

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Royal Boon Edam International B.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Issue date	02/04/2026
Valid to	01/04/2031

Crystal Tourniket Boon Edam

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EPD
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1. General Information

Boon Edam

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-BEN-20260265-IBA1-EN

This declaration is based on the product category rules:

Automatic doors, automatic gates, and revolving door systems,
01/08/2021
(PCR checked and approved by the SVR)

Issue date

02/04/2026

Valid to

01/04/2031



Dipl.-Ing. Hans Peters
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Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

Crystal Tourniket

Owner of the declaration

Royal Boon Edam International B.V.
Ambachtstraat 4
1135GG Edam
Netherlands

Declared product / declared unit

The declaration represents one automatic revolving door of the Crystal Tourniket type. It consists of a round, fully transparent glass enclosure with three (3) door wings and minimal framing. The door combines an elegant glass design with the functionality of a revolving door. The door has a diameter of 2300 mm, a height under the canopy of 2500 mm, and a total height of 2518 mm.

Scope:

Raw materials and components are provided by suppliers from around the globe and shipped to Boon Edam, where the product is manufactured and assembled before being shipped and installed on a construction site in Europe.

The energy use on-site and maintenance during the 20 years of use are both taken into account.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR	
Independent verification of the declaration and data according to ISO 14025:2011	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Mrs Kim Allbury,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The Crystal Tourniket by Boon Edam is an automatic revolving door designed to combine transparency, aesthetics, and energy efficient entrance control. It features a fully glazed circular enclosure with minimal framing and three (3) rotating door wings, providing a clear and elegant appearance suitable for prestigious building facades. The drive unit is integrated in the floor, ensuring a clean, fully transparent design and quiet operation. Sensors positioned on the roof trim regulate the door's rotation based on user presence, allowing for safe and precise movement.

For the product studied in this document, the following options were selected:

- Diameter of 2300 mm and a height under canopy of 2500 mm
- Fully glazed door wings and curved panels with minimal stainless steel framing
- Automated drive integrated in the floor

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:

- 2006/42/EC
- EMC directive 2014/30/EU
- EN 16005
- EN 60335
- EN ISO 13849
- EN 61000

The CE-marking takes into account the proof of conformity with the respective harmonised norms based on the legal provisions above.

For the application and use the respective national provisions apply.

2.2 Application

The Crystal Tourniket is widely used in medium and high-traffic buildings. Particularly used in:

- Corporate
- Governmental
- Retail
- Restaurants and hospitality
- Hotels

2.3 Technical Data

Constructional data

Name	Value	Unit
Heat transfer coefficient of the entire door or gate system acc. to EN 16361	4.4	W/(m ² K)
Airborne sound reduction acc. to EN ISO 140-3	32	dB
Burglar protection class acc. to EN 1628 - EN 1630	Class 3	-
Power input "Idle"	0	W
Power input "Standby"	75	W
Power input "Operation"	150	W
Windload resistance acc. to EN12211	771	Pa
Air permeability acc. to EN 12207 & EN 1026	76.1	m ³ /(h*m ²)

Performance data of the product according to the harmonised standards, based on provisions for harmonization.

2.4 Delivery status

The Crystal Tourniket modelled for this study is delivered ready for installation on a wooden crate and trolley, with a total weight

of 1439 kg.

It presents the following dimensions:

- External diameter: 2350 mm
- Internal diameter: 2300 mm
- Height: 2518 mm
- Height under the canopy: 2500 mm

2.5 Base materials/Ancillary materials

Name	Value	Unit
Glass (tempered) 77.66%	949	kg
Stainless Steel 12.19%	149	kg
Steel 3.44%	42	kg
Electrical components 2.7%	33	kg
Elastomers 1.31%	16	kg
Aluminum 1.06%	13	kg
Drive parts 0.74%	9	kg
Other plastics 0.65%	8	kg
Fasteners 0.25%	3	kg

Boon Edam uses substances on their own or in a preparation within its industrial or commercial activities, and is therefore a downstream user as defined in *Article 3 No. 13 of Regulation (EC) No. 1907/2006 (so-called REACH regulation)*. As a downstream user, Boon Edam has already requested that all suppliers provide confirmation regarding the correct implementation of REACH, and that our products do not contain SVHCs with a concentration greater than 0.1 percent by weight, as for the list published on the 7th of July 2017. Thus, the following declarations hold true for a Crystal Tourniket:

