



ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804:2012+A2:2019/AC:2021 & ISO 14025

SHUNTOPAC® U/H/L 20-50 K Green Line
TTM Energiprodukter AB



Programme: The international EPD® system, www.environdec.com

Programme operator: EPD International AB

EPD registration number: S-P-13837

Publication date: 2024-06-25

Valid until: 2029-06-20

Geographical scope: A1 and A2 World/EU. A3-5/B1-7/C/D SE.

EPD of multiple products, based on a representative product. SHUNTOPAC® U/H/L 20-50 K Green Line DN20, DN25, DN32, DN40 and DN50.

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

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GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	TTM Energiprodukter AB
Address	Slöjdaregatan 1, 393 66 Kalmar
Contact details	info@ttmenergi.se
Website	https://ttmenergi.se/

PRODUCT IDENTIFICATION

Product name	SHUNTOPAC® U 20-50 K DN32 Green Line
Place(s) of production	Franska vägen 6, 393 66 Kalmar, Sweden
CPC code	4325

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

EPD INFORMATION

EPD program operator	The International EPD System
EPD standards	This EPD is in accordance with EN 15804:2012+A2:2019/AC:2021 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the core PCR. In addition, the Int'l EPD System PCR 2019:14 Construction products, version 1.3.2 (Preverified) is used. This EPD follows additional requirements for construction products considered as Electronic or Electric Equipment. Product specific complementary category rules have not been applied in this EPD
EPD author	Stina Karlsson, Rejlers Sverige AB
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
Verification date	2024-06-20
EPD verifier	Daniel Böckin, Miljögiraff AB

PRODUCT INFORMATION

PRODUCT DESCRIPTION

TTM Energiprodukter has a wide range of prefabricated shunt units for heating, cooling and heat recovery, as well as combined shunt units that combine two or more of these functions. By choosing a Shuntopac shunt unit, you get a correctly dimensioned and well-functioning shunt circuit in your system.

TTM Shuntopac[®] 20-50 K Green Line is a shunt unit for conventional and district cooling systems and is available as standard with connection dimensions from DN20 to DN50. The shunt unit can be equipped with several components of any make and a number of different coupling alternatives.

TTM Shuntopac[®] 20-50 K Green Line comes with a fire and corrosion-proof casing made of polyester-covered aluminium sheet. The insulation is NH/ArmaFlex Smart as standard. The design of the pipe mixing loop works as a barrier against undesired heat transmission due to double circulation.

PRODUCT APPLICATION

Ventilation and cooling systems.

TECHNICAL SPECIFICATIONS

Dimensions: DN20 – DN50

Pressure class: PN10

Enclosure: Fire and corrosion proof cover

Insulation: Cooling insulation

Temperature range: -20 – +110 °C

PRODUCT STANDARDS

As standard, the pipe mixing loop consists of fully welded pressure vessel pipes SS-EN 10216-2 and DIN 2391 anticorrosive painted with grey primer. TTM Shuntopac[®] 20-50 K Green Line is CE marked in accordance with manufacturer's declaration 2B according to the Machinery Directive.

PHYSICAL PROPERTIES OF THE PRODUCT

Weight: 20-80 kg

Width: 750-845 mm

Height: 800 - 1050 + pump

ADDITIONAL TECHNICAL INFORMATION

Further information can be found at <https://ttmenergi.se/>.

PRODUCT RAW MATERIAL COMPOSITION

Product and Packaging Material	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-%	Biogenic material, kg C/DU
Steel	14,3	0,1	0	0
Ductile iron	6	0	0	0
Brass	4,5	1,6	0	0
Aluminium	3	0	0	0
Plastics	1	0	0	0
Stainless steel	1	0,1	0	0
Other	1	0	0	0
Packaging material:				
Cardboard	2,042	0	83,1	0.06

