epd-norge
Global program operatør

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

PERT S3 RIR

The Norwegian EPD Foundation

Owner of the declaration:
Roth North Europe A/S

Product:
PERT S3 RIR

Declared unit:
1 kg

This declaration is based on Product Category Rules:
CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR Part A: Construction products and services

Program operator:
The Norwegian EPD Foundation

Declaration number:

NEPD-4934-4281-EN

Registration number:

NEPD-4934-4281-EN

Issue date: 07.09.2023

Valid to: 07.09.2028

EPD Software:
LCA.no EPD generator ID: 70211

General information

Product

PERT S3 RIR

Owner of the declaration:

Roth North Europe A/S
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Program operator:

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Manufacturer:

Roth North Europe A/S

Declaration number: NEPD-4934-4281-EN

Place of production:

Roth North Europe A/S
Centervej 5
3600 Frederikssund, Denmark

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR Part A: Construction products and services

Management system:

EN ISO 9001:2015, EN ISO 14001:2015

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Organisation no:

34012113

Declared unit:

1 kg PERT S3 RIR

Issue date: 07.09.2023

Declared unit with option:

A1,A2,A3,A4,A5,C1,C2,C3,C4,D

Valid to: 07.09.2028

Year of study:

2023

Functional unit:

No functional unit declared

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i integrated into the company's environmental management system, ii the procedures for use of the EPD tool are approved by EPD-Norway, and iii the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Stine Bøgh Petersen

Reviewer of company-specific input data and EPD: Kim Haugsted Neubert

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Approved:

Håkon Hauan
Managing Director of EPD-Norway

(no signature required

Product

Product description:

The PERT S3 RIR is a high-quality 3-layer pipe with an outer corrugated pipe specifically designed for heating applications, particularly for casted underfloor heating systems. Roth PERT S3 fulfills all the necessary requirements for an underfloor heating pipe, ensuring optimal performance and reliability. The pipe is flexible and easy to work with, even in cold weather.

To ensure consistent quality and adherence to standards, production of the PERT S3 RIR takes place at Roth's own German factories. The manufacturing process is rigorously quality assured in accordance with ISO 9001, guaranteeing the highest level of product excellence and reliability.

The PERT S3 RIR is available in the dimensions 25 x 2,3 mm, 32 x 2,9mm and 40 x 3,7mm.

Product specification

Materials	Value	Unit
Polyethylene mid density (basic pipe)	70-80	%
Polyethylene (adhesive layer)	0-5	%
Polyethylene (oxygen barrier layer)	0-5	%
Polyethylene low density (process aid)	0-5	%
Polyethylene (corrugated pipe)	20-30	%

Technical data:

The PERT S3 exhibits exceptional heat stability, allowing for a permissible operating temperature of up to 70°C (with a maximum short-term temperature of 95°C) under an operating pressure of 6 bar. Additionally, it possesses a heat-conduction capacity of 0.35 W/mK.

Engineered as a three-layer co-extruded pipe, the PERT S3 incorporates an EVOH (ethyl vinyl alcohol) oxygen barrier as the outer layer. This barrier acts as a protective shield, preventing the entry of oxygen into the system. The pipe fulfills all the necessary requirements for oxygen diffusion resistance in accordance with DIN 4726, ensuring reliable and efficient performance.

The PERT S3 is designed to provide a reliable and high-performance solution for casted underfloor heating systems. With its advanced construction and compliance with oxygen diffusion resistance standards, it offers exceptional durability, efficiency, and meets the demands of a wide range of projects.

Market:

Denmark, Sweden, Norway, Finland & UK

Reference service life, product

50 years (Haugbølle, K., et.al, 2022)

Reference service life, building or construction works

50 years (Haugbølle, K., et.al, 2022)

LCA: Calculation rules

Declared unit:

1 kg PERT S3 RIR

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Plastic - Polyethylene	ecoinvent 3.6	Database	2019
Plastic - Polyethylene (LDPE)	ecoinvent 3.6	Database	2019
Plastic - Polyethylene (MDPE)	ecoinvent 3.6	Database	2019

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:

Module A1: Packaging has not been included due to several different available packaging options*.