1. Contains substances on *the candidate list* of SVHC (date:25.01.2021) exceeding 0.1 percentage by mass in at least one partial product: **No**
2. Contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass in at least one partial product : **No**
3. Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): **No**

2.6 Manufacture

All materials are shipped from suppliers to Boon Edam Manufacturing EMEA site in Edam, the Netherlands. Depending on the product, steel and aluminum profiles are cut to shape and size on site, and are assembled with the rest of the materials by Boon Edam.

The manufacturing site in Edam is ISO 9001 certified.

2.7 Environment and health during manufacturing

Standard cutting and coating machinery are used on-site.

Safety measures are implemented on-site and employees are required to wear personal protective equipment.

Boon Edam's Manufacturing EMEA site in Edam, the Netherlands, has set up several take-back schemes, with customers in the Netherlands and with suppliers. Metal cuttings from production (steel and aluminum alloys) are collected and sent back to suppliers to be reprocessed.

The site is ISO 14001 certified.

2.8 Product processing/Installation

Boon Edam's installation teams in Europe follow a strict safety process to define, together with the clients, safe access and working conditions during the installation. A list of personal

protective equipment to be worn for each different task is defined as part of this process.

2.9 Packaging

Packaging materials should be discarded according to the regulations in place in the country of installation, and can be recycled or incinerated (for energy recovery) once the product is installed.

The following materials are used for packaging:

- Wooden trolley - 147 kg
- Wooden crate - 66 kg
- Cardboard - 2 kg
- LDPE sheet - 1 kg
- Paper - 1 kg

2.10 Condition of use

Maintenance instructions are provided by Boon Edam, and will ensure efficient operation of the product. Annual maintenance checks are advised, and should be carried out by Boon Edam or an approved agent.

The materials used in the composition of Boon Edam products are very stable, and their composition is not expected to change in the time frame of use of the product, provided that the recommended maintenance procedures are followed.

2.11 Environment and health during use

The products manufactured by Boon Edam do not release any fluid, fumes, or chemical substances if used in accordance with the specifications provided, and if proper maintenance checks are performed regularly.

Automatic doors and gates are fitted with safety sensors and actuators that will prevent any physical damage in case of malfunction or improper use.

2.12 Reference service life

To calculate the indicators for potential impact during the use stage of a Crystal Tourniket, a service life of 20 years has been selected, as suggested in the 'Nutzungsdauern von Bauteilen' (Service Lives of Components) from the BBSR. Provided that proper maintenance procedures are followed, the characteristics of the installed product will remain stable over the years and will not suffer from ageing of materials or components. NB: A service life in accordance with the BBSR table is not a RSL according to ISO 15686.

2.13 Extraordinary effects

Fire

Fire protection

Name	Value
Building material class	Class D
Burning droplets	Class d0
Smoke gas development	Class s1

3. LCA: Calculation rules

3.1 Declared Unit

The declaration and background LCA report represent an automatic all-glass revolving door with only a minimum stainless steel frame from Boon Edam, type Crystal Tourniket. Raw materials and components are provided by suppliers from around the globe and shipped to Boon Edam, where the revolving doors are manufactured and assembled before being shipped and installed on a construction site in Europe. The energy use on site and maintenance during the 20 years of use are taken into account.

It is fitted with one (1) 230/400V 'ODG 534 TD2/566 motor' of 90W

Water

Automatic doors contain electric and electronic equipment that may malfunction in the event of contact with water. Please refer to instructions regarding maintenance and cleaning.

No impact on the environment will occur in case of such malfunction.

Mechanical destruction

Mechanical destruction will never result from a malfunction of the door or gate itself.

In case mechanical destruction is caused by an external event, no environmental damage will be caused.

A damaged door or gate will need to be deconstructed with care and replaced.

2.14 Re-use phase

At the end-of-life, Boon Edam Netherlands and several Boon Edam entities in other European countries offer a take-back scheme. Products that reached their end-of-life can be dismantled by Boon Edam, and transported to local recycling or to the waste separation facility of Boon Edam in Edam.

