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-20240017-CBA1-EN
Issue date	21.03.2024
Valid to	20.03.2029

MAGNA3 65-80/100/120 (Stainless Steel)

Grundfos Holding A/S

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD VERIFIED

GRUNDFOS

General Information

Grundfos Holding A/S

Programme holder

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

Declaration number

EPD-GRU-20240017-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

21.03.2024

Valid to

20.03.2029

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

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

MAGNA3 65-80/100/120 (Stainless Steel)

Owner of the declaration

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

Declared product / declared unit

1 PCS. of MAGNA3 65-80/100/120 (Stainless Steel)

Scope:

The declaration applies to 1 piece of MAGNA3 (Stainless Steel) 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 2021.

The declaration covers three different types of the MAGNA3 65- product (80/100/120).
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 connections.

The declaration covers three types of the MAGNA3 pump. They are grouped as shown below. The group reference in the technical data and scenarios refers also to these.

GROUP 1 - MAGNA3 65-80

GROUP 2 - MAGNA3 65-100 GROUP 3 - MAGNA3 65-120

These are all the same physical products and 100 % identical in terms of design, dimensions and materials as well as supply chain and manufacturing processes, i.e., all cradle to gate processes (A1-A3).

The products are also identical in terms of packaging, distribution, reference service life and end-of-life treatment.

The only 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. Hence, all life cycle modules are identical, except use stage module B6, which 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 as well as the corresponding harmonised norms based on these 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, 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

Electromagnetic Compatibility (EMC) Directive (2014/30/EU)

Standards used: *EN 55014-1:2017, EN 55014-2:2015,*

EN 61000-3-2:2014/2019, EN 61000-6-2:2008/2019,

EN 61000-3-3:2013 A1:2019

RoHS Directive 2011/65/EU and 2015/863//EU

Standard: *EN 50581:2012.*

Ecodesign Directive (2009/125/EC)

Commission Regulation (EC) No: 641/2009 and

Commission Regulation (EU) 622/2012

Standards used:
EN 16297-1:2012, EN 16297-2:2012, EN 16297-3:2012.

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

· domestic hot-water 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 three groups.

Constructional data

Name	Value	Unit
Frequency	50	Hz
Voltage	230	V
Energy Efficiency Index Gr.1	0,18	
Energy Efficiency Index Gr.2	0,17	
Energy Efficiency Index Gr.3	0,17	
Flow range Gr. 1 (max)	37,5	m^3/h
Flow range Gr. 2 (max)	40,0	m^3/h
Flow range Gr. 3 (max)	42,50	m^3/h
Head max. Gr.1	8	m
Head max. Gr.2	10	m
Head max. Gr.3	12	m
Power input Gr. 1 Average (from load profile describing use)	0,197	kW
Power input Gr. 2 Average (from load profile describing use)	0,249	kW
Power input Gr. 3 Average (from load profile describing use)	0,320	kW
Nominal capacity Gr.1	0,461	kW
Nominal capacity Gr. 2	0,599	kW
Nominal capacity Gr.3	0,75	kW

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

Base materials/Ancillary materials

Name	Value	Unit
Aluminium	13	%
Ceramics	0,28	%
Copper	2,75	%
Electronics	0,21	%
Magnet Nd	1,01	%
Paper	0,46	%
PCB	3,46	%
Plastics	0,31	%
Plastics, foam	1,14	%
Plastics GF	4,78	%
Rubber	0,16	%
Stainless steel	58,26	%
Steel	7,22	%
Cardboard	8	%
Plastic film	0,1	%
TOTAL	100	%

REACH

This product/article/at least one partial 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 (Stainless Steel) pump.

Declared unit

Name	Value	Unit
Declared unit	1	pce.
Mass reference	24.85	kg/pce
Conversion factor [Mass/Declared Unit]	24.85	

System boundary

This EPD is Cradle-To-Grave. The system boundaries

of the EPD follow the modular approach in *EN 15804*. By decision no. 20170712-n of the *SVR*, the modules B3, B4 and B5 are by default declared as "MNR" (module not relevant).

The product stage (A1-A3) comprises raw material extraction and processing, transport processes as well as the manufacturing process. The final production and assembly of the MAGNA3 pump takes place at a Grundfos manufacturing site in Germany. However, the full supply-chain leading to the finished product at the gate is rather complex and includes a large amount of raw materials, components and semi-finished parts which comes from both external suppliers as well as other Grundfos production facilities.

The product stage is included in the study, and according to *EN 15804* 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 any waste arising from those processes.

