## Environmental Product Declaration

# ThermaEco Tubes (ThermaEco ZZ Tubes) and ThermaEco HF Tubes (ThermaEco FRZ HF Tubes)

THERMAL INSULATION FOAMS "THERMAECO" FOR HEATING AND PLUMBING SYSTEMS, MADE OF POLYOLEFIN FOAM

Polyolefin tube insulation products for heating, plumbing, air conditioning and refrigeration in homes, offices or industry.

THERMAFLEX ®

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.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

# ENVIRONMENTAL PRODUCT DECLARATION

THERMAFLEX ®

**THERMA ECO**
THERMAL INSULATION FOAMS “THERMAECO” FOR HEATING AND PLUMBING SYSTEMS, MADE OF POLYOLEFIN FOAM

**According to ISO 14025 and EN 15804+A2**

| | |
|---|---|
| EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE | UL Solutions www.ul.com<br>333 Pfingsten Rd, Northbrook IL, 60062 www.spot.ul.com |
| GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER | Program Operator Rules v 2.7 2022 |
| MANUFACTURER NAME AND ADDRESS | Thermaflex International Holding B.V.<br>Veerweg 1 - 5145 NS Waalwijk, NETHERLANDS |
| DECLARATION NUMBER | 4791124468.103.1 |
| DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT | 1 $m^3$ |
| 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<br>Part B : Requirements on the EPD for<br>Insulating materials made of foam plastics, IBU, Version 11 of August 2024. |
| DESCRIPTION OF PRODUCT APPLICATION/USE | Thermal insulation foams “ThermaEco” for heating and plumbing systems, made of polyolefin foam |
| 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<br>PCR Review Panel<br>info@ibu-epd.com |
| This declaration was independently verified in accordance with ISO 14025: 2006.<br>☐ INTERNAL ☒ EXTERNAL | Cooper McCollum, UL Solutions |
| This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: | EVEA |
| 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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THERMAL INSULATION FOAMS “THERMAECO” FOR HEATING AND PLUMBING SYSTEMS, MADE OF POLYOLEFIN FOAM

**According to ISO 14025, and EN 15804+A2:2019**

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.

# 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 CO2 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

ThermaECO tubes are ultra-flexible thermal insulation foams, made of polyolefin, for heating and plumbing systems. They are a halogen-free (alternative) assortment for applications that do not require compliance with the highest fire resistance standards.

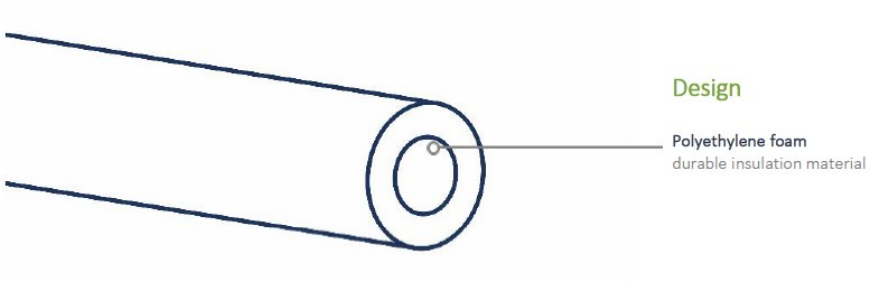


**Figure 1 : Illustration of the product**

Two product ranges are available :

- ThermaEco Tubes (ThermaEco ZZ Tubes) : standard quality, halogen free foam insulation ;
    - Inner Diameter from 12 to 114 mm
    - Insulation thickness from 6 to 20 mm
- ThermaEco HF Tubes (ThermaEco FRZ HF Tubes) : high quality, halogen free foam insulation.
    - Inner Diameter from 12 to 114 mm
    - Insulation thickness from 6 to 25 mm

All Thermaflex insulation products are made of environmentally friendly polyolefin granulate. Our products are robust and light weight, which makes them easy to install. The products are also recyclable.

