ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH:
EN 15804+A2 & ISO 14025

Product name:
INFLEX HD THERMAL
PREINSULATED PIPES FOR GEOTHERMAL SYSTEMS

EPD holder:

Ingremio Bracia Kotulscy S.K.A.

Issued on 31 December 2025
Valid until 31 December 2030

GENERAL INFORMATION

EPD OWNER

Manufacturer / EPD Holder	Ingremio Bracia Kotulscy S.K.A.
Address	ul.Laskowska 93, 32-329 Bolesław, Poland
Contact details	Phone : +48 32 647-19-00 e-mail: biuro@ingremio.pl
Website	https://www.ingremio.pl

PRODUCT IDENTIFICATION

Product name	INFLEX HD THERMAL-PREINSULATED PIPES FOR GEOTHERMAL SYSTEMS
Place(s) of production	Poland

EPD INFORMATION

EPD Polska program operator	Multicert Sp. z o.o. Ul. Mydlarska 47, 04-690 Warszawa, Poland www.epd.org.pl, epd@epd.org.pl
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804+A2 serves as the core PCR.
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☒ External verification
EPD verifier	Izabela Sztamberek-Sochan, Ph.D.
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EPD valid until	31 December 2030
Reasons for performing LCA	B2B
Accountability	The EPD Holder is responsible for the information provided and evidence. Multicert Sp. z o.o. does not hold responsibility for the manufacturer information, life cycle assessment data nor supporting evidence.

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.

COMPANY INFORMATION

HOLDER OF THE EPD

Ingremio Bracia Kotulscy S.K.A.
ul. Laskowska 93
32-329 Bolesław
Poland

Ingremio Bracia Kotulscy S.K.A. is a Polish manufacturer of specialized plastic piping systems for heating, sanitary, and industrial applications, operating in the market for over 40 years. Founded in 1983 as a family enterprise by Zbigniew and Elżbieta Kotulski, the company has evolved from a small workshop into one of Europe's most technologically advanced corrugated pipe manufacturers and the undisputed market leader in Poland.
Ingremio's core business encompasses the design, development, and production of pre-insulated piping systems, corrugated pipes, and plastic profiles using proprietary technologies and self-designed production equipment. The company operates over 40 production lines across more than 10,000 sqm of production, storage, and office facilities in Bolesław, Lesser Poland region. A key competitive advantage is Ingremio's capability to develop and manufacture its own specialized machinery and tooling, enabling flexible product customization to meet specific customer requirements.

The product portfolio focuses primarily on heating and sanitary installations, with the INFLEX range of pre-insulated pipes representing a core product line. This includes pre-insulated pipes for district heating systems, drinking and sanitary water distribution, geothermal ground heat pump systems (GHPS), and industrial applications. The INFLEX system features an HDPE carrier pipe insulated with flexible closed-cell EPE foam and protected by an external corrugated HDPE pipe, providing excellent thermal insulation, mechanical protection, and resistance to water vapor permeability.

The company launched INFLEX pre-insulated pipe production in 2002 using self-developed technologies, followed by specialized INFLEX THERMAL pipes for geothermal systems in 2004. Environmental responsibility is integrated into product development, with the INFLEX THERMAL line specifically supporting renewable energy installations through ground heat pump applications. The EPE insulation is produced without (H)CFCs, demonstrating the company's commitment to environmentally conscious manufacturing.

Ingremio's headquarters and production facilities are located in Bolesław, from where the company serves over 500 partners across Poland and exports to Austria, Czech Republic, Germany, Lithuania, Scandinavia, Slovakia, Ukraine, and the United Kingdom. The company maintains ISO 9001 quality management system certifications.

PRODUCT INFORMATION

PRODUCT DESCRIPTION

The product covered by this EPD is the INFLEX HD THERMAL pre-insulated pipe system manufactured by Ingremio Bracia Kotulscy S.K.A. in Poland. The product is designed for the transport of heat transfer fluids in ground source heat pump systems (GSHP) and for cold water distribution in sanitary and industrial installations, providing thermal insulation and mechanical protection of the carrier pipe.

The INFLEX HD THERMAL system is a factory-manufactured composite piping product consisting of three integrated layers:

• an inner HDPE carrier pipe for fluid transport,

• an intermediate thermal insulation layer made of closed-cell EPE foam,

• an outer corrugated HDPE protection pipe providing mechanical protection and moisture barrier.