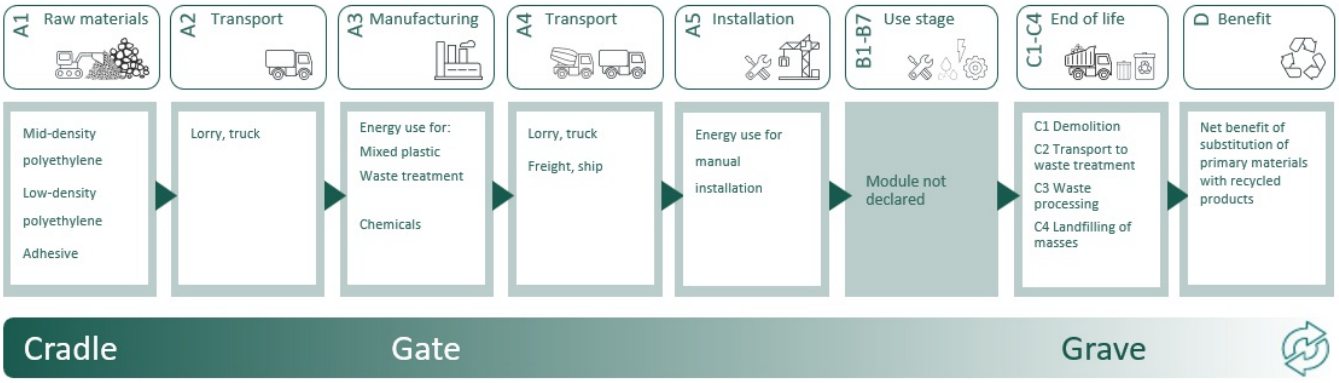
Module A4: The transportation distances provided in this EPD are derived from precise data concerning the distances between the production facility and various sales departments in different countries. Subsequently, it is assumed that the distribution from each of these sales departments to the end customers is an approximate distance of 300 km*.

Transportation by truck is assumed distribution of 80% EURO 6 and 20% EURO 5, based on data from the company's own logistics provider.

Module A5/C1: Installation and demolition are expected to be done manually, therefore no environmental impacts are included.

Module C2: The estimated transportation distance to the waste handling facility in this EPD is 100 km, assuming the use of a truck as the transport method.

*For specific packaging and transport scenarios please take contact for a project specific EPD.



Additional technical information:

No technical information declared

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Ship, Coastal Barge (km)	71,0 %	165	0,011	l/tkm	1,82
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	140	0,044	l/tkm	6,14
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	60	0,044	l/tkm	2,64
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	88	0,044	l/tkm	3,86
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	351	0,043	l/tkm	15,10
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	558	0,043	l/tkm	24,01
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	240	0,043	l/tkm	10,32

Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	100	0,044	l/tkm	4,40

Waste processing (C3)	Unit	Value			
Waste treatment per kg Polyethylene (PE), incineration with fly ash extraction (kg)	kg	1,00			

Disposal (C4)	Unit	Value			
Landfilling of ashes from incineration of Polyethylene (PE), process per kg ashes and residues (kg)	kg	0,04			

Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of electricity (MJ)	MJ	1,94			
Substitution of thermal energy, district heating (MJ)	MJ	29,40			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact												
	Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	GWP-total	kg CO_2 -eq	2,50E+00	7,25E-02	5,92E-01	2,44E-01	0	0	1,67E-02	3,02E+00	1,97E-03	-1,77E-01
	GWP-fossil	kg CO_2 -eq	2,50E+00	7,24E-02	5,83E-01	2,43E-01	0	0	1,67E-02	3,02E+00	1,97E-03	-1,70E-01
	GWP-biogenic	kg CO_2 -eq	5,81E-03	2,95E-05	8,26E-03	1,03E-04	0	0	6,80E-06	2,44E-05	1,03E-06	-3,52E-04
	GWP-luluc	kg CO_2 -eq	1,14E-03	2,53E-05	5,66E-04	9,79E-05	0	0	5,83E-06	3,59E-06	2,96E-07	-5,87E-03
	ODP	kg CFC11 -eq	7,20E-08	1,65E-08	3,22E-08	5,48E-08	0	0	3,80E-09	2,32E-09	2,04E-10	-1,24E-02
	AP	mol H+ -eq	1,01E-02	2,96E-04	1,55E-03	8,13E-04	0	0	6,81E-05	3,78E-04	6,78E-06	-1,40E-03
	EP-FreshWater	kg P -eq	6,28E-05	5,69E-07	7,03E-05	1,97E-06	0	0	1,31E-07	2,32E-07	2,67E-08	-1,51E-05
	EP-Marine	kg N -eq	1,69E-03	8,78E-05	2,47E-04	1,98E-04	0	0	2,02E-05	1,82E-04	2,11E-06	-4,59E-04
	EP-Terrestial	mol N -eq	1,91E-02	9,71E-04	3,71E-03	2,20E-03	0	0	2,23E-04	1,97E-03	2,40E-05	-4,96E-03
	POCP	kg NMVOC -eq	9,14E-03	2,97E-04	7,63E-04	7,49E-04	0	0	6,84E-05	4,71E-04	6,61E-06	-1,37E-03
	ADP-minerals&metals[1]	kg Sb -eq	3,01E-05	1,96E-06	3,94E-06	6,55E-06	0	0	4,52E-07	1,06E-07	1,06E-08	-1,70E-06
	ADP-fossil[1]	MJ	8,11E+01	1,09E+00	7,59E+00	3,66E+00	0	0	2,51E-01	1,98E-01	1,74E-02	-2,44E+00
	WDP[1]	m^3	1,15E+02	1,04E+00	6,38E+01	3,60E+00	0	0	2,40E-01	4,48E-01	1,87E-01	-3,03E+01

