ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Rigid TwinPipe S1 - DN100

LOGSTOR Denmark Holding ApS (Kingspan/Logstor/Powerpipe)

EPD HUB, HUB-2840

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GENERAL INFORMATION

MANUFACTURER

Manufacturer	LOGSTOR Denmark Holding ApS (Kingspan/Logstor/Powerpipe)
Address	Danmarksvej 11, 9670 Løgstør, Denmark
Contact details	karin.liljegren@kingspan.com
Website	www.logstor.com www.powerpipe.se

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR Version 1.1, 5 Dec 2023
Sector	Construction product
Category of EPD	Third party verified EPD
Parent EPD number	HUB-2835
Scope of the EPD	Cradle to gate with options, A5, and modules C1-C4, D
EPD author	Stefan Emil Danielsson
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Abderazak Guiz, as an authorized verifier acting for EPD Hub Limited.

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Rigid TwinPipe S1 - DN100
Place of production	Denmark, Poland, Sweden, Finland
Period for data	Calendar year 2023
Averaging in EPD	Multiple products and multiple factories
Variation in GWP-fossil for A1-A3	%

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 meter
Declared unit mass	29.5 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	7,53E+01
GWP-total, A1-A3 ($kgCO_2e$)	7,25E+01
Secondary material, inputs (%)	43.5
Secondary material, outputs (%)	18
Total energy use, A1-A3 (kWh)	306
Net freshwater use, A1-A3 (m^3)	1.97

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

The LOGSTOR group designs, manufactures and supplies products and services for installation of district heating and cooling networks. The group hosts two brands, LOGSTOR and Powerpipe and has seven manufacturing sites, all in Europe. All sites follow the Kingspan sustainability program Planet Passionate, aiming at reducing carbon emissions each year and generating own renewable energy on site. All sites run with renewable electricity and are certified for ISO 9001, 45001 and for 50001 or equivalent system. In addition, reduction of CO2e emissions in the whole life cycle of the products is targeted, from design to supplier cooperations, transports and influencing customers in choice of products and materials.

PRODUCT DESCRIPTION

Product portfolio

The manufactured product portfolio is wide and includes various types of rigid pipes, flexible piping solutions, valves and joints.

Most products are subject to EN norms, governing the details of used materials, testing procedures before, during and after production and strict control of final mechanical and functional properties.

Heat loss and materials:

The aim of the insulated products is to enable energy transmission (usually hot water) and protect the piping networks from energy loss. Thus, the foam is controlled and measured by its thermal conductivity (λ50).

The product - the rigid TwinPipe

The traditional twin pipes are produced according to EN15698-1 fulfilling EN13941 requirements, with two longitudinally P235GH steel, polyurethane foam and HDPE casing. Inside the foam runs copper wires used for alarm surveillance (leak detection).

Choosing TwinPipe products when possible, instead of two equivalent single pipe products, results in less total heat loss and less installation work.

TwinPipe pipes in this EPD

This EPD describes a TwinPipe product 2xDN100/315

The GWP-total for 36 selected variants of different diameters are declared individually in Annex, including the representative product variant.

The rigid TwinPipes are produced in series 0-3 and with steel dimensions varying from DN20-DN250.

Further information can be found at www.logstor.com / www.powerpipe.se.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	67	Europe
Minerals	-	
Fossil materials	33	Europe, World
Bio-based materials	-	

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	0.94

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 meter
Mass per declared unit	29.5 kg
Functional unit	-
Reference service life	50 years

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

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

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		
×	×	×	MND	×	MND	MND	MND	MND	MND	MND	MND	×	×	×	×	×		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR

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. These production losses are treated differently: steel pipes are sorted out for recycling, while PUR and HDPE are separated and sold to the market. PUR is mostly incinerated while HDPE is granulated for recycling.

Raw materials are supplied to production facilities in Denmark, Finland, Sweden, and two sites in Poland. Transport primarily occurs within Europe by truck and ferry, with limited use of ships. The main raw materials include carbon steel pipes, HDPE granulate, and chemical mixtures (isocyanates, polyols, blowing agents, and catalysts) used in PUR foam production. Additionally, copper wires are introduced for smart sensors, and spacers are included to ensure proper alignment of the service pipe within the casing. Packaging materials such as end caps and supporting wooden beams are also part of the supply flow.

