

## ENVIRONMENTAL PRODUCT DECLARATION

### FLEXALEN 600

PRE-INSULATED FLEXIBLE PIPES SYSTEM “FLEXALEN® 600”, INCLUDING DOMESTIC WATER AND HEATING/COOLING NETWORKS.



Pre-insulated flexible polymeric service pipe for transport of hot and cold water



At Thermaflex, our mission is to make a positive contribution to our environment by delivering sustainable insulation solutions that help minimise energy waste and optimize the use of natural resources.

Since 1976, we've led the way in efficient thermal energy distribution. We aim at developing smart, creative and distinct solutions. We are flexible and committed to continuously improve the sustainability of our processes, and use of energy sources.

We are committed to using (raw) materials that meet the highest health and safety standards, ensuring our products are energy-efficient and recyclable. The long life-cycles and recyclability of our materials significantly contribute to sustainability.

Our mission is rooted in sustainability, propelling us forward. Yet, we remain humble servants to society and future generations, dedicated to making a positive impact.




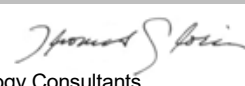
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According to ISO 14025  
and EN 15804+A2

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 Pfingsten Rd, Northbrook IL, 60062 <a href="http://www.ul.com">www.ul.com</a> <a href="http://www.spot.ul.com">www.spot.ul.com</a>
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Thermaflex International Holding B.V. Veerweg 1 - 5145 NS Waalwijk, NETHERLANDS
DECLARATION NUMBER	4791124468.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 kg
REFERENCE PCR AND VERSION NUMBER	Part A : Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, IBU, Version 1.4 of April 2024 Part B : Requirements on the EPD for preinsulated pipes for district heating and cooling, IBU, Version 1.0 of April 2024
DESCRIPTION OF PRODUCT APPLICATION/USE	Pre-insulated flexible pipes system "Flexalen® 600", including domestic water and heating/cooling networks.
PRODUCT RSL DESCRIPTION (IF APPL.)	50 years
MARKETS OF APPLICABILITY	Europe
DATE OF ISSUE	August 14, 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product specific average
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-grave
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.6
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent 3.10
LCIA METHODOLOGY & VERSION NUMBER	Ev-DEC UL PCRA 4.0 EPD Europe ei3.10 SP9.6 1.17 V1.17 (EVEA calculation method, based on EN15804+A2 indicators)
The PCR review was conducted by:	IBU
	PCR Review Panel
	<a href="mailto:info@ibu-epd.com">info@ibu-epd.com</a>
This declaration was independently verified in accordance with ISO 14025: 2006. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	Cooper McCollum, UL Solutions 
	EVEA
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants 

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### LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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## 1. Product Definition and Information

### 1.1. Description of Company/Organization

Thermaflex is an independent, family-based company established in Waalwijk, The Netherlands. We develop and produce solutions for efficient thermal energy distribution. Our solutions for heating, cooling, sanitary and ventilation are applied in residential areas, hotels, public buildings, hospitals and industries. With support and distribution offices in 15 countries, we work together with partners and clients in over 45 countries to create sustainable systems that are very efficient and can lower the barriers for the use of renewable energy.

Products are exclusively made from modern plastics that are environmentally friendly in production, easy to recycle and upon combustion at end-of-life, are not toxic.

The heating and cooling of buildings accounts for a large fraction of global CO<sub>2</sub> emissions. (1) That is exactly why professionally insulated pipes in heating and cooling are essential. At Thermaflex, with over 40 years of experience in this field, you always find the best, energy efficient and environmentally friendly solution.

### 1.2. Product Description

Flexalen 600 products are pre-insulated flexible pipes made of plastic materials, including an outer casing (casing pipe), a polyolefin foam, and one or multiple service pipes included in the foam.

They are used to transport water in buildings, either from domestic water networks, or from heating or cooling networks.

The present EPD also covers its declination Flexalen 600 HP, which includes two additional conduits to connect to heat pumps.

Many configurations of pipes are available, depending on the type of networks and on the diameters needed.

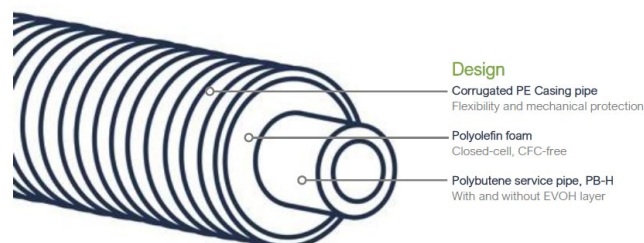


Figure 1 : Illustration of the product

Outer diameters possible	Flexalen 600	Flexalen 600 HP
Casing pipe	90, 125, 160, 200 mm	125 and 160 mm
Service pipe(s)	25 to 125 mm	Red : 32, 40 and 50 mm Grey : 25 and 32 mm

Table 1 : Configurations possible

More information on products is available at <https://thermaflex.com/products/flexalen-productlines/>

Thermaflex products, systems and solutions do not contain SHVC and the Candidate list above the threshold content value declared as per ECHA.



