xylem

NSF Certified Environmental Product Declaration
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According to ISO 14025

Environmental Product Declaration

Xylem ecocirc® and ecocirc+® Circulator Pumps (Cast Iron)

Product Category	Circulator pumps for heating, cooling, and domestic hot-water systems
Geographical Scope	Europe
Program Operator	NSF International
EPD type	Type III Environmental Declaration according to ISO 14025 and EN 15804+A2
Declared unit	1 piece of Lowara ecocirc® / ecocirc+® circulator pump, including packaging
Scope	Cradle-to-Grave (modules A1–D)
Verification	Independent external verification by NSF International
Issue Date / Valid Until	02/02/2026 - 02/02/2031
PCR applied	Pumps for Liquids (IBU, 2024)

Sustainability at Xylem

Sustainability is at the core of our business strategy, reflecting our belief that advancing environmental stewardship and contributing to a more resilient society hand in hand with financial success.

Program Operator	NSF International
General Program Instructions & Version	NSF Program Operator Rules, November 1, 2022
Manufacturer Name and Address	Xylem Service Hungary Kft. Cegléd, Külső Kátai út 61, 2700 Hungary
Declaration Number	EPD11222
Declared Product & Functional Unit	one (1) piece of product, including packaging
Reference PCR & Version Number	PCR for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report (v1.4, Institut Bauen und Umwelt e.V. (IBU)) Part B: Requirements on the EPD for Pumps for liquids and liquids with solids (v11, Institut Bauen und Umwelt e.V. (IBU))
Product Definition	Xylem ecocirc® and ecocirc+® Circulator Pumps (Cast Iron)
Product RSL Description	10 Years
Markets of Applicability	European
Date of Issue	02/02/2026
Period of Validity	02/02/2026 - 02/02/2031
EPD Type	Product-Specific
EPD Scope	Cradle to grave
Year of reported primary data	2024
LCA Software & Version Number	SimaPro v.10.2.0.1
LCI Database & Version Number	Ecoinvent v.3.11
LCIA Methodology & Version Number	EN 15804 + A2 (adapted) v1.03

This declaration was independently verified in accordance with ISO 14025: 2006.

☐ INTERNAL ☒ EXTERNAL Joseph Geibig - EcoForm Consulting

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

Cher Xue, Program Manager – Carbon Strategy of TrueNorth Collective

MD Insaf Ali and Amol Niwalkar of Xylem Water Solutions

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:

Joseph Geibig - EcoForm Consulting

1 Product Definition and Information

1.1 Description of Company

Xylem Inc. (Xylem) is a global water technology provider, founded in 2011 as a spin-off from ITT Corporation, that designs and manufactures engineered solutions for water transport, treatment, testing, and smart metering.

1.2 Product Definition

Product Name

Lowara ecocirc® / ecocirc+® circulator pumps (cast iron)

Product Type

High-efficiency glandless circulator pump with electronically commutated permanent magnet motors (ECM).

Manufacturing

Xylem Water Solutions Hungary Kft. – Cegléd, Hungary

Application

Circulation of water/water-glycol in heating, cooling, and domestic hot-water systems in residential, multi-residential, and light-commercial buildings, for indoor applications.

- Space heating: radiator, underfloor, and mixed systems
- Cooling circuits: fan-coil and chilled-water loops
- DHW recirculation
- Heat-pump and solar-thermal primary loops

Main materials

Cast iron, steel, aluminium, copper, engineered plastics, ceramics

Performance range

Head up to 8 m; Flow up to 4.5 m³/h; Power input 24–60 W

Further technical details for the product are available in the product specification brochure here.

1.3 Certifications and Standards

Product Standards and compliant to:

- Ecodesign Directive (2009/125/EC)
- Energy Efficiency Index acc. EN 16297-1/3: EEI ≤ 0.18
- Low Voltage Directive (2014/35/EU)
- EN 60335-1:2012+AC:2014+A11:2014+A13:2017+A1:
- 2019+A2:2019+A15:2021,EN 60335-2-51:2003+A1:2008+A2:2012.
- EMC Directive (2014/30/EU)
- EN 55014-1:2017, EN 55014-2:2015, EN IEC 61000-3-2:2019, EN 61000-3-3:2013.
- REACH: the product complies with Regulation (EC) No. 1907/2006. Where applicable, information regarding Substances of Very High Concern (SVHC) will be provided to customers upon request.

Manufacturing site certification:

- ISO 9001:2015, ISO 14001:2015 certified

1.4 Product Group Covered by the EPD:

This Environmental Product Declaration covers the most widely sold cast-iron variants of the Lowara ecocirc® and ecocirc+® circulator ranges in the S, M and L series. All declared products are manufactured at Xylem Water Solutions Hungary Kft. (Cegléd, Hungary) and share the same core design, material composition and manufacturing processes. They differ primarily in size, hydraulic performance and control features.

Due to the lack of quantified evidence on lifetime energy savings from the eAdapt control function, the ecocirc+ “Plus” variants are declared with the same EPD results as their corresponding base models.

ecocirc S-series

S 15-4/130, S 25-4/130, S 25-4/180

S+ 15-4/130, S+ 25-4/130

ecocirc M-series

M 15-6/130, M 25-6/130, M 25-6/180, M 32-6/180

M+ 15-6/130, M+ 25-6/130, M+ 25-6/180

ecocirc L-series

L 25-8/130, L 25-8/180, L 32-8/180

L+ 25-8/130, L+ 25-8/180, L+ 32-8/180

Notes

“Plus” models include eAdapt smart control; declared impacts are identical to the standard variants.

All listed variants have similar material composition and identical manufacturing site and process.

1.5 Declaration of Methodological Framework

This study provides life cycle inventory and environmental impacts relevant to Xylem ecocirc® and ecocirc+® series circulator pumps. The LCA follows an attributional approach as outlined in EN15804. System modeling was performed using the commercial LCA software SimaPro (version 10.2.0.1), developed by Pré Sustainability.

1.6 Technical Data

The technical specifications of the products are listed in the sections below.

