



Environmental Product Declaration IN ACCORDANCE WITH ISO 21930 AND ISO 14025

Program Operator: Smart EPD®
www.smartepd.com



SmartEPD-2026-116-0783-01

KPVS 6015, 8015, 1015, 1020 (200hp) Pump

Date of Issue

Mar 10, 2026

Expiration date

Mar 10, 2031

Last updated

Mar 10, 2026



Refer to the EPD Library at www.smartepd.com for the latest EPD listing information

General Information

Grundfos Holding A/S

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Product Name:	KPVS 6015, 8015, 1015, 1020 (200hp) Pump
Declared Unit:	1 piece
Declaration Number:	SmartEPD-2026-116-0783-01
Date of Issue:	March 10, 2026
Expiration:	March 10, 2031
Last updated:	March 10, 2026
EPD Scope:	Cradle to grave A1 – A3, A4, A5, B1 - B7, C1 - C4
Market(s) of Applicability:	North America

General Organization Information

Grundfos is a global, independent (foundation-owned) water technology company, operating in four divisions, established in 1945. Its headquarter is located in Bjerringbro, Denmark, and have solid presence in 60+ countries with 20,000+ employees.

We are committed to pioneering solutions to the world's water and climate challenges and improving the quality of life for people. With an annual production of more than 15 million pump units, we are one of the world's leading pump manufacturers and in this capacity, we set the business standard in terms of innovation, efficiency, reliability and sustainability.

Further information can be found at: <https://www.grundfos.com/content/dam/global/page-assets/about-us/media/press-materials/documents/Grundfos-facts-sheet.pdf>

Limitations, Liability and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible 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. The EPD owner has sole ownership, liability, and responsibility for the EPD.

EPDs are comparable only if they comply with ISO 21930:2017, use the same sub-category PCR where applicable. include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

Reference Standards

Standard(s): ISO 21930 and ISO 14025

Core PCR:	IBU PCR for Building-Related Products and Services Part A v1.4 v.1.4 Date of issue: April 15, 2024
Sub-category PCR:	Part B: Requirements on the EPD for Pumps for liquids and liquids with solids Date of issue: August 01, 2024 Valid until: August 01, 2029
Sub-category PCR review panel:	 Contact Smart EPD for more information.
General Program Instructions:	 Smart EPD General Program Instructions v.2.0, March 2025

Verification Information

LCA Author/Creator:	 Bence Lukács  blukacs@grundfos.com
EPD Program Operator:	 Smart EPD  info@smartepd.com  www.smartepd.com  585 Grove St., Ste. 145, Herndon, VA 20170, USA
Verification:	Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071:  Kim Allbury   kim.allbury@ricardo.com Independent external verification of EPD, according to ISO 14025 and reference PCR(s):  Kim Allbury   kim.allbury@ricardo.com

External

External

Product Information

Declared Unit:	1 piece
Mass:	1785.7 kg
Reference Service Life:	10 Years
Product Specificity:	 Product Average  Product Specific
Variation in GWP Result (Products):	+34.31% to +61.85%
Variation in GWP Result (Facilities):	0% to 0%

Product Description

The KPVS vertical split case pump is single- stage, double- entry, radial suction, centrifugal volute pump with high energy efficiency and low lifecycle costs. The split-coupled, split case, vertically mounted frame offers a compact footprint, along with easy installation and maintenance — access to seal and internal components without the need to remove the motor or alignment. The double volute design balances radial loads and reduces vibration, while extending the life of wear rings, shaft seals and bearings. The liquid- cooled sleeve bearing design also adds to increased pump life and uptime.

Further information can be found at: <https://api.grundfos.com/literature/Grundfosliterature-6511956.pdf>

Product Specifications

Product SKU(s):	The declared unit is 1 piece (pcs.) of a theoretical sales weighted average of KPVS 6015,8015,1015,1020 pump assembled with a 200hp electric motor Pump technical data for KPVS 6015,8015,1015,1020 (200hp) Voltage: 460 V Frequency: 60 Hz Number of phases: 3 Number of poles: 4 Rated flow 675 m3/h Rated head: 62 m Nominal power: 200 hp Speed full load: 1800 rpm
Product Classification Codes:	EC3 - Mechanical -> HvacPumps