This EPD covers the complete INFLEX HD THERMAL product range in available nominal diameters of the carrier pipe from DN 32 to DN 250. The pipes are supplied in 6 or 12-meter straight lengths or in coils of 25,50 and 100 meters, depending on diameter.

Representative product variant:

The environmental results presented in this EPD are based on the product variant **W2140 (INFLEX HD THERMAL 40×63)**, which consists of:

- HDPE 100 carrier pipe: 40 mm × 2.4 mm wall thickness
- EPE foam insulation layer (resultant thickness)
- HDPE corrugated outer protection pipe: 63 mm external diameter

The mass composition of this variant is:

- HDPE carrier pipe: 50.0%
- EPE foam insulation: 7.1%
- HDPE corrugated pipe: 42.9%

This variant was selected as the representative product because it accounted for over 40% of sales by mass in 2024, making it the top-selling product in the INFLEX HD THERMAL range. Due to minor variations in LCA results between different diameter variants (not exceeding ±5% of indicator values), the environmental results for this variant are considered representative for the entire product family.

Declared unit: 1 kg of INFLEX HD THERMAL pre-insulated pipe (representative variant W2140).

PRODUCT APPLICATION

INFLEX HD THERMAL pre-insulated pipes are intended for underground and outdoor installations where thermal insulation and mechanical protection are required. Typical applications include:

- ground source heat pump systems (GSHP),
- geothermal installations,
- cold water distribution in sanitary and industrial installations,
- buried outdoor installations.

The product is designed for operating temperatures from −10 °C to +20 °C under normal conditions. For higher operating temperatures up to +40 °C, pressure derating factors apply according to the manufacturer's specifications.

PRODUCT RANGE OVERVIEW

The INFLEX HD THERMAL system is manufactured in a range of nominal diameters from DN 32 to DN 250. All variants share the same three-layer construction principle and similar material composition and manufacturing processes. Variations between product variants relate mainly to dimensional proportions, insulation thickness and carrier pipe wall thickness.

Detailed technical parameters for individual diameter variants, including pressure ratings, insulation thickness and thermal performance, are provided in the manufacturer's technical documentation.

CONVERSION TO LINEAR METRE

Table 1 presents the list of available INFLEX HD THERMAL product variants, including the mass per 1 metre of pipe [kg/m] for each variant.

The values provided in the table may be used as conversion factors to calculate environmental impacts per linear metre of a specific product variant, based on the declared unit of 1 kg.

Conversion rule:

Impact per 1 m of pipe = impact per 1 kg (from EPD tables)×mass per 1 m [kg/m]

This conversion approach is applicable to all environmental indicators reported in this EPD and allows practitioners to derive results per linear metre for individual INFLEX HD THERMAL

Table 1: INFLEX HD THERMAL product variants and mass per linear metre

Ingremio code	Product name	weight 1m [kg]
W2140	Inflex Thermal 40/63 x 2,4mm/ 100m	0,560
W2141	Inflex Thermal 40/63 x 2,4mm/ 50m	0,560
W2964	Inflex Thermal 32/63 x 3,0mm / 50m	0,566
W2965	Inflex Thermal 32/63 x 3,0mm / 100m	0,566
W2970	Inflex Thermal 40/63 x 2,4mm/ 36m	0,560
W2975	Inflex Thermal 40/63 x 3,7mm/ 50m	0,580
W2980	Inflex Thermal 63/110 x 3,8mm/ 50m	1,431
W3205	Inflex Thermal 40/63 x 2,4mm / 50m	0,560
W3209	Inflex Thermal 50/90 x 3,0mm/ 50m	0,976
W3210	Inflex Thermal 90/160 x 5,4mm/ 6m	2,935
W3228	Inflex Thermal 50/90 x 3,0mm/ 18m	0,976
W3545	Inflex Thermal 110/200 x 6,6mm/ 6m	4,327
W3561	Inflex Thermal 50/90 x 4,6mm/ 50m	1,166
W3649	Inflex Thermal 90/160 x 5,4mm/ 25m	2,243
W3903	Inflex Thermal 75/160 x 6,8mm / 12m	3,070
W4424	Inflex Thermal 125/200 x 7,4mm/6m	4,922
W4555	Inflex Thermal 63/110 x 5,8mm / 50m	2,001
W4559	Inflex Thermal 90/160 x 8,2mm / 25m	3,590
W4630	Inflex Thermal 45/75 x 2,6mm/ 50m	0,738
W4669	Inflex Thermal 45/75 x 2,6mm/ 18m	0,738
W4837	Inflex Thermal 50/75 x 3,0mm/ 50m	0,841
W4863	Inflex Thermal 50/75 x 3,0mm/ 18m	0,841
W4891	Inflex Thermal 90/160 x 5,4mm / 12m	2,935
W4892	Inflex Thermal 110/200 x 6,6mm / 12m	4,327
W4901	Inflex Thermal 45/75 x 4,1mm/ 50m	0,878
W4956	Inflex Thermal 75/160 x 4,5mm / 30m	2,660
W5058	Inflex Thermal 45/75 x 2,6mm/ 100m	0,738
W5310	Inflex Thermal 50/75 x 3,0mm/ 100m	0,841
W5327	Inflex Thermal 90/160 x 8,2mm / 12m	3,590
W5630	Inflex Thermal 160/225 x 9,5mm /6m	7,900
W5631	Inflex Thermal 160/225 x 9,5mm/ 6m	9,600
W5640	Inflex Thermal 140/225 x 8,3mm/ 6m	7,200
W5680	Inflex Thermal 180/280 x 10,7mm/ 6m	10,350
W5681	Inflex Thermal 225/350 x 13,4mm/ 6m	15,800