Parts obtained from dismantled doors are not reused, for quality and safety reasons, but materials are separated and prepared for recycling.

2.15 Disposal

Waste materials are produced at the end-of-life of the product. They are listed below according to the European List of Waste 2014/955/EU.

- 16 02 Wastes from electrical and electronic equipment
- 17 02 01 Wood
- 17 02 02 Glass
- 17 02 03 Plastic
- 17 04 02 Aluminum
- 17 04 05 Iron and steel
- 17 04 11 Cables (with no hazardous substances)

Products that reached their end-of-life can be dismantled by Boon Edam on location and transported to local recycling or to the waste separation facility of Boon Edam in Edam.

2.16 Further information

See contact details.

Declared unit and mass reference

Name	Value	Unit
Mass (total system)	1439	kg
conversion factor to 1 kg	0.0007	-
Weight of materials and coatings	1439	kg/pce
Declared unit	1	pce.
Mass reference	1439	kg/pce

3.2 System boundary

Type of EPD: cradle-to-grave.

The following modules were considered in this analysis:

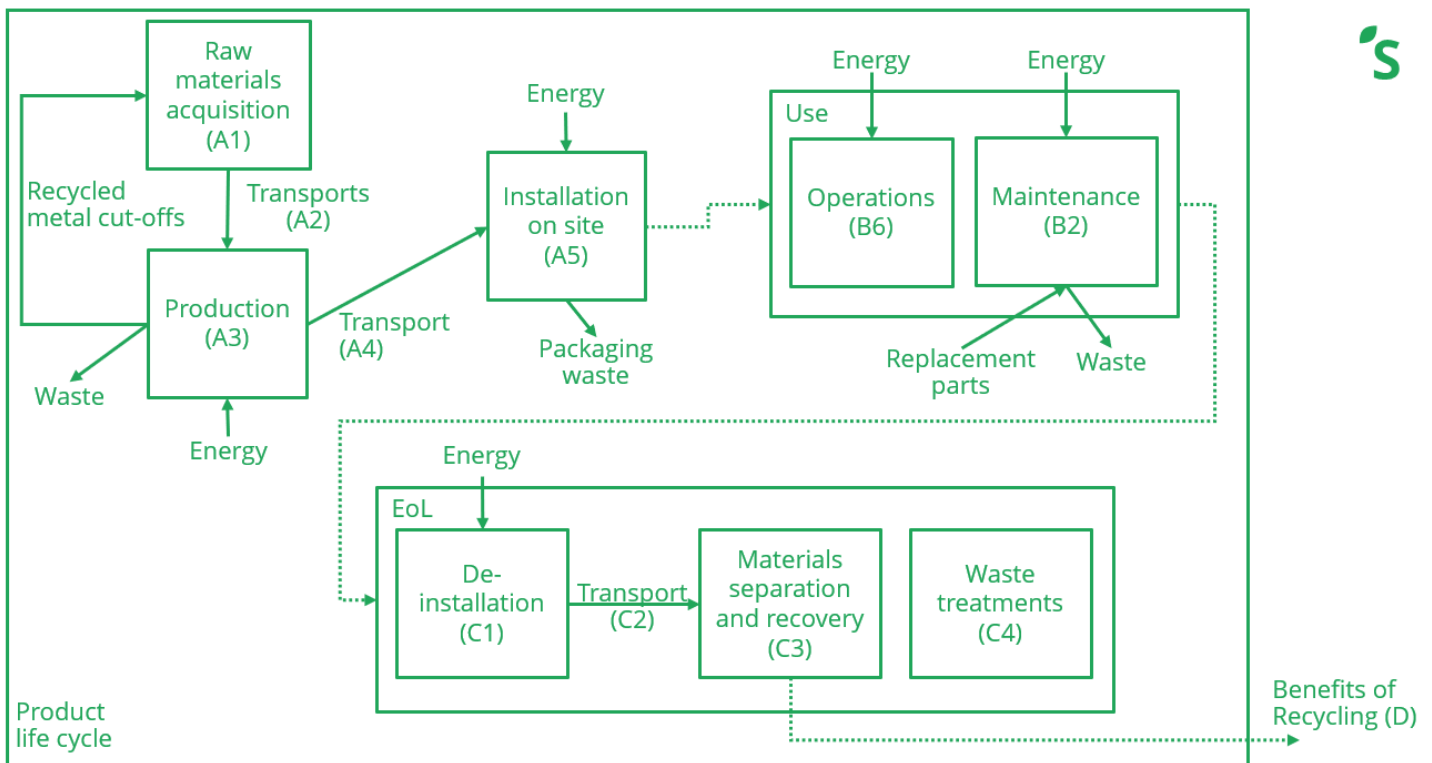
- **Product stage (A1-A3)**
The product stage includes raw material extraction and processing (A1), transport of raw materials and components to the manufacturing site (A2), and manufacturing and assembly of the product (A3). Energy use, internal transport, packaging materials, and treatment of production waste are included.
- The electricity used on site by the revolving door is supplied via the building's electrical system and is modelled using the standard Dutch residual electricity mix, with a value of 0.417 kg CO₂-eq/kWh
- **Construction stage (A4-A5)**
The construction stage covers transport of the finished product to the building site (A4) and installation activities (A5), including handling and disposal of packaging materials. No additional auxiliary materials are required beyond those included in the product system.
- **Use stage (B2, B6)**
The use stage includes routine maintenance activities (B2) and electricity consumption during normal operation (B6). No materials are required during use (B1) and no water is needed for operation (B7). Repair (B3), replacement (B4), and refurbishment (B5) are not