Wastes and losses are included in the modules where they occur according to the polluter pays principle and the modular approach of *EN 15804.*

The product includes:

· A1 Extraction and processing of raw materials;

· A1 Reuse of products or materials from a previous product system;

· A1 Processing of secondary materials;

· A1 Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;

· A1 Energy recovery and other recovery processes from secondary fuels;

· A2 Transportation up to the factory gate and internal transport;

· A3 Production of ancillary materials or pre products;

· A3 Manufacturing of products and coproducts;

· A3 Manufacturing of packaging;

· A1-A3 processing up to the end-of-waste state or disposal of final residues.

For secondary material inputs, the system boundary to the previous system (providing the secondary material) is set where outputs reach the end-of-waste state. The recycling of secondary material into new raw materials is included in the system boundary of this study. Waste materials from production processes that are recycled without any modification of the material's inherent characteristics are modelled as closed-loop within A1-A3. This is done up to the input mass flow that was used during production.

Waste for incineration arising in the product stage is accounted for in the module where the waste is produced. The environmental loads from the incineration process are declared in the module where it occurs and the electricity and heat which is produced from the incineration are considered as closed-loop within A1-A3, as described in *PCR Part A,* 5.5.1. The input of biogenic carbon from the production of packaging material is inventoried in A3. As required by *PCR Part A*, the corresponding end-of-life module of the packaging material, A5, is also declared and the emissions of biogenic carbon are inventoried.

The construction process stage (A4-A5) includes:

A4:

· Transportation from factory gate to the distribution center:

· Consumption of electricity, thermal energy and water at the distribution center;

· Transportation from distribution center to construction site;

· Wastage during distribution.

A5:

· Installation process;

· Transport of packaging waste to treatment site;

· Waste treatment of packaging.

The packaging material does not reach the end of waste state but is incinerated as waste.
According to European statistics, the average R1 value of incineration plants is > 0.6. Therefore, it is assumed that packaging material is treated thermally in an incineration plant with R1 > 0.6. The loads from the combustion process of packaging are declared in module A5 and the resulting energy benefits in module

D, as required by the *PCR Part A*, 5.5.2.

Use stage (B1-B7):

The use stage, related to the building fabric includes:

· B1, use or application of the installed product;

· B2, maintenance.

The use stage related to the operation of the building

includes:

· B6, operational energy use;

· B7, operational water use.

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).
The modules include the provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during the use stage. They also include all impacts and aspects related to the losses during the use stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

Generally, the geographical coverage of the datasets used matches the actual processes taking place. Meaning, that when modelling taking place in Grundfos Bjerringbro, the Danish electricity grid mix is used in the model and thermal energy from natural gas. These are generally of very high quality with very good technological, temporal and geographical representativeness.

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) includes all activities from when the product reaches the end of its service life and no longer provides any functionality and until all materials and components are processed for reuse/recycling or disposed of.

According to *EN 15804* and the *PCR Part A,* the end-of-life stage includes:

· C1 deconstruction of the product from the

· building, including initial on-site sorting of the

· materials;

· C2 transportation of the discarded product to a recycling site and transportation of waste to final disposal;

· C3 waste processing, collection of waste fractions from the deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery;

· C4 waste disposal including physical pretreatment and management of the disposal site.

At the end of life, the MAGNA3 pump is manually disassembled from the piping system in which it has been installed. The definition of the applied end-of-life scenario in this EPD follows the requirements in the

PCR Part A, 6.2 regarding complex products, with a combination of recycling, thermal waste treatment and landfilling. 100 % of the material is considered in the end of life scenario as required by the *PCR*. An overall collection rate of 90 % has been assumed.

Materials from which energy is recovered in an incineration process with an R1-value above 0.60 are in this study included with the environmental burdens from the incineration process inventoried in C3, the recovered energy is declared as exported energy in C3 and the energy benefits are declared in D. This procedure is according to the *PCR Part A*, 5.5.6. C3 includes the mechanical separation of the product followed by a series of sorting steps. Metal fractions are recycled and plastics, cardboard and electronics are assumed incinerated with energy recovery. The residual fractions are landfilled and declared in C4.

The specific amounts are shown in the scenarios section.

Beyond system boundary (D): According to *EN 15804* module D includes the reuse, recovery and/or recycling potentials, expressed as net impacts and benefits. Any declared benefits and loads from net

flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state are included in module D.

Contributions to module D comes from waste incineration processes in A5 and C3 as well as material recycling in C3. The specific fractions and net flows are shown in the scenarios section.

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.