At each site, the HDPE granules are melted and extruded using fully renewable electricity to form the PE casing pipes. The PUR foam is injected into the casing, filling the space between the service pipe and the casing to provide insulation. Copper wires and spacers are attached to the service pipes before encasing them in the PE pipes. Internal transport within production facilities uses diesel and gas oil.

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.

Transportation to the construction site (A4) has not been declared.

Installation (A5) assumes that a diesel-powered excavator removes sufficient soil to provide access for workers and pipe placement. Diesel consumption during excavation is non-linear, and estimations are based on best practices for pipes of different diameters.

PRODUCT USE AND MAINTENANCE (B1-B7)

These modules are excluded as the product does not require maintenance or produce emissions during its use phase.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The end-of-life is assumed to happen in almost any European country, as this is the main market.

Deconstruction (C1) follows the same procedure as installation (A5), assuming excavation for pipe removal.

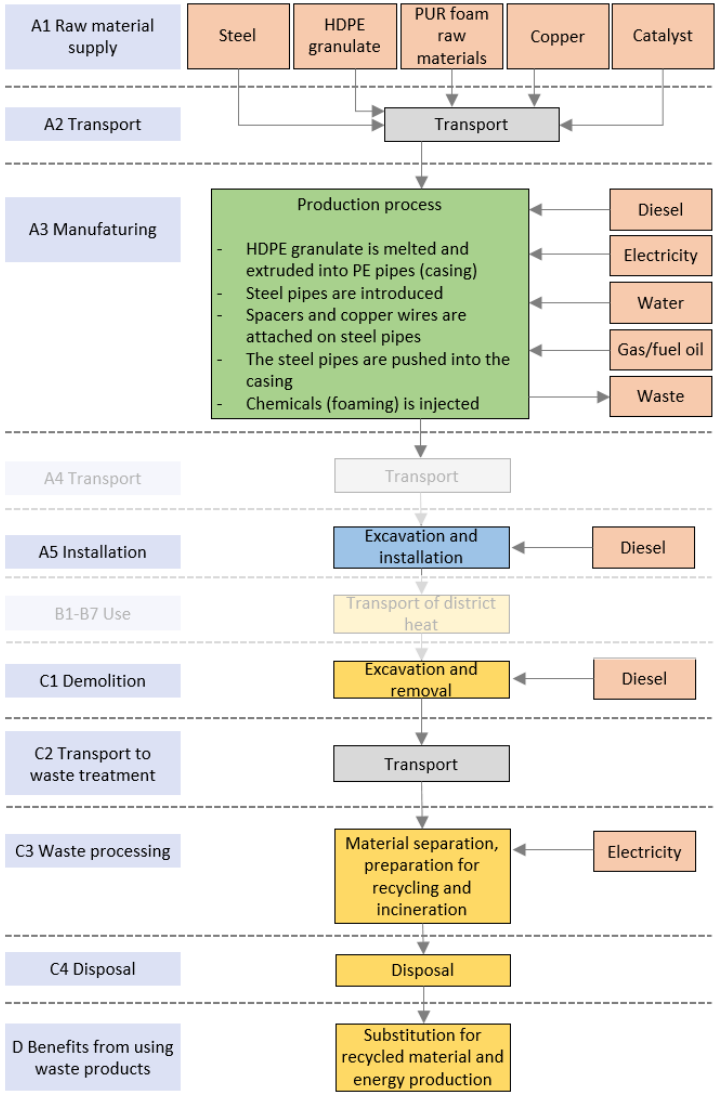
Transport to waste processing facilities (C2) assumes an average distance of 50 km by truck.

Waste processing (C3) covers three distinct material flows at the end of life:

1) Steel pipes are chopped into smaller pieces and sent to steelworks for remelting.
2) HDPE casing is chopped into pieces and transported to local municipal waste incinerators.
3) PUR foam is chopped into pieces and transported to local municipal waste incinerators.