Product Composition Diagram

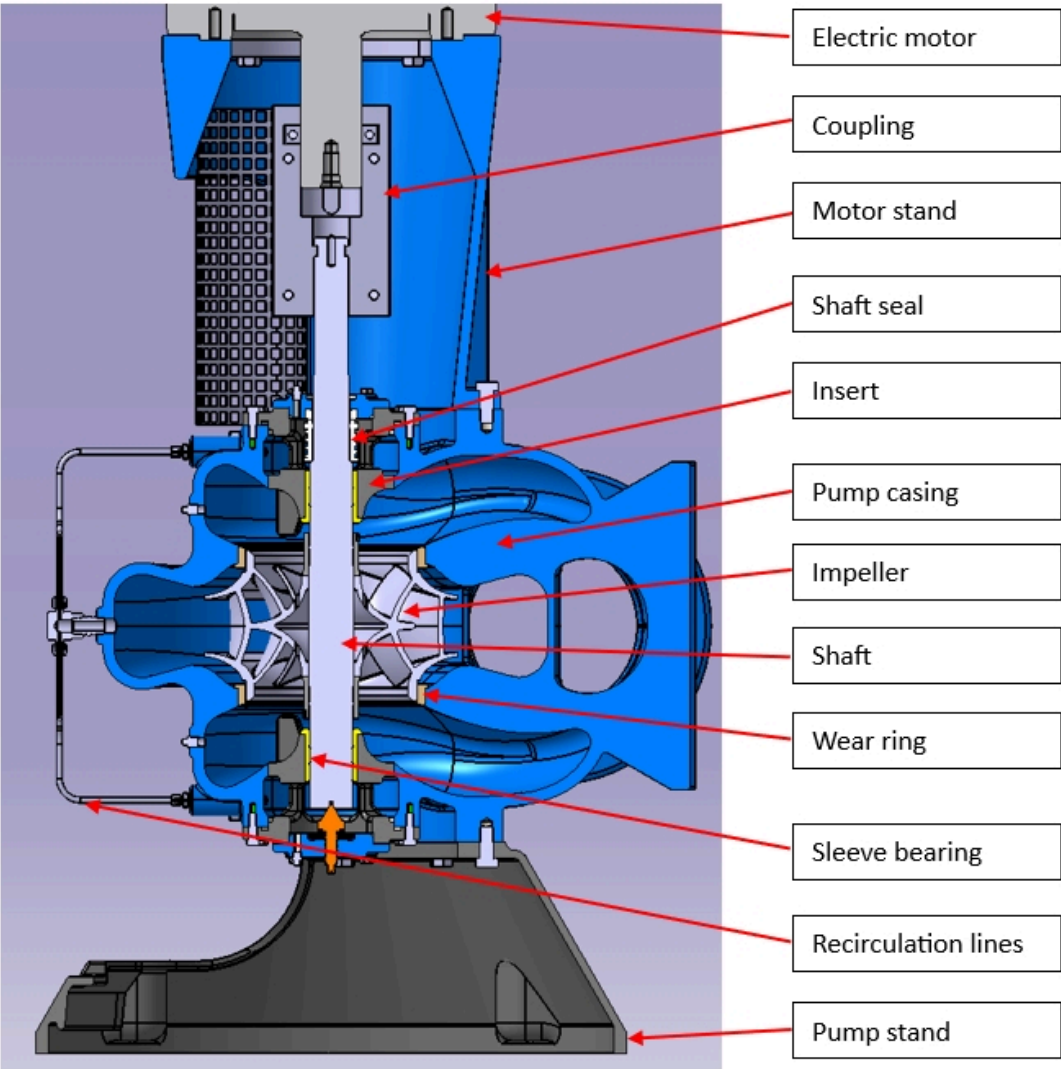


Table 1. Material Composition

Material/Component Category	Origin	% Mass
Cast iron	None	66.6
Steel	None	20.2
Copper	None	2.5
Bronze	None	3.3
Aluminium	None	1.3

Material/Component Category	Origin	% Mass
Stainless steel	None	1.5
Polymers (incl. composites and rubbers)	None	0.5
Wood	None	4.0
Other, inert materials	None	0.1

Packaging Material	Origin	kg Mass
Wood	None	68.04

Biogenic Carbon Content	kg C per piece
Biogenic carbon content in product	0None
Biogenic carbon content in accompanying packaging	29.6

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specifity

- Primary Data Year:2024
- Manufacturing Specificity:

✗ Industry Average

✗ Manufacturer Average

✓ Facility Specific

Averaging:
The sales average virtual pump for the average product EPD was created with respect to the sales records from 2022-2024. The following consumption data is available in the Grundfos system:

Model	hp	Qty	Share of the full volume (sales %)	index
6015	200	10	3,34%	1
8015	200	34	11,37%	2
1015	200	217	72,58%	3
1020	200	38	12,71%	4

The virtual sales average pump and its subcomponent weights were determined based on the sales share percentages via weighted average calculation. See below equation.

$$Weight_{average\ pump} = \sum_{i=1}^4 Weight(i) * sales\%(i)$$

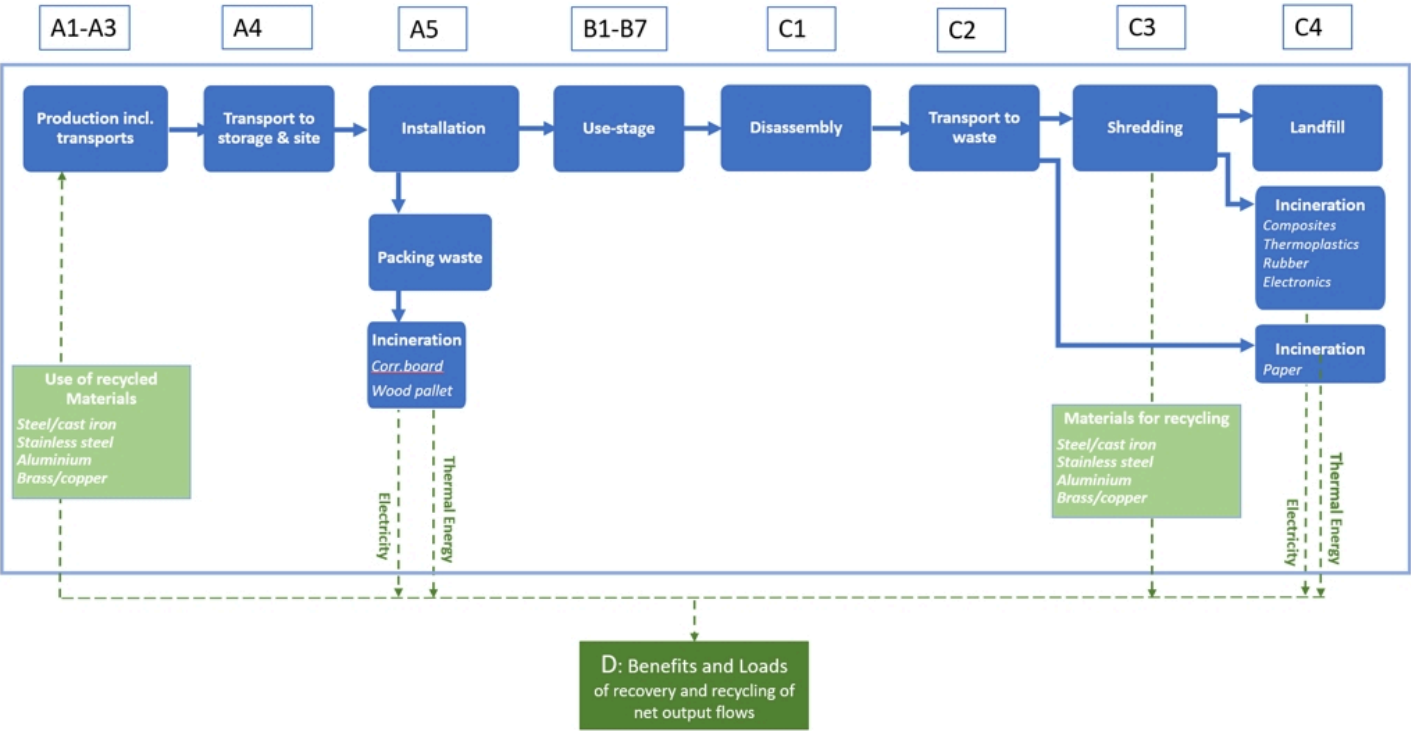
Table 2. System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	✓
	B2	Maintenance	✓
	B3	Repair	✓
	B4	Replacement	✓
	B5	Refurbishment	✓
	B6	Operational Energy Use	✓
	B7	Operational Water Use	✓
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Note:

ND = Module not declared

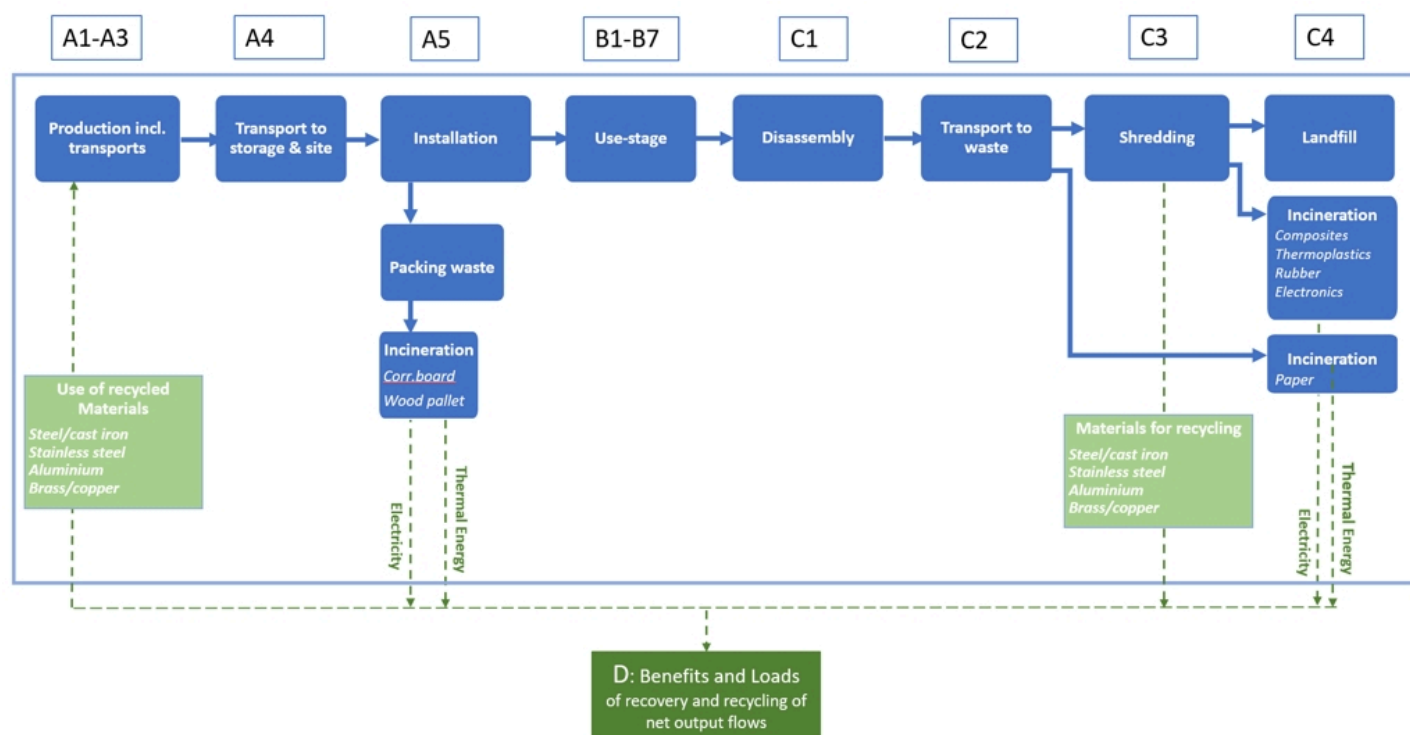
Product Composition Diagram



Plants

 Grundfos Brookshire 902 Koomey Rd, Brookshire, TX, USA

Product Flow Diagram



The KPVS pump consists of several components, where the primary ones are illustrated in Figure 1. (in attached background report) The complete bill of material of one KPVS pump lists around 60-70 individual components, from the smallest screw to the larger pump housing, but lack of production data not counting the motor and its components. All individual components have been considered for the LCI of the manufacturing process, however the motor was calculated with a generic electric motor production process, provided by Sphera. Every KPVS is assembled in Brookshire, Texas, in the US at a Grundfos production plant. Components and subcomponents of the KPVS are however produced or sourced from suppliers in China, and other states from the US. The cast iron parts (for e.g. pump casing, motor stand, pump stand etc.) is casted and machined in China. The bronze parts (impeller, wear rings) also produced in China just like the stainless-steel shaft and the aluminum motor coupling. The pump housing gets a primer and preassembled and packed prior to shipping to the US. The motor is supplied by Nidec motor corporation located in St. Louis, Missouri, US. Fixing materials, gaskets and wooden crate for packaging are also supplied from the states. Technical data: The declared unit is represented by the pump variant, whose technical data is provided in the Pump technical data table Declared unit: The declared unit is one piece (pcs.) of a theoretical composition of sales volume weighted average of KPVS 6015, 8015, 1015, and 1020 pumps assembled with a 200 hp electric motor. According to ISO 21930, Section 5.3, the deviation in environmental impacts within the group of averaging is no greater than $\pm 10\%$.

Software And Database

LCA Software:

Sphera LCA for Experts (formerly GaBi) v. 10.9

LCI Foreground Database(s):

Sphera Managed LCA Content (formerly GaBi Professional Database) v. 2025.1

GLO/US

LCI Background Database(s):

Ecoinvent v. 3.10 | Row

A foreground LCI database is the database used to model the primary, site-specific data collected for this EPD. A background LCI database is the database used to model generic or non-specific data.

Data Quality

· **Precision:** Primary data applied for the LCA is considered accurate: It is based on current KPVS bills of material (BOM) that are used for production at the plant, and that have been quality-assured with calculated mass balances. Data for allocation of energy to the assembly process is based on measurements; seasonal variations were balanced out by using annual data. KPVS makes up a small proportion of the total energy consumption and the mass-based allocation represents a conservative estimate of the consumption. All other primary data applied for the LCA are accurately quantified.

The generic datasets are based on Sphera and Ecoinvent data, used worldwide in many critically reviewed and published studies, with documented precision.

· **Completeness:** Each unit process was checked for mass balance and completeness of the inventory. All relevant process steps were considered and modelled to represent specific situations. The modelled product system is considered sufficiently complete.

· **Consistency:** To ensure consistency, all specific data were collected with the same level of detail, while generic data were sourced primarily from Sphera, otherwise from the Ecoinvent databases. The application of both databases may lead to partial inconsistencies that were limited as far as possible to not jeopardize completeness and representativeness. Allocation and other methodological choices were made consistently throughout the study. All assumptions, methods, and data were found to be consistent with the study's goal and scope.

· **Reproducibility:** Reproducibility is warranted as much as possible through the disclosure of input-output data, dataset choices, and modelling approaches in this report. Based on this information, any third party should be able to approximate the results of this study using the same data and modelling approaches.

