

# Environmental product declaration

In accordance with 14025 and EN15804+A2

X-PERT S5®



**Owner of the declaration:**

Roth North Europe A/S

**Product:**

X-PERT S5®

**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. Ver. 1.0. March 2021

**Program operator:**

The Norwegian EPD Foundation

**Declaration number:**

NEPD-4493-3753-EN

**Registration number:**

NEPD-4493-3753-EN

**Issue date:** 23.05.2023

**Valid to:** 23.05.2028

**EPD Software:**

LCA.no EPD generator ID: 60890

The Norwegian EPD Foundation

## General information

### Product

X-PERT S5®

### Program operator:

Post Box 5250 Majorstuen, 0303 Oslo, Norway  
The Norwegian EPD Foundation  
Phone: +47 23 08 80 00  
web: post@epd-norge.no

### Declaration number:

NEPD-4493-3753-EN

### 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. Ver. 1.0. March  
2021

### 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.

### Declared unit:

1 kg X-PERT S5®

### Declared unit with option:

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

### Functional unit:

The declared unit is 1 kg of pipe.

### Verification:

Independent verification of the declaration and data, according to  
ISO14025:2010

Third party verifier:



Mie Vold, LCA.no

(Independent verifier, approved by EPD-Norway)

### Owner of the declaration:

Roth North Europe A/S  
Contact person: Stine Bøgh Petersen  
Phone: +45 47 33 97 00  
e-mail: service@roth-northeurope.com

### Manufacturer:

Roth North Europe A/S

### Place of production:

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

### Management system:

### Organisation no:

34012113

### Issue date:

23.05.2023

### Valid to:

23.05.2028

### Year of study:

2021

### Comparability:

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

### The EPD has been worked out by:

Stine Bøgh Petersen

### Approved:



Håkon Hauan  
Managing Director of EPD-Norway

## Product

### Product description:

The X-PERT S5® is a high-quality 5-layer pipe specifically designed for heating applications, particularly for underfloor heating systems. Roth X-PERT S5® fulfills all the necessary requirements for an underfloor heating pipe, ensuring optimal performance and reliability. The pipe's flexibility and ease of handling make it particularly well-suited for installation, even in cold temperatures.

To ensure consistent quality and adherence to standards, production of the X-PERT S5® 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 X-PERT S5® pipe is available in various dimensions, including 10.5mm, 16mm, and 20mm, allowing for compatibility with different Roth underfloor heating systems and relevant fittings.

### Product specification

Materials	Value	Unit
Polyethylene mid density (basic pipe)	80-90	%
Polyethylene (adhesive layer)	5-10	%
Polyethylene (oxygen barrier layer)	0-5	%
Polyethylene mid density (top layer)	5-10	%

### Technical data:

The X-PERT S5® 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 five-layer co-extruded pipe, the X-PERT S5® incorporates an EVOH (ethyl vinyl alcohol) oxygen barrier. 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 X-PERT S5® is designed to provide a reliable and high-performance solution for various applications. 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 X-PERT S5®

### 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 (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

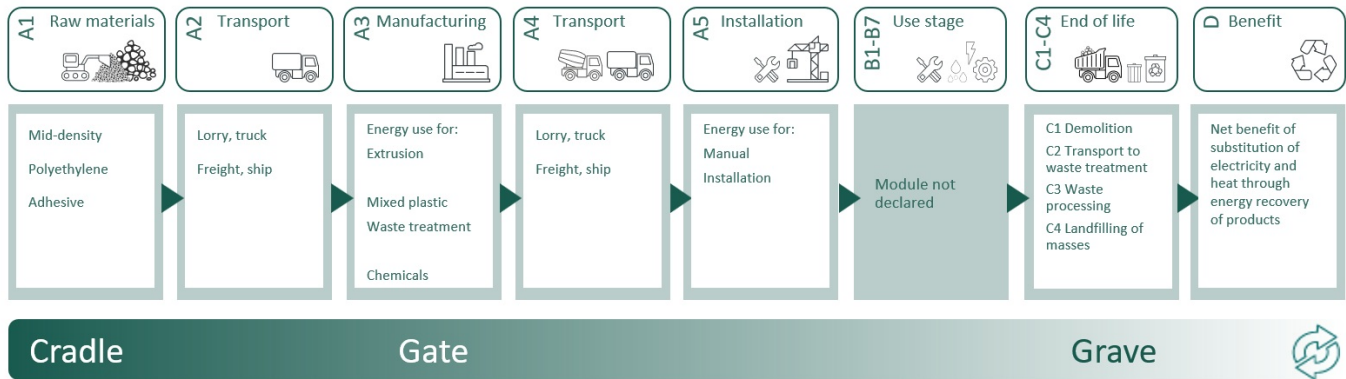
#### System boundary:

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 covers an approximate distance of 300 km\*.

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 transportation method.