More information on products is available at https://thermaflex.com/products/insulation-productlines/

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

## Flow Diagram

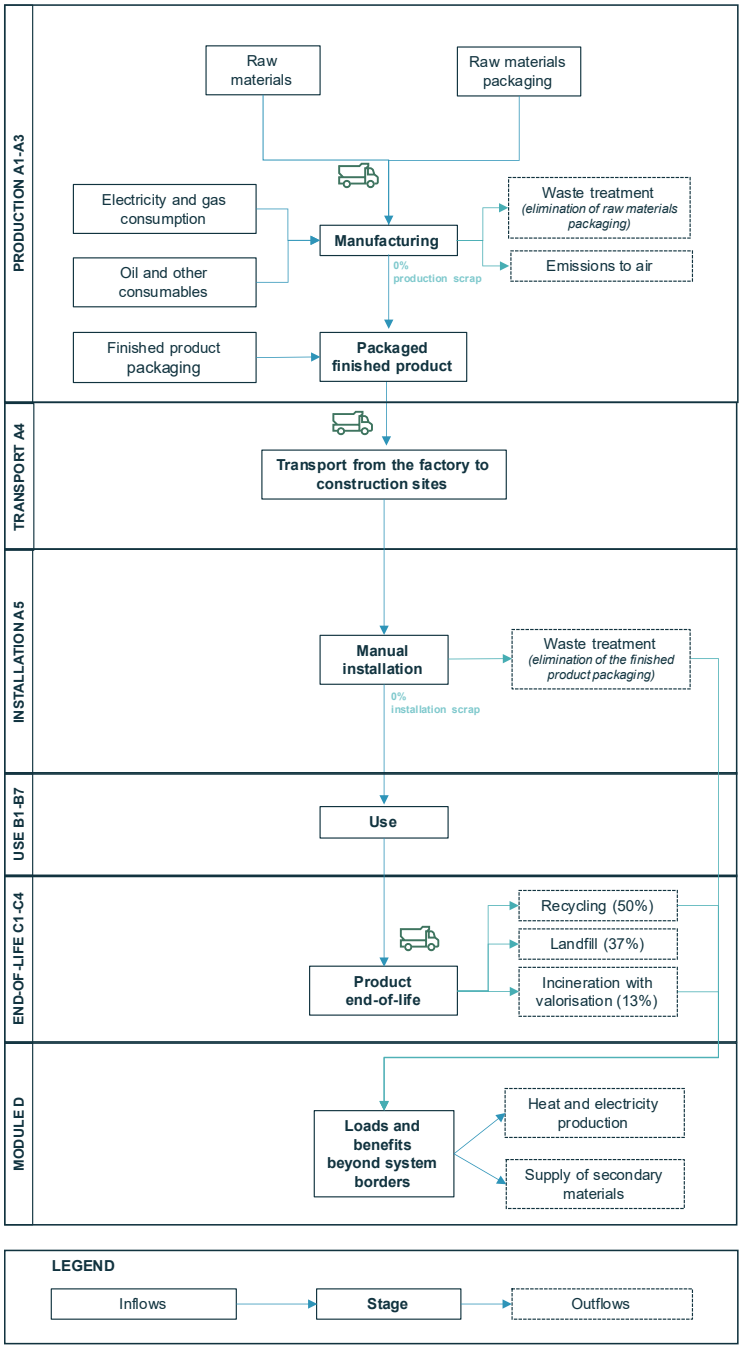


**Figure 2 : LCA diagram of the product**

## 1.3. Application

The products are used to insulate copper, iron and plastic piping and ducting in industrial applications and in commercial, residential and institutional buildings. They are produced according to EN14313. The thermal insulation is suitable for hot, cold, concealed, cool and exposed piping systems operating at temperatures from -80°C up to 95°C. Additional weather protection is needed when the insulation material is used outdoors.