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

The environmental impact for the product stage covers the impact from the manufacturing of the included materials and components, transports from the suppliers to TTMs production facility and the impact from TTMs production process. The electricity used for manufacturing is 100% renewable. 0 % recycled material is assumed for components with no specified information about recycled amount. The production process consists of welding, assembly, test pressing, insulation and packing.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in

currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

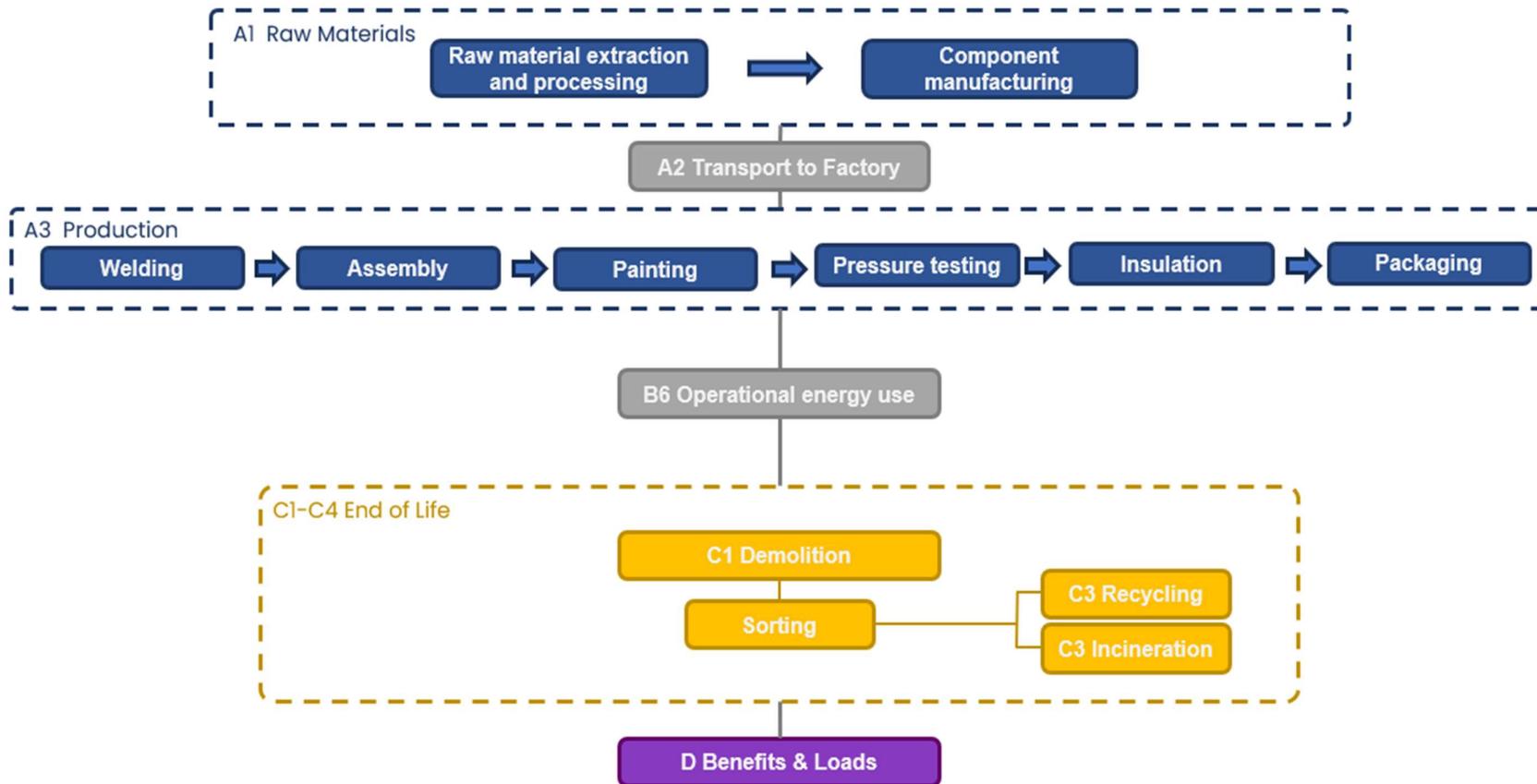
PRODUCT USE AND MAINTENANCE (B1-B7)

Energy consumption during the use phase (with a lifetime of 25 years) is based on the pump type and is assumed to have an operating time of 3000 hours per year. Since most customers are in Sweden, Swedish residual mix has been assumed as energy source. Negligible environmental impact from B1-B5, B7 as maintenance/replacement etc. is normally not needed within the products lifetime.