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Flow Diagram

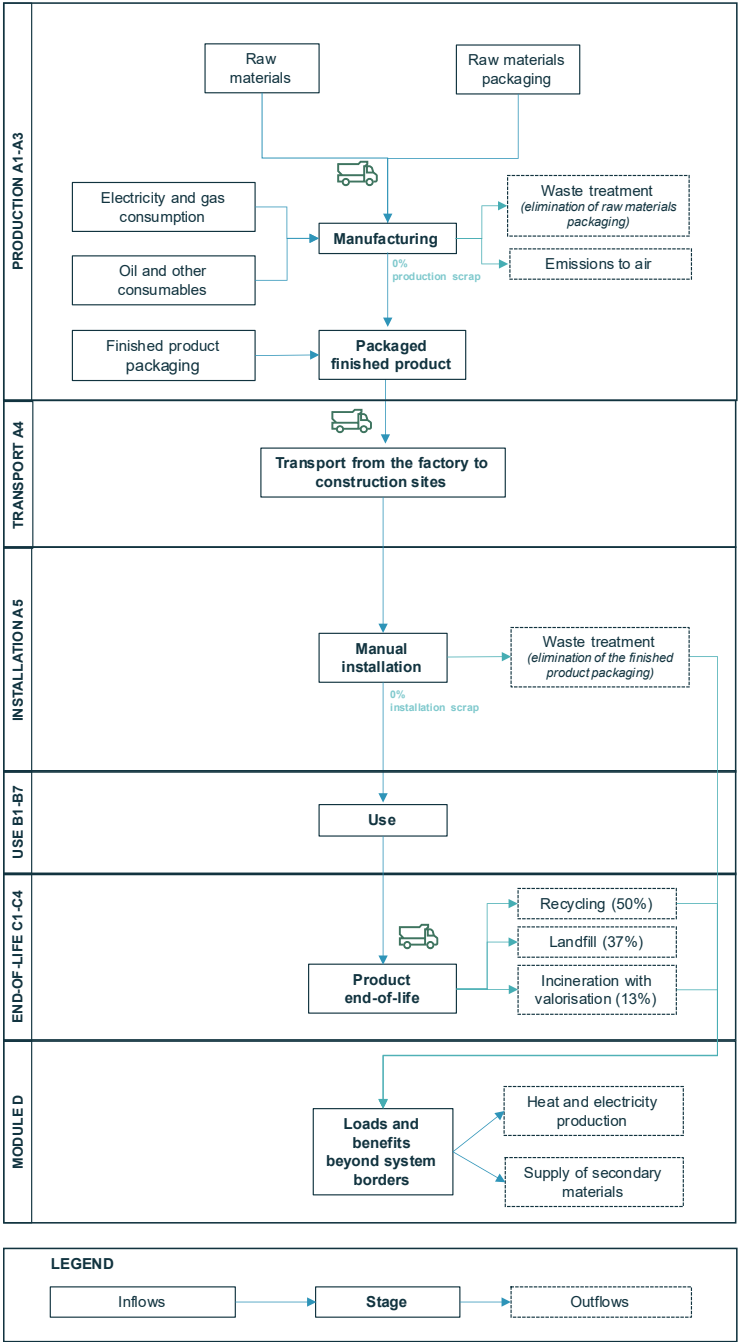


Figure 2 : LCA diagram of the product



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### 1.3. Application

The product offers a solution of highly flexible and weldable pre-insulated service pipe(s) for pressurized water application for hot and cold-water drinking / potable, District Heating and Cooling application according EN 15632. The service temperature ranges from -10°C to +95°C.

### 1.4. Declaration of Methodological Framework

This EPD, with respect to life cycle stages, covers the product life cycle from cradle-to-grave (A1-C4).

Optional life cycle stages from B1 to B7 do not have any impact since the product does not need any energy or water during its use, and that no maintenance, refurbishment, repair and replacement is expected during product life.

No known flows are deliberately excluded from this EPD.

The Reference Service Life (RSL) is 50 years.

Flexalen 600 products are also Cradle to Cradle® certified, with a Silver category.