For loads beyond the system boundary (D), credits are applied for the substitution of virgin materials (steel and HDPE) and for energy recovery from PUR foam incineration, contributing to substitution of average district heat and electricity.

PRODUCT SYSTEM



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard 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. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	No allocation
Ancillary materials	Not applicable
Manufacturing energy and waste	No allocation

AVERAGES AND VARIABILITY

Type of average	Multiple manufacturers
Averaging method	Representative product
Variation in GWP-fossil for A1-A3	39

One product variant of many different ones has been declared.

Raw materials production (A1) happens more than 99% in Europe and from similar manufacturers. The GWP impacts of steel, plastic and chemicals (for PUR foam) is high, and they are supplied to each manufacturing site from different manufacturers, but the technological representativeness is rather similar in reality. This does not lead to overrepresentation, especially given that most raw materials used is based on generic Ecoinvent data, rather than a range of different supplier specific data. For steel, several suppliers offer EPDs, but the one with the most conservative GWP results was used as representative.

The supply of raw materials (A2) to each of the five European manufacturing sites happens within Europe by truck and ferries. Since far most of the raw materials comes from Europe, the manufacturing is rather centralized to this region. A generic dataset was used for truck transport.

Manufacturing (A3) at all sites applies renewable electricity, which is representative for all, and causes virtually no major burden.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10 and One Click LCA databases as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	7,16E+01	2,76E+00	-1,96E+00	7,24E+01	MND	1,62E+01	MND	MND	MND	MND	MND	MND	MND	1,62E+01	1,53E-01	2,83E+01	0,00E+00	-2,16E+01
GWP – fossil	kg CO_2e	7,14E+01	2,76E+00	1,09E+00	7,52E+01	MND	1,62E+01	MND	MND	MND	MND	MND	MND	MND	1,62E+01	1,53E-01	2,83E+01	0,00E+00	-2,16E+01
GWP – biogenic	kg CO_2e	2,06E-01	1,38E-06	-3,06E+00	-2,85E+00	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP – LULUC	kg CO_2e	5,74E-02	1,09E-03	3,73E-03	6,22E-02	MND	2,10E-03	MND	MND	MND	MND	MND	MND	MND	2,10E-03	5,94E-05	3,53E-04	0,00E+00	-9,77E-03
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	3,84E-06	5,68E-08	6,31E-08	3,96E-06	MND	4,57E-07	MND	MND	MND	MND	MND	MND	MND	4,57E-07	3,18E-09	1,88E-08	0,00E+00	-1,19E-07
Acidification potential	mol H^+e	3,04E-01	9,06E-03	3,64E-03	3,17E-01	MND	1,31E-01	MND	MND	MND	MND	MND	MND	MND	1,31E-01	3,60E-04	1,69E-02	0,00E+00	-9,06E-02
EP-freshwater[2)]	kg Pe	2,19E-02	1,89E-04	3,12E-05	2,21E-02	MND	5,47E-04	MND	MND	MND	MND	MND	MND	MND	5,47E-04	1,07E-05	1,84E-04	0,00E+00	-9,79E-03
EP-marine	kg Ne	5,65E-02	2,34E-03	1,57E-03	6,04E-02	MND	5,69E-02	MND	MND	MND	MND	MND	MND	MND	5,69E-02	9,44E-05	1,42E-02	0,00E+00	-1,91E-02
EP-terrestrial	mol Ne	6,19E-01	2,56E-02	1,47E-02	6,59E-01	MND	6,22E-01	MND	MND	MND	MND	MND	MND	MND	6,22E-01	1,02E-03	8,64E-02	0,00E+00	-2,07E-01
POCP ("smog")[3)]	kg NMVOCe	2,90E-01	1,30E-02	3,99E-03	3,07E-01	MND	2,07E-01	MND	MND	MND	MND	MND	MND	MND	2,07E-01	6,26E-04	2,13E-02	0,00E+00	-6,91E-02
ADP-minerals & metals[4)]	kg Sbe	5,29E-04	7,70E-06	3,93E-06	5,40E-04	MND	6,80E-06	MND	MND	MND	MND	MND	MND	MND	6,80E-06	4,36E-07	9,85E-06	0,00E+00	-1,72E-04
ADP-fossil resources	MJ	1,33E+03	4,11E+01	7,54E+00	1,38E+03	MND	3,40E+02	MND	MND	MND	MND	MND	MND	MND	3,40E+02	2,29E+00	1,26E+01	0,00E+00	-2,23E+02
Water use[5)]	m^3e depr.	2,32E+01	2,08E-01	3,19E+01	5,53E+01	MND	6,81E-01	MND	MND	MND	MND	MND	MND	MND	6,81E-01	1,17E-02	1,60E+00	0,00E+00	-5,79E+00