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

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. Software and databases used: *LCA for Experts 10.7.1.28*
Schema 8007
Sphera and Ecoinvent databases

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 0.46 kg in 1 kg of material. This means that 46% biogenic carbon content is assumed 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	0.9	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	0,0332	l/100km
Transport distance	2003	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	460	kg/m^3
Wastage during distribution	0,02	%

Installation into the building (A5)

Name	Value	Unit
Packaging waste for incineration (LDPE film)	0,02	kg
Packaging waste for incineration (Paper/Cardboard)	1,955	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 Group 1	985	kWh/a
Electricity consumption Group 2	1245	kWh/a
Electricity consumption Group 3	1600	kWh/a
Average power input, Group 1	0,197	kW
Average power input, Group 2	0,249	kW
Average power input, Group 3	0,32	kW
Running hours (all groups)	5.000	h/a

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	22,871	kg
Transportation distance (C2)	500	km
Aluminium for recycling	2,74	kg
Steel for recycling	1,58	kg
Copper for recycling	0,60	kg
Stainless steel for recycling	12,76	kg
Plastics for incineration w/energy	1,40	kg
Electronics for incineration w/energy	0,80	kg
Landfilling	2,81	kg

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

Name	Value	Unit
A5, incineration w/energy recov. thermal energy	8,89	MJ
A5, incineration w/energy recov. electric energy	4,91	MJ
C3, steel for recycling (net amounts)	-0,469	kg
C3, stainless steel for recycling (net amounts)	3,93	kg
C3, aluminium for recycling (net amounts)	-0,436	kg
C3, copper for recycling (net amounts)	0,258	kg
C3, incineration w/energy recov. thermal energy	13,4	MJ
C3, incineration w/energy recov. electric energy	7,45	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 Group 1. B6 indicator results for other groups can be derived by multiplying the B6 indicator results with the following factors:

GROUP 1 - MAGNA3 65-80: 1,00
GROUP 2 - MAGNA3 65-100: 1,265
GROUP 3 - MAGNA3 65-120: 1,626

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 65-80/100/120

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.19E+02	6.12E+00	6.92E-01	1.9E+00	3.17E+00	0	0	3.21E+02	0	0	7.85E-01	6.32E+00	1.46E-01	-1.21E+01
GWP-fossil	kg CO_2 eq	1.18E+02	6.12E+00	3.91E+00	1.91E+00	4.68E-01	0	0	3.18E+02	0	0	7.89E-01	6.3E+00	1.48E-01	-1.21E+01
GWP-biogenic	kg CO_2 eq	-1.82E-02	-9.84E-03	-3.25E +00	-2.81E-02	2.7E+00	0	0	2.76E+00	0	0	-1.17E-02	1.59E-02	-1.83E-03	-3.14E-02
GWP-luluc	kg CO_2 eq	7.48E-02	9.29E-03	3.04E-02	1.73E-02	9.55E-05	0	0	3.45E-02	0	0	7.33E-03	2.34E-04	1.34E-04	-3.16E-03
ODP	kg CFC11 eq	4.74E-08	4.8E-13	4.06E-09	1.07E-11	4.18E-13	0	0	5.86E-09	0	0	1.03E-13	3.45E-11	2.47E-13	-2.44E-11
AP	mol H^+ eq	8.61E-01	1.82E-01	1.94E-02	1.14E-02	8.6E-04	0	0	6.79E-01	0	0	4.75E-03	4.74E-03	4.57E-04	-1.12E-01
EP-freshwater	kg P eq	1.52E-03	4.79E-06	6.86E-05	7.18E-06	1.56E-07	0	0	1.19E-03	0	0	2.89E-06	9.76E-06	1.7E-05	-1.55E-05
EP-marine	kg N eq	9.35E-02	4.34E-02	4.06E-03	5.5E-03	3.15E-04	0	0	1.62E-01	0	0	2.31E-03	1.23E-03	1.09E-04	-1.31E-02
EP-terrestrial	mol N eq	1.01E+00	4.76E-01	4.07E-02	6.1E-02	3.95E-03	0	0	1.7E+00	0	0	2.57E-02	1.38E-02	1.2E-03	-1.41E-01
POCP	kg NMVOC eq	2.97E-01	1.23E-01	1.14E-02	1.05E-02	8.18E-04	0	0	4.33E-01	0	0	4.39E-03	3.29E-03	3.44E-04	-4.21E-02
ADPE	kg Sb eq	9.16E-03	1.13E-07	6.05E-05	1.97E-06	4.3E-09	0	0	4.91E-05	0	0	5.24E-08	2.88E-07	3.98E-09	-1.32E-03
ADPF	MJ	1.66E+03	7.61E+01	5.8E+01	2.62E+01	1.16E+00	0	0	6.69E+03	0	0	1.08E+01	4.01E+01	2.21E+00	-1.4E+02
WDP	m^3 world eq deprived	3.94E+01	2.05E-02	3.94E-02	3.19E-02	3.81E-01	0	0	7.08E+01	0	0	9.56E-03	8.66E-01	-2.06E-03	-8E-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 65-80/100/120