## 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.

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

## 1.5. Technical Requirements

| | ThermaEco (ZZ Tube) | ThermaEco HF (FRZ HF Tube) | |
|---|---|---|---|
| **Name** | **Value** | **Value** | **Unit** |
| Gross density | 18-25 | 25-36 | $kg/m^3$ |
| Compressive strength acc. to EN 826 | xxx | xxx | $N/mm^2$ |
| Tensile strength acc. to EN 826 | xxx | xxx | $N/mm^2$ |
| Flexural strength | xxx | xxx | $N/mm^2$ |
| Modulus of elasticity acc. to EN 826 | xxx | xxx | $N/mm^2$ |
| Calculation value for thermal conductivity | xxx | xxx | W/(mK) |
| Water vapour diffusion resistance factor acc. to EN 12088 | xxx | xxx | - |
| Moisture content at 23 °C, 80% | xxx | xxx | M.-% |
| Sound absorption (if relevant) | xxx | xxx | % |
| Thermal conductivity | 0.038 at 10°C<br>0.041 at 40°C | 0.038 at 20°C<br>0.040 at 40°C | W/(mK) |
| Dynamic rigidity acc. to DIN EN 29052 | xxx | xxx | $MN/mm^3$ |
| Creep behaviour or permanent compressive strength acc. to DIN EN 1606 | xxx | xxx | $N/mm^2$ |

| | | | |
|---|---|---|---|
| Water absorption after diffusion acc. to EN 12088 | xxx | xxx | Vol.-% |
| Maximum water absorption acc. to DIN EN 12091 | xxx | xxx | Vol.-% |
| Water absorption by capillarity acc. to DIN EN 15801 | xxx | xxx | cm |

For ThermaEco Tubes (ThermaEco ZZ Tubes) :

| Properties | SI unit | Value | Test method |
|---|---|---|---|
| **Physical properties** | | | |
| Tolerances | | Compatible | EN 14313 |
| Density (foam) | $kg/m^3$ | 18-25 | - |
| Structure | - | Closed cells | - |
| Color | - | Grey | - |
| **Thermal properties** | | | |
| Max. operating temperature | °C | +95 | EN 14707 |
| Thermal conductivity coefficient (λ) | W/m·K | 0.038 @ 10°C<br>0.041 @ 40°C | EN ISO 8497 |
| **Fire properties** | | | |
| SBI classification | - | $E_L$ | EN 13501-1 |
| **Water resistance properties** | | | |
| Water absorption | - | WS 005 | EN 13472 |

**Figure 3 : Technical properties for ThermaEco ZZ Tubes**

For ThermaEco HF Tubes (ThermaEco FRZ HF Tubes) :

| Properties | Units SI | Values | Testing method |
|---|---|---|---|
| **Physical properties** | | | |
| Dimensional tolerances | - | Coherent | EN 14313 |
| Density | $kg/m^3$ | 25 - 36 | - |
| Structure | - | Fine, closed-cells | - |

| | | | |
|---|---|---|---|
| Color | - | grey | - |
| **Thermal properties** | | | |
| Service temperature range | °C | -80 to +100 | - |
| Maximum service temperature | °C | +100 | EN 14707 |
| Thermal conductivity (λ) | W/m·K | 0.038 @ 20°C<br>0.040 @ 40°C | EN ISO 8497 |
| **Fire properties** | | | |
| SBI classification | - | $E_L$ | EN 13501-1 |
| **Water resistance properties** | | | |
| Water absorption | - | WS 005 | EN 13472 |

**Figure 4 : Technical properties for ThermaEco FRZ HF Tubes**

## 1.6. Properties of Declared Product as Delivered

The products comply with the following regulations and certifications :

- EN14313 : Thermal insulation products for building equipment and industrial installations - Factory made polyethylene foam (PEF) products – Specification.
- Cradle to Cradle® certification for both references of Tubes : category Silver.

## 1.7. Material Composition

| ThermaEco Tubes (ZZ Tubes) and ThermaEco HF Tubes (FRZ HF Tubes) | | | |
|---|---|---|---|
| **Components** | **% in composition** | **Origin** | **Avg. Inbound Distance (km)** |
| Low density Polyethylene | 93 | Germany | 199 |
| Nucleating talc masterbatch | 2 – 3 | Israel | 51 |
| Glycerol Monostearate masterbatch | 2 | Israel | 353 |
| Color masterbatch | 2 - 3 | United Kingdom | 398 |

**Table 1 : Material composition of the product**

## 1.8. Manufacturing

The products are manufactured in one plant, located in the city of Zarow in Poland.

The manufacturing process is presented in the scheme below.