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 15804+A2 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+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3,24E-06	2,62E-07	8,46E-08	3,58E-06	MND	3,49E-06	MND	MND	MND	MND	MND	MND	MND	3,49E-06	1,49E-08	7,60E-08	0,00E+00	-1,61E-06
Ionizing radiation[6)]	kBq U235e	6,63E+00	4,86E-02	2,64E-02	6,70E+00	MND	1,50E-01	MND	MND	MND	MND	MND	MND	MND	1,50E-01	2,76E-03	4,79E-02	0,00E+00	-7,60E-01
Ecotoxicity (freshwater)	CTUe	2,51E+03	4,79E+00	1,84E+01	2,54E+03	MND	1,47E+01	MND	MND	MND	MND	MND	MND	MND	1,47E+01	2,70E-01	4,31E+01	0,00E+00	-5,80E+01
Human toxicity, cancer	CTUh	6,11E-07	4,63E-10	1,06E-09	6,13E-07	MND	1,84E-09	MND	MND	MND	MND	MND	MND	MND	1,84E-09	2,54E-11	1,86E-09	0,00E+00	-2,70E-08
Human tox. non-cancer	CTUh	1,35E-06	2,61E-08	1,61E-08	1,39E-06	MND	3,63E-08	MND	MND	MND	MND	MND	MND	MND	3,63E-08	1,48E-09	6,96E-08	0,00E+00	-2,11E-07
SQP[7)]	-	2,48E+02	4,03E+01	4,14E+02	7,02E+02	MND	2,21E+01	MND	MND	MND	MND	MND	MND	MND	2,21E+01	2,31E+00	1,81E+01	0,00E+00	-7,80E+01

6) EN 15804+A2 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	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	8,89E+01	6,59E-01	1,14E+01	1,01E+02	MND	1,86E+00	MND	MND	MND	MND	MND	MND	MND	1,86E+00	3,73E-02	1,10E+00	0,00E+00	-2,89E+01
Renew. PER as material	MJ	0,00E+00	0,00E+00	3,42E+01	3,42E+01	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renew. PER	MJ	8,89E+01	6,59E-01	4,55E+01	1,35E+02	MND	1,86E+00	MND	MND	MND	MND	MND	MND	MND	1,86E+00	3,73E-02	1,10E+00	0,00E+00	-2,89E+01
Non-re. PER as energy	MJ	9,73E+02	4,11E+01	-1,51E+01	9,99E+02	MND	2,11E+02	MND	MND	MND	MND	MND	MND	MND	2,11E+02	2,29E+00	-3,21E+02	0,00E+00	-2,23E+02
Non-re. PER as material	MJ	3,56E+02	0,00E+00	2,22E+01	3,79E+02	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-re. PER	MJ	1,33E+03	4,11E+01	7,13E+00	1,38E+03	MND	2,11E+02	MND	MND	MND	MND	MND	MND	MND	2,11E+02	2,29E+00	-3,21E+02	0,00E+00	-2,23E+02
Secondary materials	kg	1,28E+01	1,78E-02	1,85E-03	1,28E+01	MND	8,71E-02	MND	MND	MND	MND	MND	MND	MND	8,71E-02	9,91E-04	1,15E-02	0,00E+00	-1,88E+00
Renew. secondary fuels	MJ	1,50E-03	2,19E-04	3,54E-03	5,26E-03	MND	2,85E-04	MND	MND	MND	MND	MND	MND	MND	2,85E-04	1,25E-05	7,14E-04	0,00E+00	-2,28E-03
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	6,06E-03	6,06E-03	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	1,94E+00	5,97E-03	2,47E-02	1,97E+00	MND	1,73E-02	MND	MND	MND	MND	MND	MND	MND	1,73E-02	3,38E-04	2,87E-02	0,00E+00	-1,41E-01