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PERE	MJ	4.3E+02	1.26E+00	5.58E+01	2.03E+00	2.61E-01	0	0	4E+03	0	0	7.84E-01	2.35E+01	1.99E-01	3.04E+00
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	1.26E+00	5.58E+01	2.03E+00	2.61E-01	0	0	0	4E+03	0	0	7.84E-01	2.35E+01	1.99E-01	3.04E+00
PENRE	MJ	1.66E+03	7.63E+01	5.8E+01	2.62E+01	1.16E+00	0	0	6.69E+03	0	0	1.08E+01	4.02E+01	2.22E+00	-1.4E+02
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	1.66E+03	7.63E+01	5.8E+01	2.62E+01	1.16E+00	0	0	6.69E+03	0	0	1.08E+01	4.02E+01	2.22E+00	-1.4E+02
SM	kg	1.46E+01	0	2.31E-01	2.97E-03	0	0	0	0	0	0	0	0	0	0
RSF	MJ	1.46E-23	0	0	2.91E-27	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	1.71E-22	0	0	3.42E-26	0	0	0	0	0	0	0	0	0	0
FW	m^3	1.17E+00	1.44E-03	2.32E-02	2.32E-03	8.98E-03	0	0	3.23E+00	0	0	8.59E-04	2.94E-02	2.31E-05	2.05E-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 65-80/100/120

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
HWD	kg	7.01E-06	2.4E-10	1.21E-04	2.57E-08	2.94E-11	0	0	7.86E-07	0	0	3.35E-11	4.56E-09	1.85E-10	-2.44E-03
NHWD	kg	9.4E+00	7.8E-03	3.75E-01	6.09E-03	1.23E-01	0	0	4.9E+00	0	0	1.65E-03	6.6E-01	2.56E+00	2.1E+00
RWD	kg	5.61E-02	9.91E-05	1.78E-03	6.49E-05	5.29E-05	0	0	1.06E+00	0	0	2.02E-05	6.23E-03	2.6E-05	-2.52E-03
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	1.77E+01	0	0
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	0	0	0	0	4.91E+00	0	0	0	0	0	0	7.45E+00	0	0
EET	MJ	0	0	0	0	8.89E+00	0	0	0	0	0	0	1.34E+01	0	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 65-80/100/120

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	1.08E-05	3.15E-06	2.88E-07	7.41E-08	5.08E-09	0	0	5.71E-06	0	0	3.01E-08	3.01E-08	4.64E-09	-2.74E-06
IR	kBq U235 eq	7.53E+00	1.43E-02	2.85E-01	9.58E-03	8.25E-03	0	0	1.77E+02	0	0	3.02E-03	3.02E-03	3.85E-03	-2.13E-01
ETP-fw	CTUe	8.38E+02	5.39E+01	1.98E+01	1.84E+01	5.58E-01	0	0	1.86E+03	0	0	7.72E+00	7.72E+00	1.39E+00	-1.82E+01
HTP-c	CTUh	2.38E-05	1E-09	6.46E-07	5.27E-09	3.05E-11	0	0	9.84E-08	0	0	1.57E-10	1.57E-10	8.93E-11	-5.37E-07
HTP-nc	CTUh	1.79E-06	3.45E-08	4.24E-08	1.69E-08	1.14E-09	0	0	1.57E-06	0	0	6.97E-09	6.97E-09	7.63E-09	-7.24E-08
SQP	SQP	3.87E+02	5.86E+00	1.06E+02	1.08E+01	3.41E-01	0	0	2.62E+03	0	0	4.5E+00	4.5E+00	1.98E-01	-1.85E+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; This EPD was created using a software tool.