Representativeness: All primary data are representative from temporal, technological and geographical perspective. Generic data come from the most updated (2025.1) versions of the Sphera and Ecoinvent databases. The data quality ranges from Fair to Very good except for some datasets that has Poor time representative data quality. Across all three data quality categories the datasets are considered overall Good.

Life Cycle Module Description

Scope: This declaration applies to 1 piece (pcs.) of a theoretical composition of the sales volume weighted average of KPVS 6015,8015,1015,1020 pump assembled with 200hp electric motor. The declaration covers all standard configuration of the above mentioned product variants with cast iron pump casing and silicon bronze impeller and wear rings. The product is assembled in Brookshire, Texas, United States. The life cycle assessment is based on data collected from the ERP system of the manufacturer, including data from the manufacturing plant. 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 ISO 21930. Modules A1-A3 refer to the product stage and include raw materials extraction and processing, transportation, and the manufacturing process. The product stage is included in this study, and according to ISO 21930 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 ISO 21930. Module A4 regards the transportation from the production site to the regional distribution center, and finally to the construction and product application site. Module A5 refers to the installation process of the pump including the transportation of packaging waste to the treatment site and the waste treatment of packaging. The use of energy during installation is negligible for the selected functional unit. Modules B1-B7 refer to the use stage. All use stage modules are assessed in the study, though B1, 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 B2 regards to the maintenance within RSL (Reference Service Life). Module B6 regards energy use during the operation of the pump and includes the electricity consumption of the product. The total electricity consumption over the reference service lifetime is assessed by calculating the average power input using a specified load profile and multiplying it with the number of running hours per year and the number of years of the RSL. 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 pump until all materials and components are processed, reused, recycled, or disposed of. C1 regards the dismantling of the pump, and this module is a manual activity. C2 regards the transport to waste processing, C3 refers to the processing (shredding) of waste for recycling, and C4 refers to waste disposal: landfilling and incineration. Module D refers to the burdens and benefits beyond the system boundaries. According to ISO 21930, 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 of this declaration.

LCA Discussion

Allocation Procedure

In principle, allocation should be avoided as far as possible. However, for the KPVS assembly process in Brookshire - Texas, US, energy consumption in the plant cannot be unambiguously allocated to the KPVS production lines alone, and an allocation procedure must be applied. The American Grundfos plant manufactures numerous small and large components as well as finished, saleable products. KPVS is just one of the product series being manufactured. This is not co-production since the other components and products are manufactured independently. Nevertheless, to enable allocation of the energy use of the full plant to the production of just one KPVS unit, a *mass-based* fraction calculation of the full plant production was applied. This is in accordance with instructions in the PCR-A section 7.2.3. Allocation.

Cut-off Procedure

The criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA and information modules and any additional information follow the requirements in ISO 21930 and the PCR Part A:

- All inputs and outputs to a unit process shall be included in the calculation, for which data are available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices shall be documented.
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process. The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D (see Figure 3) shall be a maximum of 5 % of energy usage and mass. Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria.
- Particular case should be taken to include material and energy flows known to have the potential to cause significant emissions into the air and water or soil related to the environmental indicators of this standard. Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria.

