recycling process and the recycled material used in the production of the product.

This section presents the environmental performance of the ETS 50. Figure 3 below presents a high level breakdown of the product's carbon footprint over its full 10-year life.

Environmental performance

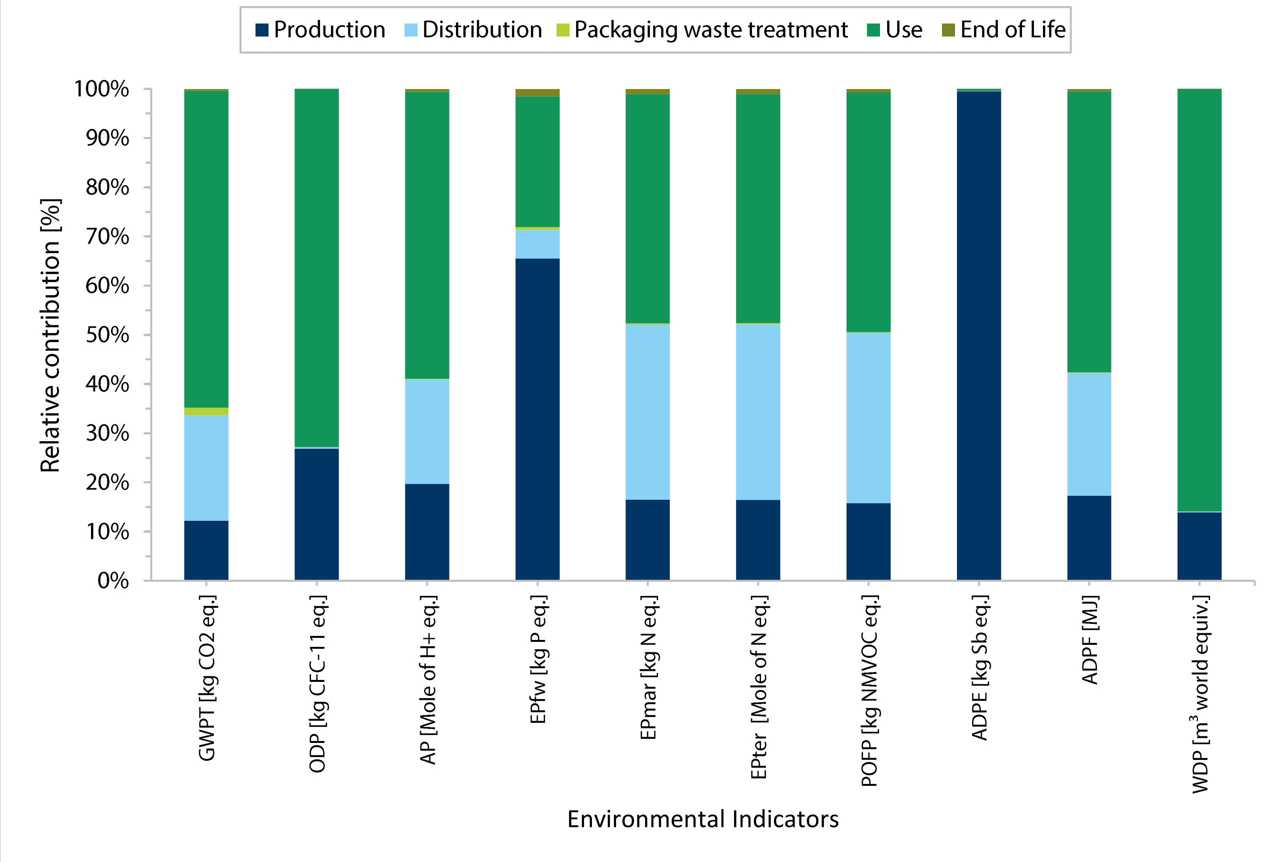


Figure 3: Breakdown of environmental impacts by life cycle stages (Average of Landfill and Recycling End-Of-Life Scenario).

The following life cycle modules from EN 15804+A2 are reported in this section:

- **A1-A3:** Manufacture of the product from 'cradle to gate'.
- **A4:** Transport of the product to the customer.
- **A5:** Installation of the product and disposal of used packaging.
- **B6:** Use of the product over its 10-year life.
- **C1:** Deinstallation of the product from the site.
- **C2:** Transport of the product to waste treatment.
- **C3:** Processing waste for recycling.
- **C4:** Disposal of waste that cannot be recycled (through landfill and incineration).
- **D:** Potential benefits and loads beyond the system boundary due to reuse, recycling, and energy recovery.

