Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 for:

Water- and Sewage system concrete pipes with reinforcement: GERMAX PG®

from

S:t Eriks AB

Programme:	The International EPD® System, www.environdec.com
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EPD Profile

	EPD Owner **S:t Eriks AB** Lars-Olof Nilsson, Technology and Development manager +46554-689715 lars-olof.nilsson@steriks.se Bryggaregatan 6, 66532 Kil
	EPD Programme The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
	EPD Producer DGE Mark och Miljö Box 258 391 23 Kalmar
	Third party Verifier Pär Lindman, Miljögiraff AB Approved by: The International EPD® System

Product category rules (PCR): The International EPD System PCR for Construction Products and Construction Services 2012:01, version 2.32 and PCR 2012:01-SUB-PCR-G
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Description of the organisation

S:t Eriks develops, manufactures, sell and delivers concrete ground-, roof- and infra systems to professional customers and retailers on the Nordic market. They are certified according to ISO 9001:2015, ISO 14001:2015, BASTA, BBC, Vilma and transQ.

Read more at: https://steriks.se/om-st-eriks/miljo-och-kvalitet/.

Name and location of production sites

The Water- and Sewage System Reinforced Concrete Pipes covered in this EPD are called GERMAX PG® and are produced at three different sites in Sweden, located in Staffanstorp (Industrivägen 4, 245 34 Staffanstorp), Hjällbo (Bollplansgatan 1, 424 33 Angered) and Kil (Bryggaregatan 6, 665 32 Kil).

EPD Product information

Product name: GERMAX PG®, Water- and sewage system concrete pipes, with reinforcement.

Product identification:

This EPD covers the Water- and sewage system reinforced concrete pipes included in the product category GERMAX PG®, covering the products identified in Table 1.

Table 1. The GERMAX PG® Water- and sewage system reinforced concrete pipes covered in this EPD, modelled as one average metric ton.

Dimension (mm)	Strength class	Product code
400x2200	165	820-042216
500x2200	165	820-052216
600x2200	110	820-062211
600x2200	165	820-062216
800x2200	110	820-082211
800x2200	165	820-082216
1000x2200	110	820-102211
1000x2200	165	820-102216
1200x2200	110	820-122211
1200x2200	165	820-122216
1400x2200	110	820-142211
1400x2200	165	820-142216

Figure 1. Picture of a GERMAX PG® reinforced concrete pipe.

Product description:

1 metric ton of average GERMAX PG®, water- and sewage system concrete pipes with reinforcement produced by S:t Eriks. The concrete pipes are used to seal waste- and surface water pipes, but also as culverts to allow water to flow under roads and trails. The product specifications of the concrete pipes are presented in Table 1.

Average compilation:

Since the assessed product category is produced on three different sites, an average was compiled. This was done based on production volumes of the product category at the three sites, where the production volumes of the assessed product category were compared resulting in each site contributing with a corresponding ratio to the average.

UN CPC code: 37550

LCA information

Declared unit: 1 metric ton of average GERMAX PG®, product category for water- and sewage system concrete pipes with reinforcement.

Reference service life: Not specified

Time representativeness: The data and information collected and modelled for refers to the production year of 2017. The general datasets from used databases are all representative and valid for the year of 2017.

Geographical scope: Sweden
The geographical coverage of this LCA is scenario adapted, i.e. set to Sweden for the manufacturing and to region specifics, when possible, for the raw material extraction and production. This means that the data used for raw material extraction and production is adapted to the geographical region it is extracted from and produced in. The geographical coverage for transports is set to Europe.

Database(s) and LCA software used: The LCA software SimaPro 9.1.0 was used in the assessment, with data from specific raw material EPDs and the databases Ecoinvent 3.5 and U.S. LCI.

Description of system boundaries: Cradle-to-gate, i.e. life cycle stages A1-A3

Excluded lifecycle stages: Since this is a cradle-to-gate EPD, life cycle stages A4, B1-B7, C1-C4 and D are neither considered nor declared.

More information:
The differences between the environmental impact indicators deviate from the average results (i.e. results for the DU) with more than ±10%. Ranges are presented in Table 5.

For more information about the EPD owner, visit www.steriks.se.

For more information about the EPD producer, visit www.dge.se.

For more information about the underlying LCA study, contact the LCA practitioner Helena Lindh (helena.lindh@dge.se).