PRODUCT STANDARDS

The INFLEX HD THERMAL system is manufactured under documented quality control in accordance with ISO 9001.

The INFLEX HD THERMAL pre-insulated pipe system is designed and tested in accordance with EN 16757.

The carrier pipe conforms to:
PN-EN 12201-2: Plastics piping systems for water supply and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes.

Key performance properties of the thermal insulation layer (e.g. thermal conductivity, water vapour diffusion resistance) are determined using relevant test methods and reported in the manufacturer's technical documentation.

PRODUCT RAW MATERIAL COMPOSITION

The INFLEX HD THERMAL system consists of three material layers:
Carrier pipe (inner layer):
• HDPE 100, 100% virgin polyethylene.

Thermal insulation (EPE foam):
• LDPE (virgin): 77%
• LDPE (internal recycled production waste): 9%
• Mineral filler: 6%
• Isopropane (blowing agent): 7%

Isopropane is used during foam production and is intended to evaporate during the manufacturing process, being replaced by air in the closed-cell structure of the finished foam.

Outer protection pipe (corrugated HDPE):
• HDPE (virgin): 50%
• HDPE (internal recycled production waste): 48%
• Pigments: 2%
The outer pipe is manufactured using internally recovered and reprocessed production waste.

Overall mass proportions by layer:
The mass proportion of each layer varies by nominal diameter due to different wall thicknesses and insulation dimensions. For the representative product variant W2140 (40×63 mm):
- HDPE carrier pipe (100% virgin): 50.0%
- EPE foam insulation (86% virgin, 9% internal recycled, 6% mineral filler): 7.1%
- HDPE corrugated pipe (50% virgin, 48% internal recycled): 42.9%

REACH – SUBSTANCES OF VERY HIGH CONCERN (SVHC)

Based on available supplier information and the REACH Candidate List valid at the time of publication, the INFLEX HD THERMAL product is not expected to contain Substances of Very High Concern (SVHC) above 0.1% by weight.

The product consists of inert thermoplastic polyethylene materials. No chemical treatments or coatings requiring SVHC disclosure are applied. Isopropane used as a blowing agent evaporates during production and is not intended to be present in the finished product.

PRODUCT LIFE-CYCLE

RAW MATERIALS ACQUISITION AND TRANSPORT (A1, A2)

Module A1 covers the supply of raw materials for the INFLEX HD THERMAL pipes. The main inputs are HDPE and LDPE granulates with minor input of mineral filler and isopropane used as blowing agent for the foam insulation layer as well as small amounts of packaging auxiliaries. These materials are purchased from suppliers in Europe and delivered to the production plant.

Module A2 includes the transport of raw materials from suppliers to the production facility. Transport is carried out mainly by road using diesel trucks (>16 t, EURO 6). The model reflects average lorry transport distances based on actual logistics data.

MANUFACTURING (A3)

Module A3 comprises the manufacturing of the INFLEX HD THERMAL pre-insulated pipe system at the manufacturer's site operated by Ingremio Bracia Kotulscy S.K.A. in Poland. The production process is fully integrated and consists of sequential extrusion and assembly steps for the three-layer composite pipe system.