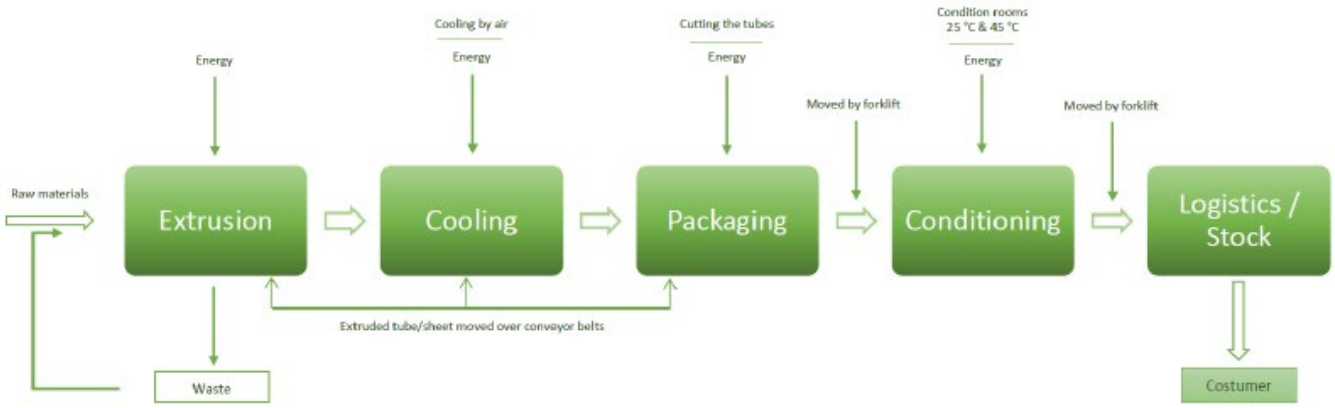


**Figure 5 : Manufacturing process**

## 1.9. Packaging

The ZZ and HF Tubes are delivered in carton boxes (205x60x40 cm), wrapped on wooden pallets with a plastic film. The standard product length is 2 m.

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 Zarow in Poland, then sent to the European market by a 16-32 metric ton type truck, on an average distance of 546 km for the ZZ Tubes, and of 606 km for the FRZ HF Tubes.

## 1.11. Product Installation

ThermaECO products do not require special tooling (e.g. knives) and specific protection. When applying glue or adhesives, the relevant safety datasheets need to be respected. In this LCA, no adhesives or adhesive tapes were included. The handling and installation of this product is explained in the by Thermaflex published installation videos and manuals.

More information is available on the Website www.thermaflex.com.

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

No installation scraps were considered during installation, since the unused part of the product can be reused on other projects.

## 1.12. Use

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

Any reduction in building operational energy consumption associated with insulation use needs to be considered on the level of the individual building, and is considered outside the scope of this LCA.

## 1.13. Reference Service Life

Following European RSL guidelines available, an estimated RSL of 50 year is assumed for those products.

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[1]: 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[2], 37% of the product is assumed to be landfilled.

[1] 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

[2] See reference 1 above.

## 2. Life Cycle Assessment Background Information

A full Life Cycle Assessment has been performed according to ISO 14040, ISO 14044 and in compliance with EN15804+A2:2019.

### 2.1. Functional or Declared Unit

The declared unit is 1 m3 of product.

The Reference Service Life considered is 50 years.

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | $m^3$ |
| Gross density | 30,5 | $kg/m^3$ |

**Table 2 : Declared Unit and values of the declared 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.

**Table 3. Scope of the study**

| | PRODUCT STAGE | | | CONSTRUCT-ION 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 |
| **EPD Type** | 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.

As no use of green electricity was considerated in the study, the country mix for Poland was selected in the calculation.

## 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.

**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 allocated for each product range by multiplying the total value of the factory by the production hours of the considered product range. Then, the result was divided by the annual production of each product range, in 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 annual production of each product range, in kg of product.