PRODUCT END OF LIFE (C1-C4, D)

The energy consumption to remove the product at the end of its lifetime is negligible (C1). The transport of the discarded product to the waste facility has been estimated at 50 km (C2). An Ecoinvent proxy has been used for calculating the handling of metal (C3). Steel scrap is predicted to have a material recovery rate of 80%, aluminium of 70 % and other ferrous metals of 80 % respectively non-ferrous metals of 60%. Other materials such as for example rubber and plastics are presumed to be incinerated without energy recovery by 50 % respectively 50 % (C4). Benefits from recycling metals and incinerating the other waste are included (D). Conservative assumptions are made in case specific data is missing, i.e., assumptions that reflect the highest environmental impacts in comparison to other assumptions.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2023
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DECLARED AND FUNCTIONAL UNIT

Declared unit	1 kg shunt unit
Mass per declared unit	1 kg
Functional unit	1 kg shunt unit
Reference service life	25 years

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0.82

SYSTEM BOUNDARY

Option b) cradle-to-gate with modules C1-C4, module D and optional modules A4, A5 and B.

Product stage		Assembly stage		Use stage							End of life stage				Beyond the system boundaries				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Geography, by two-letter ISO country code or regions. The International EPD System only.																			
GLO/EU	GLO/EU	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE			SE	
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Operational	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = ND. Modules not relevant = MNR.

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019/AC:2021 and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.

In this study, as per EN 15804:2012+A2:2019/AC:2021, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

The allocations in the Ecoinvent 3.8 datasets used in this study follow the Ecoinvent system model 'Allocation, cut-off, EN15804:2012+A2:2019/AC:2021'.

AVERAGES AND VARIABILITY

The International EPD System additional data requirements

Data specificity and GWP-GHG variability for GWP-GHG for A1-A3.

Supply-chain specific data for GWP-GHG	<10%
Variation in GWP-GHG between products	≤10 %
Variation in GWP-GHG between sites	Not relevant

The information and calculations in this EPD are based on TTM Shuntopac[®] 20-50 K Green Line DN32 with a total weight of 32 kg which is considered a representative product. The chosen product is the one in the middle of the range when it comes to weight and size. Included components fits the smallest product as well as the largest product and all the sizes in between. Since the components are representative for all products and the chosen product is the average product, the chosen product is considered as representative. Products included within this EPD are SHUNTOPAC[®] U 20-50 K Green Line DN20, DN25, DN32, DN40, DN50, SHUNTOPAC[®] L 20-50 K Green Line DN20, DN25, DN32, DN40, DN50 and SHUNTOPAC[®] H 20-50 K Green Line DN20, DN25, DN32, DN40, DN50.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. Note: additional environmental impact data may be presented in annexes. Please do not use the results of modules A1-A3 (A1-A5 for services) without considering the results of module C.

CORE ENVIRONMENTAL IMPACT INDICATORS –EN 15804:2012+A2:2019/AC:2021, PEF

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	4,54E+00	6,00E-02	9,91E-02	0	0	0	0	0	2,93E+00	0	0	4,59E-03	1,77E-01	8,03E-03	-1,64E+00
GWP – fossil	kg CO ₂ e	4,61E+00	6,00E-02	4,60E-03	0	0	0	0	0	2,93E+00	0	0	4,59E-03	1,77E-01	8,03E-03	-1,65E+00
GWP – biogenic	kg CO ₂ e	-9,45E-02	0	9,45E-02	0	0	0	0	0	0	0	0	0	0	-8,47E-22	0
GWP – LULUC	kg CO ₂ e	1,91E-02	2,16E-05	1,28E-06	0	0	0	0	0	1,69E-03	0	0	1,66E-06	2,13E-05	2,76E-06	8,75E-03
Ozone depletion pot.	kg CFC ₁₁ e	2,40E-07	1,43E-08	1,50E-10	0	0	0	0	0	1,91E-07	0	0	1,09E-09	2,26E-09	6,37E-10	-4,85E-08
Acidification potential	mol H ⁺ e	5,92E-02	2,50E-04	9,54E-06	0	0	0	0	0	5,16E-02	0	0	1,92E-05	2,21E-04	2,09E-05	-1,14E-02
EP-freshwater ²⁾	kg Pe	3,19E-04	4,11E-07	5,22E-08	0	0	0	0	0	1,02E-04	0	0	3,29E-08	8,65E-07	5,85E-08	-5,43E-05
EP-marine	kg Ne	5,45E-03	7,58E-05	1,55E-05	0	0	0	0	0	4,72E-03	0	0	5,79E-06	5,06E-05	1,24E-05	-1,68E-03
EP-terrestrial	mol Ne	6,35E-02	8,35E-04	2,92E-05	0	0	0	0	0	1,73E-01	0	0	6,38E-05	5,80E-04	6,93E-05	-1,92E-02
POCP (“smog”) ³⁾	kg NMVOCe	2,04E-02	2,69E-04	1,03E-05	0	0	0	0	0	1,24E-02	0	0	2,05E-05	1,57E-04	2,15E-05	-3,85E-03
ADP-minerals & metals ⁴⁾	kg Sbe	8,09E-01	1,41E-07	2,08E-08	0	0	0	0	0	0	0	0	1,08E-08	2,11E-06	6,72E-09	-9,51E-05
ADP-fossil resources	MJ	5,96E+01	9,18E-01	1,76E-02	0	0	0	0	0	0	0	0	6,99E-02	2,34E-01	5,30E-02	-1,87E+01
Water use ⁵⁾	m ³ e depr.	2,82E+00	4,24E-03	7,94E-04	0	0	0	0	0	1,15E+02	0	0	3,20E-04	8,62E-03	3,77E-04	2,92E-01