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1,54E+00	5,93E-02	1,95E-02	1,62E+00	MND	2,46E-01	MND	MND	MND	MND	MND	MND	MND	2,46E-01	3,31E-03	4,02E-01	0,00E+00	-8,92E+00
Non-hazardous waste	kg	1,48E+02	1,18E+00	1,53E+00	1,51E+02	MND	3,76E+00	MND	MND	MND	MND	MND	MND	MND	3,76E+00	6,63E-02	1,33E+01	0,00E+00	-5,41E+01
Radioactive waste	kg	1,96E-03	1,21E-05	2,95E-05	2,00E-03	MND	3,73E-05	MND	MND	MND	MND	MND	MND	MND	3,73E-05	6,89E-07	1,13E-05	0,00E+00	-1,92E-04

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	1,01E-01	0,00E+00	2,18E-03	1,03E-01	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	1,97E+01	0,00E+00	0,00E+00
Materials for energy rec	kg	1,21E-02	0,00E+00	9,79E-05	1,22E-02	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	9,80E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	3,60E-02	3,60E-02	MND	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ANNEX

The following result table sums up the GWP-total for all the product variants studied.

GWP-TOTAL – SERIES 1 PRODUCT GROUP, EN 15804+A2, PEF

Service *pipe DN*	*Steel pipe OD mm*	Casing	*Weight kg/m*	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
DN 20 x2	*26.9*	125	5.2	kg CO_2e	1,08E+01	4,88E-01	-2,37E+00	8,96E+00	MND	1,82E+01	MND	1,82E+01	2,68E-02	6,14E+00	0,00E+00	-3,34E-01
DN 25 x 2	*33.7*	140	6.5	kg CO_2e	1,35E+01	6,08E-01	-2,34E+00	1,17E+01	MND	1,75E+01	MND	1,75E+01	3,35E-02	7,27E+00	0,00E+00	-3,79E-01
DN 32 x 2	*42.4*	160	8.2	kg CO_2e	1,65E+01	7,56E-01	-2,31E+00	1,50E+01	MND	1,68E+01	MND	1,68E+01	4,17E-02	8,72E+00	0,00E+00	-4,48E-01
DN 40 x 2	*48.3*	160	8.9	kg CO_2e	1,74E+01	8,25E-01	-2,31E+00	1,59E+01	MND	1,68E+01	MND	1,68E+01	4,58E-02	8,74E+00	0,00E+00	-4,48E-01
DN 50 x 2	*60.3*	200	12.6	kg CO_2e	2,53E+01	1,17E+00	-2,21E+00	2,43E+01	MND	1,57E+01	MND	1,57E+01	6,49E-02	1,27E+01	0,00E+00	-6,32E-01
DN 65 x 2	*76.1*	225	15.9	kg CO_2e	3,16E+01	1,48E+00	-2,14E+00	3,09E+01	MND	1,51E+01	MND	1,51E+01	8,19E-02	1,56E+01	0,00E+00	-7,70E-01
DN 80 x 2	*88.9*	250	20	kg CO_2e	3,91E+01	1,85E+00	-2,06E+00	3,89E+01	MND	1,46E+01	MND	1,46E+01	1,03E-01	1,88E+01	0,00E+00	-9,15E-01
DN 100 x 2	*114.3*	315	29.5	kg CO_2e	**5,88E+01**	**2,74E+00**	**1,14E+00**	**6,27E+01**	MND	**1,37E+01**	MND	**1,37E+01**	**1,52E-01**	**2,82E+01**	0,00E+00	**-1,34E+00**
DN125 x 2	*139.7*	400	39.9	kg CO_2e	8,71E+01	3,74E+00	-1,39E+00	8,94E+01	MND	1,23E+01	MND	1,23E+01	2,05E-01	4,46E+01	0,00E+00	-2,07E+00
DN 150 x 2	*168.3*	450	51.7	kg CO_2e	1,10E+02	4,84E+00	-1,12E+00	1,14E+02	MND	1,18E+01	MND	1,18E+01	2,66E-01	5,52E+01	0,00E+00	-2,55E+00
DN 200 x 2	*219.1*	560	76.4	kg CO_2e	1,65E+02	7,16E+00	-4,06E-01	1,72E+02	MND	1,09E+01	MND	1,09E+01	3,93E-01	8,22E+01	0,00E+00	-3,73E+00
DN 250 x 2	*273.0*	710	111.9	kg CO_2e	2,54E+02	1,06E+01	8,62E-01	2,65E+02	MND	1,04E+01	MND	1,04E+01	5,76E-01	1,30E+02	0,00E+00	-5,83E+00