Concrete in use goes through a carbonation process. Carbonation of concrete is a chemical reaction, a natural process by which CO_2 in the ambient air penetrates the concrete and reacts with hydration products in the concrete. Not only the $Ca(OH)_2$ component of the hardened cement paste is able to carbonate, but also other calcium rich hydrated oxides in the concrete have been shown to gradually transform into carbonate by first decompose to $Ca(OH)_2$ when pH is getting lower due to carbonation. For concrete carbonation this means that part of the carbon dioxide emitted during cement production is rebound to the concrete during use and end of life stages of a structure. The carbonation process for the products assessed is not considered, since the life cycle stages for usage and end of life is not included.

System diagram

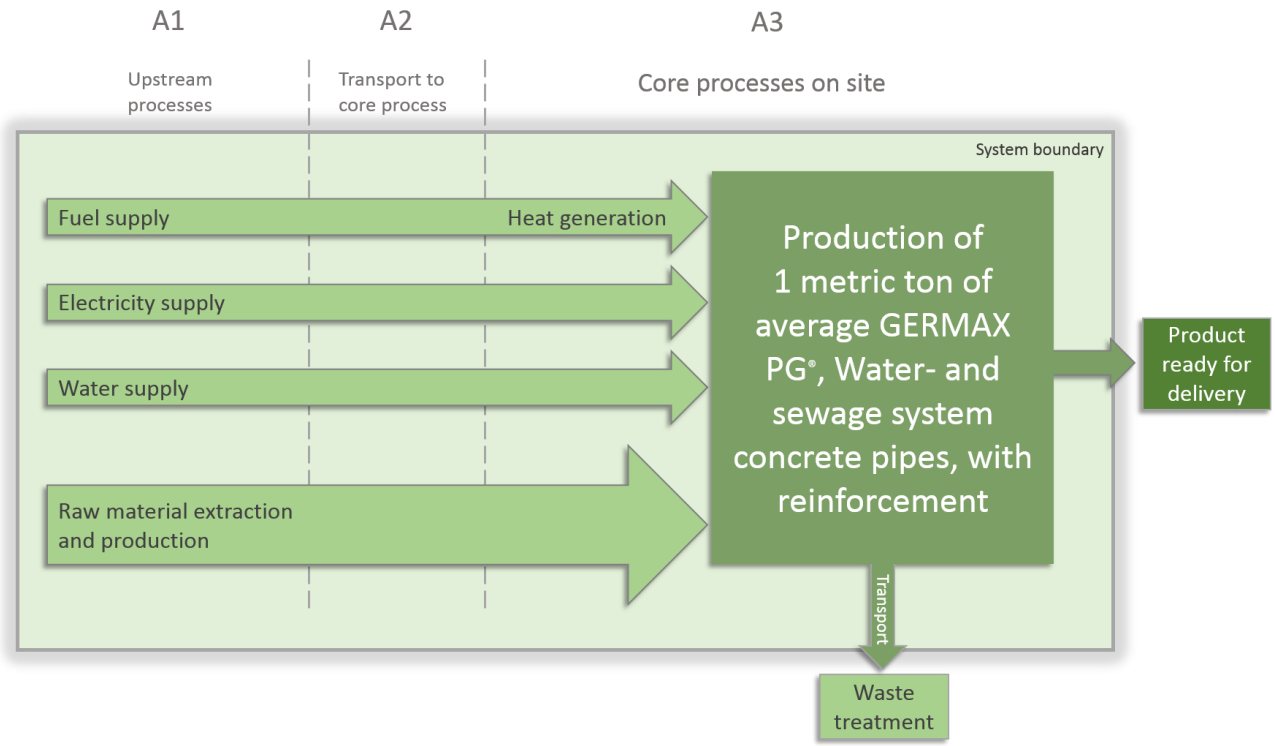

Figure 2. Flow diagram of the assessed life cycle stages for GERMAX PG®, beginning with raw material extraction and production, followed by transport from supplier to site and finally manufacturing at the core sites.