The HDPE carrier pipe is manufactured by continuous extrusion of virgin HDPE 100 granulate. The material is gravimetrically dosed, plastified in the extruder and extruded through a circular die to form a pipe of the required nominal diameter and wall thickness. The pipe is subsequently vacuum-calibrated, cooled in a water bath and cut to length or prepared for downstream coiling, depending on the product variant.

In parallel, the outer corrugated HDPE protection pipe is produced by extrusion using a blend of virgin HDPE and internally recycled production waste. The melt is extruded and formed into a corrugated geometry using a vacuum forming process, then cooled to achieve dimensional stability. Trims and off-spec pieces generated during this process are immediately ground and returned to the production line via a closed internal regrind loop.

The thermal insulation layer is applied by extrusion foaming of polyethylene (EPE). Virgin LDPE, internally recycled production waste and mineral filler are gravimetrically dosed and plastified in the extruder. Isopropane is injected as a physical blowing agent, forming a closed-cell foam structure during extrusion. The foam expands and is shaped to the required thickness, after which isopropane evaporates during the production process and is replaced by air in the finished insulation layer.

The three components are assembled in-line to form the final INFLEX HD THERMAL system. The carrier pipe is concentrically positioned within the corrugated outer pipe, and the annular space is filled with the foamed insulation layer, resulting in a mechanically integrated, factory-manufactured composite pipe.

Energy use for this module is based on site-specific production data per declared unit and includes grid electricity used for extrusion, forming, cooling, conveying and auxiliary equipment. No fossil fuels are used directly in the manufacturing processes.

Finished pipes are supplied either in straight lengths or coils, depending on diameter. Each product batch undergoes quality control checks, including dimensional inspection, visual control of corrugation and insulation continuity, and verification of conformity with internal specifications. Compliant products are labelled for traceability, packaged and prepared for shipment.

All production off-cuts and out-of-spec materials are managed according to standard industrial practice. Recyclable polyethylene fractions are internally recovered and reused on-site, while non-recyclable residues are treated as industrial waste. Internal recycling does not generate credits in Module D and is accounted for via process yields in Module A3.

TRANSPORT TO THE BUILDING SITE (A4)

Distribution of finished products is modelled using the 2024 logistics mix per declared unit (1 kg), combining road transport by EURO 6 lorries and sea container shipping.

END OF LIFE (C1, C2, C3, C4, D)

Module C1:

At end of life, the INFLEX HD THERMAL system is removed using standard site-specific practices during refurbishment or demolition. As the product is typically installed underground, removal involves excavation. Energy use and emissions associated with dismantling are included in Module C1 and are modelled according to the defined end-of-life scenarios.

Module C2:

After dismantling, the post-use INFLEX HD THERMAL system is transported by lorry to waste management facilities. Transport distances and vehicle types are defined in the end-of-life scenarios.

Module C3:

Mechanical pre-treatment (sorting and size reduction) is applied prior to routing post-use INFLEX HD THERMAL system components to downstream treatment processes. Shares of material recycling and energy recovery are modelled in accordance with the defined end-of-life scenarios. Exported energy from incineration is reported as inventory flows in Module C3, with the corresponding benefits reported in Module D. No benefits are assigned to recycled material at end of life, in accordance with the cut-off / net-scrap approach.

Module C4:

Final disposal of the remaining product mass is modelled as sanitary landfill, with associated emissions reported in this module.

Module D:

Loads and benefits beyond the system boundary associated with energy recovery at end of life are reported in Module D. Exported electricity and heat are modelled as substituting average grid electricity and natural-gas-based heat, respectively. Material substitution credits are calculated in accordance with EN 15804+A2 Annex D and the defined end-of-life scenarios.

LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Data reference period	2024 year

DECLARED AND FUNCTIONAL UNIT

Declared Unit	1 kg
Mass per Declared Unit	1 kg

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in the product, kg C:	**-**
Biogenic carbon content in the packaging, kg C:	**-**

SYSTEM BOUNDARY

The EPD scope is "cradle-to-gate with options" in accordance with EN 15804. The study covers the product stage A1–A3, A4 - transportation of the finished product, C1–C4 (end-of-life: deconstruction, waste transport, waste processing and disposal), and D (benefits and loads beyond the system boundary from material recovery / avoided burdens).