## 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.

**All the flows presented in this section are the one of the declared product, and are given per declared unit (1 m3 of product).**

**Table 4. 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 | 576 | km |
| Capacity utilization (including empty runs, mass based | 36 | % |
| Gross density of products transported | 30,5 | kg/m$^3$ |
| Weight of products transported (if gross density not reported) | - | kg |
| Volume of products transported (if gross density not reported) | - | m$^3$ |
| Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products) | < 1 | 1 |

**Table 5. 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$^3$ |
| 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 : 1,14E-02<br>Pallet : 5,72E-01<br>Cardboard : 9,53E-02<br><br>(See details below) | kg |
| Biogenic carbon contained in packaging | 3,29E-01 | kg C |
| Direct emissions to ambient air, soil and water | - | kg |
| VOC content | - | µg/m$^3$ |

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

**Table 6. Reference Service Life**

| NAME | VALUE PER DECLARED UNIT | UNIT |
|---|---|---|
| RSL | 50 | years |
| Declared product properties (at the gate) and finishes, etc. | Products are manufactured in accordance with EN 14313. 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 14313 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. A weather protection must notably be used when installed outdoor. | - |
| Use conditions, e.g. frequency of use, mechanical exposure. | Service temperature range to respect during use. For ZZ Tubes : maximum +95°C. For FRZ HF Tubes : from -80 to +100°C. | - |
| Maintenance, e.g. required frequency, type and quality of replacement components | No maintenance needed | - |

**Table 7. 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[3]). 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 | 30,5 | kg |
| Recovery (specified by type) | Reuse | - | kg |
| | Recycling | 15,25 | kg |
| | Landfill | 11,3 | kg |
| | Incineration | - | kg |
| | Incineration with energy recovery | 3,97 | 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 8. 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 : 2,63E+01 Heat : 4,73E+01 | 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 :<br><br>Cardboard :<br>83,1% recycling + 14,9 % incineration + 2% landfill<br><br>Wood :<br>34,2% recycling + 54% incineration + 11,8% landfill<br><br>Plastics :<br>40,7% recycling + 35% incineration + 24.3% landfill | |
| Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors); | - | |

[3] 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

## 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 $CO_2$-Eq.] | 1,69E+02 | 3,51E+00 | 1,06E+00 | 0,00E+00 | 2,90E-01 | 9,50E+00 | 2,67E+01 | -3,32E+01 |
| GWP-fossil | [kg $CO_2$-Eq.] | 1,69E+02 | 3,51E+00 | 2,63E-02 | 0,00E+00 | 2,90E-01 | 9,50E+00 | 2,67E+01 | -3,35E+01 |
| GWP-biogenic | [kg $CO_2$-Eq.] | -9,06E-01 | 6,36E-04 | 1,03E+00 | 0,00E+00 | 5,25E-05 | 3,86E-04 | 3,86E-04 | 3,61E-01 |
| GWP-luluc | [kg $CO_2$-Eq.] | 8,40E-01 | 1,17E-03 | 8,71E-06 | 0,00E+00 | 9,65E-05 | 3,43E-04 | 9,56E-05 | -1,63E-02 |
| ODP | [kg CFC11-Eq.] | 5,25E-06 | 6,98E-08 | 2,48E-10 | 0,00E+00 | 5,76E-09 | 4,73E-09 | 8,48E-09 | -1,71E-06 |
| AP | [mol $H^+$-Eq.] | 8,19E-01 | 7,31E-03 | 8,08E-05 | 0,00E+00 | 6,03E-04 | 2,53E-03 | 5,68E-03 | -9,86E-02 |
| EP-freshwater | [kg P-Eq.] | 1,09E-02 | 2,74E-05 | 3,03E-07 | 0,00E+00 | 2,26E-06 | 1,16E-05 | 5,44E-06 | -6,60E-04 |
| EP-marine | [kg N-Eq.] | 1,31E-01 | 1,71E-03 | 3,54E-05 | 0,00E+00 | 1,41E-04 | 1,05E-03 | 2,79E-03 | -1,62E-02 |
| EP-terrestrial | [mol N-Eq.] | 1,38E+00 | 1,90E-02 | 3,45E-04 | 0,00E+00 | 1,56E-03 | 1,09E-02 | 2,86E-02 | -1,81E-01 |
| POCP | [kg NMVOC-Eq.] | 1,13E+00 | 1,22E-02 | 1,06E-04 | 0,00E+00 | 1,00E-03 | 2,79E-03 | 7,14E-03 | -1,85E-01 |
| ADPE | [kg Sb-Eq.] | 9,03E-04 | 1,17E-05 | 3,77E-08 | 0,00E+00 | 9,67E-07 | 8,52E-07 | 1,68E-06 | -2,67E-04 |
| ADPF | [MJ] | 4,32E+03 | 4,94E+01 | 1,88E-01 | 0,00E+00 | 4,07E+00 | 3,78E+00 | 3,99E+00 | -1,14E+03 |
| WDP | [$m^3$ world-Eq deprived] | 7,35E+01 | 2,08E-01 | 1,31E-03 | 0,00E+00 | 1,72E-02 | 7,07E-02 | 1,19E-01 | -1,89E+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] | 2,12E+02 | 8,48E-01 | 4,64E+00 | 0,00E+00 | 7,00E-02 | 6,38E-01 | 2,49E-01 | -2,59E+01 |
| PERM | [MJ] | 1,14E+01 | 0,00E+00 | -8,58E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| PERT | [MJ] | 2,23E+02 | 8,48E-01 | -3,94E+00 | 0,00E+00 | 7,00E-02 | 6,38E-01 | 2,49E-01 | -2,59E+01 |
| PENRE | [MJ] | 3,02E+03 | 4,94E+01 | 3,60E-01 | 0,00E+00 | 4,07E+00 | 3,78E+00 | 3,99E+00 | -1,14E+03 |
| PENRM | [MJ] | 1,29E+03 | 0,00E+00 | -3,72E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | -1,42E-12 |
| PENRT | [MJ] | 4,32E+03 | 4,94E+01 | -1,23E-02 | 0,00E+00 | 4,07E+00 | 3,78E+00 | 3,99E+00 | -1,14E+03 |
| SM | [kg] | 1,53E-01 | 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 | [$m^3$] | 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**

