

ENVIRONMENTAL PRODUCT DECLARATION

FROSTGUARD

SELF-REGULATING HEATING CABLE KIT



RAYCHEM FrostGuard pre-assembled self-regulating heating cables are designed for freeze protection of pipes and roof and gutter de-icing applications.

chemelex[®]
excellence is everything

Chemelex is a global leader in electrical heat tracing products and services, mineral-insulated fire rated wiring, electrical floor heating systems, and fluid Leak detection systems. The company supports customers with products and services in industries ranging from commercial and residential construction, data centers, energy, industrial process heating and transportation. Its products are marketed globally under leading brands including Raychem, Tracer, Pyrotex, and Nuheat.

Chemelex's Raychem brand is at the forefront of the heat tracing industry. Products include industrial process heating systems, pipe freeze protection, surface snow melting & de-icing, floor heating, and hot water temperature maintenance. Raychem solutions are vital in sectors including energy, infrastructure, and commercial & residential building. Applications ensure accurate temperature maintenance for operational efficiency, enhanced safety and customer comfort.



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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 www.ul.com www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Solutions General Program Instructions v.2.7 2022
MANUFACTURER NAME AND ADDRESS	Chemelex, 15375 Memorial Drive, Houston, TX 77079, United States
DECLARATION NUMBER	4791545949.102.1
DECLARED PRODUCT	1 unit of FrostGuard 10m kit
REFERENCE PCR AND VERSION NUMBER	Core PCR: EN 15804:2012+A2:2019 Guidance PCR: PEP-PCR-ed4-EN-2021 09 06
DESCRIPTION OF PRODUCT APPLICATION/USE	Pipe freeze protection and flow maintenance of grease waste line and fuel lines
PRODUCT RSL DESCRIPTION (IF APPL.)	25 years
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	April 21, 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-grave
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	LCA For Experts 10.8
LCI DATABASE(S) & VERSION NUMBER	Sphera MLC 2024.2
LCIA METHODOLOGY & VERSION NUMBER	EF 3.1 (as per EN 15804+A2)

The PCR review was conducted by:

PepEcoPassport

PCR Review Panel

contact@pep-ecopassport.org

This declaration was independently verified in accordance with ISO 14025: 2006.

☐ INTERNAL

☒ EXTERNAL

Cooper McCollum, UL Solutions

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

WAP Sustainability

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:

Peter Yeon, H.I.P. Pathway

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

Chemelex is a global leader in electric thermal and sensing solutions, protecting the world’s critical processes, places and people. With over 50 years of innovation and a commitment to excellence, we develop solutions that ensure safety, reliability, and efficiency in diverse environments – from industrial plants and data centers to people’s homes. Chemelex delivers future-ready technologies, advanced engineering capabilities and local expertise backed by global standards. Our offering includes a leading portfolio from our trusted brands: Raychem, Tracer, Pyrotenax and Nuheat.

1.2. Product Description



Figure 1: FrostGuard Product Image

The reference product to represent the RAYCHEM FrostGuard self-regulating cable kit is FROSTGUARD-10M. RAYCHEM FrostGuard kits contain self-regulating trace heating cables, pre-installed with electrical cable and plug to provide an energy-efficient and easy-to-use solution for pipe freeze protection. It is available in 17 sizes and contains a small and flexible trace heating cable, pre-installed with a plug and cold lead to avoid the need for connection by an electrician, ideal for small diameter pipework and condensate pipework of condensing boilers.

Table 1: Products covered in the EPD

PRODUCT NUMBER	PRODUCT NAME	LENGTH
928206-000	FROSTGUARD-2M	2 m
524628-000	FROSTGUARD-4M	4 m
845612-000	FROSTGUARD-6M	6 m
493074-000	FROSTGUARD-8M	8 m
641438-000	FROSTGUARD-10M	10 m
108722-000	FROSTGUARD-13M	13 m
924248-000	FROSTGUARD-16M	16 m
468683-000	FROSTGUARD-19M	19 m
107442-000	FROSTGUARD-22M	22 m
768868-000	FROSTGUARD-25M	25 m
1244-022826	FROSTGUARD-30M	30 m
1244-022827	FROSTGUARD-35M	35 m
1244-022828	FROSTGUARD-40M	40 m
1244-022829	FROSTGUARD-50M	50 m
1244-022830	FROSTGUARD-60M	60 m
1244-022831	FROSTGUARD-80M	80 m
1244-022832	FROSTGUARD-100M	100 m





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1.3. Application

RAYCHEM FrostGuard kits are used for pipe freeze protection and are intended to be used on or in pipes for the purpose of freezing pipe prevention in and around buildings.