### 1.5. Technical Requirements

Name	Value	Unit
Pre-insulated pipe – pipe assembly		
Thermal conductivity $\lambda_{50}$	0.038	W/(mK)
Maximum Operation Temperature	95	°C
Continuous Operation Temperature	80	°C
Maximum operating pressure (depending on the diameter of the pipe)	8	bar
Axial shear strength (23 + 2) °C min	Not tested	
Axial shear strength (140 + 2) °C min	Not tested	
Minimum bending radius (depending on the diameter of the pipe)	0.40 (single line) 0.60 (double line)	m
Foam density (polyethylene foam)	32-43	kg/m3
Casing		
Elongation at break	Not tested	%
Heat reversion	Not tested	%
Stress crack resistance	Not tested	h
Carbon black content (LDPE)	Not tested	%
Inspection of thermal stability (OIT) at 2100C (LDPE)	Not tested	min

Table 2 : Technical properties of the product

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The volume weight of the entire product (foam + casing + service pipe(s)) depends on the product's configuration and goes from 117 to 263 kg/m<sup>3</sup>.

For the total system (pipe, foam and casing), the following parameters have also been tested :

Aspect	Requirement	Test parameters		Test method
Ring stiffness	≥ 4 kN/m <sup>2</sup>	Temperature	(23 +/- 2)°C	NEN-EN-ISO-9969
		Compression	3%	
		Velocity of compression	5 +/- 1 mm/min	
Creep ratio	≤ 5	Temperature	(23 +/- 2)°C	NEN-EN-ISO-9967

Table 3 : Requirements with regard to long-term compression of the piping package

## 1.6. Properties of Declared Product as Delivered

The product complies with the following regulations and certifications :

- EN 15632 : District heating pipes – Pre-insulated flexible pipe systems
- CSTB Certification QB08 : Water supply or drainage pipes
- Technical Appraisal (ATec) N°14.1/12-1783
- KIWA certification, as well as third-party control, according to BRL KOMO 5609-2 and BRL K17401
- Cradle to Cradle® certification : category Silver.

## 1.7. Material Composition

Components	% in composition	Origin	Avg. Inbound Distance (km)
Low density Polyethylene	9 - 27	Netherlands	74
High density Polyethylene	21 - 55	Netherlands	40
Polybutene	20 - 68	Germany	580
Other components	1 - 8	Netherlands	40 to 118

Table 4 : Material composition of the product



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### 1.8. Manufacturing

Flexalen600 products are manufactured in one plant, located in the city of Waalwijk in the Netherlands.

The manufacturing process is presented in the scheme below.

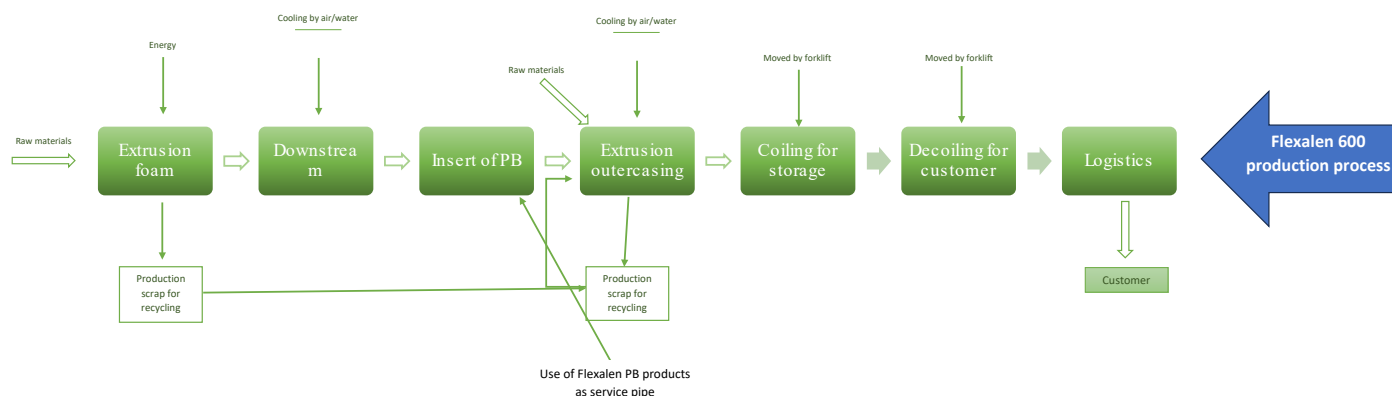


Figure 3 : Manufacturing process

### 1.9. Packaging

Flexalen 600 is delivered in the form of coils, tied up with a textile strap with buckle, and wrapped with a LDPE stretch foil.

As for the packaging waste scenario, it follows the European Commission report about EU Construction & Demolition Waste Protocol and Guidelines.

It depends on the material considered :

- Cardboard : 83,1% recycling + 14,9% incineration + 2% landfill
- Wood : 34,2% recycling + 54% incineration + 11,8% landfill
- Plastic : 40,7% recycling + 35% incineration + 24,3% landfill

### 1.10. Transportation

The products are manufactured in Waalwijk in the Netherlands, then sent to the European market by a 16-32 metric ton type truck, on an average distance of 772 km.