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| HWD | [kg] | 2,74E+00 | 6,85E-03 | -1,92E-04 | 0,00E+00 | 5,65E-04 | 1,27E-02 | 3,05E-02 | -2,29E-01 |
| NHWD | [kg] | 1,70E-01 | 1,51E-03 | 3,98E-03 | 0,00E+00 | 1,25E-04 | 1,37E-01 | 3,90E-01 | 1,33E-01 |
| RWD | [kg] | 7,26E+01 | 2,92E+00 | 8,12E-02 | 0,00E+00 | 2,41E-01 | 1,40E-01 | 2,83E-01 | -6,64E+00 |
| CRU | [kg] | 7,09E-04 | 3,95E-06 | 8,28E-08 | 0,00E+00 | 3,26E-07 | 4,08E-06 | 8,22E-07 | -1,62E-04 |
| MFR | [kg] | 2,37E-03 | 1,20E-05 | 2,80E-07 | 0,00E+00 | 9,88E-07 | 1,40E-05 | 2,92E-06 | -5,40E-04 |
| 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] | 4,01E-01 | 0,00E+00 | 2,79E-01 | 0,00E+00 | 0,00E+00 | 1,53E+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] | 4,10E-06 | 2,57E-07 | 1,18E-09 | 0,00E+00 | 2,12E-08 | 1,08E-08 | 2,49E-08 | -5,32E-07 |
| IRP | [kBq U235-Eq.] | 4,08E+00 | 2,28E-02 | 4,59E-04 | 0,00E+00 | 1,88E-03 | 2,24E-02 | 4,85E-03 | -9,03E-01 |
| ETP-fw | [CTUe] | 8,74E+02 | 1,34E+01 | 1,27E-01 | 0,00E+00 | 1,11E+00 | 2,07E+01 | 5,76E+01 | -1,10E+02 |
| HTP-c | [CTUh] | 5,46E-07 | 2,49E-08 | 1,46E-10 | 0,00E+00 | 2,06E-09 | 2,26E-09 | 4,50E-09 | -1,55E-07 |
| HTP-nc | [CTUh] | 1,67E-06 | 3,10E-08 | 6,30E-10 | 0,00E+00 | 2,56E-09 | 2,23E-08 | 6,11E-08 | -2,26E-07 |
| SQP | [-] | 7,60E+02 | 2,98E+01 | 1,13E-01 | 0,00E+00 | 2,46E+00 | 7,66E-01 | 9,72E-01 | -4,13E+01 |

| 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.