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN EN 15804:2012+A2:2019/AC:2021 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804:2012+A2:2019/AC:2021, PEF

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	6,53E-01	7,05E-09	1,35E-10	0	0	0	0	0	3,64E-07	0	0	5,37E-10	2,69E-09	3,72E-10	-1,47E-07
Ionizing radiation ⁶⁾	kBq U235e	7,27E-01	4,73E-03	1,75E-04	0	0	0	0	0	2,67E+01	0	0	3,53E-04	2,46E-03	2,68E-04	-1,28E-01
Ecotoxicity (freshwater)	CTUe	4,45E+02	7,63E-01	1,07E-01	0	0	0	0	0	1,71E+02	0	0	5,93E-02	1,22E+00	1,93E+01	-6,82E+01
Human toxicity, cancer	CTUh	1,22E+00	2,01E-11	3,90E-12	0	0	0	0	0	4,17E-09	0	0	1,54E-12	3,10E-11	1,94E-12	-7,23E-08
Human tox. non-cancer	CTUh	6,62E-07	8,08E-10	8,10E-11	0	0	0	0	0	8,58E-08	0	0	6,17E-11	1,41E-09	5,16E-11	-4,10E-08
SQP ⁷⁾	-	3,20E+01	1,07E+00	1,66E-02	0	0	0	0	0	1,01E+01	0	0	8,12E-02	4,32E-01	1,02E-01	-8,18E+00

6) EN 15804:2012+A2:2019/AC:2021 disclaimer for ionizing radiation, human health. 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	1,36E+01	1,19E-02	1,38E-03	0	0	0	0	0	2,60E+02	0	0	8,77E-04	3,85E-02	1,58E-03	-5,20E+00
Renew. PER as material	MJ	8,15E-01	0	-8,15E-01	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renew. PER	MJ	1,44E+01	1,19E-02	-8,14E-01	0	0	0	0	0	2,60E+02	0	0	8,77E-04	3,85E-02	1,58E-03	-5,20E+00
Non-re. PER as energy	MJ	5,84E+01	9,18E-01	1,76E-02	0	0	0	0	0	5,50E+02	0	0	6,99E-02	2,34E-01	5,30E-02	-1,87E+01
Non-re. PER as material	MJ	2,88E-01	0	-9,79E-02	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-re. PER	MJ	5,87E+01	9,18E-01	-8,04E-02	0	0	0	0	0	5,50E+02	0	0	6,99E-02	2,34E-01	5,30E-02	-1,87E+01
Secondary materials	kg	5,17E-01	2,59E-04	3,35E-05	0	0	0	0	0	0	0	0	1,96E-05	2,57E-04	1,36E-05	-2,86E-01
Renew. secondary fuels	MJ	5,34E-03	2,28E-06	1,75E-07	0	0	0	0	0	0	0	0	1,79E-07	1,30E-05	5,68E-07	-8,75E-04
Non-ren. secondary fuels	MJ	2,28E-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water	m ³	1,72E-01	1,22E-04	1,22E-05	0	0	0	0	0	6,43E-01	0	0	9,22E-06	3,31E-04	5,21E-05	-4,78E-03