Constructional Data

Name	Value	Unit
Frequency	50-60 Hz	Hz
Flow Rate (max)	Up to 4.5	m3/h
Power Input Average (from load profile describing use)		
ECOCIRC S	0.011	kW
ECOCIRC M	0.015	kW
ECOCIRC L	0.025	kW

Name	Value	Unit
Nominal Capacity		
ECOCIRC S	0.024	kW
ECOCIRC M	0.035	kW
ECOCIRC L	0.060	kW
Voltage	230	V
Energy Efficiency Index (EEI)		
ECOCIRC S	0.16	-
ECOCIRC M	0.17	-
ECOCIRC L	0.18	-
Pumped Liquid	Water	-
Head Max.		
ECOCIRC S	4	m
ECOCIRC M	6	m
ECOCIRC L	8	m

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

1.7 Raw Materials (A1)

The main materials are cast iron, steel, aluminum, copper, engineered plastics and ceramics. The material composition among the 10 products is similar.

Base materials/Ancillary materials

Name	Value	Unit
Cast Iron	41 - 53	%
Steel	12 - 15	%
Aluminum	9 – 11	%
Packaging	7 – 11	%
Engineered Plastics	6 – 9	%
Copper	6 – 9	%
Miscellaneous Hardware	5 – 6	%
Ceramics	<1	%

ECOCIRC S, L and M series complies with Regulation (EC) No 1907/2006 (REACH); SVHC information will be provided to customers upon requests.

1.8 Transportation (A2, A4)

Transportation includes the delivery of supplied materials to Xylem facility for manufacturing and assembly, transport of scrap to waste treatment, and the transport of product to customer locations.

1.9 Packaging (A3)

The packaging materials include Polycoated Kraft Paper, PET, PE Label, Paper, Cardboard, and Rubber Gaskets. Packaging weights by materials are summarized in table below.

Name	Value	Unit
Polycoated Kraft Paper	0.002	kg
PET	0.001	kg
PE Label	<0.001	kg
Paper	0.040	kg
Cardboard	0.107 – 0.166	kg
Rubber Gaskets	0.004 – 0.008	kg

1.10 Manufacturing (A3)

Manufacturing of circulator pump products includes Stator Production, Rotor Production Final Assembly and Packaging, as described in a simple flow diagram in Figure 1 below.

Manufacturing includes material and energy inputs into the system, during manufacturing processes, and the processing of any waste arising from the processes. Wastes and losses are included in the module.

Flow Diagram

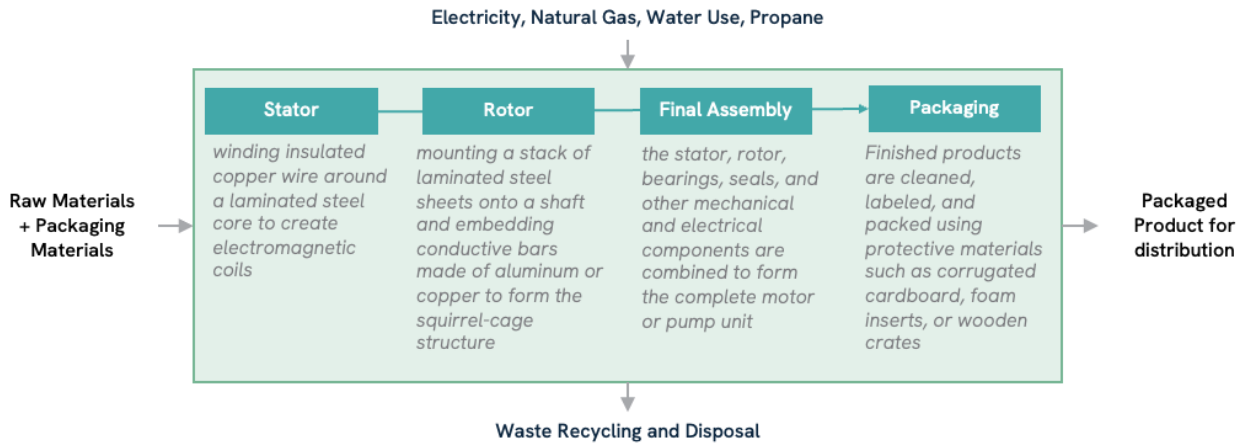

Figure 1: Manufacturing Flow Diagram

1.11 Product Installation (A5)

The installation requires manual handling only; therefore, A5 includes packaging waste treatment only, in accordance with EN 15804+A2. The end of life treatment of packaging references EU region average rates as shown below.

Name	EOL Treatment	Value
Plastics	Recycled	37.6%
	Incineration	11.3%
	Landfill	51.1%
Paper and Paperboard	Recycled	81.5%
	Incineration	3.3%
	Landfill	15.25%
Other	Landfill	100%

1.12 Use (B6)

Operational energy use (B6) uses the average annual power consumption representative for each product size class (S, M, L). The other use stage modules B1-B5 and B7 are declared as having zero impacts as there is no water use during the use phase, nor are any direct emissions from the pump products once they are installed. The pumps do not require repair or replacement once they are installed.

1.13 Reference Service Life

The use stage sub-module B6 is declared per year as required by the PCR Part B and a formula was provided in the results section for extrapolating B6 over the total life cycle. A Reference Service Life (RSL) is required because the EPD reports use-phase energy consumption (module B6). An estimated RSL of 10 years is used to facilitate building calculations. This estimate is based on a consensus EU assumption, as referenced in Appendix 7: Lot 11 – Circulators in Buildings, prepared by AEA Energy & Environment for the European Commission in the context of the Ecodesign Directive.

At the same time, there is no definitive information on average service life of circulator pumps. Actual lifetimes vary widely and are influenced by several factors, including the fact that many circulators are scrapped prematurely when the connected boiler is replaced.

A review of competitor EPDs for comparable products shows the same approach: an estimated RSL is stated for calculation transparency, while B6 results are reported per year. To ensure consistency with PCR guidance, alignment with market practice, and to avoid any misinterpretation of Xylem's EPD results, the same approach has been adopted here.