1.4. Technical Requirements

The technical requirements are available on the Chemelex product page under engineering specifications:
<https://www.nvent.com/en-gb/raychem/products/frostguard-self-regulating-cable-kit-0>

1.5. Properties of Declared Product as Delivered

The product is packaged in a cardboard box.

1.6. Material Composition

Table 2: Material composition, per 10m of cable

MATERIAL	Weight [%]
COPPER	18
PLASTIC	60
ELECTRONICS	15
MINERALS AND OTHER ADDITIVES	7
TOTAL	100

1.7. Manufacturing

The Frostguard Cable Kit uses a European CEE7/7 Type plugged cold lead with a self-regulated heating cable (R-ETL-A). The cable is cut to length, the jacket is stripped, and the leads are crimped to the cold lead assembly, which is a purchased part. The electrical splice is molded with resin for added stability and rigidity, and a heat-shrink water-resistant jacket is applied for protection. The end is sealed with a heat shrink cap. The product undergoes a test in water, is dried, and then packaged.

1.8. Packaging

The product packaging is a cardboard box that is recyclable and removed prior to the product installation.

1.9. Transportation

The units are placed into cardboard boxes and onto pallets in Reynosa, Mexico. The pallets are shipped via truck to the



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port after which, they are shipped to Antwerp, Belgium. They are delivered by truck to the Leuven, Belgium warehouse to fulfill customer orders by shipping the units (which could be one or multiple) to distributors via ground deliveries. Finally, the distributors transport the goods to their final installation sites in continental Europe.

1.10. Product Installation

Installation requires no tools. Zero product waste is assumed during installation. No maintenance is required after installation.

1.11. Use

The cable provides 10w/m @ 5°C if powered.

1.12. Reference Service Life

The reference service life (RSL) of the product is 25 years.

1.13. Reuse, Recycling, and Energy Recovery

The end-of-life disposal rates (recycling, energy recovery, and disposal) used in the study were based on EN 50639:2019 – Product category rules for life cycle assessments of electronic and electrical products and systems, Table G.4, and as shown in Table 3.

Table 3: End-of-life disposal rates

	MATERIAL RECOVERY RATE (%)	ENERGY RECOVERY RATE (%)	DISPOSAL RATE (%)
COPPER	60	0	40
ALUMINUM	70	0	30
STEEL	80	0	20
PLASTIC	20	40	40
ELECTRONICS	50	0	50
MINERALS AND OTHER ADDITIVES	0	0	100

1.14. Disposal

At end-of-life, the product is removed from the building site and shipped to disposal. It is assumed that it is transported 1,000 km by truck to the disposal site as per the default value for local/national transport from the PEP PCR. The product is disposed of following the disposal rates indicated above.



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2. Life Cycle Assessment Background Information

2.1. Functional Unit

The functional unit is 1 unit of cable kit, containing 10 m of R-ETL-A cable.

2.2. System Boundary

This EPD is a Cradle-to-Grave study.

2.3. Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44 and EN 15804+A2. The primary data was collected as annual totals for electricity usage and production volume. The utility usage information was divided by the production to find a utility consumption per kilometer of cable produced.

2.4. Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and was used for all manufacturing processes. Whenever available, supplier data was used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production was utilized from Sphera Managed LCA Content Database 2024.2.

2.6. Data Quality

The geographical scope of the manufacturing portion of all life cycle modules is North America. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent. Time coverage of this data is considered excellent. Primary data provided by the manufacturer is specific to the technology used in manufacturing their product. It is site-specific and considered of good quality. Data necessary to model cradle-to-gate unit processes was sourced from Sphera Managed LCA Content LCI datasets.

2.7. Period under Review



The period under review is the full calendar year 2023.