8) PER = Primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	7,70E-01	9,84E-04	3,53E-04	0	0	0	0	0	2,84E-01	0	0	7,93E-05	1,43E-03	0	-3,12E+00
Non-hazardous waste	kg	1,63E+01	1,71E-02	5,07E-03	0	0	0	0	0	6,10E+00	0	0	1,36E-03	9,67E-02	2,42E-01	-2,62E+00
Radioactive waste	kg	4,52E-03	6,33E-06	8,86E-08	0	0	0	0	0	1,02E-02	0	0	4,78E-07	1,23E-06	0	-3,85E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	6,77E-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	1,57E-04	0	5,26E-02	0	0	0	0	0	0	0	0	0	7,10E-01	0	0
Materials for energy rec	kg	0	0	6,50E-03	0	0	0	0	0	0	0	0	0	5,10E-02	0	0
Exported energy: Thermal	MJ	0	0	7,10E-02	0	0	0	0	0	0	0	0	0	8,70E-01	0	0
Exported energy: Electricity	MJ	0	0	1,27E-02	0	0	0	0	0	0	0	0	0	1,60E-01	0	0

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ¹⁰⁾	kg CO ₂ e	4,61E+00	6,00E-02	4,60E-03	0	0	0	0	0	2,93E+00	0	0	4,59E-03	1,77E-01	8,03E-03	-1,65E+00

10) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition, the characterisation factors for the flows - CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 1.3.2 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019/AC:2021 except that the characterization factor for biogenic CO₂ is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Renewable electricity (wind, water, solar, biogas) with good quality
Electricity CO _{2e} / kWh	0,0433

BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

Ecoinvent database v3.8 (2021) and One Click LCA database.

EN EN 15804:2012+A2:2019/AC:2021 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.

Int'l EPD System PCR 2019:14 Construction products, version 1.3.2 (Preverified)

EPD International (2021). General Programme Instructions of the international EPD® system. Version 4.0. www.environdec.com.

SHUNTOPAC® U 20-50 K DN32 Green Line LCA background report 30.04.2024

ABOUT THE MANUFACTURER

TTM are experts in hydronic HVAC-systems since 1969 and deliver solutions that give the user a higher thermal comfort at a reduced cost. The products we develop, manufacture and sell optimize hydronic performance and reduce failures which makes the HVAC-system more energy efficient. Our shunt-units (circulation-units) distribute the right temperature and right flow to each part of the HVAC-system and has been a success in the building industry since its, amongst other things, time saving. Since the 90's when energy efficient, low temperature and closed heating systems became the new normal of how to design a heating system, we have helped our customers optimizing their heat transfer fluids. Our hydronic fluid-treatment solutions pressurize and keep the HVAC-system clean and efficient by removing air, dirt and magnetite. The products we deliver such as degassers, magnetite separators, pressurization units and mixing vessels are designed for quick installation and easy commissioning and have become a basic demand to keep HVAC-systems free from failure and energy efficient.

Manufacturer	TTM Energiprodukter AB
EPD author	Stina Karlsson, Rejlers Sverige AB
EPD verifier	Daniel Böckin, Miljögiraff AB
EPD program operator	The International EPD System
Background data	This EPD is based on Ecoinvent 3.8 (Allocation, cut-off, EN 15804:2012+A2:2019/AC:2021) and One Click LCA databases.
LCA software	The LCA and EPD have been created using One Click LCA Pre-Verified EPD Generator for Construction products

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with EN 15804:2012+A2:2019/AC:2021, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The background report (project report) for this EPD

Why does verification transparency matter? [Read more online.](#)

VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

EPD verification information	Answer
Independent EPD verifier	Daniel Böckin, Miljögiraff AB
Supply-chain specific data %	<10%
Approver of the EPD verifier	The International EPD System

Author & tool verification	Answer
EPD author	Stina Karlsson, Rejlers Sverige AB
EPD Generator module	Construction products
Independent software verifier	Ugo Pretato and Elia Rillo - Studio
Software verification date	05 January 2024

VERIFICATION AND REGISTRATION (INTERNATIONAL EPD SYSTEM)

ISO standard ISO 21930 and CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the core Product Category Rules (PCR)	
PCR	PCR 2019:14 Construction products, version 1.3.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
Third party verifier	Daniel Böckin, Miljögiraff AB
Procedure for follow-up during EPD validity involves third party verifier	Approved by: The International EPD® System Technical Committee, supported by the Secretariat <input type="checkbox"/> yes <input checked="" type="checkbox"/> no