Table 2: system boundary diagram

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
X	X	X	X	MND	MNR	MNR	MNR	MNR	MNR	MNR	MNR	X	X	X	X	X
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deinstallation/Demolition	Transport	Waste processing	Disposal	Reuse / Recycling

X – module included/declared
MND – Module Not Declared
MNR – Module Not Relevant

CUT-OFF CRITERIA

The study fully covers all mandatory EN 15804:2012+A2:2019 modules and processes. No hazardous materials or substances have been omitted from the system boundary.

All major raw material and energy inputs are included. All inputs and outputs from unit processes for which data are available are taken into account in the calculations. No single neglected unit process exceeds 1% of the total mass or energy flows. The total of all neglected input and output flows does not exceed 5% of the total mass or energy use.

The production of capital goods (equipment), construction of infrastructure, and the maintenance and operation of capital equipment are excluded. Personnel-related activities, as well as energy and water use associated with company management and sales/administrative activities, are also excluded.

ESTIMATES AND ASSUMPTIONS

The Life Cycle Assessment (LCA) was carried out in accordance with EN 15804+A2, applying the standard rules for impact indicators, system boundaries, data quality requirements, allocation procedures, and the cut-off approach. The study models Modules A1–A3, A4, and end-of-life Modules C1–C4 and D. Module A5 is not declared, as installation impacts are highly project-specific and outside the scope of this Environmental Product Declaration (EPD). The main modelling assumptions are described below.

Results are first calculated separately for the carrier pipe, insulation foam, and outer protective pipe. Based on their respective mass shares in the finished product, aggregated results are declared for the INFLEX HD THERMAL system. The declared unit (DU) is 1 kg of INFLEX HD THERMAL pre-insulated pipe (representative variant W2140).

Foreground data for material compositions, production electricity consumption, and logistics are based on manufacturer and supplier information for the reference year 2024. Background data are taken from EN 15804+A2-consistent datasets from ecoinvent v3.9.1 (allocation, cut-off by classification), implemented in openLCA.

Raw materials acquisition and transport (A1, A2):

A full mass balance was applied for the carrier pipe, insulation foam, and outer protective pipe using the respective compound formulations and polymer feedstock datasets. Minor additives (such as fillers, pigments, curing agents, and processing auxiliaries) are included where relevant to the compound recipes. Module A2 includes the transport of raw materials from suppliers to the production facility. Transport is modelled primarily as road transport using diesel-powered lorries (>16 t, EURO 6).

Manufacturing energy and processes (A3):

Manufacturing is modelled at the production plant(s) as electricity-driven processes only. Production off-cuts and out-of-spec pieces are collected and reprocessed through an internal regrind loop. Electricity supply is modelled using the national grid mix.
Production scraps are treated according to standard industrial practice. Recyclable fractions are internally recovered and reused on-site, while the remaining fraction is treated as industrial waste. Internal regrind is accounted for via process yields and does not generate Module D credits, in accordance with the cut-off approach.

Transport to the building site (A4):

Distribution of finished products is modelled using the 2024 logistics mix per declared unit (1 kg), combining road transport by EURO 6 lorries and sea container shipping, based on available sales and distribution data.

End of life:

Module C1:

At end of life, the INFLEX HD THERMAL system is removed using standard site-specific practices during refurbishment or demolition. As the system is commonly used in underground applications, removal requires excavation. A hydraulic excavator with a bucket capacity of 0.35 m^3 is assumed. Diesel consumption of 0.314 litres per cubic metre of excavated soil is applied. The excavated soil volume per declared unit is derived from typical trench dimensions and representative product application scenarios.

Module C2:

After dismantling, the post-use INFLEX HD THERMAL system is transported by lorry (>16 t, EURO 6) to waste management facilities. A one-way transport distance of 50 km is assumed.

Module C3:

Mechanical pre-treatment (sorting and size reduction) is modelled prior to routing post-use INFLEX HD THERMAL system components to downstream treatment processes. Recycling and energy recovery shares of 25% and 50%, respectively, are assumed, based on HDPE data for construction and demolition waste streams reported by the European Recycling Industries' Confederation (EuRIC).

Exported energy from incineration is recorded as exported electrical energy (EEE) and exported thermal energy (EET) in Module C3 (inventory indicators only), with the corresponding avoided burdens reported in Module D. As part of the INFLEX HD THERMAL system is produced using recycled HDPE, no benefits are assigned to that fraction at end of life, in accordance with the net-scrap approach.

