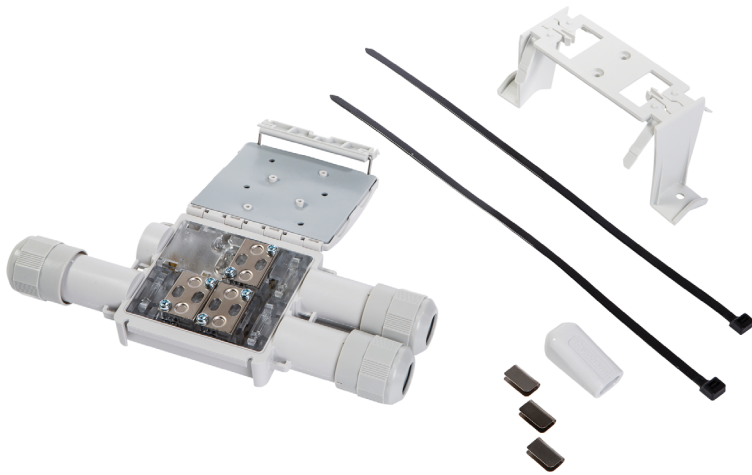


ENVIRONMENTAL PRODUCT DECLARATION

RAYCLIC

CONNECTOR DEVICE



Chemelex RAYCHEM RayClic connection system is a simple, fast and reliable set of connection kits developed for select nVent RAYCHEM XL-Trace, IceStop and HWAT self-regulating heating cables.

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, Pyrotenax, 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's 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.




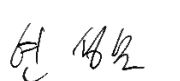
ENVIRONMENTAL PRODUCT DECLARATION



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Connector device

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	4791545949.103.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 unit of RayClic connection system connecting together self-regulating heating cables, under operating conditions identical to those of the cables, over a lifetime of 25 years.
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	Connection kit for self-regulating heating cables
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. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	Cooper McCollum, UL Solutions 
	WAP Sustainability
This life cycle assessment was conducted 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: RayClic Product Image

The reference product for the RAYCHEM RayClic connection system is the RayClic-T-03. It is a simple, fast and reliable set of connection kits developed for select Chemelex RAYCHEM XL-Trace, IceStop and HWAT self-regulating heating cables. No heat guns or wire stripping are needed, because insulation displacement technology is used to make the electrical connection.

Table 1: Products covered in the EPD

PRODUCT NUMBER	PRODUCT NAME	MODEL
364855-000	RAYCLIC-S-02	Heating Cable/Heating Cable
636284-000	RAYCLIC-PT-02	Power Connection and T-Branch
235422-000	RAYCLIC-CE-02	Power Connection to One Heating Cable
716976-000	RAYCLIC-PS-02	Power Connection to Two Heating Cables
441524-000	RAYCLIC-T-02	T-Branch
001013-000	RAYCLIC-X-02	X-Branch
805979-000	RAYCLIC-E	End Seal
P000000770	RAYCLIC-LE-03	Lighted End Seal
233053-000	RAYCLIC-PC-03	Power Connection to One Heating Cable
861247-000	RAYCLIC-PS-03	Power Connection to Two Heating Cables
804231-000	RAYCLIC-PT-03	Power Connection and T-Branch
559871-000	RAYCLIC-S-03	Heating Cable/Heating Cable
014023-000	RAYCLIC-T-03	T-Branch
546349-000	RAYCLIC-X-03	X-Branch



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According to ISO 14025
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1.3. Application

The RayClic connection kit acts as a power connection by supplying power to one or more self-regulating heating cables in the system. It also serves as a heating cable connection by linking two or three cables at a single point, and as a heating cable termination.

1.4. Technical Requirements

Minimum installation temperature: -20°C.

The technical requirements are available on the Chemelex product page under engineering specifications:

<https://www.nvent.com/en-us/raychem/products/rayclic-connection-kit-0>

1.5. Properties of Declared Product as Delivered

The product is wrapped in a plastic bag and packaged in a cardboard box with the accessories (a replacement end seal, wall mounting bracket and/or pipe mounting bracket).