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



X-PERT S5®	
Dimensions (mm)	Weight (kg/m)
10,5 x 1,3	0,044
14 x 2,0	0,059
16 x 2,0	0,109
20 x 2,0	0,132

#### Additional technical information:














## 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 %	698	0,044	l/tkm	30,71
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	439	0,044	l/tkm	19,32
Truck, 16-32 tonnes, EURO 5 (km) - Europe	36,7 %	300	0,044	l/tkm	13,20
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	29,34			

## 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-A3	A4	A5	C1	C2	C3	C4	D	
 GWP-total	kg CO <sub>2</sub> -eq	2,85E+00	2,47E-01	0	0	1,67E-02	3,02E+00	1,96E-03	-1,76E-01	
 GWP-fossil	kg CO <sub>2</sub> -eq	2,84E+00	2,47E-01	0	0	1,67E-02	3,02E+00	1,96E-03	-1,70E-01	
 GWP-biogenic	kg CO <sub>2</sub> -eq	1,32E-02	1,04E-04	0	0	6,80E-06	2,44E-05	1,03E-06	-3,51E-04	
 GWP-luluc	kg CO <sub>2</sub> -eq	1,48E-03	9,81E-05	0	0	5,83E-06	3,58E-06	2,95E-07	-5,86E-03	
 ODP	kg CFC11 -eq	1,02E-07	5,59E-08	0	0	3,80E-09	2,31E-09	2,03E-10	-1,24E-02	
 AP	mol H+ -eq	9,93E-03	1,06E-03	0	0	6,81E-05	3,78E-04	6,77E-06	-1,40E-03	
 EP-FreshWater	kg P -eq	1,19E-04	1,98E-06	0	0	1,31E-07	2,31E-07	2,66E-08	-1,51E-05	
 EP-Marine	kg N -eq	1,72E-03	3,24E-04	0	0	2,02E-05	1,81E-04	2,10E-06	-4,58E-04	
 EP-Terrestrial	mol N -eq	2,00E-02	3,58E-03	0	0	2,23E-04	1,96E-03	2,40E-05	-4,95E-03	
 POCP	kg NMVOC -eq	9,41E-03	1,08E-03	0	0	6,84E-05	4,70E-04	6,60E-06	-1,37E-03	
 ADP-minerals&metals <sup>1</sup>	kg Sb -eq	2,53E-05	6,55E-06	0	0	4,52E-07	1,06E-07	1,06E-08	-1,69E-06	
 ADP-fossil <sup>1</sup>	MJ	8,58E+01	3,71E+00	0	0	2,51E-01	1,97E-01	1,73E-02	-2,43E+00	
 WDP <sup>1</sup>	m <sup>3</sup>	1,77E+02	3,61E+00	0	0	2,40E-01	4,47E-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 W Potential land use change; ODP Ozone Depletion; AP Acidification; EP freshwater Eutrophication aquatic freshwater; EP marine Eutrophication aquatic marine; EP terrestrial Eutrophication terrestrial ;POCP Photochemical zone formation; ADPE Abiotic Depletion Potential minerals and metals; ADPf Abiotic Depletion Potential fossil fuels;

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 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-A3	A4	A5	C1	C2	C3	C4	D	
 PM	Disease incidence	7,56E-08	1,74E-08	0	0	1,20E-09	1,48E-09	8,30E-11	-8,49E-08	
 IRP <sup>2</sup>	kgBq U235 -eq	9,40E-02	1,62E-02	0	0	1,10E-03	3,34E-04	8,29E-05	-1,55E-02	
 ETP-fw <sup>1</sup>	CTUe	1,91E+01	2,74E+00	0	0	1,85E-01	5,89E-01	3,29E-02	-1,32E+01	
 HTP-c <sup>1</sup>	CTUh	7,20E-10	0,00E+00	0	0	0,00E+00	6,70E-11	1,00E-12	-2,42E-10	
 HTP-nc <sup>1</sup>	CTUh	2,07E-08	2,87E-09	0	0	2,00E-10	2,53E-09	6,10E-11	-1,27E-08	
 SQP <sup>1</sup>	dimensionless	5,08E+00	2,57E+00	0	0	1,73E-01	2,39E-02	4,75E-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 Soil Quality (dimensionless)

"Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$ "

\*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-A3	A4	A5	C1	C2	C3	C4	D	
 PERE	MJ	2,79E+00	5,35E-02	0	0	3,55E-03	5,80E-03	1,04E-03	-1,50E+01	
 PERM	MJ	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 PERT	MJ	2,79E+00	5,35E-02	0	0	3,55E-03	5,80E-03	1,04E-03	-1,50E+01	
 PENRE	MJ	4,01E+01	3,71E+00	0	0	2,51E-01	1,97E-01	1,73E-02	-2,43E+00	
 PENRM	MJ	4,25E+01	0,00E+00	0	0	0,00E+00	-4,25E+01	0,00E+00	0,00E+00	
 PENRT	MJ	8,26E+01	3,71E+00	0	0	2,51E-01	-4,23E+01	1,73E-02	-2,43E+00	
 SM	kg	5,44E-03	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 RSF	MJ	4,65E-01	1,98E-03	0	0	1,27E-04	1,63E-04	2,59E-05	-2,63E-03	
 NRSF	MJ	2,05E-02	6,89E-03	0	0	4,53E-04	0,00E+00	3,59E-03	-8,91E-01	
 FW	m <sup>3</sup>	3,45E-02	3,99E-04	0	0	2,65E-05	5,57E-04	1,59E-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 Use of net fresh water

