ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Grundfos Holding A/S
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-GRU-20240273-CBA1-EN
Issue date	01.08.2024
Valid to	31.07.2029

MAGNA3 25,32-40/60/80/100/120, 32-40/60/80/100 F, 40-40/60 F (Cast iron)

Grundfos Holding A/S

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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General Information

Grundfos Holding A/S

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-GRU-20240273-CBA1-EN

This declaration is based on the product category rules:

Pumps for liquids and liquids with solids, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

01.08.2024

Valid to

31.07.2029

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

MAGNA3 25,32-40/60/80/100/120, 32-40/60/80/100 F, 40-40/60 F (Cast iron)

Owner of the declaration

Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro
Denmark

Declared product / declared unit

1 PCS. of MAGNA3 (cast iron) pump

Scope:

The declaration applies to 1 piece of MAGNA3 (Cast iron) pump.

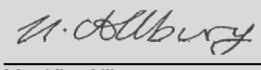
The product is produced in Wahlstedt, Germany, and the life cycle assessment is based on data collected at the production site. Production has been modeled using annual production data from 2022.
The declaration covers the following MAGNA3 products with cast iron pump house:
MAGNA3 25-40/60/80/100/120 (threaded),
MAGNA3 32-40/60/80/100/120 (threaded),
MAGNA3 32-40/60/80/100 F (flanged),
MAGNA 3 40-40/60 F (flanged).

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Mrs Kim Allbury,
(Independent verifier)

Product

Product description/Product definition

The Grundfos MAGNA3 circulator pumps are designed for circulating liquids in heating systems, air conditioning and cooling systems and domestic hot water systems. However, the pump range can also be used in ground source heat pump systems and solar heating systems.
The MAGNA3 pump is a centrifugal pump powered by an electrical motor. It has a high-performance neodymium magnet rotor which increases motor efficiency and an insulation shell to reduce heat loss from the cast iron pump housing with threaded or flanged connections.

The declaration represents a weighted average of MAGNA3 pumps with identical control box and motor/pump head. The size of the pump housing distinguishes the different pumps, indicated in the first numbers: 25 (threaded), 32 (threaded), 32 F (flanged), 40 F (flanged). The average is defined based on sales volumes.
Materials as well as supply chain and manufacturing processes are identical, i.e., all cradle to gate processes (A1-A3). The packaging is the high runner type for the included products. The products are also identical in terms of distribution, reference service life and end-of-life treatment.
Another thing that differentiates the products from each other is the software which controls how the pump operates in the system in which it is installed, making them fit for different applications. This is indicated in the second numbers: 40, 60, 80, 100, 120. Hence, the use stage module B6 will change, as the applied scenarios for electricity consumption changes.

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:
Machinery Directive (2006/42/EC):
Standard used: *EN 809:1998 + A1:2009*
Radio Equipment Directive (2014/53/EU)
Standards used:
EN 60335-1:2012+AC:2014+A11:2014+A13:2017+A1:2019 +A14:2019+A2:2019+A15:2021, EN 60335-2-51:2003 + A1:2008 + A2:2012, EN 62233:2008. EN 55014-1:2006 + A1:2009 + A2:2011, EN 55014-1:2017, EN 61000-6-2:2005, EN 61000-3-2:2014, EN 61000-3-3:2013, ETSI EN 301 489-1 V2.2.0, ETSI EN 301 489-17 V3.2.0. ETSI EN 300 328 V2.1.1
Ecodesign Directive (2009/125/EC)
Commission Regulation (EC) No 641/2009 and Commission Regulation (EC) No 622/2012
Standards used: *EN 16297-1:2012, EN 16297-2:2012*
RoHS Directive 2011/65/EU and 2015/863//EU
Standard: *EN IEC 63000:2018*

The CE marking takes into account the proof of conformity with the respective harmonized norms based on the legal provisions above.
MAGNA3 pumps are not harmonized in accordance with the *CPR.*

Application

For the application and use the respective national provisions apply.
The pump is designed for circulating liquids in the following systems:
· heating systems
· air-conditioning and cooling systems
· ground-source heat-pump systems
· solar-heating systems
The pump is suitable for thin, clean, non-aggressive and non-explosive liquids, not containing solid particles or fibres that may attack the pump mechanically or chemically. In heating systems, the water must meet the requirements of accepted standards on water quality in heating systems. The pumps are also suitable for domestic hot-water systems.