1.6. Material Composition

Table 2: Material composition, per 1 km

MATERIAL	Weight [%]
COPPER	3
STEEL	31
PLASTIC	66
MINERALS AND OTHER ADDITIVES	1
TOTAL	100

1.7. Manufacturing

Custom-made individual plastic and metal components are initially assembled into sub-assemblies. These sub-assemblies are subsequently integrated into the final RayClic products through the use of fasteners or welding techniques.

1.8. Packaging

The product is packaged in a labelled plastic bag.



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1.9. Transportation

The units are placed into secondary cardboard boxes and stacked on pallets. The pallets are shipped via ocean freight from Suzhou, China to the Chemelex distribution sites in Redwood City, USA and Leuven, Belgium. The units are shipped to distributors and to final installation sites via ground transportation.

1.10. Product Installation

Installation only requires the use of hand tools. Zero product loss is expected during installation. The product packaging (plastic bag) is disposed of following the disposal rates from the US EPA 2018 municipal solid waste figures.

1.11. Use

The RayClic connection kit doesn't require any energy inputs during its use but acts as a connector between one or multiple self-heating cables. No maintenance is required.

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

The product is removed from the building at end-of-life and shipped by truck to the disposal facility. A distance of 1,000 km by truck was assumed based on the PEP PCR default values for the end-of-life treatment scenario. After separation of aluminum and plastic, aluminum can be recycled, plastic can be disposed as per the disposal rates shared in Table 3 above.



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According to ISO 14025
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2. Life Cycle Assessment Background Information

2.1. Functional Unit

The functional unit is 1 unit of connection system connecting together self-regulating heating cables, under operating conditions identical to those of the cables, over a lifetime of 25 years.

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 mass 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



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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	3.61E+03	-	1.05E+04	-
Gross density of products transported	kg/m ³	n/a			
Weight of products transported (if gross density not reported)	kg	8.87E-01			
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	0.00E+00	kg
Waste materials at the construction site before waste processing, generated by product installation	1.97E-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
Biogenic carbon contained in packaging	7.32E-02	kg C



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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.	The product is packaged in a labelled plastic bag.	Units as appropriate
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)	Engineered for use with Raychem self-regulating heating cables. Suitable for applications including pipe freeze protection, hot water temperature maintenance, roof & gutter de-icing, and grease line flow maintenance in buildings.	
An assumed quality of work, when installed in accordance with the manufacturer's instructions	10 Year product only extended warranty when installed & commissioned 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	Suitable for outdoor exposure, UV and wind resistant, IP68 rated, and temperature range to +65°C.	
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)	Suitable for indoor use.	
Use conditions, e.g. frequency of use, mechanical exposure.	Suitable for intermittent or continuous usage.	
Maintenance, e.g. required frequency, type and quality of replacement components	Maintenance free, No replacements are necessary.	

Table 7. Operational energy use (B6)

NAME	VALUE	UNIT
Lifetime of product	25	years
Power consumption	n/a	W/ft
Power consumption over lifetime	n/a	MJ/km

Table 8. End of life (C1-C4)

NAME	VALUE	UNIT
Recovery (specified by type)	Reuse	0.00E+00 kg
	Recycling	1.79E-01 kg
	Landfill	2.82E-01 kg
	Incineration	2.29E-01 kg
	Incineration with energy recovery	0.00E+00 kg
Disposal (landfill)	Product or material for final deposition	2.82E-01 kg
Removals of biogenic carbon (excluding packaging)	0.00E+00	kg CO ₂





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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)	1.86E+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 1 unit of product