Renewable Electricity

Energy Attribute Certificates (EACs) such as Renewable Energy Certificates (RECs) or Power Purchase Agreements (PPAs) are included in the baseline reported results: ✗ No

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	diesel
Liters of Fuel:	2.1 l/100km
Vehicle Type:	Truck - heravy/bulk (EPA SmartWay)
Transport Distance:	655 km

Capacity Utilization:	50 %
Packaging Mass:	68 kg
Gross density of products transported:	471.8 kg/m ³
Capacity utilization volume factor:	<1
Assumptions for scenario development:	Transportation distance was determined according to smartEPD PCR Part A, Table 24. Default transport distances by commodity were used on page 72. For machinery goods, it is 655km (407miles).

Installation in to the building/construction site (A5)

A5 Module

Installation Scrap Rate Assumed:	0 %
Ancillary Materials:	0 kg
Net Fresh Water Consumption Specified by Water Source and Fate:	0 m ³
Other Resources:	0 kg
Electricity Consumption:	0 kWh
Other Energy Carriers:	0 MJ
Product Lost per Declared/Functional Unit:	0 kg
Waste Materials at the Construction Site Before Waste Processing:	0 kg
Output Materials Resulting from On-site Waste Processing:	0 kg
Mass of Packaging Waste Specified by Type:	68 kg
Biogenic Carbon Contained in Packaging (kg C):	0 kg
Direct Emissions to Ambient Air, Soil and Water:	0 kg
VOC Emissions:	0 ug/m ³
Assumptions for scenario development:	Considering commissioning does not require any ancillary materials. The packaging material occurs as waste generated at A5.

Maintenance (B2)

B2 Module

Maintenance Cycle:	5 Cycles/RSL N/A Cycles/ESL
Net Fresh Water Consumption Specified by Water Source and Fate:	0 m ³
Ancillary Materials Specified by Type:	0 kg
Other Resources:	9.7 kg
Energy Input:	0 kWh
Other Energy Carriers:	0 kWh
Power Output of Equipment:	0 kWh
Waste Materials from Maintenance:	184.16 kg
Direct Emissions to Ambient Air, Soil and Water:	0 kg
VOC Emissions:	0 ug/m ³
Maintenance Process Information:	The Installation, operation and maintenance manual prescribes service activities during the reference service life. These service kits were considered in the LCA study in module B2. Apart

Further assumptions for scenario development:

from the service items there is no other material input needed for the intended use.

Shaft seals and gaskets should be replaced after each 2 yrs. Wear ring / Hardware / bearing / impeller/ shaft sleeve / motor bearings should be replaced after each 5 years.

Repair (B3)

B3 Module

Repair Cycle:	0 Cycles/RSL
	0 Cycles/ESL
Net Fresh Water Consumption Specified by Water Source and Fate:	0 m3
Ancillary Materials Specified by Type:	0 kg
Energy Input:	0 kWh
Waste Materials From Repair:	0 kg
Direct Emissions to Ambient Air, Soil and Water:	0 kg
Repair Process Information:	-
Inspection Process Information:	-
Further assumptions for scenario development:	-

Replacement (B4)

B4 Module

Reference Service Life:	0 Years
Replacement Cycle:	0 (ESL/RSL)-1
Energy Input:	0 kWh
Net Fresh Water Consumption Specified by Water Source and Fate:	0 m3
Ancillary Materials Specified by Type:	0 kg
Replacement of Worn Parts:	0 kg
Direct Emissions to Ambient Air, Soil and Water:	0 kg
Further assumptions for scenario development:	-

Refurbishment (B5)

B5 Module

Replacement Cycle:	0 Cycles/RSL
	0 Cycles/ESL
Energy Input:	0 kWh
Net Fresh Water Consumption Specified by Water Source and Fate:	0 m3
Material Input for Refurbishment:	0 kg
Waste Materials From Repair:	0 kg
Direct Emissions to Ambient Air, Soil and Water:	0 kg
Refurbishment Process Description:	-
Further assumptions for scenario development:	-

Operational Energy Use (B6) & Operational Water Use (B7)

B6 & B7 Modules

Net Fresh Water Consumption Specified by Water 0 m³

Source and Fate:

Ancillary Materials Specified by Type: 0 kg

Energy Input: 486569 kWh

Equipment Power Output: N/A kWh

Direct Emissions to Ambient Air, Soil and Water: 0 kg

Characteristic Performance:

RSL = 10 years operational time: 3625 h/a

Further assumptions for scenario development:

Reference Service Life (RSL): For pump products like the declared unit, an RSL of 10 years can be assumed according to the guideline by Europump (2024).

Therefore, to facilitate building reference calculations, an RSL of 10 years is declared. The pump running conditions during the service life are partially specified in the PCR-B: The number of running hours per year is assumed to be 3625 h according to the guideline Europump (2024). The average power input of the pump in the case of a fixed-speed motor was determined in accordance with the aforementioned standard by multiplying the nominal power of the pump motor by the control factor (CF) of 0.9.