### 1.11. Product Installation



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Flexalen® 600 service pipe products required depending on the accessories / system components used, no special tooling for mechanical fittings and special welding equipment for weldable fittings. System accessories and other materials used for installation are not scope of this LCA. Pre-insulated Pipes are cut to length in meter, delivered and installed in the required lengths. The handling, installation and required tooling for product is explained in the by Thermaflex published installation videos and manuals.

More information is available on the Website [www.thermaflex.com](http://www.thermaflex.com).

As the product is installed manually, there is neither energy nor water consumption during this step.

And as the exact length of product needed can be delivered to the customers, no installation scraps were considered during installation.

### 1.12. Use

Once installed, the product does not consume energy and requires no maintenance. There are no parts to repair or refurbish during its life. Consequently, the use phase is considered to be burden-free.

### 1.13. Reference Service Life

Following the calculation method proposed in EN 15632, an estimated reference service life of 50 years has been calculated by Thermaflex.

It is to be noted that the RSL applies for the in-use conditions only (see Table in §3).

### 1.14. Reuse, Recycling, and Energy Recovery

The product end-of-life scenario is in line with the European Commission assumptions<sup>1</sup>: 50% goes to recycling and 13% get incinerated with energy recovery. The rest goes to landfill.

### 1.15. Disposal

In compliance with the European Commission assumptions<sup>2</sup>, 37% of the product is assumed to be landfilled.

## 2. Life Cycle Assessment Background Information

A full Life Cycle Assessment has been performed according to ISO 14040, ISO 14044 and in compliance with

<sup>1</sup> European Commission. EU Construction & Demolition Waste Protocol and Guidelines. 2018.

[https://single-market-economy.ec.europa.eu/news/eu-construction-and-demolition-waste-protocol-2018-09-18\\_en](https://single-market-economy.ec.europa.eu/news/eu-construction-and-demolition-waste-protocol-2018-09-18_en)

<sup>2</sup> See reference 1 above.

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## 2.1. Functional or Declared Unit

The declared unit is 1 kg of product, which is in accordance with the PCR part B chosen.

Given the wide variety of product's configurations and the differences in their volume weight, the choice of this declared unit allowed us to declare the results of the average product.

The Reference Service Life considered is 50 years.

Name	Value	Unit
Declared unit	1	kg
Mass of pipe	0,43	kg
Mass of isolation	0,23	kg
Mass of casing	0,35	kg

**Table 5 : Declared Unit and values of the declared product (average product)**

## 2.2. System Boundary

This EPD is declared from cradle-to-grave, including the following stages:

A1 – A3: includes the provision of all raw materials and their packaging, transport to the production site and energy consumption during the manufacturing of the product, as well as processing of waste generated by the factory.

A4 – A5: includes the transport from the factory to the final customer, packaging of the final product and the installation of the product, as well as all consumables and energy required and processing of waste generated during the installation.

B1 – B7: includes provision and transport of all materials, products and services related to the use phase of the product, as well as their related energy and water consumption, and the processing of any resulting waste.

C1 – C4: includes provision and transport of all materials, products and services related to the end of life phase of the product, including energy and water consumption, as well as the end of life processing of the product.

The Module D is also declared in the EPD.

**Interpreting the Results in Module D:** The values in Module D include a recognition of the benefits or impacts related to packaging waste and product end-of-life, which are partly recycled and partly incinerated, with energy recovery.

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**Table 6. Scope of the study**

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
<b>EPD Type</b>	X	X	X	X	X	X*	X*	X*	X*	X*	X*	X*	X*	X	X	X	X

\*The module has been considered but has no associated inputs/outputs, therefore it does not appear in the results.

For the environmental impact, the use of green electricity was calculated taking into account the residual electricity mix for the remaining electricity. The proportion of electricity demand covered by green electricity in the total electricity demand is 100%.

## 2.3. Estimates and Assumptions

Estimates and assumptions are made for transport, installation and end-of-life.

Details are provided in the concerned sections.

## 2.4. Cut-off Criteria

For this study, the cut-off rules were not used. All known mass and energy flows have been considered.

## 2.5. Data Sources

As a general rule, specific data derived from specific production processes or average data derived from specific production processes have been used as the first choice as a basis for calculating an EPD.

To model the life cycle of the product, the software SimaPro 9.6, developed by PRé, has been used in conjunction with the LCA database ecoinvent v3.10

## 2.6. Data Quality

The requirements for data quality and LCA data are in accordance with the specifications of the PCR.