2.8. Allocation

General principles of allocation were based on ISO 14040/44. To derive a per-unit value for manufacturing inputs such as electricity, thermal energy and water, allocation based on total production by mass was adopted. As a default, secondary Sphera Managed LCA datasets use a physical basis for allocation.

3. Life Cycle Assessment Scenarios

It is assumed that all raw materials are delivered to the manufacturing facility via truck and ship, based on global region. Distances were calculated using the supplier location and the location of manufacturing.

Table 4. Transport to the building site (A4)

NAME	UNIT	TRUCK	RAIL	SHIP	AIR
Vehicle type		Heavy Heavy-duty Diesel Truck / 53,333 lb payload - 8b	Rail transport cargo – Diesel, average train, gross tonne weight 1,000t/726t payload capacity	Bulk commodity carrier, 1.000 to 250.000 dwt payload capacity, deep sea	Cargo plane, 65t payload
Fuel efficiency for full vehicle		42 l/100km	1.17E-05 kg / kg	15,134 l/100km	0.00175 kg / lb
Capacity utilization (including empty runs, mass based)	%	85	40	53	66
Transport distance	km	7.77E+02	-	6.97E+03	-
Gross density of products transported	kg/m ³	n/a			
Weight of products transported (if gross density not reported)	kg	1.96E+00			
Volume of products transported (if gross density not reported)	m ³	n/a			

Table 5. Installation into the building (A5)

NAME	VALUE	UNIT
Ancillary materials	0.00E+00	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0.00E+00	m ³
Other resources	0.00E+00	kg
Electricity consumption	0.00E+00	MJ
Other energy carriers	0.00E+00	MJ
Product loss per functional unit	6.83E-02	kg
Waste materials at the construction site before waste processing, generated by product installation	6.66E-01	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	0.00E+00	kg

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NAME	VALUE	UNIT
Biogenic carbon contained in packaging	2.58E-01	kg C
Direct emissions to ambient air, soil and water	0.00E+00	kg
VOC content	0.00E+00	µg/m ³

Table 6. Reference Service Life

NAME	VALUE	UNIT
RSL	25	years
Declared product properties (at the gate) and finishes, etc.	<u>The product is designed for indoor and outdoor use for pipe freeze protection applications in accordance with EN 60335-1 and third party verified and certified.</u>	
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)		
An assumed quality of work, when installed in accordance with the manufacturer's instructions		
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature		
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)		
Use conditions, e.g. frequency of use, mechanical exposure.	No replacements are necessary.	
Maintenance, e.g. required frequency, type and quality of replacement components		

Table 7. Operational energy use (B6)

NAME	VALUE	UNIT
Lifetime of cable	25	years
Power consumption @ 5°C	10	W/m
Power consumption over lifetime	1.73E+05	MJ/km

Table 8. End of life (C1-C4)

NAME	VALUE	UNIT
Recovery (specified by type)	Reuse	0.00E+00 kg
	Recycling	3.02E-01 kg
	Landfill	6.75E-01 kg
	Incineration	3.28E-01 kg
	Incineration with energy recovery	0.00E+00 kg
Disposal (landfill)	Product or material for final deposition	6.75E-01 kg
Removals of biogenic carbon (excluding packaging)	0.00E+00	kg CO ₂

Table 9. Reuse, recovery and/or recycling potentials (D), relevant scenario information

NAME	VALUE	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	0.00E+00	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	3.30E+00	MJ
Net energy benefit from material flow declared in C3 for energy recovery	0.00E+00	MJ



4. Life Cycle Assessment Results

Table 10. Description of the system boundary modules

	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
Cradle to Grave	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Modules B1-B5, B7 and C1 to be reported were all zero following the calculation, hence have not been included in the results tables for an easier reading experience.