End of Life (C1 - C4)

C1 - C4 Modules

Collection Process

Collected Separately: 0 kg

Collected with Mixed Construction Waste: 1717.7 kg

Recovery

Reuse: 0 kg

Recycling: 1626.3 kg

Landfill: 91.4 kg

Incineration: 0 kg

Incineration with Energy Recovery: 0 kg

Energy Conversion: 0 kg

Disposal

Product or Material for Final Disposal: 0 kg

Removals of Biogenic Carbon: 0 kg CO₂

Assumptions for scenario development:

Material routing at End-of-life stage in North America, C1-C4 (acc. To Smart EPD PCR Part A: Table 3. Product Disposal Assumptions by Region: North America: United States)

Results

Table 3. Environmental Impact Assessment Results

TRACI 2.2

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Indicator	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	TRACI 2.2	ND	6.16e+3	5.95e+1	1.11e+2	0	3.57e+2	ND	ND	ND	2.31e+6	0	0	2.81e+1	5.09e+1	1.98e+0
GWP-total (excl biogenic)	TRACI 2.2	ND	6.23e+3	5.92e+1	2.46e+0	0	3.57e+2	ND	ND	ND	2.30e+6	0	0	2.80e+1	5.08e+1	1.98e+0
GWP-total (incl biogenic)	TRACI 2.2	ND	6.15e+3	5.95e+1	1.11e+2	0	3.56e+2	ND	ND	ND	2.30e+6	0	0	2.81e+1	5.08e+1	1.98e+0
ODP	TRACI 2.2	ND	2.26e-6	1.69e-11	1.53e-11	0	3.62e-7	ND	ND	ND	2.04e-5	0	0	7.99e-12	4.50e-10	7.76e-12
AP	TRACI 2.2	ND	2.39e+1	2.81e-1	1.78e-2	0	2.18e+0	ND	ND	ND	2.79e+3	0	0	1.33e-1	6.16e-2	1.07e-2
EP-freshwater	TRACI 2.2	ND	1.63e-2	4.88e-5	1.38e-6	0	9.59e-3	ND	ND	ND	3.48e-1	0	0	2.30e-5	7.69e-6	7.94e-5
EP-marine	TRACI 2.2	ND	1.02e+1	2.61e-1	1.24e-2	0	9.27e-1	ND	ND	ND	1.17e+3	0	0	1.23e-1	2.58e-2	5.14e-3
POCP	TRACI 2.2	ND	3.72e+2	6.45e+0	3.86e-1	0	3.32e+1	ND	ND	ND	4.18e+4	0	0	3.05e+0	9.31e-1	1.86e-1
HTP-c	TRACI 2.2	ND	3.17e-6	5.39e-10	5.13e-10	0	2.92e-7	ND	ND	ND	2.17e-4	0	0	2.55e-10	5.07e-9	7.46e-11
HTP-nc	TRACI 2.2	ND	1.66e-7	8.84e-10	1.63e-11	0	1.60e-7	ND	ND	ND	4.55e-6	0	0	4.18e-10	1.00e-10	3.59e-11
ETP-fw	TRACI 2.2	ND	8.54e+1	3.91e+0	6.73e-2	0	2.31e+1	ND	ND	ND	1.38e+4	0	0	1.85e+0	3.04e-1	1.56e-1
PM	TRACI 2.2	ND	2.69e+0	6.62e-3	6.63e-4	0	4.00e-1	ND	ND	ND	1.96e+2	0	0	3.13e-3	4.85e-3	8.50e-4

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particulate Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited

comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Table 4. Resource Use Indicator

Indicator	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ, net calorific value	1.67e+4	3.20e+1	1.16e+3	ND	8.59e+2	1.11e+7	ND	ND	ND	ND	0	1.51e+1	2.46e+2	5.39e+0
PERM	MJ, net calorific value	1.16e+3	0	-1.16e+3	ND	0	0	ND	ND	ND	ND	0	0	0	0
PERT	MJ, net calorific value	1.78e+4	3.20e+1	7.64e+0	ND	8.59e+2	1.11e+7	ND	ND	ND	ND	0	1.51e+1	2.46e+2	5.39e+0
PENRE	MJ, net calorific value	7.00e+4	7.70e+2	3.46e+1	ND	4.33e+3	3.84e+7	ND	ND	ND	ND	0	3.64e+2	8.48e+2	3.29e+1
PENRM	MJ, net calorific value	2.28e+2	0	0	ND	0	0	ND	ND	ND	ND	0	0	0	0
PENRT	MJ, net calorific value	7.00e+4	7.70e+2	3.46e+1	ND	4.33e+3	3.84e+7	ND	ND	ND	ND	0	3.64e+2	8.48e+2	3.29e+1
SM	kg	7.39e+2	0	0	ND	3.35e+1	0	ND	ND	ND	ND	0	0	0	0
RSF	MJ, net calorific value	0	0	0	ND	0	0	ND	ND	ND	ND	0	0	0	0
NRSF	MJ, net calorific value	0	0	0	ND	0	0	ND	ND	ND	ND	0	0	0	0
FW	m3	2.58e+1	3.45e-2	2.86e-1	ND	1.76e+0	1.47e+4	ND	ND	ND	ND	0	1.63e-2	3.24e-1	6.97e-3

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM = Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Table 5. Waste and Output Flow Indicators

Indicator	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	6.62e+0	1.28e-7	1.58e-8	ND	4.42e+0	ND	ND	ND	2.28e-2	ND	0	6.03e-8	5.04e-7	7.15e-9
NHWD	kg	1.93e+2	7.87e-2	2.18e+0	ND	1.11e+2	ND	ND	ND	1.32e+4	ND	0	3.72e-2	2.91e-1	9.15e+1
RWD	kg	1.52e+0	2.64e-3	1.50e-3	ND	1.01e-1	ND	ND	ND	3.77e+3	ND	0	1.25e-3	8.32e-2	4.58e-4
CRU	kg	0	0	0	ND	0	ND	ND	ND	0	ND	0	0	0	0
MFR	kg	0	0	0	ND	2.70e+2	ND	ND	ND	0	ND	0	0	1.63e+3	0
MER	kg	0	0	0	ND	0	ND	ND	ND	0	ND	0	0	0	0
EEE	MJ	0	0	1.54e+2	ND	0	ND	ND	ND	0	ND	0	0	0	0
EET	MJ	0	0	2.77e+2	ND	0	ND	ND	ND	0	ND	0	0	0	0