Technical Data

The performance data of the product according to the harmonized norms, based on the harmonization provisions above apply.
The relevant technical specifications according to the *PCR Part B* are given in the table below.
Characteristics that are the same for all product groups are only given once. Others are given individually for all products.

Constructional data

Name	Value	Unit
Frequency	50 / 60	Hz
Voltage	230	V
Pumped liquid	water	-
Energy Efficiency Index (all, except 40-60 F)	0,18	
Energy Efficiency Index (40-60 F)	0,19	
Head max. (25,32-40, 32,40-40 F)	4	m
Head max. (25,,32-60, 32,40-60 F)	6	m
Head max. (25,32-80, 32-80 F)	8	m
Head max. (25,32-100, 32-100 F)	10	m
Head max. (25,32-120)	12	m
Flow range max (25-40)	6,5	m^3/h
Flow range max (25-60)	8,7	m^3/h
Flow range max (25-80)	10,3	m^3/h
Flow range max (25-100)	11	m^3/h
Flow range max (25-120)	12,5	m^3/h
Flow range max (32-40, 32-40 F)	8	m^3/h
Flow range max (32-60, 32-60 F)	10	m^3/h
Flow range max (32-80, 32-80 F)	11,3	m^3/h
Flow range max (32-100, 32-100 F)	12,3	m^3/h
Flow range max (32-120)	12,6	m^3/h
Flow range max (40-40 F)	13	m^3/h
Flow range max (40-60 F)	17,4	m^3/h
Nominal capacity (25-40)	0,05	kW
Nominal capacity (25-60)	0,084	kW
Nominal capacity (25-80)	0,116	kW
Nominal capacity (25-100)	0,153	kW
Nominal capacity (25-120)	0,185	kW
Nominal capacity (32-40, 32-40 F)	0,068	kW
Nominal capacity (32-60, 32-60 F)	0,103	kW
Nominal capacity (32-80, 32-80 F)	0,136	kW
Nominal capacity (32-100, 32-100 F)	0,171	kW
Nominal capacity (32-120)	0,182	kW
Nominal capacity (40-40 F)	0,098	kW
Nominal capacity (40-60 F)	0,185	kW

Average power input values are declared in Chapter 4. LCA Scenarios, see table "Operational energy use (B6)".

Performance data of the product according to the harmonised standards, based on provisions for harmonisation.

Base materials/Ancillary materials

Name	Value	Unit
Aluminium	5,6	%
Ceramics	0,8	%
Copper	3,6	%
Magnet Nd	2.0	%
Paper	3,7	%
PCB	4,9	%
Plastics	0,5	%
Plastics, foam	1,5	%
Plastics GF	12,6	%
Rubber	0,3	%
Stainless steel	7.0	%
Steel	7,1	%
Cast iron	43,7	%
Cardboard	6,7	%
Plastic film	0,03	%
TOTAL	100	%

REACH

This product/article contains substances listed in the *ECHA candidate list* (date: 10.06.2022) exceeding 0.1 percentage by mass: **no**

The Wahlstedt production has been assessed and certified as meeting the requirements in *ISO 14001, ISO 50001, ISO 45001 and ISO 9001.*

Reference service life

No use stage scenario which refers to the lifetime of the product is declared. However, to facilitate building calculations, an estimated RSL of 10 years can be used. This is an EU consensus-based estimation, referenced on page 37 in Appendix 7: *Lot 11 – Circulators in Buildings*, prepared by AEA Energy & Environment for the European Commission in the context of the Eco Design Directive:

There is no definitive information on the average circulator life available, there is consensus within the industry that it is at least 12 years. However, this is complicated by many factors, including many being scrapped prematurely when e.g. the boiler they are connected to is replaced.

From the estimated stock (140Mpa) and annual sales (14Mpa), the average lifetime of the circulator is taken as 10 years for the purposes of this study.

The RSL of the declared product is not directly influencing the results in this study, as no declared use stage scenario is dependent on the RSL; The use stage sub-module B6 is declared per year as required by the *PCR Part B.*

LCA: Calculation rules

Declared Unit

The declared unit is 1 piece (pcs.) of MAGNA3 (Cast iron) pump.

Declared unit

Mass includes packaging.

Name	Value	Unit
Declared unit	1	pce.
Mass reference	6.1	kg/pce
Conversion factor [Mass/Declared Unit]	6.1	

Other declared units are allowed if the conversion is shown transparently.

The weighted average product has been calculated based on the sales volumes of the included product models.