required under normal use and proper maintenance and are therefore not declared.

- This EPD follows additional requirements for EEE-products.
- **End-of-life stage (C1-C4)**
The end-of-life stage includes de-construction of the product (C1), transport to waste treatment facilities (C2), waste processing (C3), and final disposal of residues (C4).
- **Benefits and loads beyond the system boundary (D)** Module D reports the potential benefits and loads from reuse, recovery, and recycling of materials beyond the system boundary.

This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

No materials are required during use (B1) and no water is needed for operation (B7). Repair (B3), Replacement (B4) and Refurbishment (B5) are not needed if proper maintenance is followed. These submodules are not declared as they would be zero, or are estimated to fall below the cut-off criteria.



3.3 Estimates and assumptions Main assumptions and proxies

Cutting losses: Boon Edam manufactures doors made from both Aluminum and Glass. However, the Aluminum cutting losses for glass doors are not available individually and the total Aluminum cutting losses are available as a proxy. Since Aluminum cutting losses in Aluminum doors are higher, this leads to an overestimation of Aluminum cutting losses for glass doors. However, the Aluminum cutting losses contribute less than 1% to overall emissions. Furthermore, the cutting losses

are sent back to the suppliers who process the lost Aluminum and Steel and thus they do not contribute to waste disposal (C) and avoided burden (D) stages.

Survey and modelling methodology: This EPD is generated through an automated EPD tool. As a first step, users are invited to answer a survey which contains questions about the amount of products and energy used for packaging, manufacturing, installation of the product as well as the maintenance. The answers to these questions serve as an input to a LCA model. The model results are then populated in a pre-defined EPD template which generates the EPD in PDF format.

Waste processing data assumptions: Boon Edam provides the option to its users to collect back the waste and return it back to suppliers for processing. However, in the absence of any other data, the waste scenarios for different materials were treated according to the average waste scenarios for that particular product in the Netherlands. For example, for packaging wastes, 97% of waste was assumed to be incinerated and 3% of waste was assumed to be landfilled. For some metals and alloys such as Aluminum and Steel, there are no specific datasets for incineration and landfilling. So, the environmental impacts of incineration and landfilling of these materials have been accounted for through the incineration and landfilling processes of common municipal solid waste, albeit not providing any electricity or heat recovery for these processes.

3.4 Cut-off criteria

Production stage

All materials and energy inputs and outputs were considered, based on the nomenclature of the product considered, and on the energy inputs and waste flows from the factory. To the best of our knowledge, no input or output having a significant impact on the indicators have been left aside.

Use stage

During the use stage, the only maintenance activities not included are the cleaning and technical checks. These would consist of: energy necessary to power the cleaning devices, water, soap and transport of personnel for the technical checks. Given the predominance of the operational energy use (B6), these impacts will be negligible in comparison.