EF 3.1	A1 – A3	A4	A5	B6	C2	C3	C4	D
GWP _{total} [kg CO ₂ eq]	1.29E+01	2.53E-01	1.56E-01	0.00E+00	4.78E-02	5.71E-01	7.82E-03	-5.92E-01
GWP _{fossil} [kg CO ₂ eq]	1.31E+01	2.52E-01	1.09E-02	0.00E+00	4.78E-02	5.71E-01	7.81E-03	-5.94E-01
GWP _{biogenic} [kg CO ₂ eq]	-1.75E-01	2.03E-04	1.45E-01	0.00E+00	4.65E-05	3.93E-06	-2.30E-05	1.92E-03
GWP _{land use} [kg CO ₂ eq]	3.59E-03	1.20E-04	5.97E-06	0.00E+00	2.68E-05	2.70E-05	2.96E-05	-2.20E-04
ODP [kg CFC-11 eq]	2.91E-11	3.60E-14	4.94E-15	0.00E+00	7.06E-15	1.21E-13	2.56E-14	-5.93E-13
AP [kg SO ₂ eq]	3.57E-02	1.80E-03	1.56E-04	0.00E+00	2.22E-04	7.18E-05	4.71E-05	-1.57E-03
EP _{freshwater} [kg N eq]	1.75E-05	1.07E-06	1.00E-06	0.00E+00	2.43E-07	2.95E-08	3.86E-06	-2.29E-07
EP _{marine} [kg N eq]	1.16E-02	8.32E-04	3.96E-05	0.00E+00	1.10E-04	1.98E-05	1.03E-05	-2.06E-04
EP _{terrestrial} [kg N eq]	1.23E-01	9.15E-03	7.32E-04	0.00E+00	1.21E-03	3.32E-04	1.13E-04	-2.01E-03
POCP [kg O ₃ eq]	3.63E-02	1.95E-03	9.81E-05	0.00E+00	2.26E-04	5.72E-05	3.30E-05	-7.67E-04
ADP _{element} [kg Sb-eq]	1.47E-04	3.26E-08	1.40E-09	0.00E+00	6.31E-09	1.26E-09	5.20E-10	-3.08E-05
ADP _{fossil} [MJ, LHV]	2.15E+02	3.28E+00	1.47E-01	0.00E+00	6.33E-01	2.50E-01	1.32E-01	-7.39E+00
WDP [m ³]	1.63E+00	1.26E-02	8.40E-04	0.00E+00	2.86E-03	5.43E-02	1.00E-03	-7.31E-02

Table 12. Resource Use Indicators

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
PERE [MJ]	1.51E+01	1.26E-01	8.30E-03	0.00E+00	2.80E-02	6.63E-02	1.99E-02	-6.21E-01
PERM [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
PERT [MJ]	1.51E+01	1.26E-01	8.30E-03	0.00E+00	2.80E-02	6.63E-02	1.99E-02	-6.21E-01
PENRE [MJ]	1.82E+02	3.28E+00	1.47E-01	0.00E+00	6.33E-01	2.50E-01	1.32E-01	-7.39E+00
PENRM [MJ]	3.33E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	2.15E+02	3.28E+00	1.47E-01	0.00E+00	6.33E-01	2.50E-01	1.32E-01	-7.39E+00
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]	3.68E-01	4.10E-04	2.58E-05	0.00E+00	9.30E-05	1.29E-03	3.00E-05	-3.10E-02

Table 13. Output Flows and Waste Categories

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
HWD [kg]	5.16E-08	4.43E-10	2.24E-11	0.00E+00	8.53E-11	1.43E-10	3.24E-11	-2.33E-08
NHWD [kg]	2.85E-01	3.04E-04	5.58E-02	0.00E+00	6.31E-05	5.19E-02	2.81E-01	5.65E-02
RWD [kg]	1.52E-03	9.77E-06	6.14E-07	0.00E+00	1.91E-06	8.41E-06	1.84E-06	-2.33E-04
CRU [kg]	7.32E-01	0.00E+00	6.82E-02	0.00E+00	0.00E+00	1.79E-01	0.00E+00	0.00E+00