1.14 Reuse, Recycling, and Energy Recovery

No secondary materials are used in module A1. However, there are secondary material included in the background ecoinvent dataset. No recovered energy or secondary fuels are generated during the life cycle. Scrap metal from manufacturing (A3) is reused internally within the system boundary.

At end-of-life (C4), the pumps can be manually disassembled. Metals such as cast iron and steel typically enter established recycling streams, while plastics and elastomers are treated through energy recovery or disposal, depending on local practices.

Module D reports the net benefits and burdens associated with these recycling and recovery processes in accordance with EN 15804+A2

1.15 Disposal

Materials not recycled at the end of life is transported to the landfill site for disposal and is classified as non-hazardous waste, classified as 17 04 07 mixed metals per European Waste Codes.

2 Life Cycle Assessment Background Information

2.1 Declared Unit

Definition: one (1) piece of product, including packaging

Conversion factors to 1 kg of the declared unit are provided in accordance with PCR Part A. Product total weight including packaging (kg per piece) provided in Table 12 can be used to convert results from one (1) piece of product to a per-kilogram-of-product basis.

2.2 System Boundary

The life cycle assessment follows a cradle-to-grave system boundary and includes modules A1–C4 and D, in accordance with EN 15804+A2.

Table 1. Description of the system boundary modules

	Product Stage			Construction Process Stage		Use Stage							End Of Life Stage				Benefits And Loads Beyond The System Boundary
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw Material Supply	Transport	Manufacturing	Transport From Gate To Site	Assembly/ Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste Processing	Disposal	Reuse, Recovery, Recycling Potential
EPD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

*MND: module not declared
*X: module was declared

System Boundary Diagram

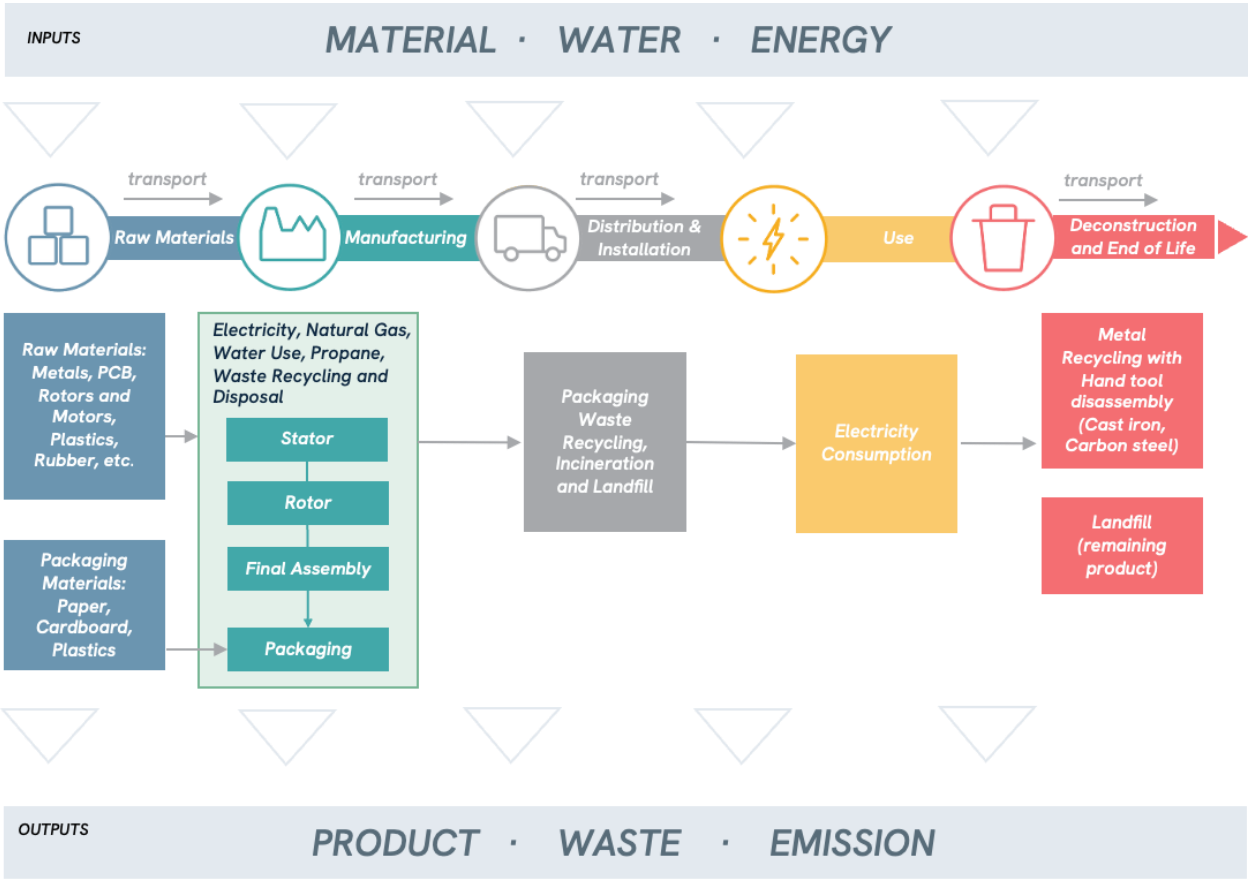

Figure 2: System Boundary Diagram

Included life cycle stages

A1–A3 (Product stage):

- A1: Raw material supply
- A2: Transport of materials to the manufacturing site
- A3: Manufacturing and assembly, including internal scrap reuse

A4–A5 (Construction stage):

- A4: Transport of packaged pumps from Xylem to customers
- A5: Installation stage, covering packaging waste generation only (Installation of the pump requires manual handling only and is modelled with zero additional impacts.)

B6 (Use stage):

- Electricity consumption during operation, calculated using size-class specific average annual power values as required by the PCR

Modules B1–B5 and B7 are declared as having zero impact. The pumps do not require water consumption, repair, maintenance, or replacement within the declared year of use, and they generate no direct emissions during operation.