## 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. Then comes the production stage, whose impact is mainly due to the impact of the electricity country mix in Poland, and to the use of isobutane during the extrusion process.

The end of life (C3, C4) comes next.

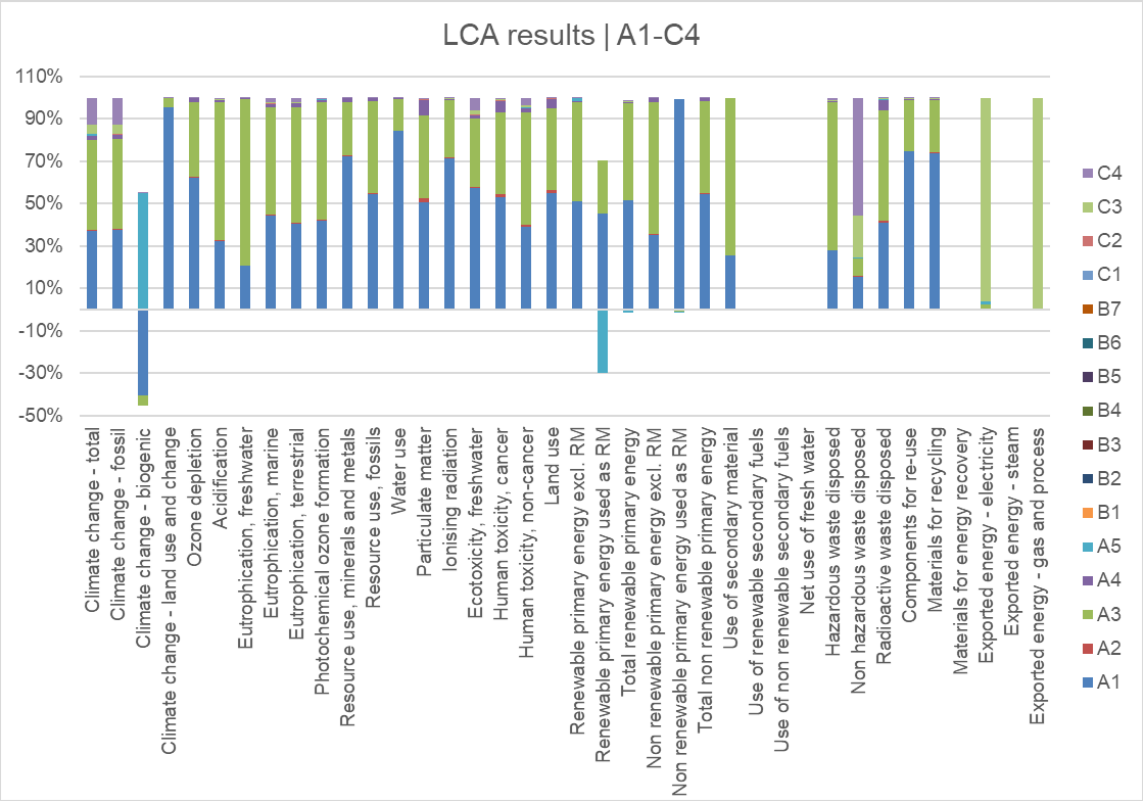


**Figure 6 : LCA results for modules A1 to C4 (European EN15804+A2 indicators)**

# 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.

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.

Dust extraction is also carried out at various stages of the production process.

## 6.2. Environment and Health During Installation

Thermaflex provides an installation manual. The manufacturer's guidelines should be adhered to during the products 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 published methods : ISO 16000-3, ISO 16000-6, ISO 16000-9, ISO 16000-10, ISO 16000-11.

New results are expected for August 2025.

## 6.3. Extraordinary Effects

**Fire protection** (for both ZZ tubes and HF Tubes)

| FIRE PROPERTIES | UNITS SI | | VALUES | TESTING METHOD |
|---|---|---|---|---|
| SBI classification | - | | $E_L$ | EN 13501-1 |

**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.

## 6.4. Environmental Activities and Certifications

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

## 6.5. Further Information

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

## 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 Insulating materials made of foam plastics". Version 11 from August 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, including specification of minimum inferior calorific value

## 9. Contact Information


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