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MFR [kg]	2.74E-02	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	1.04E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E+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

PARAMETER	A1 – A3	A4	A5	B6	C2	C3	C4	D
PM [disease incidence]	4.05E-07	3.20E-08	1.28E-09	0.00E+00	2.25E-09	8.79E-10	4.97E-10	-1.40E-08
IRP [kBq U235 eq]	1.33E-01	8.24E-04	5.47E-05	0.00E+00	1.61E-04	1.15E-03	2.53E-04	-1.27E-02
ETP [CTUe]	9.25E+01	2.56E+00	4.45E-01	0.00E+00	4.94E-01	1.68E-01	2.57E-01	-1.09E+00
HTCE [CTUh]	3.03E-09	5.86E-11	6.18E-12	0.00E+00	1.19E-11	8.27E-12	3.89E-12	6.75E-11
HTnCE [CTUh]	6.47E-08	9.78E-10	1.14E-10	0.00E+00	1.96E-10	6.62E-10	8.49E-11	-6.58E-10
LU [Pt]	2.93E+01	5.36E-01	2.63E-02	0.00E+00	1.23E-01	6.56E-02	2.26E-02	-7.06E-01

5. LCA Interpretation

The manufacturing stage (A1-A3) contributes to the majority impacts across the life cycle stages, and across all indicators, as shown in Figure 2.

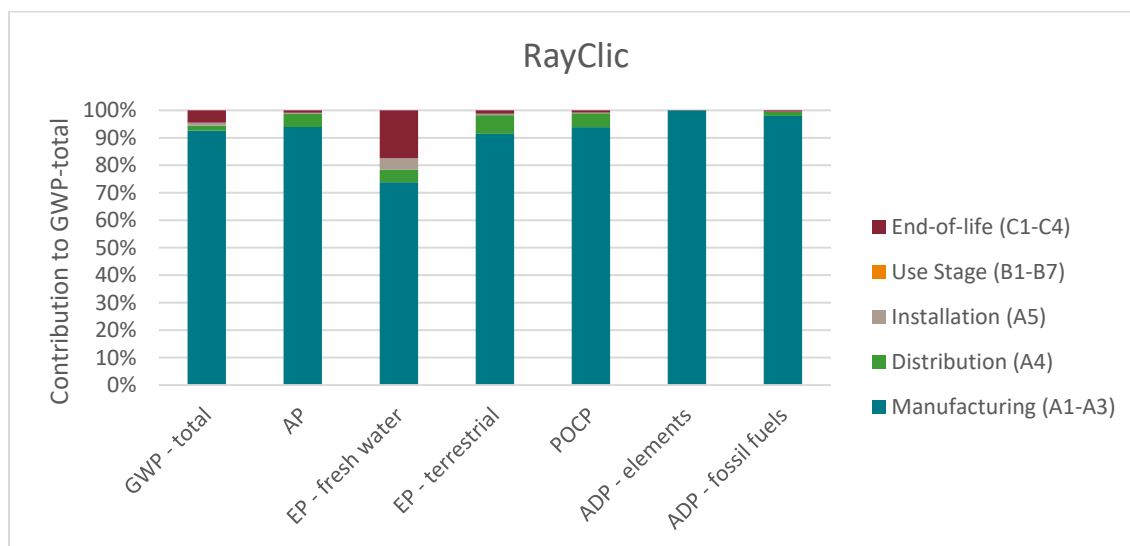


Figure 2: LCA Results for RayClic, by life cycle stage





RAYCHEM RayClic
Connector device



According to ISO 14025
and EN 15804+A2

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-us/raychem/products/rayclic-connection-kit-0>

6.2 Further Information

Further information about the product can be found on the Chemelex RAYCHEM website product page:
<https://www.nvent.com/en-us/raychem/products/rayclic-connection-kit-0>

7. References

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