Module C4

Final disposal of the remaining 25% of the product mass is modelled as sanitary landfill, with associated emissions reported in this module.

Module D:

Loads and benefits beyond the system boundary associated with energy recovery at end of life are reported in Module D. Exported electricity (EEE) and heat (EET) are modelled as substituting average grid electricity and natural-gas-based heat, respectively.

No benefits are reported for recycled HDPE used as an input material, as the LCA applies the cut-off / net-scrap approach in accordance with EN 15804+A2 Annex D. The recycled material input is MMR_in = 0.212 kg per 1 kg declared unit, while the amount of material sent to recycling at end of life is MMR_out = 0.25 kg per 1 kg declared unit. The resulting net material output is 0.038 kg; therefore, material substitution credits are reported for 0.038 kg in Module D. Module D also includes energy recovery credits from incineration, as applicable.

ALLOCATION

Allocation follows EN 15804+A2. Foreground inputs/outputs for 2024 were inventoried for the full product portfolio and allocated on a mass basis to the declared unit (1 kg product) because resources and processing steps are common across variants. Internal regrind becomes secondary material for other products manufactured at the same manufacturing facility and is accounted for via process yields (no Module-D credits).

DATA QUALITY

For foreground data, the LCA study relies on high-quality primary data gathered by Ingremio for the year 2024 (energy meters, materials procurement, transport distances, production volumes). Background data are taken from ecoinvent 3.9.1 (cut-off), accessed in openLCA; datasets are recent, documented, and consistent with EF 3.1 impact assessment. Electricity in A3 reflects the Emission Factors for Electricity in Poland reported in December 2024 by KOBiZE - the National Centre for Emissions Management in Poland. Overall, data quality is considered high in terms of technological, geographical and temporal representativeness, and is adequate for the intended use of this EPD.

GEOGRAPHIC REPRESENTATIVENESS

The product system is manufactured and managed in Poland (Europe).

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2 – [DU=1KG]

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-Total	kg CO2 eq.	1,78E+00	7,75E-02	5,38E-01	2,40E+00	1,48E-01	MND	MNR	4,76E-01	8,77E-03	1,64E+00	3,19E-02	-1,97E+00
GWP-fossil	kg CO2 eq.	1,76E+00	7,74E-02	5,35E-01	2,37E+00	1,48E-01	MND	MNR	4,76E-01	8,76E-03	1,63E+00	3,19E-02	-1,97E+00
GWP-biogenic	kg CO2 eq.	2,58E-02	6,27E-05	2,92E-03	2,88E-02	1,20E-04	MND	MNR	1,10E-04	6,99E-06	6,69E-03	2,36E-05	-4,40E-03
GWP-luluc	kg CO2 eq.	8,66E-04	3,89E-05	1,56E-04	1,06E-03	7,25E-05	MND	MNR	5,36E-05	4,27E-06	1,15E-04	2,27E-06	-4,58E-04
ODP	kg CFC-11 eq.	1,29E-08	1,75E-09	2,55E-09	1,72E-08	3,35E-09	MND	MNR	7,57E-09	1,99E-10	1,81E-09	6,95E-11	-5,06E-08
AP	mol H+ eq.	6,52E-03	1,88E-04	3,86E-03	1,06E-02	3,90E-04	MND	MNR	4,41E-03	2,17E-05	5,79E-04	2,15E-05	-6,56E-03
EP-freshwater	kg P eq.	3,44E-04	5,83E-06	6,29E-04	9,78E-04	1,09E-05	MND	MNR	1,46E-05	6,47E-07	3,32E-05	3,99E-07	-8,45E-04
EP-marine	kg N eq.	1,27E-03	5,02E-05	5,78E-04	1,90E-03	1,10E-04	MND	MNR	2,05E-03	5,91E-06	2,30E-04	1,20E-04	-1,11E-03
EP-terrestrial	mol N eq.	1,27E-02	5,12E-04	5,14E-03	1,83E-02	1,09E-03	MND	MNR	2,22E-02	6,07E-05	2,02E-03	8,46E-05	-1,07E-02
POCP	kg NMVOC eq.	7,36E-03	3,03E-04	3,12E-03	1,08E-02	6,10E-04	MND	MNR	6,59E-03	3,54E-05	6,19E-04	3,65E-05	-4,88E-03
ADPE (disc.2)	kg Sb eq.	4,45E-06	1,64E-07	1,64E-07	4,78E-06	2,85E-07	MND	MNR	9,24E-08	1,70E-08	3,32E-07	3,52E-09	-1,39E-06
ADPF (disc.2)	MJ, (NCV)	6,36E+01	1,17E+00	6,13E+00	7,09E+01	2,26E+00	MND	MNR	6,28E+00	1,34E-01	1,59E+00	6,48E-02	-3,62E+01
WDP (disc.2)	m3 World eq.	9,20E-01	6,10E-03	1,13E-01	1,04E+00	1,16E-02	MND	MNR	1,55E-02	6,90E-04	7,48E-02	3,70E-04	-3,61E-01
Acronyms	GWP-total – Climate change, total global warming potential; GWP-fossil – Climate change, fossil fuels; GWP-biogenic – Climate change, biogenic carbon; GWP-luluc – Climate change, land use and land use change; ODP – Ozone layer depletion; AP – Acidification of terrestrial and freshwater environments; EP-freshwater – Eutrophication, freshwater; EP-marine – Eutrophication, marine; EP-terrestrial – Eutrophication, terrestrial; POCP – Photochemical ozone formation (smog formation); ADPE – Abiotic depletion, minerals and metals; ADPF – Abiotic depletion, fossil fuels; WDP – Water scarcity (water use deprivation potential); NCV - net calorific value.												
Disclaimer 2	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.												