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

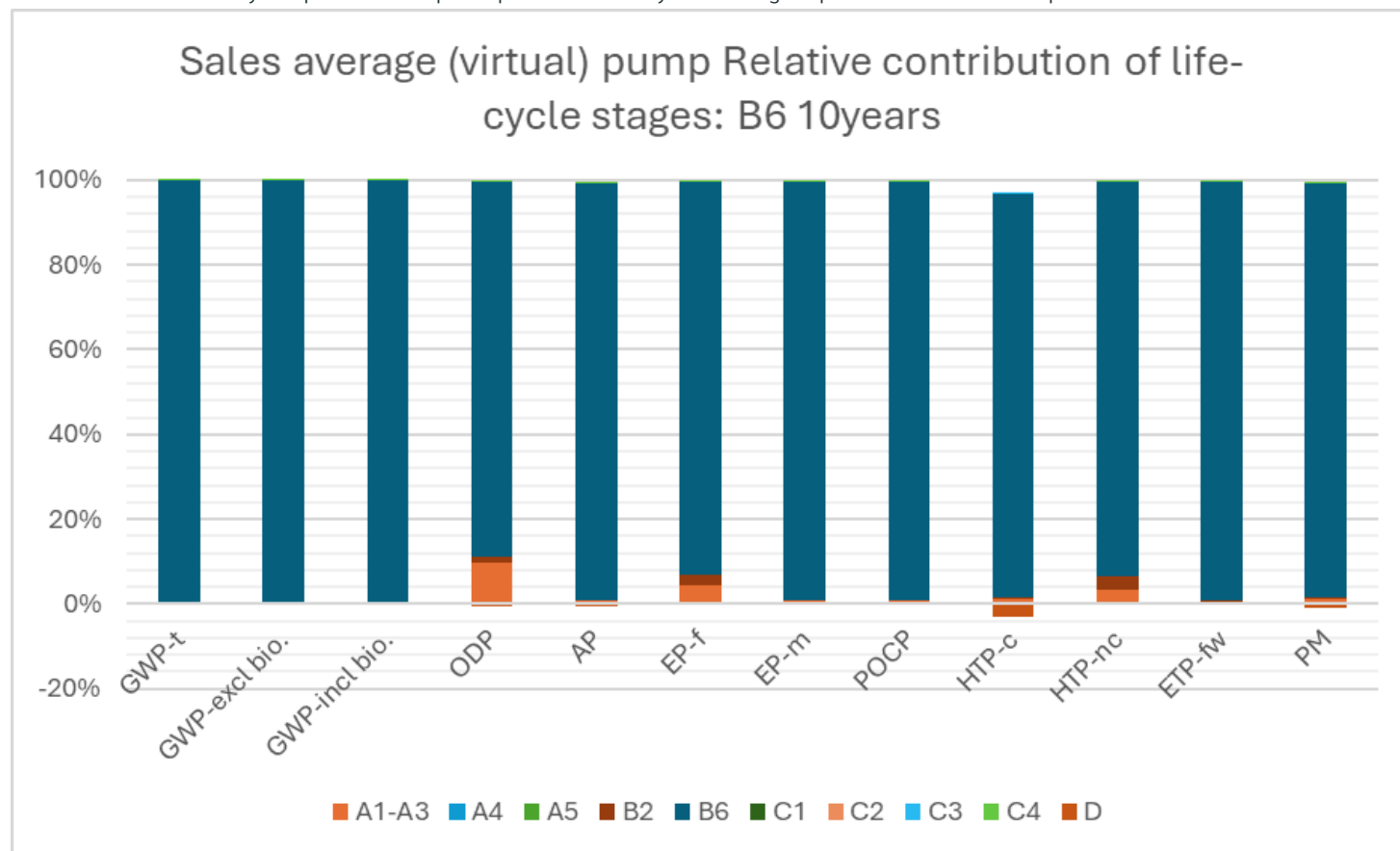
Interpretation

By comparing the overall life cycle results for the sales-weighted average pumps it can be derived that regardless of KPVS model type, the environmental burden related to electricity consumption in use stage (B6) has absolute majority for nearly all environmental impact indicators both in one and 10 years period. The Bigger the pump the greater the environmental impacts in all stages. (Use phase impact is only dependent on energy consumption)

In the case of the 10-year period both the specific (8015-250hp) and the sales average pump has the use phase (B6) as the major contributor in all impact categories. The manufacturing (A1-A3) impacts in ODP is around 5-10%, in EP-f less than 5%. The impacts of all other stages are nearly invisible on the charts.

In the one-year period, the indicators show a similar tendency. Every other stage than B6, demonstrate significant growth compared to the ten-year results. The A1-A3 impact in ODP is 34%-48%; in EP-F, 16%-26%; in HTP-NC, 12%-21%; in PM, 8%-12%; and in AP, EP-M, POCP, and ETP-FW is almost the same volume, 4%-8%, for 8015-250 hp and the average sales pump. The total emission of GWP gases is located less than 4% in the manufacturing phase.