C1–C4 (End-of-life stage):

- C1: Not relevant (manual deinstallation; negligible impacts)
- C2: Transport to end-of-life treatment
- C3: waste processing
- C4: Final disposal of materials that are not recycled

D (Benefits and loads beyond the system boundary):

- Potential benefits from recycling of metals and energy recovery of non-recyclable materials

General considerations

All relevant materials, energy inputs, auxiliary materials, and upstream and downstream processes required to produce one (1) packaged pump are included. Waste generation is modelled in the module where it occurs. No secondary materials are used in module A1, and no recovered fuels or energy are generated during any life cycle stage.

2.3 Estimates and Assumptions

Manufacturing allocation: Electricity allocated using equipment-level sub-metering (2023 Energy Report); all other manufacturing inputs allocated by mass per PCR requirements.

End-of-life: Pumps are manually dismantled; metals are recycled, remaining materials treated via energy recovery or landfill.

Transport: Manufacturing, packaging, and end-of-life waste are assumed to travel 500 km by truck to treatment facilities.

2.4 Cut-off Criteria

All known material and energy flows within the system boundary are included. Primary data are used where available, supported by secondary datasets to close gaps. Representative proxies were applied only when primary information was not obtainable. In accordance with ISO 14044 and the applicable PCR, cut-off criteria have been applied only where data gaps exist and where exclusions are demonstrated to be environmentally insignificant. The following minimum requirements are met:

- At least 95% of the total mass of the declared product is included.
- At least 95% of the total primary energy use is included.
- No excluded flow is expected to contribute more than 1% to total mass, energy use, or any relevant environmental impact category.
- The sum of all excluded flows does not exceed 5% of total mass or energy.

2.5 Background Data

This study uses both primary and secondary data. Primary information on raw materials, supplier locations, and manufacturing inputs/outputs was collected directly from Xylem and reviewed for accuracy. For internal process flows that do not represent direct exchanges with the environment, secondary datasets from Ecoinvent v3.11 (Cut-off by Classification), compiled in 2025, were used to model upstream and downstream processes.

2.6 Data Quality

Data quality was evaluated in accordance with the PCR:

Time coverage: Foreground data represent 2024 operations and meet the PCR requirement of being less than 3 years old and averaged over at least one year. The methodology applies a 100-year life cycle assessment (LCA) time horizon, which is standard practice in LCA and carbon foot printing. A 100-year LCA evaluates the total environmental impacts (e.g., CO_2e, energy use) of a product over its full cradle-to-grave life cycle, including manufacturing, use, maintenance, and end-of-life stages. This time horizon is commonly applied for long-lived materials and products and is consistent with the use of 100-year Global Warming Potentials (GWP100) in IPCC and ISO-based LCA methodologies.

Geographical coverage: Data reflect the Xylem manufacturing facility in Cegléd, Hungary, and its associated supply chain.

Technological coverage: Data corresponds to the current manufacturing technologies used for the in-scope circulator products.

2.7 Period under Review

All the primary data in the scope of this EPD was collected from Xylem manufacturing facility for 2024.

2.8 Geographic Representativeness

This study covers the Xylem Hungary facility and Xylem’s value chain where manufacturing is carried out for the products in this report.

2.9 Allocation

Allocation follows ISO 14040 and the PCR. Where possible, process subdivision was applied; otherwise, inputs and outputs were allocated using mass-based factors. This applies to plant utilities, resource use, ancillary materials, and waste streams.

No multi-output processes occur in the foreground system. Product and packaging materials, as well as scrap generation, are allocated using product-specific Bills of Materials (BOMs). Background data from ecoinvent v3.11 include allocation as defined in the respective datasets.

The principle of modularity is followed in the study. Where processes influence the product□s environmental performance during its life cycle, they shall be assigned to the module in the life cycle where they occur.

In accordance with the polluter pays principle, environmental burdens are assigned to the life cycle stage and process in which the emissions or resource use occur. Recycling is modeled using the cut-off approach: primary material production bears the burdens of raw-material extraction and processing, while recycled materials carry only the burdens of collection and reprocessing. Related benefits are reported in Module D.

Production-line electricity consumption is available and used for subdivision prior to mass allocation. Remaining energy, water, and operational flows are allocated per kg of product output across the facility.

2.10 Comparability

EPDs from different programs or based on different background data may not be directly comparable, even when developed using the same PCR. Meaningful comparison of construction products requires the use of identical system boundaries, life-cycle modules, scenarios, and data sets across the full life cycle.

Comparisons at component or system level are possible only when all relevant conditions defined in the PCR and EN 15804+A2 are met. The information provided in this EPD is presented transparently to support appropriate interpretation of comparability limitations.

3 Life Cycle Assessment Scenarios

The products under consideration do not contain biogenic content. Even in instances where such content may be present, it accounts for less than 5% of the total composition. Biogenic Carbon Content in Product is reported as null values, and the declaration of biogenic carbon content may be omitted according to the specified PCR.

The Biogenic Carbon content in the accompanying packaging is calculated based on the value included with the secondary dataset in ecoinvent database. The biogenic carbon content per declared unit of each packaging material is listed in table below. The total biogenic carbon content per declared unit is calculated by multiplying the corresponding packaging material weight by its biogenic carbon content value.

Table 2. Biogenic Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	See breakdowns below	
Polycoated Kraft Paper	0.0004	kg C
Paper	0.0167	kg C
Cardboard	0.0482 – 0.0745	kg C
Total Biogenic Content per Declared Unit	0.065 – 0.092	kg C

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

The products are distributed to more than 30 countries. Country-specific transport distances and modes to Hungary were calculated, and the model applies a weighted average distance per transport mode based on the percentage of orders provided by Xylem. A summary of these values is presented in Table 2 below for the dominate transportation mode (truck) only. Other modes, including ocean and air transport, are used only to a very limited extent as indicated in the transportation distance below.