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**Temporal Coverage** – producer specific data is averaged on 1 entire year of production and from within the last 5 years (2023). Generic data are from the ecoinvent 3.10 database (updated in 2024). The reference years of the generic and specific data sets therefore do not exceed the respective limits of 10 years and 5 years of age specified by the standard. Inputs and outputs from the system are accounted for over a period of 100 years from the year for which the data set is deemed relevant.

**Technological Coverage** – the technological coverage of the data reflects the physical reality of the declared product. Technologies used to manufacture raw materials and products were collected specifically from the declarant. Technologies reflect the physical reality as far as possible through the generic data used, taking account as far as possible of the representativeness of the technological and geographical combination.

**Geographical Coverage** – whenever possible, country specific data reflecting the reality of Thermaflex's supply chain has been used. If country specific data is unavailable, European regional data is used in preference to global data sources.

## 2.7. Period under Review

Primary data was collected by the manufacturer for the production year 2023.

## 2.8. Allocation

The overall values for the factory's material during a period of one year have been divided by the annual production in linear meter for each product, then divided by the average lineic weight of the product range to get a value per kg of product.

The only exception is for the electricity consumption. Ratios have been supplied by the manufacturer and applied to the total electricity consumption of the factory to take into account : the electricity used only by production lines, and the production hours of each product range. This result was then divided by the reference annual production of each product range (in linear meters per year) to obtain the electricity consumption needed to produce one linear meter of the product. Finally, this new result was divided by an arithmetic average of all lineic weights possible for the concerned product range to obtain the consumption needed for 1 kg of the concerned product range.

## 2.9. Comparability

Environmental declarations from different programs based upon differing PCRs may not be comparable.

Given this PCR ensures products meet the same functional requirements, comparability is permissible provided the information given for such comparison is transparent and the limitations of comparability explained.

When comparing EPDs created using this PCR, variations and deviations are possible.

Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.

## 3. Life Cycle Assessment Scenarios

The following Tables give the detail of LCA scenario for the European market.

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**All the flows presented in this section are the one of the declared product, and are given per declared unit (1 kg of product).**

**Table 7. Transport to the building site (A4)**

NAME	VALUE PER DECLARED UNIT	UNIT
Fuel type :	Diesel, low sulfur	
Liters of fuel	26	l/100km
Vehicle type	16-32 metric ton EURO 6	
Transport distance	772	km
Capacity utilization (including empty runs, mass based)	36	%
Gross density of products transported	169,9	kg/m <sup>3</sup>
Weight of products transported (if gross density not reported)	-	kg
Volume of products transported (if gross density not reported)	-	m <sup>3</sup>
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	< 1	1

**Table 8. Installation into the building (A5)**

NAME	VALUE PER DECLARED UNIT	UNIT
Ancillary materials	-	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m <sup>3</sup>
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Product loss per functional unit	-	kg
Waste materials at the construction site before waste processing, generated by product installation	-	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	Stretch foil : 6,99E-03 Textile strap : 3,02E-03 (See details below)	kg
Biogenic carbon contained in packaging	0	kg C
Direct emissions to ambient air, soil and water	-	kg
VOC content	-	µg/m <sup>3</sup>

Waste elimination scenario for the packaging is the following :

Type of production waste	Recycling rate	Incineration rate	Landfill rate
Plastics (Stretch foil and Textile strap)	40,7%	35%	24,3%

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Cardboard	83,1%	14,9%	2%
Wood	34,2%	54%	11,8%

**Table 9. Reference Service Life**

NAME	VALUE PER DECLARED UNIT	UNIT
RSL	50	years
Declared product properties (at the gate) and finishes, etc.	Declared product properties are described in ATEc N°14.1/12-1783, in accordance with EN 15632. A technical datasheet is also available.	-
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)	Products are in accordance with EN 15632 and technical prescription of the manufacturer	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Assumed to be installed according to the manufacturer's instructions	-
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	Assumed to be installed according to the manufacturer's instructions	-
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)	Assumed to be installed according to the manufacturer's instructions	-
Use conditions, e.g. frequency of use, mechanical exposure.	Maximum allowed temperature of +95°C to be respected during use.	-
Maintenance, e.g. required frequency, type and quality of replacement components	No maintenance needed	-

**Table 10. End of life (C1-C4)**

NAME	VALUE PER DECLARED UNIT	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The product is carried out by hand and eliminated as follows : 50% recycling + 13% incineration (with energy recovery) + 37% landfill(Source : European Commission assumptions <sup>3</sup> ). Waste transport is made by truck (16-32 metric ton, EURO6), on a considered distance of 50 km.	
Collection process (specified by type)	Collected separately	kg
	Collected with mixed construction waste	kg
Recovery (specified by type)	Reuse	kg
	Recycling	kg