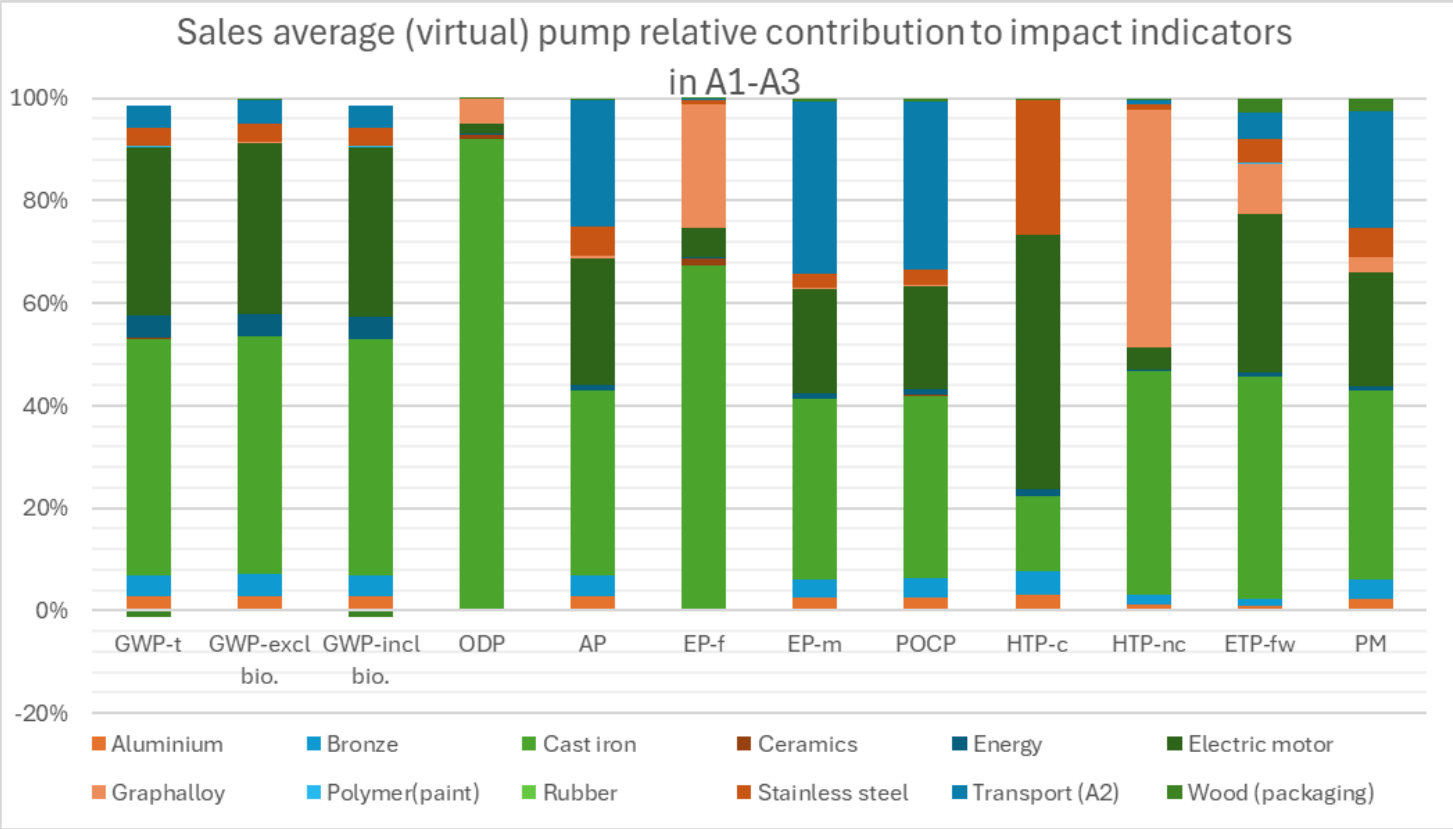
Conclusion: Motor efficiency and power consumption optimization are key for reducing the product environmental impacts.



Upon comparing the manufacturing impacts, the first and most obvious observation is that the cast iron and the aggregated electric motor production have the most prominent environmental impact on every indicator. In GWP indicators roughly 80% for both pumps, for the rest of the indicators it is from around 50% up to 80%. Transportation (A2) significantly contributes to the AP, EP-m, POCP and PM indicators in a range of 20-35%.

The stainless-steel components despite the low material composition (~1,5% of the product) have a great impact on HTP-c with 26-30% of the total impacts. Another relatively high contributor, considering its tiny mass distribution of less than 0.1% of the product, is the Graphalloy sleeve bearing. Its

impact ranges from 10% to 20% in EP-f, likely due to the technological water requirements for production. In the HTP-nc category, its overall impact ranges from 24% to almost 50%.



■ Production (A1 - A3) ■ Construction (A4 - A5) ■ Use (B1 - B7) ■ End of Life (C1 - C4)

References

STANDARDS:

ISO 21930: ISO 21930:2017 Sustainability in buildings and civil engineering works - core rules for environmental product declarations of construction products and services

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

FURTHER REFERENCES

Software: Sphera LCA for Experts, v. 10.9.1.17

Databases: - Sphera Professional database, v. 2025.1

- Ecoinvent database, v. 3.10

Smart EPD PCR-A v1.2: PART A PRODUCT CATEGORY RULES FOR BUILDING AND CONSTRUCTION PRODUCTS AND SERVICES

Standard 1000, version 1.2, March 14, 2025

PCR-B: PCR Guidance-Text for Building-Related Products and Services, Part B: Requirements on the EPD for Pumps for liquids and liquids with solids. Version 4, 2023.

Europump (2024): Use Phase GHG Emissions from Pump Units. A Europump Guide. Europump, 2024, 18p. Available from Publications - www.europump.net

ECO Platform: LCA Calculation Rules and Specifications for EPDs. Version 2.0, December 2024

Data booklet: KPVS Split case pump, 60 Hz. Grundfos Data Booklet. Available from Grundfos Product Center.