Environmental performance

Table 6: Environmental impact indicators

	Production	Distribution	Packaging waste treatment	Use	End-of-Life						(not included in Figure 3)	
Life cycle stages based on EN 15804+A2	**A1-A3**	**A4**	**A5**	**B6**	**C1**	**C2**	**C3.1** Recycling	**C3.2** Landfill	**C4.1** Recycling	**C4.2** Landfill	**D.1** Recycling	**D.2** Landfill
Description / **Environmental Impact Indicators**	Manufacture of the product from 'cradle-to-gate'	Transport of the product to the customer	Installation of the product and disposal of used packaging	Use of the product over its lifetime e.g., 10 years	Deinstallation of the product from the site	Transport of the product to waste treatment	Processing waste for recycling		Disposal of waste that cannot be recycled (through landfill and incineration)		Potential benefits and loads beyond the system boundary due to reuse, recycling, and energy recovery	
GWPT [kg CO2 eq.]	5,49E+00	9,63E+00	6,97E-01	2,89E+01	N/A	1,48E-02	1,45E-01	N/A	4,21E-03	4,01E-02	-1,00E+00	2,96E-01
GWPF [kg CO2 eq.]	6,14E+00	9,63E+00	3,64E-02	2,89E+01	N/A	1,48E-02	1,44E-01	N/A	4,21E-03	4,01E-02	-9,99E-01	2,96E-01
GWPB [kg CO2 eq.]	-6,61E-01	0,00E+00	6,61E-01	0,00E+00	N/A	0,00E+00	0,00E+00	N/A	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWPLULUC [kg CO2 eq.]	6,65E-03	1,64E-03	2,48E-05	1,49E-02	N/A	3,52E-07	9,72E-04	N/A	7,76E-07	4,55E-05	-2,10E-03	2,14E-04
ODP [kg CFC-11 eq.]	3,95E-11	4,36E-13	2,74E-15	1,07E-10	N/A	1,70E-18	1,58E-14	N/A	1,60E-15	5,82E-14	3,70E-13	5,22E-12
AP [Mole of H+ eq.]	3,38E-02	3,63E-02	2,03E-04	1,00E-01	N/A	2,20E-05	8,75E-04	N/A	8,27E-06	2,63E-04	-6,07E-03	8,00E-03
EPfw [kg P eq.]	2,64E-05	2,32E-06	2,31E-07	1,07E-05	N/A	3,15E-09	5,15E-07	N/A	1,01E-09	1,95E-07	-8,22E-07	2,36E-06
EPmar [kg N eq.]	7,58E-03	1,63E-02	1,04E-04	2,14E-02	N/A	8,97E-06	4,26E-04	N/A	3,44E-06	8,89E-05	-7,88E-04	3,66E-04
EPter [Mole of N eq.]	8,19E-02	1,78E-01	1,14E-03	2,32E-01	N/A	9,90E-05	4,72E-03	N/A	3,82E-05	9,72E-04	-8,50E-03	3,84E-03
POFP [kg NMVOC eq.]	2,06E-02	4,51E-02	1,93E-04	6,35E-02	N/A	2,08E-05	8,08E-04	N/A	8,63E-06	2,21E-04	-2,60E-03	1,19E-03
ADPE [kg Sb eq.]	3,88E-04	4,05E-07	1,18E-08	1,55E-06	N/A	5,18E-10	1,46E-08	N/A	6,45E-11	3,07E-09	-1,15E-05	1,01E-03
ADPF [MJ]	9,01E+01	1,30E+02	4,74E-01	2,98E+02	N/A	2,10E-01	1,90E+00	N/A	1,11E-02	5,42E-01	-1,59E+01	-1,22E+00
WDP [m^3 world equiv.]	1,44E+00	1,67E-02	2,78E-03	8,87E+00	N/A	2,46E-05	1,75E-03	N/A	5,42E-04	2,70E-03	-3,21E-01	1,81E-01