Table 3. Transport to the building site (A4)

Name	Value	Unit
Liters of fuel	27.6 (diesel)	l/100km
Transport distance	1630 (Road), 4 (Sea), 21 (Air)	km
Vehicle Type	lorry, 16-32 metric ton	-
Capacity utilization (including empty runs, mass based)	37	%
Product dimensions[1]	0.004 (packaged, in delivery	m3

[1] Dimensions have been added for all products in delivery status, indicating that they are packaged in individual containers. Packaged product dimensions are identical across all products. Minor differences in reported packaging weight may occur due to data system entries for individual packaging materials, which can include small components for which weights may not be available or may be estimated. These differences are expected to be negligible and do not materially affect the results.

	status)	
Gross density of products transported	524 to 657	kg/m3
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	<1	-

The installation process is manual using hand tools that don't consume energy. Therefore, only product packaging waste is included in this module. It is assumed all packaging wastes are transported to a waste treatment facility with an average of 500 km by truck. The EOL treatment per kilogram of each total packaging materials is summarized in Table 4 below.

Table 4. Installation into the building (A5)

Name	Value	Unit
Ancillary materials	n.a.	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	n.a.	m^3
Other resources	n.a.	kg
Electricity consumption	n.a.	kWh
Other energy carriers	n.a.	MJ
Product loss per functional unit	n.a.	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	See breakdowns below	
Total Packaging – Recycled	0.8	kg
Total Packaging – Incinerated	0.03	kg
Total Packaging – Landfilled	0.16	kg
Dust in the air	n.a.	kg
VOC in the air	n.a.	kg

Product use phase energy consumption is modeled based on the weighted average power, which has been calculated by Xylem according to method described in EU Regulation (EC) No 641/2009 for calculating energy efficiency index (EEI). Annual electricity consumption is summarized in Table 5 below based on 5000 annual operating hours.

Table 5. Pump Class Annual Electricity Use (B6)

Name	Value	Unit
Water Consumption	n.a.	M3
Electricity Consumption	See breakdowns below	
ECOCIRC S-series	56.5	kWh/yr
ECOCIRC M-series	76.9	kWh/yr
ECOCIRC L-series	124.9	kWh/yr
Other energy carriers	n.a.	MJ
Average power input	See breakdowns below	
ECOCIRC S-series	0.011	kW
ECOCIRC M-series	0.015	kW
ECOCIRC L-series	0.025	kW

Operational energy use declared per year as required by PCR; identical for standard and Plus variants.

Based on the product design, certain components can be easily removed at the end of life. The removal requires only human labor and does not contribute to lifetime environmental impacts. Out of these components, cast iron and carbon steel are commonly recycled. The remaining materials are transported to the landfill site for disposal and are classified as non-hazardous waste. The End of Life Assumptions are summarized in Table 6 below.

Table 6. End of life (C1-C4)

Name	Value	Unit
Collected separately	0.77	kg
Collected with mixed construction	0.89	kg
Reuse	n.a.	kg
Recycling	0.77	kg
Energy Recovery	n.a.	kg
Landfilling	0.89	kg

Module D provides information on potential loads and benefits of secondary material, secondary fuel or recovered energy leaving the product system. Table 7 below summarizes the secondary materials being integrated in product and scrap materials generated during manufacturing and disposal, calculated based on S 15-4/130.

Table 7. Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Net output flow leaving the product system	0.275	kg
A1 –secondary material included in the background dataset from ecoinvent	0.495	kg
A3 - 100% of scrap produced at factories is recycled back into the manufacturing processes - no flows of recovered materials out from the pump product system	0	kg
C4 - the cast iron and carbon steel components are assumed to be recycled.	0.77	kg

4 Life Cycle Assessment Results

4.1 Life Cycle Assessment Results for S 15-4/130

Modules B1-B5 and B7 and C1 were considered in the scope of this study, but were deemed to not be relevant. As such, all impacts from these modules are zero and not shown in the results table in the section for simplicity.

Table 8. Core Environmental Impact Indicators - S 15-4/130

Indicator	Unit	A1-A3	A4	A5	B6	C2	C3	C4	D
GWP-total	kg CO2 eq	1.41E+01	6.14E-01	4.88E-02	1.92E+01	1.58E-01	0.00E+00	6.28E-01	-8.36E-01
GWP-fossil	kg CO2 eq	1.40E+01	6.13E-01	2.57E-02	1.85E+01	1.58E-01	0.00E+00	7.70E-02	-8.40E-01
GWP-biogenic	kg CO2 eq	5.47E-02	4.04E-04	2.30E-02	6.38E-01	1.09E-04	0.00E+00	5.51E-01	4.03E-03
GWP-luluc	kg CO2 eq	1.75E-02	1.95E-04	7.18E-06	5.52E-02	5.24E-05	0.00E+00	1.17E-05	-2.19E-04
ODP	kg CFC11 eq	6.72E-07	1.33E-08	4.67E-10	3.10E-07	3.48E-09	0.00E+00	4.82E-10	-2.18E-09
AP	mol H+ eq	8.62E-02	3.39E-03	1.25E-04	9.20E-02	8.87E-04	0.00E+00	2.52E-04	-2.91E-03

EP-freshwater	kg P eq	8.59E-03	4.01E-05	4.92E-06	1.70E-02	1.08E-05	0.00E+00	8.83E-05	-2.25E-04
EP-marine	kg N eq	1.88E-02	1.41E-03	1.54E-04	1.63E-02	3.70E-04	0.00E+00	2.75E-03	-6.60E-04
EP-terrestrial	mol N eq	1.58E-01	1.54E-02	5.56E-04	1.40E-01	4.04E-03	0.00E+00	7.34E-04	-7.13E-03
POCP	kg NMVOC eq	5.05E-02	5.01E-03	1.82E-04	4.47E-02	1.31E-03	0.00E+00	3.08E-04	-2.44E-03
ADP-minerals&metals	kg Sb eq	1.04E-03	1.97E-06	6.97E-08	3.98E-05	5.33E-07	0.00E+00	3.31E-08	7.77E-07
ADP-fossil fuels	MJ	1.83E+02	8.72E+00	3.05E-01	4.33E+02	2.26E+00	0.00E+00	3.83E-01	-8.53E+00
WDP	m3 depriv.	3.13E+00	3.26E-02	1.81E-03	4.08E+00	8.71E-03	0.00E+00	1.07E-02	-5.58E-02

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; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossile fuels = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