<sup>3</sup> European Commission. EU Construction & Demolition Waste Protocol and Guidelines. 2018.  
[https://single-market-economy.ec.europa.eu/news/eu-construction-and-demolition-waste-protocol-2018-09-18\\_en](https://single-market-economy.ec.europa.eu/news/eu-construction-and-demolition-waste-protocol-2018-09-18_en)



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	Landfill	0,37	kg
	Incineration	-	kg
	Incineration with energy recovery	0,13	kg
	Energy conversion efficiency rate (for the incinerator)	Electric efficiency : 15,84% Thermal efficiency : 28,51%	
Disposal (specified by type)	Product or material for final deposition	-	kg
Removals of biogenic carbon (excluding packaging)		0	kg C

**Table 11. Reuse, recovery and/or recycling potentials (D), relevant scenario information**

NAME	VALUE PER DECLARED UNIT	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	Electricity : 8,42E-01 Heat : 1,52E+00	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	-	MJ
Net energy benefit from material flow declared in C3 for energy recovery	-	MJ
Process and conversion efficiencies	Scenario for the packaging waste treatment :	
	Cardboard : 83,1% recycling + 14,9 % incineration + 2% landfill	
	Wood : 34,2% recycling + 54% incineration + 11,8% landfill	
	Plastics : 40,7% recycling + 35% incineration + 24.3% landfill	
Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors);	-	

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## 4. Life Cycle Assessment Results

The tables below present the results of the declared product according to EN 15804+A2.

It is reminded that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risk.

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: declared unit and product

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> -Eq.]	2,75E+00	1,47E-01	1,05E-02	0,00E+00	9,50E-03	3,12E-01	8,77E-01	-1,08E+00
GWP-fossil	[kg CO <sub>2</sub> -Eq.]	2,74E+00	1,47E-01	1,05E-02	0,00E+00	9,50E-03	3,11E-01	8,77E-01	-1,09E+00
GWP-biogenic	[kg CO <sub>2</sub> -Eq.]	1,42E-03	2,66E-05	1,72E-07	0,00E+00	1,72E-06	1,26E-05	1,27E-05	1,19E-02
GWP-luluc	[kg CO <sub>2</sub> -Eq.]	1,31E-03	4,88E-05	1,38E-07	0,00E+00	3,16E-06	1,12E-05	3,14E-06	-5,30E-04
ODP	[kg CFC11-Eq.]	1,55E-07	2,92E-09	5,05E-12	0,00E+00	1,89E-10	1,55E-10	2,78E-10	-5,59E-08
AP	[mol H <sup>+</sup> -Eq.]	8,64E-03	3,06E-04	1,95E-06	0,00E+00	1,98E-05	8,28E-05	1,86E-04	-3,22E-03
EP-freshwater	[kg P-Eq.]	5,68E-05	1,14E-06	4,65E-09	0,00E+00	7,41E-08	3,81E-07	1,78E-07	-2,14E-05
EP-marine	[kg N-Eq.]	1,71E-03	7,15E-05	9,06E-07	0,00E+00	4,63E-06	3,45E-05	9,14E-05	-5,30E-04
EP-terrestrial	[mol N-Eq.]	1,80E-02	7,92E-04	8,97E-06	0,00E+00	5,13E-05	3,56E-04	9,37E-04	-5,92E-03
POCP	[kg NMVOC-Eq.]	1,47E-02	5,08E-04	2,60E-06	0,00E+00	3,29E-05	9,13E-05	2,34E-04	-6,05E-03
ADPE	[kg Sb-Eq.]	2,39E-05	4,90E-07	7,57E-10	0,00E+00	3,17E-08	2,79E-08	5,52E-08	-8,76E-06
ADPF	[MJ]	8,24E+01	2,06E+00	3,46E-03	0,00E+00	1,34E-01	1,24E-01	1,31E-01	-3,73E+01
WDP	[m³ world-Eq deprived]	1,52E+00	8,68E-03	2,47E-05	0,00E+00	5,62E-04	2,32E-03	3,91E-03	-6,20E-01
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential								

### RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: declared unit and product

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	5,56E+00	3,54E-02	2,28E-04	0,00E+00	2,29E-03	2,09E-02	8,15E-03	-8,37E-01
PERM	[MJ]	1,24E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	5,57E+00	3,54E-02	2,28E-04	0,00E+00	2,29E-03	2,09E-02	8,15E-03	-8,37E-01
PENRE	[MJ]	4,06E+01	2,06E+00	1,34E-01	0,00E+00	1,34E-01	1,24E-01	1,31E-01	-3,73E+01
PENRM	[MJ]	4,17E+01	0,00E+00	-2,82E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	8,24E+01	2,06E+00	-1,48E-01	0,00E+00	1,34E-01	1,24E-01	1,31E-01	-3,73E+01
SM	[kg]	5,54E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Caption	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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

### RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: declared unit and product



# ENVIRONMENTAL PRODUCT DECLARATION



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Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	2,08E-02	2,86E-04	-5,94E-06	0,00E+00	1,85E-05	4,17E-04	1,00E-03	-7,47E-03
NHWD	[kg]	3,49E-03	6,31E-05	1,24E-04	0,00E+00	4,09E-06	4,49E-03	1,28E-02	4,36E-03
RWD	[kg]	1,11E+00	1,22E-01	2,59E-03	0,00E+00	7,91E-03	4,59E-03	9,29E-03	-2,17E-01
CRU	[kg]	1,39E-05	1,65E-07	1,31E-09	0,00E+00	1,07E-08	1,34E-07	2,69E-08	-5,25E-06
MFR	[kg]	4,64E-05	5,00E-07	4,46E-09	0,00E+00	3,24E-08	4,61E-07	9,57E-08	-1,74E-05
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	2,23E-02	0,00E+00	4,07E-03	0,00E+00	0,00E+00	5,00E-01	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy								

## RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: [declared unit and product]

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	7,14E-08	1,08E-08	1,72E-11	0,00E+00	6,96E-10	3,56E-10	8,16E-10	-1,74E-08
IRP	[kBq U235-Eq.]	8,10E-02	9,52E-04	7,35E-06	0,00E+00	6,17E-05	7,36E-04	1,59E-04	-2,92E-02
ETP-fw	[CTUe]	1,06E+01	5,61E-01	7,80E-03	0,00E+00	3,64E-02	6,78E-01	1,89E+00	-3,56E+00
HTP-c	[CTUh]	1,15E-08	1,04E-09	2,16E-12	0,00E+00	6,74E-11	7,40E-11	1,48E-10	-5,03E-09
HTP-nc	[CTUh]	2,37E-08	1,30E-09	1,49E-11	0,00E+00	8,39E-11	7,32E-10	2,00E-09	-7,40E-09
SQP	[-]	8,76E+00	1,25E+00	2,52E-03	0,00E+00	8,07E-02	2,51E-02	3,19E-02	-1,34E+00
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index								

Disclaimer 1 – for the indicator "Potential Human exposure efficiency relative to U235".

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators "abiotic depletion potential for non-fossil resources", "abiotic depletion potential for fossil resources", "water (user) deprivation potential, deprivation-weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans – cancerogenic", "Potential comparative toxic unit for humans - not cancerogenic", "potential soil quality index".

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



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## 5. LCA Interpretation

The following graph presents the repartition of impacts on all 15804+A2 european indicators.

The primary contributor to the main environmental impacts of the product is A1 stage. The end of life (C3, C4) comes next.

We can see that transport of the product and production stages have a quite low impact on the LCA.