How to read scientific numbers:

e.g. 2,05E02 = $2{,}05 \times 10^2$ = 205

2,04E-01 = $2{,}04 \times 10^{-1}$ = 0,204

Environmental performance

Table 7: Environmental impact indicator descriptions

Acronym	Unit	Indicator
GWPT	kg CO_2 eq.	Carbon footprint (Global Warming Potential) – total
GWPF	kg CO_2 eq.	Carbon footprint (Global Warming Potential) – fossil
GWPB	kg CO_2 eq.	Carbon footprint (Global Warming Potential) – biogenic
GWPLULUC	kg CO_2 eq.	Carbon footprint (Global Warming Potential) – land use and land use change
ODP	kg CFC-11 eq.	Depletion potential of the stratospheric ozone layer
AP	Mole H+ eq.	Acidification potential
EPfw	kg P eq.	Eutrophication potential – aquatic freshwater
EPmar	kg N eq.	Eutrophication potential – aquatic marine
EPter	Mole of N eq.	Eutrophication potential – terrestrial
POFP	kg NMVOC eq.	Summer smog (photochemical ozone formation potential)
ADPE*	kg Sb eq.	Depletion of abiotic resources – minerals and metals
ADPF*	MJ	Depletion of abiotic resources – fossil fuels
WDP*	m^3 world eq.	Water deprivation potential (deprivation-weighted water consumption)

Results for module A1-A3 are specific to the product. All results from module A4 onwards should be considered as scenarios that represent one possible outcome. The true environmental performance of the product will depend on actual use.

The results in this section are relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks. EPDs from different programmes may not be comparable.

Carbon footprint

The total carbon footprint (GWPF), cradle-to-grave, of the product is **4,48E+01 kg CO2-eq** (A1-C4), based on the average End-of-Life scenario. The carbon footprint (GWPF) of production of this product, cradle-to-gate, is **6,14E+00 kg CO2-eq** (A1-A3).

Environmental performance

Table 8: Resource use

	A1-A3	A4	A5	B6	C1	C2	C3.1 Recycling	C3.2 Landfill	C4.1 Recycling	C4.2 Landfill	D.1 Recycling	D.2 Landfill
PERE [MJ]	3,76E01	5,74E-01	2,10E-02	7,57E01	N/A	6,92E-04	1,32E-01	N/A	1,17E-03	4,95E-02	-1,43E00	2,49E00
PERM [MJ]	6,00E-02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PERT [MJ]	3,76E01	5,74E-01	2,10E-02	7,57E01	N/A	6,92E-04	1,32E-01	N/A	1,17E-03	4,95E-02	-1,43E00	2,49E00
PENRE [MJ]	8,98E01	1,30E02	5,09E-01	2,98E02	N/A	2,10E-01	1,90E00	N/A	1,11E-02	5,43E-01	-1,60E01	-1,21E00
PENRM [MJ]	3,32E-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PENRT [MJ]	9,01E01	1,30E02	5,09E-01	2,98E02	N/A	2,10E-01	1,90E00	N/A	1,11E-02	5,43E-01	-1,60E01	-1,21E00
SM [kg]	2,33E00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RSF [MJ]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NRSF [MJ]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FW [m3]	4,40E-02	8,38E-04	8,93E-05	2,11E-01	N/A	1,11E-06	1,55E-04	N/A	1,31E-05	8,25E-05	-1,28E-02	-2,52E-03

Table 9: Resource use indicator descriptions

Acronym	Unit	Indicator
PERE	MJ	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	MJ	Use of renewable primary energy resources used as raw materials
PERT	MJ	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PENRE	MJ	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM	MJ	Use of non-renewable primary energy resources used as raw materials
PENRT	MJ	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)
SM	kg	Use of secondary material
RSF	MJ	Use of renewable secondary fuels
NRSF	MJ	Use of non-renewable secondary fuels
FW	m^3	Net use of fresh water