End-of-life

During the end of life stage, all the end-of-life activities have been accounted for. The end of life phase is divided into recycling, incineration and landfilling. Environmental impacts of these activities for all materials have been accounted for to the best of our knowledge and no material having significant impact has been left aside. The avoided burden from materials recycled, electricity and heat recovered has also been considered for all packaging as well as constituent materials of the CRYSTAL TOURNIKET.

3.5 Background data

The EPD is generated by an EPD tool, which enables the modelling of the environmental impacts of a revolving glass door and speed gates. For the application of the EPD tool, its users are required to enter the weight of different materials used in manufacture and packaging of the door through a survey, which then triggers a model run and generates the EPD. The EPD is generated from the EPD tool version 2.0 (validity: September 2025 to September 2030), owned by PRé Sustainability bv, Amersfoort, NL.

3.6 Data quality

The *ecoinvent 3 database* is used for every background datasets, ensuring consistency of the scope. Global market data were used for all supplies that are procured

on the market without specific requirement for location, and more specific geographies were used otherwise (e.g. electricity used on-site is representative of the Dutch electricity market). All background data have been reviewed by the editor in 2020.

Primary data have been collected specifically for the product considered, at the time when the assessment has been made, and are representative of the current situation at Boon Edam. Based on the data quality framework of EN15804 provided by UN environment, the model data are assessed on three criteria of geography, time and technical accuracy. According to the framework, the data quality for Boon Edam's Crystal Tourniket is assessed as follows:

- Geographical representativeness - Good: Most of the data on production, transport and energy use is representative of the whole of Europe. So, the data is from a larger area (Europe) in which the area under study (Netherlands) is included. This satisfies the good quality data criteria of UN environment global guidance on LCA development.
- Time representativeness - Good: Most of the processes in *ecoinvent 3.10* accurately reflect the data for 2020.
- Technical representativeness - Good: For Boon Edam's Crystal Tourniket, the materials used are very commonly available on the market, and thus, the processes corresponding to their production are readily available in the *ecoinvent* database and they represent the actual material accurately.

3.7 Period under review

Manufacturing data for the production site have been collected in 2024 and represents the average consumption in 2023.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

3.9 Allocation

Given the variations in size of the products manufactured by Boon Edam, allocating manufacturing (A3) inputs and outputs per product was not deemed fair. As production lines within the facility were similar, allocation was done on the basis of the number of production lines.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. Background data processes were obtained from *ecoinvent version 3.10, with the Cut-off system model, as compiled for SimaPro* in June 2023.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.

If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon

shall always be declared.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	89.669	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

Transport to the building site (A4)

The distance is calculated as an average of Boon Edam's actual delivery, and is modelled as a freight truck transport.

Name	Value	Unit
Litres of fuel for 1t transported	4.5	l/100km
Transport distance	3500	km
Capacity utilisation (including empty runs)	49	%

Installation into the building (A5)

Name	Value	Unit
Wooden Trolley	147	kg
Wooden Crate	66	kg
Cardboard box	2	kg
LDPE Sheet	1	kg
Paper	1	kg

Maintenance (B2)

A yearly maintenance check is recommended. Motors and moving parts are prone to wear, and are replaced every few years, over the 20 years of the product.

Name	Value	Unit
Electronics	3	kg
Motor	13	kg
Rubber	5	kg
Steel	2	kg

20 years.

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies to the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list of service life by *BNB* is declared.

Reference service life

Name	Value	Unit
Life Span (according to BBSR)	20	a

Operational energy use (B6) and Operational water use (B7)

The electricity consumption of the motor drive is divided in two ranges of use:

- The door or gate is in idle
- The door or gate is in standby mode
- The door or gate is active

The electricity consumption process was modelled using low voltage electricity mix for Europe.

The estimated operating conditions are given below.

Name	Value	Unit
Years of use (life span)	20	years
Days used per year	312	days/year
Hours idle (on day used)	8	hours/day
Hours in standby (on day used)	8	hours/day
Hours active (on day used)	8	hours/day
Power Idle	0	W
Power in standby	75	W
Power active	150	W
Electricity consumption over lifetime	11232	kWh

End of life (C1-C4)

The common practice in the European construction sector is to collect metals separately (for economic reasons) and glass separately (for safety reasons).