ANNEX 1: ENVIRONMENTAL IMPACTS – EN 15804:2012+A2:2019/AC:2021, CML

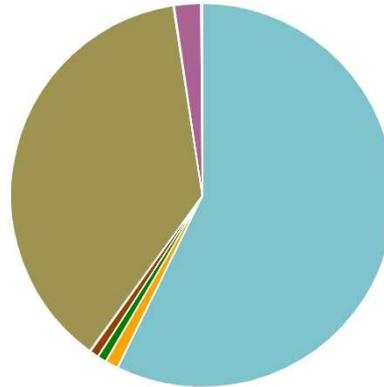
Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	3,07E+00	5,94E-02	1,09E-02	0	0	0	0	0	3,44E+00	0	0	4,54E-03	1,76E-01	6,88E-03	-1,63E+00
Ozone depletion Pot.	kg CFC ₋₁₁ e	2,07E-07	1,13E-08	1,24E-10	0	0	0	0	0	1,67E-07	0	0	8,60E-10	1,86E-09	5,06E-10	-3,42E-08
Acidification	kg SO ₂ e	4,43E-02	1,94E-04	7,38E-06	0	0	0	0	0	3,38E-02	0	0	1,49E-05	1,77E-04	1,62E-05	-9,57E-03
Eutrophication	kg PO ₄ ³ e	1,57E-02	4,34E-05	5,98E-05	0	0	0	0	0	8,80E-03	0	0	3,35E-06	6,55E-05	3,32E-04	-2,26E-03
POCP ("smog")	kg C ₂ H ₄ e	2,36E-03	7,63E-06	1,90E-06	0	0	0	0	0	1,61E-03	0	0	5,85E-07	6,48E-06	1,59E-06	1,05E-04
ADP-elements	kg Sbe	9,73E-04	1,37E-07	2,05E-08	0	0	0	0	0	8,68E-05	0	0	1,05E-08	2,10E-06	6,46E-09	-9,51E-05
ADP-fossil	MJ	4,19E+01	9,18E-01	1,76E-02	0	0	0	0	0	5,50E+02	0	0	6,99E-02	2,34E-01	5,30E-02	-1,87E+01

13) RW = Radioactive waste

ANNEX 2: LIFE-CYCLE ASSESSMENT RESULT VISUALIZATION

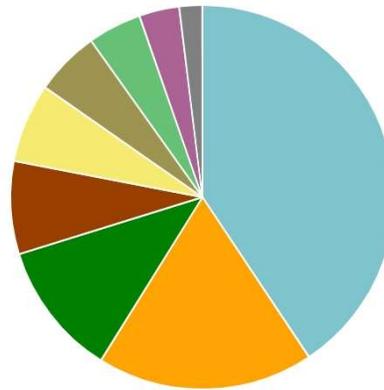
Global Warming Potential fossil kg CO2e - Life-cycle stages

- A1 Raw material extraction and processing - 57.3%
- A2 Transport to the manufacturer - 1.1%
- A3 Manufacturing - 0.8%
- A4 Transport to the building site - 0.8%
- A5 Installation into the building - 0.1%
- B6 Operational energy use - 37.6%
- C2 Waste transport - 0.1%
- C3 Waste processing - 2.3%
- C4 Waste disposal - 0.1%



Global Warming Potential fossil kg CO2e - Classifications

- Energy use during use phase - 40.6%
- Pressure vessel pipes - 11.3%
- Control valve - 6.7%
- Adapter - 4.5%
- Shut-off valve - 1.9%
- Pump - 18.2%
- Cover - 7.8%
- Adjustment valve - 5.4%
- Plastic & Rubber EoL - 3.4%



Global Warming Potential fossil kg CO2e - Resource types

- Electricity - 47.6%
- Water heating and handling equipment - 21.4%
- 25:Manufacture of fabricated metal products, except machinery and equipment - 16.4%
- 24:Manufacture of basic metals - 5.1%
- 38:Waste collection, treatment and disposal activities; materials recovery - 3.2%
- Hot-dip galvanized/zinc coated steel - 2.5%
- 35:Electricity, gas, steam and air conditioning supply - 1.4%
- Transport of goods, Road - 1.2%
- Other insulation - 0.8%
- Other resource types - 1.0%