GWP-TOTAL – SERIES 2 PRODUCT GROUP, EN 15804+A2, PEF

Service *pipe DN*	*Steel pipe OD mm*	Casing	W*eight kg/m*	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
DN 20 x 2	*26.9*	140	5.5	kg CO_2e	1,21E+01	5,19E-01	-2,48E+00	1,01E+01	MND	1,45E+01	MND	1,45E+01	2,83E-02	6,98E+00	0,00E+00	-3,56E+00
DN 25 x 2	*33.7*	160	6.9	kg CO_2e	1,49E+01	6,50E-01	-2,45E+00	1,31E+01	MND	1,46E+01	MND	1,46E+01	3,55E-02	8,42E+00	0,00E+00	-4,56E+00
DN 32 x 2	*42.4*	180	8.6	kg CO_2e	1,85E+01	8,09E-01	-2,40E+00	1,69E+01	MND	1,48E+01	MND	1,48E+01	4,43E-02	1,01E+01	0,00E+00	-5,77E+00
DN 40 x 2	*48.3*	180	9.4	kg CO_2e	1,93E+01	8,78E-01	-2,40E+00	1,78E+01	MND	1,48E+01	MND	1,48E+01	4,84E-02	1,02E+01	0,00E+00	-6,59E+00
DN 50 x 2	*60.3*	225	13.4	kg CO_2e	2,83E+01	1,26E+00	-2,29E+00	2,73E+01	MND	1,51E+01	MND	1,51E+01	6,90E-02	1,50E+01	0,00E+00	-9,19E+00
DN 65 x 2	*76.1*	250	16.7	kg CO_2e	3,46E+01	1,56E+00	-2,22E+00	3,39E+01	MND	1,53E+01	MND	1,53E+01	8,60E-02	1,79E+01	0,00E+00	-1,17E+01
DN 80 x 2	*88.9*	280	21.1	kg CO_2e	4,33E+01	1,97E+00	-2,12E+00	4,31E+01	MND	1,56E+01	MND	1,56E+01	1,09E-01	2,20E+01	0,00E+00	-1,50E+01
DN 100 x 2	*114.3*	355	31.6	kg CO_2e	6,67E+01	2,96E+00	-1,81E+00	6,79E+01	MND	1,63E+01	MND	1,63E+01	1,63E-01	3,42E+01	0,00E+00	-2,19E+01
DN125 x 2	*139.7*	450	42.8	kg CO_2e	9,86E+01	4,06E+00	-1,32E+00	1,01E+02	MND	1,74E+01	MND	1,74E+01	2,20E-01	5,31E+01	0,00E+00	-2,74E+01
DN 150 x 2	*168.3*	500	54.9	kg CO_2e	1,23E+02	5,18E+00	-1,04E+00	1,27E+02	MND	1,80E+01	MND	1,80E+01	2,83E-01	6,43E+01	0,00E+00	-3,64E+01
DN 200 x 2	*219.1*	630	82.2	kg CO_2e	1,87E+02	7,77E+00	-1,54E-01	1,95E+02	MND	1,97E+01	MND	1,97E+01	4,23E-01	9,86E+01	0,00E+00	-5,35E+01
DN 250 x 2	*273.0*	800	121.1	kg CO_2e	2,90E+02	1,15E+01	1,35E+00	3,03E+02	MND	2,18E+01	MND	2,18E+01	6,24E-01	1,56E+02	0,00E+00	-7,51E+01