System boundary

This EPD is Cradle-To-Grave and Module D. The system boundaries of the EPD follow the modular approach in *EN 15804*.

Production and installation (A1-A5)

Modules A1-A3 refer to the product stage and includes raw materials extraction and processing, transportation, and the manufacturing process. The product stage is included in this study, and according to EN 15804:2019 + A2 the system boundary with nature is set to include those processes that provide the material and energy inputs into the system and the following manufacturing, transport up to the factory gate as well as the processing of waste arising from those processes. The assembly of the product, as well as the packaging, are also included in A1-A3. Wastes and losses are included in the modules where they occur according to the polluter pays principle and the modular approach of EN 15804:2019+A2

Module A4 regards the transportation from the production site to the regional distribution centre, and finally to the construction and product application site. Module A5 refers to the installation process of the pump including the transportation of packaging waste to the treatment site and the waste treatment of packaging. The use of energy during installation is negligible for the selected functional unit.

Use stage (B1-B7):

In this study, all use stage modules are assessed, though B1, B2 and B7 are assessed to be zero. By decision no. 20170712-n of the *SVR*, the modules B3, B4 and B5 are by default declared as "MNR" (module not relevant).
Contributions to operational energy use during the use stage (B6) come from the electricity consumption of the product. The annual electricity consumption is calculated by multiplying the average power input, which is based on a defined load profile, with the annual running hours. For use stage (B6) European Average electricity grid mix has been used. These values are declared in the scenarios section.

The End-of-Life stage (C1-C4)

The End-of-Life stage (C1-C4) Modules C1-C4 refer to the End-of-life stage. A product reaches the end-of-life of its service life when it no longer provides any functionality. This life cycle stage includes all activities from the end-of-life of the control valve until all materials and components are processed, reused, recycled, or disposed of.C1 regards the dismantling of the pump, and this module is a manual activity. C2 regards the transport to waste processing, C3 refers to the processing (shredding) of waste for recycling, and C4 refers to waste disposal: landfilling and incineration. The End-of-Life assumption is that 95 % is collected as electronic waste, while 5 % goes to landfill. The specific amounts are shown in the scenarios section.

Beyond system boundary (D):

Module D refers to the burdens and benefits beyond the system

boundaries. According to EN15804:A2+2019, module D includes the reuse, recovery and/or recycling potentials, expressed in net impacts and benefits. Contributions to module D come from waste incineration processes in A5 and C4 as well as material (metal) recycling in C3. The specific fractions and net flows are shown in the scenarios section.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The primary database used for background data is Sphera, while Ecoinvent served as a secondary database.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it will be separately declared for the product and for any accompanying packaging, as required from the *PCR Part A*. The carbon content of cardboard and paper is assumed to 0.43 kg C, meaning 43% of the paper and cardboard packaging is biogenic carbon. Overall, there is an amount of weight-% Carbon in the product leaving the factory gate and has to be considered

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.273	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2

Transport from the gate to the site (A4)

Name	Value	Unit
Litres of fuel	1,7	l/100 tkm
Transport distance	1513	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported	568	kg/m^3
Wastage during distribution	-	%

Installation into the building (A5)

Name	Value	Unit
Packaging waste for incineration (LDPE film)	0,02	kg
Packaging waste for incineration (Paper/Cardboard)	0,41	kg

An estimated RSL of 10 years can be used to facilitate building calculations. This is an EU consensus-based estimation, referenced in Appendix 7: Lot 11 – *Circulators in Buildings*, prepared by *AEA Energy & Environment* for the European Commission in the context of the *Eco Design Directive*.

Reference service life

Name	Value	Unit
Life Span according to the manufacturer	10	a

Operational energy use (B6)

Name	Value	Unit
Electricity consumption 25-40	114	kWh/a
Electricity consumption 25-60	192	kWh/a
Electricity consumption 25-80	265	kWh/a
Electricity consumption 25-100	350	kWh/a
Electricity consumption 25-120	423	kWh/a
Electricity consumption 32-40, 32-40 F	156	kWh/a
Electricity consumption 32-60, 32-60 F	236	kWh/a
Electricity consumption 32-80, 32-80 F	311	kWh/a
Electricity consumption 32-100, 32-100 F	391	kWh/a
Electricity consumption 32-120	416	kWh/a
Electricity consumption 40-40 F	224	kWh/a
Electricity consumption 40-60 F	423	kWh/a
Running hours (all products)	5.000	h/a
Average power input, 25-40	0,023	kW
Average power input 25-60	0,038	kW
Average power input 25-80	0,053	kW
Average power input 25-100	0,070	kW
Average power input 25-120	0,085	kW
Average power input 32-40, 32-40 F	0,031	kW
Average power input 32-60, 32-60 F	0,047	kW
Average power input 32-80, 32-80 F	0,062	kW
Average power input 32-100, 32-100 F	0,078	kW
Average power input 32-120	0,083	kW
Average power input 40-40 F	0,045	kW
Average power input 40-60 F	0,085	kW