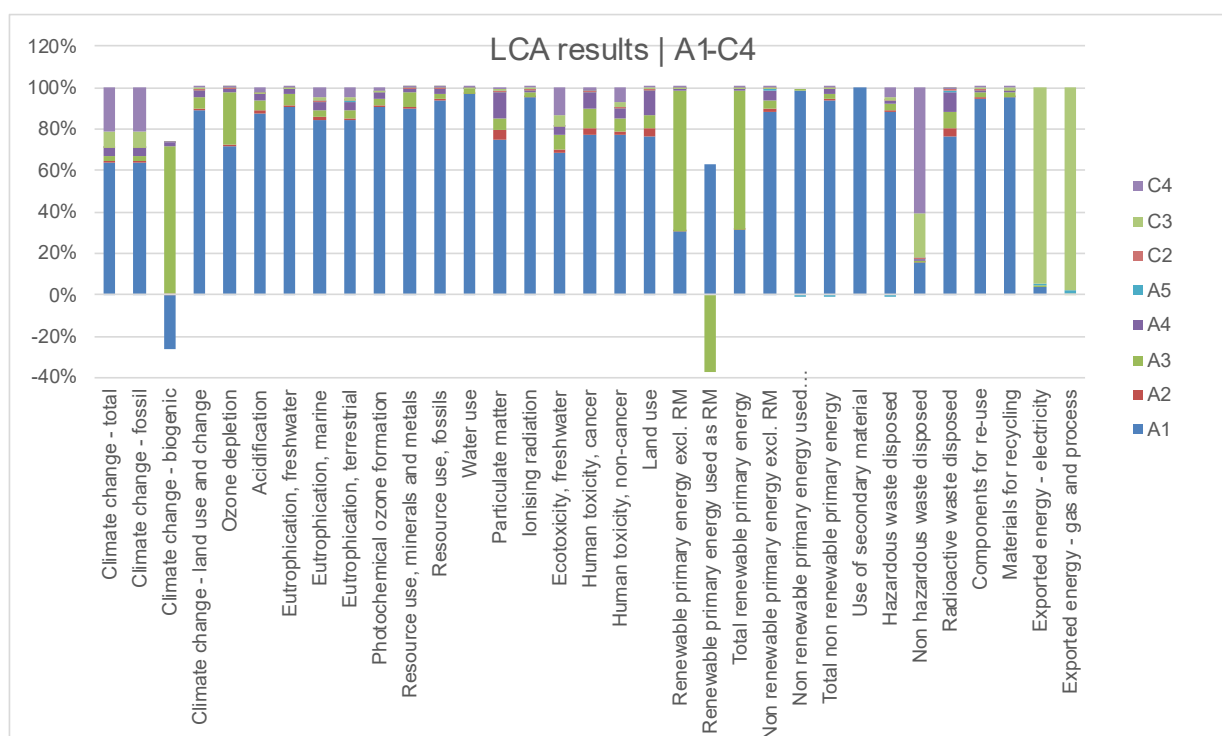


Figure 4 : LCA results for modules A1 to C4 (European EN15804+A2 indicators)

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## 6. Additional Environmental Information

### 6.1. Environment and Health During Manufacturing

Thermaflex factories conform to the ISO 9001:2015 Quality Management Systems and ISO 14001:2015 Environmental Management System.

Thermaflex Netherlands has established different safety documents and a management system to guaranty health and safety of their employees. These documents are to be read and fulfilled before starting to work at Thermaflex. An annual reminder is also realised. Employees are trained to work on the machines and are aware of the associated risks.

Employees use protective clothing and noise-reducing earplugs to limit health risks. Periodic medical examinations are conducted for each employee and they also benefit from an additional medical package.

### 6.2. Environment and Health During Installation

Thermaflex provides a decoiling warning for the unpacking of the tubes. Installation guidelines are also provided.

During installation, no additional protective measures are required other than the standard ones, such as protective clothing.

The products do not create emissions to air or discharges to water or soil.

Products have been tested for VOC emissions at Eurofins Product Testing A/S based on various testing standards, notably ISO 16000-3 -6 -9 -11, EN 16516 and CDPH 01350 . Results are also provided to fulfill the requirements of some environmental certifications (BREEAM, LEED) and national european regulations.

### 6.3. Extraordinary Effects

#### Fire protection

The product is B2 classified according to the standard DIN4102-1 (testing method DIN50050-1(1/88)) and considered as normally flammable.

#### Water

Even if unexpected flooding exposes the product to water, there are no risks to the environment or human health.

#### Mechanical Destruction

Mechanical destruction of the product is neither expected to alter chemically the product nor pose any risks to the environment or human health.

#### Delayed Emissions

No delayed emissions are taken into account.

# ENVIRONMENTAL PRODUCT DECLARATION



## **FLEXALEN® 600**

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### **6.4. Environmental Activities and Certifications**

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Flexalen 600 products are Cradle to Cradle® certified, with a Silver category.

### **6.5. Further Information**

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Further information concerning the product may be found at the company website : <https://thermaflex.com/>



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## 7. Supporting Documentation

All documentation necessary to confirm the data provided in this EPD has been submitted to the verifier.

## 8. References

### EPD RULES AND PCR :

- **UL Environment** : General Program Instructions.
- **PCR Part A**  
"Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019" Version 1.4 of April 2024. IBU.
- **PCR Part B**  
"Requirements on the EPD for preinsulated pipes for district heating and cooling". Version 1.0 from April 2024. IBU.

### ENVIRONMENTAL DATABASE :

- **ecoinvent V3.10** : ecoinvent Life Cycle Inventory database Version 3.10  
<http://www.ecoinvent.org>

### SUSTAINABILITY REPORTING STANDARDS :

- **ISO 14025 :2010** - ISO 14025:2006 : Environmental labels and declarations — Type III environmental declarations — Principles and procedures
- **NF EN 15804+A2 :2019** - Contribution of construction works to sustainable development - Environmental product declarations - Rules for construction product groups
- **NF EN 15804+A2 :2022** - Contribution of construction works to sustainable development - Environmental product declarations - Rules for construction product groups
- **NF EN ISO 14040 :2006** – Environmental management - Life cycle assessment - Principle and framework
- **NF EN ISO 14044 :2006** - Environmental management - Life cycle assessment - Requirements and guidelines
- **European Commission, PEFCR Guidance document** - Guidance for the development of Product Environmental Footprint Category Rules (PEFCRs), version 6.3, December 2017.
- **NF EN 13431 :2004 - Packaging** - Requirements for packaging recoverable in the form of energy recovery,

# ENVIRONMENTAL PRODUCT DECLARATION






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According to ISO 14025,  
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including specification of minimum inferior calorific value

## 9. Contact Information

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