GWP-TOTAL – SERIES 3 PRODUCT GROUP, EN 15804+A2, PEF

Service *pipe DN*	*Steel pipe OD mm*	Casing	*Weight kg/m*	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
DN 20 x 2	26.9	160	6.0	kg CO_2e	1,36E+01	5,61E-01	-2,46E+00	1,17E+01	MND	1,45E+01	MND	1,45E+01	3,04E-02	8,13E+00	0,00E+00	-3,62E+00
DN 25 x 2	33.7	180	7.4	kg CO_2e	1,69E+01	7,03E-01	-2,41E+00	1,52E+01	MND	1,46E+01	MND	1,46E+01	3,81E-02	9,84E+00	0,00E+00	-4,63E+00
DN 32 x 2	42.4	200	9.2	kg CO_2e	2,07E+01	8,72E-01	-2,37E+00	1,92E+01	MND	1,47E+01	MND	1,47E+01	4,74E-02	1,19E+01	0,00E+00	-5,86E+00
DN 40 x 2	48.3	200	10.0	kg CO_2e	2,16E+01	9,41E-01	-2,37E+00	2,01E+01	MND	1,47E+01	MND	1,47E+01	5,15E-02	1,19E+01	0,00E+00	-6,68E+00
DN 50 x 2	60.3	250	14.4	kg CO_2e	3,22E+01	1,36E+00	-2,22E+00	3,14E+01	MND	1,51E+01	MND	1,51E+01	7,42E-02	1,79E+01	0,00E+00	-9,33E+00
DN 65 x 2	76.1	280	18.0	kg CO_2e	3,97E+01	1,70E+00	-2,13E+00	3,93E+01	MND	1,53E+01	MND	1,53E+01	9,27E-02	2,16E+01	0,00E+00	-1,19E+01
DN 80 x 2	88.9	315	22.8	kg CO_2e	4,96E+01	2,14E+00	-2,01E+00	4,98E+01	MND	1,56E+01	MND	1,56E+01	1,17E-01	2,65E+01	0,00E+00	-1,52E+01
DN 100 x 2	114.3	400	34.1	kg CO_2e	7,72E+01	3,23E+00	-1,63E+00	7,88E+01	MND	1,64E+01	MND	1,64E+01	1,76E-01	4,15E+01	0,00E+00	-2,23E+01
DN125 x 2	139.7	500	46.3	kg CO_2e	1,13E+02	4,44E+00	-1,08E+00	1,16E+02	MND	1,74E+01	MND	1,74E+01	2,39E-01	6,33E+01	0,00E+00	-2,79E+01
DN 150 x 2	168.3	560	59.5	kg CO_2e	1,41E+02	5,66E+00	-7,17E-01	1,46E+02	MND	1,81E+01	MND	1,81E+01	3,06E-01	7,73E+01	0,00E+00	-3,70E+01
DN 200 x 2	219.1	710	90.3	kg CO_2e	2,20E+02	8,63E+00	4,12E-01	2,29E+02	MND	1,97E+01	MND	1,97E+01	4,65E-01	1,21E+02	0,00E+00	-5,46E+01
DN 250 x 2	273.0	900	133.7	kg CO_2e	3,41E+02	1,29E+01	2,24E+00	3,56E+02	MND	2,18E+01	MND	2,18E+01	6,89E-01	1,92E+02	0,00E+00	-7,68E+01

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This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, 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 digital background data for this EPD

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I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Abderazak Guiz, as an authorized verifier acting for EPD Hub Limited
07.02.2025