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF [DU=1KG]

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PM	Disease Incidence	6,70E-08	5,47E-09	8,23E-09	8,07E-08	1,11E-08	MND	MNR	1,22E-07	6,60E-10	6,75E-09	4,49E-10	-2,16E-08
IRP (disc.1)	kBq U235 eq.	1,93E-01	1,58E-03	1,73E-02	2,12E-01	2,82E-03	MND	MNR	2,96E-03	1,70E-04	1,57E-02	8,98E-05	-7,21E-02
ETP-fw (disc.2)	CTUe	3,07E+00	5,65E-01	1,61E+00	5,25E+00	1,08E+00	MND	MNR	2,98E+00	6,38E-02	7,89E-01	4,79E-02	-2,79E+00
HTP-c (disc.2)	CTUh	4,52E-10	3,45E-11	1,63E-10	6,49E-10	6,46E-11	MND	MNR	1,45E-10	3,82E-12	1,62E-10	1,74E-12	-3,80E-10
HTP-nc (disc.2)	CTUh	8,96E-09	7,16E-10	5,94E-09	1,56E-08	1,38E-09	MND	MNR	9,11E-10	8,19E-11	3,40E-09	6,68E-11	-9,97E-09
SQP (disc.2)	Dimensionless	2,77E+00	1,08E+00	1,29E+00	5,14E+00	2,27E+00	MND	MNR	4,20E-01	1,35E-01	9,22E-01	1,45E-01	-1,68E+00
Acronyms	PM – Particulate matter emissions (potential incidence of disease);IRP – Ionising radiation, human health exposure potential; ETP-fw – Ecotoxicity, freshwater; HTP-c – Human toxicity, cancer effects; HTP-nc – Human toxicity, non-cancer effects; SQP – Land use related impacts, soil quality.												
Disclaimer 1	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.												

USE OF NATURAL RESOURCES – [DU=1KG]

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	MJ, (NCV)	1,65E+00	1,81E-02	5,56E-01	2,23E+00	3,28E-02	MND	MNR	3,55E-02	1,95E-03	1,47E-01	1,19E-03	-1,10E+00
PERM	MJ, (NCV)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ, (NCV)	1,65E+00	1,81E-02	5,56E-01	2,23E+00	3,28E-02	MND	MNR	3,55E-02	1,95E-03	1,47E-01	1,19E-03	-1,10E+00
PENRE	MJ, (NCV)	6,36E+01	1,17E+00	6,13E+00	7,09E+01	2,26E+00	MND	MNR	6,28E+00	1,34E-01	1,59E+00	6,48E-02	-3,62E+01
PENRM	MJ, (NCV)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ, (NCV)	6,36E+01	1,17E+00	6,13E+00	7,09E+01	2,26E+00	MND	MNR	6,28E+00	1,34E-01	1,59E+00	6,48E-02	-3,62E+01
SM	kg	0,00E+00	0,00E+00	7,61E-02	7,61E-02	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ, (NCV)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ, (NCV)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	4,88E-02	2,06E-04	1,61E-02	6,51E-02	4,00E-04	MND	MNR	5,60E-04	2,35E-05	1,64E-03	7,02E-05	-3,08E-02
Acronyms	PERE – Use of renewable primary energy as energy carriers; PERM – Use of renewable primary energy resources as raw materials; PERT – Total use of renewable primary energy resources (PERE + PERM); PENRE – Use of non-renewable primary energy as energy carriers; PENRM – Use of non-renewable primary energy resources as raw materials; PENRT – Total use of non-renewable primary energy resources (PENRE + PENRM); SM – Use of secondary material; RSF – Use of renewable secondary fuels; NRSF – Use of non-renewable secondary fuels; FW – Net use of fresh water; NCV - net calorific value.												