Environmental performance

Table 10: Waste categories and output flows

	A1-A3	A4	A5	B6	C1	C2	C3.1 Recycling	C3.2 Landfill	C4.1 Recycling	C4.2 Landfill	D.1 Recycling	D.2 Landfill
HWD [kg]	1,97E-07	3,42E-10	2,10E-12	2,85E-08	N/A	1,45E-12	1,05E-11	N/A	5,44E-13	1,98E-11	-7,74E-05	-3,96E-05
NHWD [kg]	8,14E-01	1,23E-02	4,73E-05	1,33E-01	N/A	2,10E-05	3,12E-04	N/A	2,79E-02	1,64E00	-8,36E-03	5,46E-02
RWD [kg]	2,87E-03	1,13E-04	1,21E-06	6,37E-03	N/A	2,25E-07	3,62E-06	N/A	1,36E-07	3,93E-06	2,05E-05	3,87E-04
CRU [kg]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MFR [kg]	2,25E-02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,55E00	N/A	N/A	N/A
MER [kg]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EEE [MJ]	1,38E-04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6,88E-03	N/A	N/A	N/A
EET [MJ]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,26E-02	N/A	N/A	N/A

Table 11: Waste category and output flow descriptions

Acronym	Unit	Indicator
HWD	kg	Hazardous waste disposed
NHWD	kg	Non-hazardous waste disposed
RWD	kg	Radioactive waste disposed
CRU	kg	Components for reuse
MFR	kg	Materials for recycling
MER	kg	Materials for energy recovery
EEE	kg	Exported energy (electrical)
EET	kg	Exported energy (thermal)

Environmental performance

Table 12: Additional indicators*

	A1-A3	A4	A5	B6	C1	C2	C3.1 Recycling	C3.2 Landfill	C4.1 Recycling	C4.2 Landfill	D.1 Recycling	D.2 Landfill
PM [Disease incidences]	4,80E-07	1,18E-07	1,17E-09	1,38E-06	N/A	1,17E-10	5,23E-09	N/A	6,09E-11	2,65E-09	-1,08E-07	3,25E-08
IRP [kBq U235 eq.]	4,46E-01	1,57E-02	1,02E-04	3,98E-01	N/A	3,19E-05	5,39E-04	N/A	1,83E-05	4,50E-04	3,22E-03	1,32E-02
ETPfw [CTUe]	4,24E01	9,08E01	3,83E-01	5,67E01	N/A	1,52E-01	1,34E00	N/A	6,84E-03	5,02E00	-8,98E00	4,85E00
HTPc [CTUh]	1,87E-07	1,68E-09	6,13E-12	5,35E-09	N/A	2,83E-12	2,78E-11	N/A	6,00E-13	3,06E-11	-1,06E-08	-4,75E-09
HTPnc [CTUh]	8,92E-08	7,38E-08	2,55E-10	1,42E-07	N/A	1,23E-10	1,71E-09	N/A	5,90E-11	3,20E-09	-1,24E-08	4,51E-08
SQP [Pt]	5,84E01	1,54E00	1,08E-01	3,26E01	N/A	5,37E-04	8,02E-01	N/A	1,51E-03	6,75E-02	-1,65E00	6,08E00

Table 13: Optional indicator descriptions

Acronym	Unit	Indicator
PM	Disease incidence	Potential incidence of disease due to particulate matter emissions
IRP**	kBq U235 eq.	Potential human exposure efficiency relative to U235
ETPfw*	CTUe	Potential Comparative Toxic Unit for ecosystems (fresh water)
HTPc*	CTUh	Potential Comparative Toxic Unit for humans (cancer)
HTPnc*	CTUh	Potential Comparative Toxic Unit for humans (non-cancer)
SQP*	Dimensionless	Potential soil quality index

**Disclaimer for ADPE, ADPF, WDP, ETPfw, HTPc, HTPnc, SQP:* The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

***Disclaimer for ionising radiation:* 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.

References

CEN (2019). *EN 15804:2012+A2:2019: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.* Brussels, Belgium: European Committee for Standardization.

Danfoss (2021). *Environmental Product Declarations: Core Rules for Danfoss Products (Revised: 2022-09-20)*. Nordborg, Denmark: Danfoss A/S.

ISO (2006a). *ISO 14025:2006: Environmental labels and declarations – Type III environmental declarations – Principles and procedures*. Geneva, Switzerland: International Organization for Standardization.

ISO (2006b). *ISO 14040:2006: Environmental management – Life cycle assessment – Principles and framework*. Geneva, Switzerland: International Organization for Standardization.

ISO (2006c). *ISO 14044:2006: Environmental management – Life cycle assessment – Requirements and guidelines*. Geneva, Switzerland: International Organization for Standardization.