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed








End of life - Waste										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 HWD	kg	3,55E-03	1,91E-04	0	0	1,28E-05	0,00E+00	2,98E-02	-1,14E-04	
 NHWD	kg	1,57E-01	1,73E-01	0	0	1,20E-02	0,00E+00	1,64E-02	-5,75E-02	
 RWD	kg	9,35E-05	2,53E-05	0	0	1,71E-06	0,00E+00	1,04E-07	-1,27E-05	

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

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

End of life - Output flow										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 CRU	kg	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 MFR	kg	6,92E-02	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 MER	kg	1,99E-07	0,00E+00	0	0	0,00E+00	1,00E+00	0,00E+00	0,00E+00	
 EEE	MJ	2,78E-02	0,00E+00	0	0	0,00E+00	1,94E+00	0,00E+00	0,00E+00	
 EET	MJ	4,21E-01	0,00E+00	0	0	0,00E+00	2,93E+01	0,00E+00	0,00E+00	

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

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*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 CO<sub>2</sub>

## Additional Norwegian 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 CO <sub>2</sub> -eq/kWh

### Dangerous substances

The product contains substances given by the REACH Candidate list and the Norwegian priority list that are less than 0,1 % by weight.

### Indoor environment

## Additional Environmental Information






Environmental impact indicators EN 15804+A1 and NPCR Part A v2.0									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO <sub>2</sub> -eq	2,73E+00	2,45E-01	0	0	1,65E-02	3,02E+00	2,04E-03	-1,73E-01
ODP	kg CFC11 -eq	1,07E-07	4,43E-08	0	0	3,00E-09	2,08E-09	1,66E-10	-1,79E-08
POCP	kg C <sub>2</sub> H <sub>4</sub> -eq	1,10E-03	3,27E-05	0	0	2,20E-06	3,88E-06	2,31E-07	-2,04E-04
AP	kg SO <sub>2</sub> -eq	7,98E-03	5,25E-04	0	0	3,27E-05	2,61E-04	3,58E-06	-1,03E-03
EP	kg PO <sub>4</sub> <sup>3-</sup> -eq	9,78E-04	6,21E-05	0	0	3,49E-06	8,13E-05	4,88E-07	-2,96E-04
ADPM	kg Sb -eq	2,53E-05	6,55E-06	0	0	4,52E-07	1,06E-07	1,06E-08	-1,69E-06
ADPE	MJ	8,07E+01	3,63E+00	0	0	2,46E-01	1,97E-01	1,73E-02	-1,96E+00
GWPIOBC	kg CO <sub>2</sub> -eq	2,85E+00	2,47E-01	0	0	1,67E-02	3,02E+00	2,04E-03	-1,74E-01

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources; GWP-IOBC/GHG Global warming potential calculated according to the principle of instantaneous oxidation (except emissions and uptake of biogenic carbon)

## Bibliography

ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures.  
 ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.  
 EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.  
 ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products.  
 ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.  
 Iversen et al., (2021) eEPD v2021.09 Background information for EPD generator tool system verification, LCA.no Report number: 07.21  
 Jeroen Graafland, (2023) EPD for Roth MultiPex RIR - TG 2556 and Roth X-PERT S5, Background information for manual EPD and LCA data, LCA.no report number: 08.23  
 NPCR Part A: Construction products and services. Ver. 2.0. April 2021, EPD-Norge.

Haugbølle, K., Mahdi, V., Morelli, M., & Wahedi, H. (2022). BUILD Levetidstabel. BUILD - Institut for Byggeri, by Og Miljø, 2, 978-87-563-2072-6.  
<https://build.dk/Pages/BUILD-levetidstabel.aspx>

 <b>epd-norway</b> <small>Global Program Operator</small>	<b>Program operator and publisher</b> The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway	Phone: +47 23 08 80 00 e-mail: <a href="mailto:post@epd-norge.no">post@epd-norge.no</a> web: <a href="http://www.epd-norge.no">www.epd-norge.no</a>
	<b>Owner of the declaration:</b> Roth North Europe A/S Centervej 5, 3600 Frederikssund	Phone: +45 47 33 97 00 e-mail: <a href="mailto:service@roth-northeurope.com">service@roth-northeurope.com</a> web: <a href="http://roth-northeurope.com">roth-northeurope.com</a>
	<b>Author of the Life Cycle Assessment</b> LCA.no AS Dokka 6B, 1671	Phone: +47 916 50 916 e-mail: <a href="mailto:post@lca.no">post@lca.no</a> web: <a href="http://www.lca.no">www.lca.no</a>
	<b>Developer of EPD generator</b> LCA.no AS Dokka 6B, 1671 Kråkerøy	Phone: +47 916 50 916 e-mail: <a href="mailto:post@lca.no">post@lca.no</a> web: <a href="http://www.lca.no">www.lca.no</a>
	ECO Platform ECO Portal	web: <a href="http://www.eco-platform.org">www.eco-platform.org</a> web: ECO Portal