Table 9. Additional environmental impact indicators - S 15-4/130

Indicator	Unit	A1-A3	A4	A5	B6	C2	C3	C4	D
PM	Disease incidence	8.43E-07	6.32E-08	2.29E-09	3.17E-07	1.71E-08	0.00E+00	2.29E-09	-8.45E-08
IR	kBq U235 eq.	2.07E+00	9.95E-03	5.14E-04	1.23E+01	2.68E-03	0.00E+00	4.69E-03	-4.56E-03
ETP-fw	CTUe	1.38E+02	1.12E+00	2.91E-01	4.10E+01	2.99E-01	0.00E+00	6.77E+00	-2.77E+00
HTP-c	CTUh	1.38E-08	2.24E-10	9.01E-12	2.70E-09	6.04E-11	0.00E+00	1.90E-11	-1.11E-09
HTP-nc	CTUh	6.27E-07	6.89E-09	3.43E-10	1.28E-07	1.79E-09	0.00E+00	2.55E-09	-1.57E-09
SQP	dimensionless	7.43E+01	4.90E+00	1.91E-01	6.17E+01	1.33E+00	0.00E+00	5.47E-01	-1.59E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential human exposure efficiency relative to U-235; ETP-fw = Potential comparative toxic unit for ecosystems; HTP-c = Potential comparative toxic unit for humans (carcinogenic); HTP-nc = Potential comparative toxic unit for humans (non-carcinogenic); SQP = Potential soil quality index

Table 10. Inventory Metrics - S 15-4/130

Indicator	Unit	A1-A3	A4	A5	B6	C2	C3	C4	D
PERE	*MJ, net calorific value*	1.48E+01	1.36E-01	5.26E-03	9.80E+01	3.66E-02	0.00E+00	1.45E-02	-1.55E-01
PERM	*MJ, net calorific value*	3.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	*MJ, net calorific value*	1.87E+01	1.36E-01	5.26E-03	9.80E+01	3.66E-02	0.00E+00	1.45E-02	-1.55E-01
PENRE	*MJ, net calorific value*	1.94E+02	9.28E+00	3.24E-01	4.52E+02	2.40E+00	0.00E+00	4.04E-01	-9.07E+00
PENRM	*MJ, net calorific value*	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	*MJ, net calorific value*	1.95E+02	9.28E+00	3.24E-01	4.52E+02	2.40E+00	0.00E+00	4.04E-01	-9.07E+00
SM	*kg*	4.68E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	*MJ, net calorific value*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	*MJ, net calorific value*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	*m3*	9.99E-02	1.05E-03	4.53E-05	2.67E-01	2.80E-04	0.00E+00	8.59E-05	-1.81E-03

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

Table 11. Output flows and Waste Category Indicators - S 15-4/130

Indicator	Unit	A1-A3	A4	A5	B6	C2	C3	C4	D
HWD	kg	1.99E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	4.74E-02	0.00E+00	2.12E-01	0.00E+00	0.00E+00	0.00E+00	8.92E-01	0.00E+00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	1.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	2.60E-01	0.00E+00	1.71E-01	0.00E+00	0.00E+00	7.70E-01	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

5 LCA Interpretation

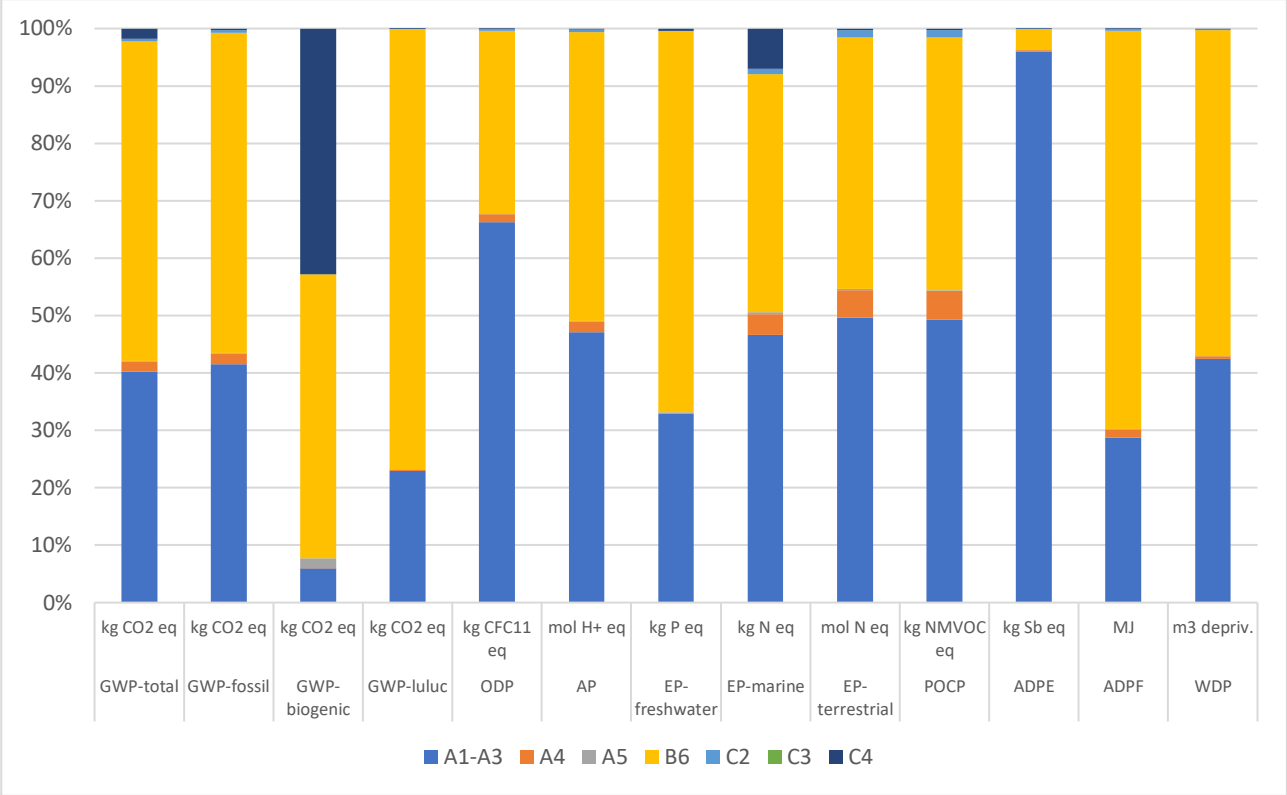

Figure 1: Contribution Analysis of S 15-4/130, EN15804 + A2 Core impact results

Main life-cycle contributors:

- The cradle-to-gate stages (A1–A3) and operational energy use (B6) dominate all impact categories.
- Depending on the indicator, A1–A3 contribute 4–94%, primarily driven by materials.