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	5,7	kg
Transportation distance (C2)	100	km
Aluminium for recycling	0,328	kg
Steel for recycling (incl. cast iron)	2,95	kg
Copper for recycling (incl. brass)	0,199	kg
Stainless steel for recycling	0,404	kg
Plastics for incineration (incl. rubber)	0,719	kg
Electronics for incineration w/energy	0,285	kg
Paper for incineration	0,214	kg
Landfilling	0,60	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
A5, incineration w/energy recov. thermal energy	0,809	MJ
A5, incineration w/energy recov. electric energy	0,893	MJ
C3, steel for recycling (net amounts)	0,931	kg
C3, stainless steel for recycling (net amounts)	0,341	kg
C3, aluminium for recycling (net amounts)	0,004	kg
C3, copper for recycling (net amounts)	0,186	kg
C4, incineration w/energy recov. thermal energy	3,85	MJ
C4, incineration w/energy recov. electric energy	4,28	MJ

LCA: Results

Characterization model: *EN 15804* - 2012+A2 - 2019, PEF. By Decision no. 20170712-n of the IBU SVR, the modules B3, B4, B5 are marked as MNR (module not relevant) as default. The LCA results in module B6 are given on a period of one year, according to *PCR Part B*. To obtain the results from module B6 over the entire life cycle, the LCA results of module B6 must be multiplied by the estimated RSL of 10 years. The indicator results for module B6 are declared for MAGNA3 25-40. B6 indicator results for other groups can be derived by multiplying the B6 indicator results with the following factors:

MAGNA3 25-60: 1,68; MAGNA3 25-80: 2,32; MAGNA3 25-100: 3,06; MAGNA3 25-120: 3,7;
MAGNA3 32-40, 32-40 F: 1,36; MAGNA3 32-60, 32-60 F: 2,06; MAGNA3 32-80, 32-80 F: 2,72; MAGNA3 32-100, 32-100 F: 3,42;
MAGNA3 32-120: 3,64;
MAGNA3 40-40 F: 1,95; MAGNA3 40-60 F: 3,7

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	X	X	MNR	MNR	MNR	X	X	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1PCS of MAGNA3 pump

Parameter	Unit	A1-A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	4.13E+01	7.85E-01	5.9E-01	0	0	3.72E+01	0	0	4.84E-02	1.12E-01	2.55E+00	-3.97E+00
GWP-fossil	kg CO_2 eq	4.22E+01	7.89E-01	2.32E-02	0	0	3.69E+01	0	0	4.86E-02	1.11E-01	2.24E+00	-3.96E+00
GWP-biogenic	kg CO_2 eq	-9.88E-01	-1.17E-02	5.67E-01	0	0	3.21E-01	0	0	-7.2E-04	9.62E-04	3.09E-01	-1.49E-03
GWP-luluc	kg CO_2 eq	4.23E-02	7.33E-03	3.59E-05	0	0	4.01E-03	0	0	4.52E-04	1.2E-05	3.73E-05	-2.99E-03
ODP	kg CFC11 eq	3.63E-08	1.03E-13	7.19E-14	0	0	6.81E-10	0	0	6.35E-15	2.04E-12	2.83E-13	-6.46E-12
AP	mol H^+ eq	2.05E-01	5.09E-03	1.83E-04	0	0	7.88E-02	0	0	3.13E-04	2.36E-04	6.27E-04	-2.56E-02
EP-freshwater	kg P eq	5.67E-04	2.9E-06	3.52E-08	0	0	1.38E-04	0	0	1.78E-07	4.13E-07	2.99E-06	-3.99E-06
EP-marine	kg N eq	4.02E-02	2.49E-03	6.96E-05	0	0	1.89E-02	0	0	1.54E-04	5.66E-05	2.3E-04	-2.94E-03
EP-terrestrial	mol N eq	3.37E-01	2.76E-02	8.54E-04	0	0	1.97E-01	0	0	1.7E-03	5.91E-04	2.96E-03	-3.14E-02
POCP	kg NMVOC eq	9.64E-02	4.81E-03	1.76E-04	0	0	5.03E-02	0	0	2.97E-04	1.51E-04	6.22E-04	-9.57E-03
ADPE	kg Sb eq	2.77E-03	5.25E-08	8.84E-10	0	0	5.71E-06	0	0	3.24E-09	1.71E-08	2.33E-09	-5.64E-04
ADPF	MJ	5.78E+02	1.08E+01	2.32E-01	0	0	7.77E+02	0	0	6.65E-01	2.33E+00	1.04E+00	-4.35E+01
WDP	m^3 world eq deprived	1.45E+01	9.57E-03	7.26E-02	0	0	8.22E+00	0	0	5.9E-04	2.47E-02	2.55E-01	-5.68E-01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1PCS of MAGNA3 pump