Table 2. Table declaring the life cycle stages included in the LCA.
X= included in the LCA, MND= Module Not Declared

Product stage			**Construction process stage**		**Use stage**							**End of life stage**				**Resource recovery stage**
Raw materials	Transport	Manufacturing	Transport	Construction-Installation	Usage stage	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse-recovery-recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Description of life cycle stages A1-A3: Raw material extraction and production, transport from suppliers and manufacturing on site

Table 3. The life cycle stages included in this EPD and a description of each stage.

Stage	Description
A1 Raw materials	Extraction and processing of all raw materials occurring upstream from the manufacturing process, including the energy generation needed for these processes (extraction, refining and transport of energy from primary energy sources) as well as the energy needed for the manufacturing process (A3).
A2 Transport	The external transportation of raw materials to each of the three manufacturing sites. The modelling includes transportation on road and/or water, with processes for each raw material.
A3 Manufacturing	The manufacturing of the reinforced concrete pipes takes place at S:t Eriks' three sites in Staffanstorp, Hjällbo and Kil. All raw materials are weighted in by a computer driven process. Gravels and cement are mixed, followed by dosing of water and addition of plasticizer. Reinforcement steel is installed in the cast oil-coated cast, equipped with a vibrating core, before the concrete mix is poured into it. After the completed production cycle, the cast is removed, and the pipe is hardened for 24 hours. Electricity, fuel and water consumption and waste generation is included in this stage.

Content declaration per declared unit

1 metric ton average of GERMAX PG®

Table 4. Content declaration of the declared unit.

Raw materials	Mass ratio
Cement	<17%
Gravel, crushed	<45%
Gravel, natural round	<35%
Reinforcement steel	<2%
Plasticizer	<0,05%
Cast oil	<0,01%
Rubber joint	<0,2%
*Water**	*<10%*

**The water weight included in the products are the calculated amounts left after hardening, to sum up to the total weight*.

Environmental performance

1 metric ton average of GERMAX PG®

Environmental impacts

Table 5. The results from the LCA showing the environmental impacts from 1 DU during the life cycle stages assessed.

IMPACT CATEGORY	UNIT	A1	A2	A3	TOTAL A1-A3	*Deviation range from average*
Acidification potential (AP)	kg SO_2 eq.	0,35	0,03	0,03	**0,40**	-40% to +15%
Eutrophication potential (EP)	kg PO_4^{3-} eq.	0,086	0,004	0,007	**0,098**	-35% to +26%
Global warming potential (GWP100a)	kg CO_2 eq.	122	3,55	5,88	**131**	-22% to +7%
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	0,029	0,001	0,001	**0,031**	-30% to +20%
Abiotic depletion potential, elements	kg Sb eq.	3,51E-04	4,96E-06	6,54E-06	**3,63E-04**	-9% to +13%
Abiotic depletion potential, fossil resources	MJ, net calorific value	635	54	65	**755**	-27% to +14%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	1,99E-06	6,50E-07	1,90E-06	**4,55E-06**	-31% to +8%

1 metric ton average of GERMAX PG®

Use of resources

Table 6. The results from the LCA showing the resource consumption from 1 DU during the life cycle stages assessed.

PARAMETER		UNIT				TOTAL A1-A3
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	28	1	93	122
	Used as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	28	1	93	122
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	360	55	220	635
	Used as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	360	55	220	635
Secondary material		kg	11	0	0	11
Renewable secondary fuels		MJ, net calorific value	154	0	0	154
Non-renewable secondary fuels		MJ, net calorific value	176	0	0	176
Net use of fresh water		m^3	1,52	0,01	0,17	1,70

Waste production and output flows

1 average metric ton of GERMAX PG®

Waste production

Table 7. The results from the LCA showing the waste production from 1 DU during its different life cycle stages.

IMPACT CATEGORY	UNIT	A1	A2	A3	TOTAL
Hazardous waste disposed	kg	0,003	0,001	0,064	0,069
Non-hazardous waste disposed	kg	2,86	9,20E-05	0,143	3,00
Radioactive waste disposed	kg	0,007	0	2,81E-05	0,007

Output flows

Table 8. The results from the LCA showing the output flows from 1 DU during its different life cycle stages.

IMPACT CATEGORY	UNIT	A1	A2	A3	TOTAL
Components for reuse	kg	0	0	0	0
Material for recycling	kg	4,26E-03	0	0,13	0,13
Materials for energy recovery	kg	2,63E-03	0	0,70	0,70
Energy recovery	MJ	0	0	0	0

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