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4.1 Life Cycle Impact Assessment Results

Table 11. EF 3.1 Impact Assessment Results, per functional unit

EF 3.1	A1 – A3	A4	A5	B6	C2	C3	C4	D
GWP _{total} [kg CO ₂ eq]	3.51E+01	3.33E-01	1.20E+00	1.98E+04	1.00E-01	1.02E+00	1.78E-02	-1.18E+00
GWP _{fossil} [kg CO ₂ eq]	3.68E+01	3.30E-01	8.93E-02	1.95E+04	9.82E-02	1.02E+00	1.78E-02	-1.17E+00
GWP _{biogenic} [kg CO ₂ eq]	-1.63E+00	4.78E-04	1.11E+00	2.74E+02	2.37E-04	6.98E-06	-5.91E-05	2.26E-03
GWP _{land use} [kg CO ₂ eq]	2.09E-02	3.34E-03	1.04E-03	3.83E+00	1.67E-03	4.81E-05	6.98E-05	-3.79E-03
ODP [kg CFC-11 eq]	1.61E-10	4.52E-14	6.65E-14	6.13E-07	1.46E-14	2.16E-13	5.67E-14	-1.17E-11
AP [kg SO ₂ eq]	2.41E-01	4.59E-03	7.88E-04	3.06E+01	1.06E-03	1.28E-04	1.09E-04	-1.48E-02
EP _{freshwater} [kg N eq]	6.75E-05	8.79E-07	3.39E-06	1.22E-01	4.24E-07	5.25E-08	6.88E-06	-3.07E-06
EP _{marine} [kg N eq]	2.58E-02	2.12E-03	4.35E-04	9.55E+00	5.33E-04	3.52E-05	2.48E-05	-8.97E-04
EP _{terrestrial} [kg N eq]	2.81E-01	2.33E-02	4.09E-03	9.83E+01	5.88E-03	5.90E-04	2.70E-04	-9.29E-03
POCP [kg O ₃ eq]	8.57E-02	4.89E-03	9.49E-04	2.30E+01	1.01E-03	1.02E-04	7.80E-05	-3.08E-03
ADP _{element} [kg Sb-eq]	1.30E-02	3.28E-08	6.39E-09	4.12E-03	8.65E-09	2.24E-09	1.20E-09	-6.62E-04
ADP _{fossil} [MJ, LHV]	4.81E+02	4.20E+00	1.22E+00	2.74E+05	1.31E+00	4.44E-01	2.93E-01	-1.41E+01
WDP [m ³]	8.59E+00	3.64E-03	3.34E-03	6.33E+02	1.54E-03	9.65E-02	2.22E-03	-5.07E-01

Table 12. Resource Use Indicators, per functional unit

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
PERE [MJ]	1.27E+02	2.39E-01	1.12E-01	2.94E+05	1.13E-01	1.18E-01	4.44E-02	-6.27E+00
PERM [MJ]	1.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	1.28E+02	2.39E-01	1.12E-01	2.94E+05	1.13E-01	1.18E-01	4.44E-02	-6.27E+00
PENRE [MJ]	4.35E+02	4.20E+00	1.22E+00	2.74E+05	1.31E+00	4.44E-01	2.93E-01	-1.41E+01
PENRM [MJ]	4.65E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	4.81E+02	4.20E+00	1.22E+00	2.74E+05	1.31E+00	4.44E-01	2.93E-01	-1.41E+01
SM [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
FW [m ³]	2.59E-01	2.71E-04	1.46E-04	9.26E+01	1.25E-04	2.30E-03	6.67E-05	-9.50E-03

Table 13. Output Flows and Waste Categories, per functional unit

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
HWD [kg]	3.60E-07	3.16E-10	1.07E-10	6.77E-04	5.01E-11	2.54E-10	7.19E-11	-1.02E-08
NHWD [kg]	2.77E+00	5.17E-04	3.08E-01	2.77E+02	2.14E-04	9.23E-02	7.09E-01	5.07E-01
RWD [kg]	7.30E-03	9.19E-06	6.82E-06	2.63E+01	2.38E-06	1.50E-05	4.01E-06	-3.02E-04



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CRU [kg]	3.57E-02	0.00E+00	4.29E-01	0.00E+00	0.00E+00	2.48E-01	0.00E+00	0.00E+00
MFR [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
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.30E+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