Parameter	Unit	A1-A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PERE	MJ	1.3E+02	7.85E-01	6.2E+00	0	0	4.64E+02	0	0	4.84E-02	1.39E+00	3.56E+00	-6E+00
PERM	MJ	9.52E+00	0	-6.15E+00	0	0	0	0	0	0	0	-3.38E+00	0
PERT	MJ	1.4E+02	7.85E-01	4.79E-02	0	0	4.64E+02	0	0	4.84E-02	1.39E+00	1.82E-01	-6E+00
PENRE	MJ	5.54E+02	1.08E+01	3.87E-01	0	0	7.77E+02	0	0	6.67E-01	2.33E+00	2.59E+01	-4.36E+01
PENRM	MJ	2.5E+01	0	-1.55E-01	0	0	0	0	0	0	0	-2.49E+01	0
PENRT	MJ	5.79E+02	1.08E+01	2.32E-01	0	0	7.77E+02	0	0	6.67E-01	2.33E+00	1.04E+00	-4.36E+01
SM	kg	3.98E+00	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.43E-01	8.6E-04	1.71E-03	0	0	3.75E-01	0	0	5.3E-05	1.12E-03	6E-03	-1.37E-02

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1PCS of MAGNA3 pump

Parameter	Unit	A1-A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
HWD	kg	2.96E-04	3.35E-11	5.96E-12	0	0	9.59E-08	0	0	2.07E-12	2.88E-10	5.87E-11	-2.13E-04
NHWD	kg	1.51E+00	1.65E-03	1.83E-02	0	0	5.69E-01	0	0	1.02E-04	1.71E-03	6.84E-01	4E-01
RWD	kg	1.45E-02	2.03E-05	9.85E-06	0	0	1.23E-01	0	0	1.25E-06	3.7E-04	3.53E-05	-1.49E-03
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	3.88E+00	0	0
EEE	MJ	0	0	8.93E-01	0	0	0	0	0	0	0	4.28E+00	0
EET	MJ	5.51E-03	0	8.09E-01	0	0	0	0	0	0	0	3.85E+00	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1PCS of MAGNA3 pump

Parameter	Unit	A1-A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	2.68E-06	1.89E-08	9.63E-10	0	0	6.63E-07	0	0	1.16E-09	1.99E-09	4.37E-09	-3.94E-07
IR	kBq U235 eq	1.83E+00	3.02E-03	1.56E-03	0	0	2.05E+01	0	0	1.86E-04	6.16E-02	5.51E-03	-2.53E-01
ETP-fw	CTUe	3.54E+02	7.73E+00	1.11E-01	0	0	2.16E+02	0	0	4.76E-01	7.28E-01	5.45E-01	-1.11E+01
HTP-c	CTUh	3.78E-07	1.57E-10	5.52E-12	0	0	1.14E-08	0	0	9.67E-12	8.84E-11	4.6E-11	-4.98E-08
HTP-nc	CTUh	5.08E-07	6.98E-09	1.49E-10	0	0	1.82E-07	0	0	4.3E-10	5.68E-09	2.7E-09	-2.01E-08
SQP	SQP	2.17E+02	4.51E+00	7.35E-02	0	0	3.05E+02	0	0	2.78E-01	9.14E-01	2.07E-01	-1.04E+01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator 'Potential Human exposure efficiency relative to U235'.
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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

Disclaimer 3: *JRC Technical Reports, Version 2, 2018* Page 6, for the indicator "EP-freshwater". This indicator has been calculated as 'kg P eq' as required in the characterization model EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe;

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SVR

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