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Remarks to environmental impacts

Additional environmental impact indicators

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	PM	Disease incidence	7,85E-08	5,21E-09	6,83E-09	1,51E-08	0	0	1,20E-09	1,48E-09	8,30E-11	-8,51E-08
	IRP[2]	kgBq U235 -eq	7,53E-02	4,77E-03	2,18E-02	1,60E-02	0	0	1,10E-03	3,34E-04	8,30E-05	-1,56E-02
	ETP-fw[1]	CTUe	2,23E+01	8,04E-01	5,71E+00	2,71E+00	0	0	1,85E-01	5,90E-01	3,30E-02	-1,33E+01
	HTP-c[1]	CTUh	7,80E-10	0,00E+00	1,54E-10	0,00E+00	0	0	0,00E+00	6,80E-11	1,00E-12	-2,42E-10
	HTP-nc[1]	CTUh	2,17E-08	8,68E-10	5,75E-09	2,87E-09	0	0	2,00E-10	2,53E-09	6,20E-11	-1,27E-08
	SQP[1]	dimensionless	6,47E+00	7,53E-01	1,57E+00	2,56E+00	0	0	1,73E-01	2,40E-02	4,76E-02	-1,63E+01

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. 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.

Resource use												
Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	PERE	MJ	2,16E+00	1,54E-02	1,15E+00	5,34E-02	0	0	3,55E-03	5,81E-03	1,05E-03	-1,51E+01
	PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PERT	MJ	2,16E+00	1,54E-02	1,15E+00	5,34E-02	0	0	3,55E-03	5,81E-03	1,05E-03	-1,51E+01
	PENRE	MJ	3,54E+01	1,09E+00	7,59E+00	3,66E+00	0	0	2,51E-01	1,98E-01	1,74E-02	-2,44E+00
	PENRM	MJ	4,57E+01	0,00E+00	-3,26E+00	0,00E+00	0	0	0,00E+00	-4,26E+01	0,00E+00	0,00E+00
	PENRT	MJ	8,11E+01	1,09E+00	4,34E+00	3,66E+00	0	0	2,51E-01	-4,24E+01	1,74E-02	-2,44E+00
	SM	kg	4,14E-03	0,00E+00	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	RSF	MJ	1,08E-01	5,52E-04	3,58E-01	1,98E-03	0	0	1,27E-04	1,64E-04	2,60E-05	-2,64E-03
	NRSF	MJ	1,54E-02	1,97E-03	1,93E-03	6,87E-03	0	0	4,53E-04	0,00E+00	3,59E-03	-8,92E-01
	FW	m^3	3,39E-02	1,15E-04	3,26E-03	3,98E-04	0	0	2,65E-05	5,58E-04	1,60E-05	-1,81E-02

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Waste

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	HWD	kg	3,08E-03	5,57E-05	1,79E-03	1,90E-04	0	0	1,28E-05	0,00E+00	2,99E-02	-1,15E-04
	NHWD	kg	1,45E-01	5,22E-02	2,95E-02	1,73E-01	0	0	1,20E-02	0,00E+00	1,64E-02	-5,76E-02
	RWD	kg	6,57E-05	7,45E-06	2,86E-05	2,49E-05	0	0	1,71E-06	0,00E+00	1,05E-07	-1,28E-05

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Output flow

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	1,09E-05	0,00E+00	6,92E-02	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MER	kg	2,55E-05	0,00E+00	1,99E-07	0,00E+00	0	0	0,00E+00	1,00E+00	0,00E+00	0,00E+00
	EEE	MJ	4,74E-05	0,00E+00	2,78E-02	0,00E+00	0	0	0,00E+00	1,94E+00	0,00E+00	0,00E+00
	EET	MJ	7,17E-04	0,00E+00	4,21E-01	0,00E+00	0	0	0,00E+00	2,94E+01	0,00E+00	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

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

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Data source	Amount	Unit
Electricity, Germany (kWh)	ecoinvent 3.6	585,93	g CO2-eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

Indoor environment

Not relevant. No tests have been carried out on the product concerning indoor environment.

Additional Environmental Information

Additional environmental impact indicators required in NPCR Part A for construction products											
Indicator	**Unit**	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWPIOBC	kg CO_2 -eq	2,50E+00	7,25E-02	5,90E-01	2,44E-01	0	0	1,67E-02	3,02E+00	2,04E-03	-1,74E-01

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

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NPCR 000 Part B for xx, Ver. 0.0, xx.xx.202x, EPD Norway.

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