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-20240028-CBA1-EN
Issue date	20/03/2024
Valid to	19/03/2029

MIXIT 50-40 F

Grundfos Holding A/S

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

General Information

Grundfos Holding A/S

Programme holder

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

Declaration number

EPD-GRU-20240028-CBA1-EN

This declaration is based on the product category rules:

control valves , 01/06/2023
(PCR checked and approved by the SVR)

Issue date

20/03/2024

Valid to

19/03/2029

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

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

MIXIT 50-40 F

Owner of the declaration

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

Declared product / declared unit

One piece of MIXIT 50-40 Flanged (F) control valve

Scope:

The declared product is one piece of MIXIT 50-40 Flanged (F) control valve.
This declaration covers all MIXIT Flanged variants with the connection- and flow combination 50-40.

The product is assembled in Germany or Hungary.
The life cycle assessment is based on data collected from the ERP system of the manufacturer, including data from the production plant.
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 declared product MIXIT is a prefabricated control valve unit with integrated control functions. The unit integrates a temperature controller, a balancing valve, an actuator, and temperature and flow sensors.This EPD covers MIXIT Flanged (F) variants with the connection and flow size 50-40.

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)
Standards used: *EN 60730-1:2016 + A1:2019, EN 60730-2-8:2020, EN 60730-2-14:2019.*

Radio Equipment Directive (2014/53/EU)
Standards used: *EN 60730-1:2016 + A1:2019, EN 60730-2-8:2020, EN 60730-2-14:2019, EN 62479:2010, EN 61000-3-2:2019, EN 61000-3-3:2013 + A1:2019, ETSI EN 301 489-1 V2.2.3, ETSI EN 301 489-17 V3.2.3., ETSI EN 300 328 V2.2.2.*

RoHS Directives (2011/65/EU and 2015/863/EU)
Standards used: *EN IEC 63000:2018.*

The CE-marking takes into account the proof of conformity with the respective harmonized standards based on the legal provisions above.

For the application and use the respective national provisions apply.

Application

In a building application, a MIXIT unit is installed in series with a water circulation pump to form a complete heating or cooling mixing loop. The matching circulation pump is not part of this declaration. Mixing loops are used whenever there is a need for controlling (liquid) flow temperature. The basic principle is to mix primary incoming water with return water to obtain the required mixed flow temperature. MIXIT can be used in mixing loops in heating and cooling systems where there is a need to control water flow temperature, such as radiator heating, underfloor heating, air handling units, and cooling applications.

Technical Data

Technically, a control valve is characterized by the following attributes, according to the PCR-B:

Control valve data

Name	Value	Unit
Max valve capacity, Kvs	40	m^3/h
Nominal dimension of ports	50	(DN)
Nominal power input	8	W
Power input in stand-by mode	2.5	W
Number of ports	3	-
Liquid temperature range	0 - 90	°C
Ambient temperature range	0 - 50	°C

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

Base materials/Ancillary materials

Main constituents of the product

Name	Value	Unit
Cast iron and steel	72.7	%
Stainless steel	4.0	%
Brass	4.3	%
Plastics incl. composites	6.2	%
Plastic foam	1.0	%
Rubber	0.1	%
Plastic film	0.0	%
Electronics	2.9	%
Paper	0.5	%
Corrugated board	8.3	%

"Plastics incl. composites" include thermoplastics and plastics reinforced with glass fibres.

REACH

The product does not contain substances listed in the *Candidate List* of Substances of Very High Concern for Authorisation (August 2023) exceeding 0.1 percentage by mass.

Reference service life

According to the PCR-B, a reference service life of 10 years has been assumed for the purpose of this study, for estimating the energy consumption during the use stage of the control valve.

LCA: Calculation rules

Declared Unit

The declared unit is one piece of MIXIT 50-40 Flanged (F) control valve.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	pce.
Mass reference	17.3	kg/pce

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System boundary

This EPD is classified as a Cradle-to-Grave and module D. All major steps from the extraction of natural resources to the final disposal of the product are included in the scope of the study, following the modular approach of *EN 15804*.

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* 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 included in 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*.

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 control valve,

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.

Modules B1-B7 refer to the use stage. All use stage modules are assessed in the study, though B1, B2 and B7 are assessed to be zero. The modules B3, B4 and B5 are declared as "MNR" (module not relevant) according to the PCR-B.
Module B6 regards energy use during the operation of the product and includes the electricity consumption of the product. The total electricity consumption over the reference service lifetime is calculated by multiplying the power consumption in activation and standby conditions, respectively, with the reference values of annual activation and standby duration. The control valve is assumed to operate all year, with activation taking up 5 % of the total time.

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 control valve, 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.

Module D refers to the burdens and benefits beyond the system boundaries. According to *EN 15804*, 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
In the declared net product, there is no biogenic carbon exceeding the minimal reporting requirement of 5 % of the mass of the net product.
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2

Biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.62	kg C

In the following, technical scenario information is provided for modules A4, A5, B6, C1-C4, and D.