For other materials, end-of-life fates are divided between recycling, incineration and landfill, based on European data from 2020.

For the calculation below, it is assumed that aluminum, steel, stainless steel, and glass are collected separately, whereas fasteners, drive parts, electrical components, rubber, and nylon are not. The percentages of each material directed to recycling, incineration, and landfill, respectively, are aggregated over the bill of materials (BOM) to compute the amounts of waste recycled, incinerated and landfilled.

Name	Value	Unit
Collected separately waste type	1186	kg
Collected as mixed construction waste construction waste	39	kg
Recycling	1155	kg
Waste incineration	51	kg
Landfilling	16	kg

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

Name	Value	Unit
Glass recycled	949	kg
Heat generated	116	MJ
Electricity generated	59	MJ
Steel recycled	37	kg
Aluminum recycled	10	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	X	MNR	MNR	MNR	X	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 unit 1439 kg Crystal Tourniket

Parameter	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	5.13E+03	1.79E+02	2.16E+01	2.61E+02	3.66E+03	1.96E+00	1.05E+01	3.59E+01	8.19E-01	-4.84E+02
GWP-fossil	kg CO ₂ eq	5.09E+03	1.79E+02	2.03E+01	2.6E+02	3.64E+03	1.95E+00	1.05E+01	3.59E+01	8.19E-01	-4.8E+02
GWP-biogenic	kg CO ₂ eq	3.12E+01	2.91E-02	1.3E+00	3.15E-01	8.19E+00	4.38E-03	1.7E-03	4.69E-04	3.64E-05	-3.37E+00
GWP-luluc	kg CO ₂ eq	4.92E+00	5.91E-02	1.12E-02	3.02E-01	1.12E+01	6.01E-03	3.46E-03	1.28E-04	1.79E-05	-7.07E-01
ODP	kg CFC11 eq	1.13E-04	3.57E-06	3.54E-07	9.55E-06	6.3E-05	3.37E-08	2.09E-07	1.14E-08	2.98E-09	-1.15E-05
AP	mol H ⁺ eq	3.44E+01	7.1E-01	8.11E-02	1.72E+00	1.85E+01	9.9E-03	4.16E-02	7.61E-03	6.12E-04	-3.29E+00
EP-freshwater	kg P eq	2.43E+00	1.18E-02	3.21E-03	2.54E-01	3.24E+00	1.73E-03	6.93E-04	8.46E-05	6.04E-06	-1.85E-01
EP-marine	kg N eq	6.81E+00	2.68E-01	3.82E-02	3.15E-01	3.21E+00	1.72E-03	1.57E-02	4.53E-03	1.86E-02	-5.17E-01
EP-terrestrial	mol N eq	7.06E+01	2.92E+00	3.19E-01	3.4E+00	2.79E+01	1.49E-02	1.71E-01	3.83E-02	2.71E-03	-6.94E+00
POCP	kg NMVOC eq	2.14E+01	1.08E+00	1.12E-01	1.12E+00	9.26E+00	4.94E-03	6.33E-02	9.57E-03	1.22E-03	-1.97E+00
ADPE	kg Sb eq	2.69E+04	2.07E+02	5.23E+01	1.73E+03	6.19E+04	3.31E+01	1.21E+01	9.44E-01	1.44E-01	-3.26E+03
ADPF	MJ	3.89E-01	5.54E-04	5.23E-05	6.15E-02	7.44E-03	3.97E-06	3.24E-05	1.31E-06	1.72E-07	-2.85E-03
WDP	m ³ world eq deprived	1.95E+03	1.48E+01	-1.1E+00	9.99E+01	3.07E+03	1.64E+00	8.68E-01	1.76E+00	-1.71E+00	-2.43E+02

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: 1 unit 1439 kg Crystal Tourniket