Composition of A1–A3

- Raw materials account for ~70% of cradle-to-gate impacts, mainly due to cast iron, steel, aluminium, and copper.
- Manufacturing inputs contribute moderately, with ~47% of site electricity linked to general plant operations (HVAC, lighting, support systems).

Use-phase dominance (B6)

- B6 is declared per year as required by the PCR.
- When scaled to a 10-year Reference Service Life, B6 becomes the largest contributor across most indicators, representing 44–85% of total impacts (except Resource use – minerals and metals, at ~6%).

Improvement considerations

- Further increase energy-efficiency performance through motor and control optimization.
- Explore recycled metal content in components where feasible.
- Continue reducing manufacturing electricity intensity, especially overhead consumption.

6 Calculation Rules for Product Specific EPD Results

Life cycle inventory data (materials, packaging, LCIA indicators and other inventory metrics) were compiled for the ten declared products. A parameterized LCA model is used to calculate product-specific results.

For each life-cycle module, impacts are first normalized using the most relevant model parameter (e.g., mass-based normalization for A1–A3). Normalized A1 results are combined into a weighted average factor using annual production volumes. For the use stage (B6), products are assigned to small, medium, or large size classes, each with a representative average annual power consumption.

Product-specific results are then obtained by applying module-specific scaling factors to the normalized values:

Impact per product = Σ (Normalized module result × Module scaling factor)

Module-specific scaling factors for all declared variants are provided in Table 12.

6.1 Scaling Factors

Module-specific scaling factors for different products are provided in this section. The same set of factors are applied to all reported impact categories. Product specific results can be calculated based on the calculation steps and formula in the previous section. For Module B6, impacts are provided over one year of use per piece of product. The corresponding B6 values should be added to the product impacts based on the product specific motor size (S, M or L).

Table 12: Module Specific Scaling Factors

Life Cycle Module	A1-A4	A5	B6	C2	C3	C4	D
Normalized by:	Total weight of product and packaging (kg per piece)	Weight of packaging (kg per piece)	3 sets of one-year use phase impacts based on motor power (S, M, or L)	Weight of product (kg per piece)	Recycled weight	Non-recycled weight	Recycled weight
ECOCIRC S 15-4/130	1.87	0.21	S	1.66	0.77	0.89	0.77
ECOCIRC S 25-4/130	2.04	0.21	S	1.83	0.94	0.89	0.94
ECOCIRC S 25-4/180	2.12	0.15	S	1.96	1.07	0.90	1.07
ECOCIRC M 15-6/130	1.87	0.21	M	1.66	0.77	0.89	0.77
ECOCIRC M 25-6/130	2.04	0.21	M	1.83	0.94	0.89	0.94
ECOCIRC M 25-6/180	2.12	0.15	M	1.96	1.07	0.90	1.07
ECOCIRC M 32-6/180	2.26	0.16	M	2.10	1.20	0.90	1.20
ECOCIRC L 25-8/130	2.12	0.21	L	1.91	0.94	0.97	0.94
ECOCIRC L 25-8/180	2.20	0.15	L	2.04	1.07	0.98	1.07
ECOCIRC L 32-8/180	2.34	0.16	L	2.18	1.20	0.98	1.20

6.2 Normalized Life Cycle Assessment Results

Table 13. Core Environmental Impact Indicators – Normalized Results

Indicator	Unit	A1-A3	A4	A5	B6 (S)	B6 (M)	B6 (L)	C2	C3	C4	D
GWP-total	kg CO2 eq	7.41E+00	3.27E-01	2.32E-01	1.92E+01	2.62E+01	4.25E+01	9.53E-02	0.00E+00	7.04E-01	-1.09E+00
GWP-fossil	kg CO2 eq	7.36E+00	3.27E-01	1.25E-01	1.85E+01	2.52E+01	4.08E+01	9.52E-02	0.00E+00	8.63E-02	-1.09E+00
GWP-biogenic	kg CO2 eq	4.08E-02	2.16E-04	1.07E-01	6.38E-01	8.67E-01	1.41E+00	6.54E-05	0.00E+00	6.17E-01	5.23E-03
GWP-luluc	kg CO2 eq	8.78E-03	1.04E-04	3.39E-05	5.52E-02	7.50E-02	1.22E-01	3.15E-05	0.00E+00	1.31E-05	-2.85E-04
ODP	kg CFC11 eq	3.44E-07	7.07E-09	2.21E-09	3.10E-07	4.22E-07	6.85E-07	2.09E-09	0.00E+00	5.40E-10	-2.84E-09
AP	mol H+ eq	4.59E-02	1.81E-03	5.91E-04	9.20E-02	1.25E-01	2.03E-01	5.34E-04	0.00E+00	2.82E-04	-3.78E-03
EP-freshwater	kg P eq	4.51E-03	2.14E-05	2.31E-05	1.70E-02	2.32E-02	3.77E-02	6.50E-06	0.00E+00	9.90E-05	-2.92E-04
EP-marine	kg N eq	9.78E-03	7.53E-04	7.32E-04	1.63E-02	2.22E-02	3.60E-02	2.23E-04	0.00E+00	3.08E-03	-8.57E-04
EP-terrestrial	mol N eq	8.41E-02	8.23E-03	2.62E-03	1.40E-01	1.90E-01	3.08E-01	2.43E-03	0.00E+00	8.23E-04	-9.26E-03
POCP	kg NMVOC eq	2.67E-02	2.67E-03	8.60E-04	4.47E-02	6.08E-02	9.87E-02	7.90E-04	0.00E+00	3.45E-04	-3.16E-03
ADP-minerals&metals	kg Sb eq	5.48E-04	1.05E-06	3.29E-07	3.98E-05	5.42E-05	8.80E-05	3.21E-07	0.00E+00	3.71E-08	1.01E-06
ADP-fossil fuels	MJ	9.60E+01	4.65E+00	1.44E+00	4.33E+02	5.90E+02	9.57E+02	1.36E+00	0.00E+00	4.29E-01	-1.11E+01
WDP	m3 depriv.	1.63E+00	1.74E-02	8.75E-03	4.08E+00	5.55E+00	9.02E+00	5.24E-03	0.00E+00	1.20E-02	-7.25E-02