Table 14. Additional Indicators, per functional unit

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
PM [disease incidence]	2.73E-06	8.65E-08	7.68E-09	2.41E-04	1.03E-08	1.56E-09	1.18E-09	-1.19E-07
IRP [kBq U235 eq]	7.83E-01	1.06E-03	1.01E-03	2.79E+03	3.45E-04	2.05E-03	5.43E-04	-3.30E-02
ETP [CTUe]	1.94E+02	3.17E+00	9.78E-01	1.02E+05	9.71E-01	2.99E-01	4.94E-01	-8.05E+00
HTCE [CTUh]	9.19E-09	5.98E-11	1.93E-11	5.81E-06	1.98E-11	1.47E-11	7.78E-12	-5.67E-10
HTnCE [CTUh]	2.52E-07	2.15E-09	1.42E-09	8.01E-05	8.82E-10	1.18E-09	1.79E-10	-1.75E-08
LU [Pt]	2.41E+02	1.29E+00	4.27E-01	1.92E+05	6.43E-01	1.17E-01	5.20E-02	-1.22E+01

5. LCA Interpretation

The use stage (B6) contributes to the majority impacts across the life cycle stages, and across all indicators, except for Resource Use, minerals and metals, as shown in Figure 2. This is due to the electricity consumed during the use of the product over its lifetime of 25 years.

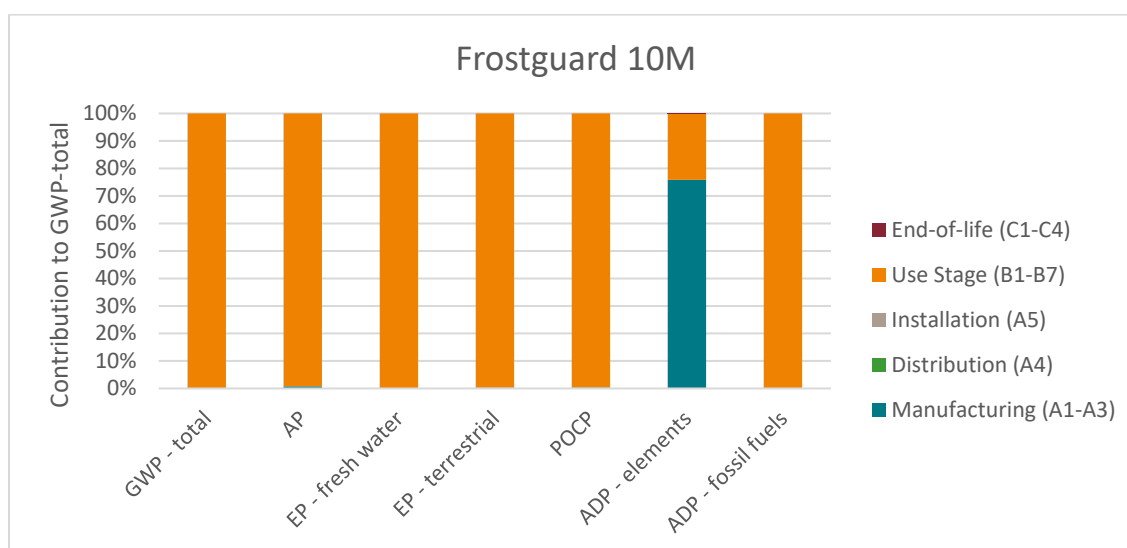


Figure 2: LCA Results for FrostGuard, by life cycle stage



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6. Additional Environmental Information

6.1 Environment and Health During Installation

Further information about the product installation can be found on the Chemelex RAYCHEM website product page:
<https://www.nvent.com/en-gb/raychem/products/frostguard-self-regulating-cable-kit-0>

6.2 Environmental Activities and Certifications

Installation in drinking water approved: Agency - KIWA Drinking Water Swedish type approval.

6.3 Further Information

Further information about the product can be found on the Chemelex RAYCHEM website product page:
<https://www.nvent.com/en-gb/raychem/products/frostguard-self-regulating-cable-kit-0>.

7. References

- CEN. (2019). *EN 15804+A2: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products*. European Committee for Standardization.
- EN 50639:2019 – Product category rules for life cycle assessments of electronic and electrical products and systems.
- ISO. (2006). *ISO 14040/Amd 1:2020: Environmental management - Life cycle assessment - Principles and framework*. Geneva: International Organization for Standardization.
- ISO. (2006). *ISO 14044/Amd 1:2017/Amd 2:2020: Environmental Management - Life cycle assessment - Requirements and Guidelines*. Geneva: International Organization for Standardization.
- PEP ecopassport: Product Category Rules for Specific Rules for Wires, Cables and Accessories. PSR-0001-ed4-EN-2022 11 16.