Parameter	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PERE	MJ	1.32E+04	4.28E+01	1.47E+01	3.98E+02	2.01E+04	1.07E+01	2.5E+00	3.33E-01	6.45E-02	-9.38E+02
PERM	MJ	4.1E+03	0	0	0	0	0	0	0	0	0
PERT	MJ	1.73E+04	4.28E+01	1.47E+01	3.98E+02	2.01E+04	1.07E+01	2.5E+00	3.33E-01	6.45E-02	-9.38E+02
PENRE	MJ	2.64E+04	2.07E+02	9.52E+01	1.73E+03	6.19E+04	3.31E+01	1.21E+01	4.07E+02	1.44E-01	-3.26E+03
PENRM	MJ	4.49E+02	0	-4.29E+01	0	0	0	0	-4.06E+02	0	0
PENRT	MJ	2.68E+04	2.07E+02	5.23E+01	1.73E+03	6.19E+04	3.31E+01	1.21E+01	9.43E-01	1.44E-01	-3.26E+03
SM	kg	2.6E+02	0	0	1.46E+00	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m ³	4.56E+01	3.42E-01	-2.6E-02	2.32E+00	7.15E+01	3.82E-02	2E-02	4.08E-02	-3.99E-02	-5.88E+00

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: 1 unit 1439 kg Crystal Tourniket

Parameter	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
HWD	kg	3.54E-01	1.7E-02	1.69E-03	3.16E-02	1.27E-01	6.8E-05	9.94E-04	1.45E-04	1.4E-05	4.1E-02
NHWD	kg	4.21E+02	1.2E+02	3.41E+01	2.27E+01	1.76E+02	9.41E-02	7.01E+00	1.82E-01	8.89E+00	-5.59E+01
RWD	kg	1.07E-01	8.04E-04	4.03E-04	6.06E-03	6.17E-01	3.3E-04	4.7E-05	5.01E-06	8.11E-07	-1.44E-02
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	1.28E+02	4E+00	0	0	0	1.17E+03	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	8.48E+01	2.74E+01	0	0	0	5.93E+01	0	0

EET	MJ	0	0	1.78E+02	5.36E+01	0	0	0	1.16E+02	0	0
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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:
1 unit 1439 kg Crystal Tourniket**

Parameter	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PM	Disease incidence	3.68E-04	1.18E-05	1.16E-06	1.44E-05	5.96E-05	3.18E-08	6.89E-07	3.21E-08	1.4E-08	-3.17E-05
IR	kBq U235 eq	3.86E+02	3.23E+00	1.58E+00	2.45E+01	2.4E+03	1.28E+00	1.89E-01	1.95E-02	3.48E-03	-5.65E+01
ETP-fw	CTUe	5.41E+04	5.14E+02	5.66E+01	5.17E+03	5.36E+03	2.86E+00	3.01E+01	7.22E+01	2.36E+00	-6.34E+03
HTP-c	CTUh	6.06E-05	1.25E-06	1.25E-07	2.28E-06	7.04E-06	3.76E-09	7.3E-08	5.28E-09	5.33E-10	-6.79E-06
HTP-nc	CTUh	1.79E-05	2.75E-07	2.82E-08	1.38E-06	2.28E-06	1.22E-09	1.61E-08	5.3E-09	8.85E-11	-7.73E-07
SQP	SQP	7.09E+04	1.56E+03	1.56E+02	1.77E+03	1.53E+04	8.2E+00	9.13E+01	1.42E+00	5.23E+00	-3.63E+03

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.

This EPD was created using a software tool.

6. LCA: Interpretation

Dominance analysis indicates that the product stage (modules A1-A3) is the primary contributor to most environmental impact categories. This stage is dominated by energy-intensive production of glass, which account for the majority of embodied impacts. Operational energy use (module B6) represents the second largest contribution, drive by cumulative electricity over the assumed 20-year service life.

Transport and installation (modules A4-A5) have minor influence. End-of-life processes (modules C1-C4) assume high recycling rates for metals and glass, generating credits in module D, and introducing some uncertainty linked to future recovery conditions. Key elementary flows influencing the

results are raw material production and electricity demand.

Results are sensitive to assumptions regarding materials sourcing, operational energy, electricity mix, and recycling efficiency, yet the dominance structure remains consistent across impact categories. Data quality is considered appropriate, combining primary production data with representative secondary datasets, and no significant inconsistencies were identified. The interpretation confirms that improving material selection during design and operational energy efficiency are the most effective strategies for reducing the overall environmental footprint of the Crystal Tourniket system.

7. Requisite evidence

Not applicable for this product. It relies on electric energy for functioning and no emissions will be released in normal

conditions.

8. References

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