References

Standards

Machinery Directive

DIRECTIVE 2006/42/EC OF THE EUROPEAN

PARLIAMENT AND OF THE COUNCIL of 17 May

2006 on machinery

Radio Equipment Directive

DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of

radio equipment

Electromagnetic Compatibility (EMC) Directive

DIRECTIVE 2014/30/EU OF THE EUROPEAN

PARLIAMENT AND OF THE COUNCIL of 26 February

2014 on the harmonistion of the laws of the Member

States relating to electromagnetic compatibility

Ecodesign Directive

DIRECTIVE 2009/125/EC OF THE EUROPEAN

PARLIAMENT AND OF THE COUNCIL of 21 October

2009 establishing a framework for the setting of

ecodesign requirements for energy-related products

EC 641/2009

COMMISSION REGULATION (EC) No 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in

products

EC 622/2012

COMMISSION REGULATION (EU) No 622/2012 of 11 July 2012 amending Regulation (EC) No 641/2009 with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products

DIRECTIVE 2011/65/EU

DIRECTIVE 2011/65/EU OF THE EUROPEAN

PARLIAMENT AND OF THE COUNCIL of 8 June 2011

on the restriction of the use of certain hazardous

substances in electrical and electronic equipment

DIRECTIVE 2015/863/EU

DIRECTIVE 2015/863/EU of 31 March 2015 amending

Annex II to Directive 2011/65/EU of the European

Parliament and of the Council as regards the list of

restricted substances

ETSI EN 301 489-1

ETSI EN 301 489-1 V2.2.0, Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

ETSI EN 301 489-17

ETSI EN 301 489-17 V3.2.0, Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems

ETSI EN 300 328 V2.1.1

ETSI EN 300 328 V2.1.1, Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques

EN 809

EN 809:1998-10 + A1:2009, Pumps and pump units for

liquids - Common safety requirements

EN 55014-1

EN 55014-1:2017, Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission

EN 55014-2

EN 55014-2:2015, Electromagnetic compatibility –

Requirements for household appliances, electric tools

and similar apparatus – Part 2: Immunity – Product

family standard (CISPR 14-2:2015)

EN 50581:2012

EN 50581:2012, Technical documentation for the

assessment of electrical and electronic products with

respect to the restriction of hazardous substances

EN 60335-1

EN 60335-1:2012/A11:2014/A13:2017, Household

and similar electrical appliances – Safety – Part 1:General requirements

EN 60335-2-51

EN 60335-2-51:2003-03 + A1:2008 + A2:2012, Household and similar electrical appliances – Safety –Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations

EN 61000-3-2

EN 61000-3-2:2014/2019, Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current =16 A per phase)

EN 61000-3-3

EN 61000-3-3:2013-08/ A1:2019, Electromagnetic compatibility (EMC) – Part 3-3:
Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low voltage supply systems, for equipment with

rated current <= 16 A per phase and not subject to conditional connection

EN 61000-6-2

EN 61000-6-2:2008/2019, Electromagnetic compatibility (EMC) – Part 6-2: Generic standards –Immunity for industrial environments

EN 16297-1

EN 16297-1:2012-10, Pumps – Rotodynamic pumps – Glandless circulators – Part 1:
General requirements and procedures for testing and calculation of energy efficiency index (EEI)

EN 16297-2

EN 16297-2:2012-10, Pumps – Rotodynamic pumps – Glandless circulators – Part 2: Calculation of energy efficiency index (EEI) for standalone circulators

EN 16297-3

EN 16297-3:2012, Pumps – Rotodynamic pumps –Glandless circulators – Part 3: Energy efficiency index (EEI) for circulators integrated in products

ISO 14001

EN ISO 14001:2015-09, Environmental management systems - Requirements with guidance for use

ISO 14025

DIN EN /ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804

EN 15804:2012-04+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

PCR Part A

Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Building-Related Products and Services, Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, Version 1.3.

PCR Part B

Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Building-Related Products and Services, Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part B: Requirements on the EPD for Pumps for liquids and liquids with solids, Version 1.0 (2018)

Further references

CPR

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

CML 2001

Impact assessment characterization factors Institute of Environmental Sciences, Leiden University, Netherlands

ECHA candidate list

Candidate List of substances of very high concern (SVHCs) for authorisation, European Chemicals Agency (ECHA), Helsinki, Finland

EUTREND model

Struijs et al., 2009b

AEA Energy & Environment

Circulators in Buildings

Ecoinvent

Ecoinvent v3.9.1

LCA for Experts

LCA for Experts 10.7.1.28Schema 8007

REACH
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (Status: 27.06.2018)

SVR

Advisory Board (formerly SVA)

Decision no.
20170712-n

Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

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

+45 87501400
LCA_EPD@grundfos.com
www.grundfos.com

Owner of the Declaration

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

+45 87501400
LCA_EPD@grundfos.com
www.grundfos.com