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; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil fuels = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

Table 14. Additional environmental impact indicators – Normalized Results

Indicator	Unit	A1-A3	A4	A5	B6 (S)	B6 (M)	B6 (L)	C2	C3	C4	D
PM	Disease incidence	4.46E-07	3.37E-08	1.08E-08	3.17E-07	4.32E-07	7.02E-07	1.03E-08	0.00E+00	2.56E-09	-1.10E-07
IR	kBq U235 eq.	1.09E+00	5.31E-03	2.42E-03	1.23E+01	1.67E+01	2.72E+01	1.61E-03	0.00E+00	5.26E-03	-5.92E-03
ETP-fw	CTUe	7.13E+01	5.95E-01	1.37E+00	4.10E+01	5.58E+01	9.07E+01	1.80E-01	0.00E+00	7.58E+00	-3.59E+00
HTP-c	CTUh	7.57E-09	1.19E-10	4.27E-11	2.70E-09	3.68E-09	5.97E-09	3.63E-11	0.00E+00	2.13E-11	-1.44E-09
HTP-nc	CTUh	3.55E-07	3.68E-09	1.62E-09	1.28E-07	1.75E-07	2.83E-07	1.08E-09	0.00E+00	2.86E-09	-2.04E-09
SQP	dimensionless	3.83E+01	2.61E+00	9.03E-01	6.17E+01	8.40E+01	1.36E+02	7.98E-01	0.00E+00	6.13E-01	-2.06E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential human exposure efficiency relative to U-235; ETP-fw = Potential comparative toxic unit for ecosystems; HTP-c = Potential comparative toxic unit for humans (carcinogenic); HTP-nc = Potential comparative toxic unit for humans (non-carcinogenic); SQP = Potential soil quality index

Table 15. Inventory Metrics – Normalized Results

Indicator	Unit	A1-A3	A4	A5	B6 (S)	B6 (M)	B6 (L)	C2	C3	C4	D
PERE	MJ, net calorific value	7.78E+00	7.24E-02	2.49E-02	9.80E+01	1.33E+02	2.17E+02	2.20E-02	0.00E+00	1.62E-02	-2.02E-01
PERM	MJ, net calorific value	1.73E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ, net calorific value	9.51E+00	7.24E-02	2.49E-02	9.80E+01	1.33E+02	2.17E+02	2.20E-02	0.00E+00	1.62E-02	-2.02E-01
PENRE	MJ, net calorific value	1.02E+02	4.95E+00	1.53E+00	4.52E+02	6.13E+02	9.97E+02	1.45E+00	0.00E+00	4.53E-01	-1.18E+01
PENRM	MJ, net calorific value	2.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, net calorific value	1.02E+02	4.95E+00	1.53E+00	4.52E+02	6.13E+02	9.97E+02	1.45E+00	0.00E+00	4.53E-01	-1.18E+01
SM	kg	2.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	5.16E-02	5.60E-04	2.19E-04	2.67E-01	3.63E-01	5.90E-01	1.69E-04	0.00E+00	9.63E-05	-2.36E-03

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

Table 16. Output flows and Waste Category Indicators – Normalized Results

Indicator	Unit	A1-A3	A4	A5	B6 (S)	B6 (M)	B6 (L)	C2	C3	C4	D
HWD	kg	1.06E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	2.53E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	1.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	1.39E-01	0.00E+00	8.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

7 Additional Environmental Information

7.1 Environment and Health During Manufacturing and Installation

No substances required to be reported as hazardous are associated with the production of the products.

7.2 Environment and Health During Use

The products do not release any dangerous, regulated substances that affect health and the environment according to the relevant market of applicability.

7.3 Disclaimer

This EPD is intended for business-to-business (B2B) communication. It reflects average conditions at Xylem's Cegléd facility for 2024. Comparisons with other EPDs are only valid when based on the same PCR and system boundaries.

PCR Part A	Institut Bauen und Umwelt e.V. (IBU). (2024). 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 1.4).
PCR Part B	Institut Bauen und Umwelt e.V. (IBU). (2024). PCR Guidance-Texts for Building-Related Products and Services. Part B: Requirements on the EPD for Pumps for liquids and liquids with solids (v11).
EN 15804	DS/EN 15804:2021+A2:2019 (2021). Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
ISO 14025	ISO. (2006). ISO 14025:2006: Environmental labels and declarations — Type III environmental declarations — Principles and procedures. International Organization for Standardization.
ISO 14044	ISO. (2006). ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines. International organization for Standardization (ISO).
ISO 14040	ISO. (2006). ISO14040:2006/Amd 1:2020 -- Environmental management -- Life cycle assessment -- Principles and framework. International Organization for Standardization.
ISO 14046	ISO. (2014). ISO 14046:2014 Environmental management - Water footprint - Principles, requirements and guidelines.
Ecoinvent	Weidema B P, B. C. (2013). Overview and methodology. Data quality guideline for the ecoinvent database version 3. St. Gallen: The ecoinvent Centre.

Much of the data utilized for this Environmental Product Declaration/LCA Report is based on information supplied by the manufacturer. TrueNorth Collective is not responsible for the accuracy, completeness, or reliability of the data provided by the manufacturer or any information or conclusions derived therefrom.

7.4 Limitations

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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