Transport from the gate to the site (A4)

Name	Value	Unit
Transport distance	1500	km
Capacity utilisation (including empty runs)	55	%
Gross density of products transported	401	kg/m^3

Assembly (A5)

Name	Value	Unit
Water consumption	-	m^3
Electricity consumption	-	kWh
Packaging waste for incineration	1.44	kg

Reference lifetime: The PCR-B outlines a reference value of RSL as well as reference conditions of application to facilitate reference building calculations: A Reference Service Life of 10 years is assumed together with running conditions fulltime, with activation of the valve at 5 % of the time and standby conditions at 95 % of the time.

Reference service life

Name	Value	Unit
Life Span according to the manufacturer	10	a
Usage conditions: Operation time	100	%
Usage conditions: Activation fraction of operation	5	%

Operational energy use (B6) and Operational water use (B7)

Name	Value	Unit
Water consumption	-	m^3
Electricity consumption (Reference scenario)	243	kWh

The electricity consumption is calculated over the RSL for the specified Usage conditions, and the power consumption at activation and stand-by is specified in the Technical data table. The electricity mix applied for the reference scenario is a European residual mix, according to the PCR-B.

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type , Electronic waste (WEEE)	15.8	kg
Collected as mixed construction waste	-	kg
Recycling ; Steel, incl. cast iron	11.9	kg
Recycling ; Stainless steel	0.7	kg
Recycling ; Brass/Copper	0.7	kg
Incineration ; Plastics, electronics, paper	1.6	kg
Landfilling	1	kg

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

Name	Value	Unit
A5, Packaging incineration w/energy recovery , Electricity	3.11	MJ
A5, Packaging incineration w/energy recovery , Thermal energy	2.82	MJ
C3, Copper for recycling , net output flow	0.013	kg
C3, Stainless steel for recycling , net output flow	0.63	kg
C4, Waste incineration w/energy recovery , Electricity	5.90	MJ
C4, Waste incineration w/energy recovery , Thermal energy	5.30	MJ

LCA: Results

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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:

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	6.58E+01	1.23E+00	-1.02E+00	2.5E+00	2.06E+00	0	0	1.01E+02	0	0	6.63E-01	3.72E-01	3.41E+00	-3.55E+00
GWP-fossil	kg CO_2 eq	6.52E+01	1.23E+00	1.24E+00	2.52E+00	7.05E-02	0	0	1.01E+02	0	0	6.66E-01	3.73E-01	3.3E+00	-3.54E+00
GWP-biogenic	kg CO_2 eq	6.09E-01	-1.31E-02	-2.27E+00	-3.7E-02	1.99E+00	0	0	3.94E-02	0	0	-9.8E-03	-1.04E-03	1.08E-01	-1.26E-02
GWP-luluc	kg CO_2 eq	4.52E-02	8.64E-03	5.85E-03	2.32E-02	1.41E-04	0	0	9.38E-03	0	0	6.16E-03	1.19E-04	5.65E-05	-4.62E-04
ODP	kg CFC11 eq	3.99E-08	1.3E-13	3.16E-12	3.27E-13	2.52E-13	0	0	1.01E-09	0	0	8.65E-14	8.52E-10	3.95E-13	-1.51E-11
AP	mol H^+ eq	1.5E-01	7.71E-03	4.01E-03	4.55E-03	5.88E-04	0	0	1.56E-01	0	0	1.21E-03	1.43E-03	9.28E-04	-2.15E-02
EP-freshwater	kg P eq	5.67E-04	3.46E-06	3.72E-05	9.18E-06	1.29E-07	0	0	1.01E-04	0	0	2.43E-06	4.61E-05	3.51E-06	-4.99E-06
EP-marine	kg N eq	3.6E-02	3.22E-03	1.9E-03	1.83E-03	2.15E-04	0	0	4.4E-02	0	0	4.84E-04	2.49E-04	3.52E-04	-2.95E-03
EP-terrestrial	mol N eq	3.43E-01	3.56E-02	1.86E-02	2.09E-02	2.68E-03	0	0	4.65E-01	0	0	5.53E-03	3.11E-03	4.47E-03	-3.17E-02
POCP	kg NMVOC eq	9.3E-02	8.44E-03	4.65E-03	4.08E-03	5.65E-04	0	0	1.22E-01	0	0	1.08E-03	7.34E-04	9.47E-04	-9.18E-03
ADPE	kg Sb eq	1.19E-03	6.43E-08	4.57E-07	1.66E-07	3.2E-09	0	0	4.97E-06	0	0	4.41E-08	6.34E-06	3.12E-09	-1.39E-04
ADPF	MJ	9.26E+02	1.65E+01	1.84E+01	3.42E+01	8.34E-01	0	0	2.25E+03	0	0	9.05E+00	7.37E+00	1.5E+00	-4.87E+01
WDP	m^3 world eq deprived	3.22E+00	1.15E-02	1.22E-01	3.03E-02	2.54E-01	0	0	8.62E+00	0	0	8.03E-03	9.11E-02	3.42E-01	-3E-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:

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PERE	MJ	3.75E+02	9.29E-01	1.26E+01	2.49E+00	2.18E+01	0	0	3.09E+02	0	0	6.59E-01	4.19E+00	1.44E+00	-1.03E+01
PERM	MJ	1.18E+00	0	2.16E+01	0	-2.16E+01	0	0	0	0	0	0	0	-1.18E+00	0
PERT	MJ	3.76E+02	9.29E-01	3.42E+01	2.49E+00	1.7E-01	0	0	3.09E+02	0	0	6.59E-01	4.19E+00	2.54E-01	-1.03E+01
PENRE	MJ	8.9E+02	1.66E+01	1.83E+01	3.43E+01	9.64E-01	0	0	2.25E+03	0	0	9.09E+00	7.37E+00	3.51E+01	-4.87E+01
PENRM	MJ	3.73E+01	0	1.29E-01	0	-1.29E-01	0	0	0	0	0	0	0	-3.35E+01	0
PENRT	MJ	9.27E+02	1.66E+01	1.84E+01	3.43E+01	8.35E-01	0	0	2.25E+03	0	0	9.09E+00	7.37E+00	1.5E+00	-4.87E+01
SM	kg	1.36E+01	0	1.28E+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	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	2.27E-01	1.02E-03	1.7E-02	2.73E-03	5.99E-03	0	0	5.16E-01	0	0	7.22E-04	3.7E-03	8.04E-03	-1.05E-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:

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
HWD	kg	1.44E-04	4.3E-11	4.41E-07	1.06E-10	2.1E-11	0	0	1.31E-07	0	0	2.81E-11	8.44E-10	8.89E-11	-4.07E-04
NHWD	kg	1.52E+00	2.55E-03	5.08E-02	5.23E-03	6.42E-02	0	0	4.97E-01	0	0	1.39E-03	4.91E-03	1.09E+00	1.02E-01
RWD	kg	4.25E-02	2.51E-05	5.48E-04	6.42E-05	3.46E-05	0	0	3.51E-01	0	0	1.7E-05	1.07E-03	4.82E-05	-2.91E-03
CRU	kg	0	0	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	1.33E+01	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	3.11E+00	0	0	0	0	0	0	0	5.9E+00	0
EET	MJ	1.08E-01	0	7.13E-04	0	2.82E+00	0	0	0	0	0	0	0	5.3E+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:

Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	2.61E-06	1.8E-07	7.03E-08	5.62E-08	3.39E-09	0	0	1.41E-06	0	0	1.49E-08	1.22E-08	6.46E-09	-4.9E-07
IR	kBq U235 eq	4.64E+00	3.67E-03	9.06E-02	9.58E-03	5.48E-03	0	0	5.27E+01	0	0	2.54E-03	1.8E-01	7.48E-03	-4.7E-01
ETP-fw	CTUe	4.66E+02	1.24E+01	4.61E+00	2.45E+01	4.05E-01	0	0	1.96E+02	0	0	6.49E+00	2.9E+00	7.54E-01	-8.07E+00
HTP-c	CTUh	1.21E-06	2.48E-10	2.66E-10	4.97E-10	1.96E-11	0	0	1.16E-08	0	0	1.32E-10	4.48E-10	6.83E-11	-9.01E-08
HTP-nc	CTUh	5.52E-07	1.07E-08	1.24E-08	2.21E-08	5.36E-10	0	0	3.74E-07	0	0	5.86E-09	2.22E-08	4.17E-09	-2.11E-08
SQP	SQP	3.21E+02	5.31E+00	7.79E+01	1.43E+01	2.67E-01	0	0	3.05E+02	0	0	3.78E+00	4.32E+00	2.86E-01	-7.18E+00

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.

The module B6 has been calculated for a Reference Service Life of 10 years.

References

Candidate List of substances of very high concern for Authorisation (published in accordance with Article 59(10) of the REACH Regulation). Available at https://echa.europa.eu/candidate-list-table

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

EN 60730 Automatic electrical controls. Part 1: General requirements. Part 2: Particular requirements.

EN IEC 61000 Electromagnetic compatibility (EMC). Part 3-2: Limits - Limits for harmonic current emissions. Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems

EN IEC 62479:2010 Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

ETSI EN 301 489 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services

ETSI EN 300 328 Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

Machinery Directive 2006/42/EC
Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC

Radio Equipment Directive (2014/53/EU)
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 and repealing Directive 1999/5/EC

RoHS Directives (2011/65/EU) and (2015/863/EU)
EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

IBU 2022
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.1, Berlin: Institut Bauen und Umwelt e.V., 2022, www.ibu-epd.com

Software and database
Sphera LCA for Experts, v. 10.7.1.28,
incl. Sphera Professional Database v. 2023.1
Additional database: Ecoinvent v. 3.9.1

PCR-A
Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according

to EN 15804+A2:2019. Version 1.3, 2021.

PCR-B

PCR Guidance-Text for Building-Related Products and Services, Part B: Requirements on the EPD for control valves. Version 1, 2023.

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

+4587501400
LCA_EPD@grundfos.com
www.grundfos.com

Owner of the Declaration

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

+4587501400
LCA_EPD@grundfos.com
www.grundfos.com