OUTPUT FLOWS – [DU=1KG]

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	2,50E-01	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	5,00E-01	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	3,22E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MNR	0,00E+00	0,00E+00	1,29E+01	0,00E+00	0,00E+00
Acronyms	CRU – Components for re-use; MFR – Materials for recycling; MER – Materials for energy recovery; EEE – Exported electrical energy; EET – Exported thermal energy.												

WASTE – [DU=1KG]

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	kg	2,70E-05	7,26E-06	4,43E-06	3,87E-05	1,40E-05	MND	MNR	4,20E-05	8,28E-07	6,39E-06	3,18E-07	-7,16E-05
NHWD	kg	4,28E-03	2,96E-05	9,17E-05	4,40E-03	5,32E-05	MND	MNR	1,20E-04	3,15E-06	3,07E-04	2,50E-01	-1,09E-03
RWD	kg	4,93E-05	3,84E-07	4,25E-06	5,39E-05	6,82E-07	MND	MNR	6,83E-07	4,05E-08	4,01E-06	2,16E-08	-1,82E-05
Acronyms	HWD – Hazardous waste disposed; NHWD – Non-hazardous waste disposed; RWD – Radioactive waste disposed.												

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity supply mix	100% national grid electricity (Poland), based on metered annual consumption/production data
Source and quality of electricity data (grid share)	Emission Factors for Electricity in Poland reported in December 2024 by KOBiZE – the National Centre for Emissions Management in Poland
Electricity CO_2 / kWh (grid share only)	0.701 kg CO_2e / kWh

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EPD VERIFICATION:

The verification procedure of this Environmental Product Declaration (EPD) was carried out in accordance with ISO 14025. The EPD is valid for five years from the date of publication and may be updated earlier in case of significant changes. Renewal of validity requires review and, if necessary, updating.

EPD CONTRIBUTORS

Manufacturer representative	Dariusz Siemieński, Quality Manager
EPD verifier	Izabela Sztamberek-Sochan, Ph.D.

Note: The sole ownership, liability, and liability of this declaration are with the owner. Construction product declarations may not be comparable if they do not comply with EN 15804. For detailed information on comparability, please refer to EN 15804 and ISO 14025.

EPD POLSKA CERTIFICATE

Program EPDPolska
Operator: MULTICERT Sp. z o.o.

inGremio

CERTIFICATE

TYPE III EPD DECLARATION

(ENVIRONMENTAL PRODUCT DECLARATION)

Reg. No. EPD-P 05.12.2025

EPD Environmental Product Declaration
EPD VERIFIED
EPD POLAND

This document confirms that the Environmental Product Declaration developed by **Ingremio Bracia Kotulscy S.K.A.** for

INFLEX HD THERMAL PREINSULATED PIPES FOR GEOTHERMAL SYSTEM

manufactured in accordance with standards:
EN 16757 and **PN-EN 12201-2**,
meets the requirements of standards **EN 15804:2012+A2:2019** and **ISO 14025**, and that the data contained therein has been prepared correctly.

The Declaration was published on December 31, 2025 and is valid until December 31, 2030, or until it is deregistered or its publication on the website www.epd.org.pl is discontinued.

Authenticity of this certificate can be confirmed in.
the public register at www.epd.org.pl

Izabela Sztamberek-Sochan, Ph.D.
EPD Polska Verifier

MULTICERT JEDNOSTKA CERTYFIKACYJNA

Grzegorz Suwara
CEO Multicert Sp. z o.o.

Warsaw, December 31, 2025