Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019/AC:2021 for:

Elbow Switches with ABS Frame by JC Kontakter AB

Covering 10 different variations of elbow switches, including:

- JCK103
- JCK105
- JCK107
- JCK109
- JCK110
- JCK203
- JCK205
- JCK209
- JCK211
- JCK212

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Multiple product grouping	EPD of multiple products, based on weighted average results *An EPD should provide current information and may be updated if conditions change.*

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General information

Programme information

Programme:	EPD International AB
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14, Construction Products, version 1.3.4 UN CPC code: 36990 – Articles of plastics n.e.c.
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact
Life Cycle Assessment (LCA)
LCA accountability: Alexander Munge, CHM Analytics AB
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via EPD verification by individual verifier Third-party verifier: Katrin Molina-Besch, Miljögiraff AB Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Information on the use of the EPD

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Results of modules A1-A3 should not be used without considering the results of module C.

This EPD follows additional requirements for construction products considered as Electronic or Electric Equipment.

The use of the EPD is restricted to the products defined in the Product Information chapter of this EPD. The results are based on weighted average results to account for the difference in production volume of the various products. In order to see the impacts from the specific product in this EPD, see chapter of additional environmental information for conversion factors. Contact JC Kontakter AB directly for information if this EPD is valid for a specific purchase.

Contact information

Owner of the EPD

JC Kontakter AB
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Contact

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Mail: peter@jcgt.se

Description of the organisation

JC Kontakter is a family-owned business specialized in design and manufacturing of elbow switches for automatic doors. The company was founded in 1984 and is now run by the second generation within the family. The business idea is built upon their vision of being the market leaders and they are therefore focused on a few products that is marketed and distributed to retailers in Sweden and Europe.

Name and location of production site

JC Kontakter AB manufacturing site
Hagelvädersgatan 11
418 34, Gothenburg
Sweden

Product information

Product name

JC Kontakter AB designs and manufactures elbow switches for automatic doors in Gothenburg, Sweden. The product portfolio covers a wide variety of different elbow switches, consisting of metal and plastic frames. The products studied are the following elbow switches:

Product	Frame material	Sizes
JCK 103	Plastic frame (flat, white)	250 mm (standard size)
JCK 105	Plastic frame (flat, grey)	250 mm (standard size)
JCK 109	Plastic frame (flat, all white)	250 mm (standard size)
JCK 203	Plastic frame (convex, white)	250 mm (standard size)
JCK 205	Plastic frame (convex, grey)	250 mm (standard size)
JCK 209	Plastic frame (convex, black)	250 mm (standard size)
JCK 211	Plastic frame (convex, all white)	250 mm (standard size)
JCK 212	Plastic frame (convex, black with white contrast)	250 mm (standard size)
JCK 107	Plastic frame (with steel plate, dark grey)	250 mm (standard size)
JCK 110	Plastic frame (with steel plate, dark grey and white)	250 mm (standard size)

Product description

JC Kontakter AB is a manufacturer of elbow switches used for buildings to operate doors. There are various customizations that are available to tailor the elbow switches, including engraving details on the elbow switches.

The results are based on a weighted average in accordance to PCR 2019:14 v. 1.3.4.

The UN CPC classification for the product is 36990 – Articles of plastics n.e.c. This classification is applicable to all variants of the elbow switches.

The studied system is a type b) EPD in PCR 2019:14 v. 1.3.4 (Cradle-to-gate with options module C1-C4, module D and optional modules A4, A5, and B1-B7). Modules B1-B7 are included as mandatory in accordance with PCR2019:14 v.1.3.4 for Electric and Electronic Equipment (EEE). All activities within the modules take place in Sweden, with the exception of raw material extraction and refinement at supplier site, as well as transport from supplier to JC Kontakter, which is global.

The products have the following physical properties:

Table 1: Physical properties of the studied product

Product	JCK 103, 105, & 109	JCK 203, 205, 209, 211, & 212	JCK 107 & 110
Weight, in g	216	230	321
Nominal rated current		12 V, 6A (Resistive) 12 V, 6A (Inductive, L/R 5 ms) 24V, 6A (Resistive) 24V, 5A (Inductive, L/R ms)	
Lowest rated current		1 mA/4 V DC	

The EPD is declared as an EPD of multiple products based on the weighted average results, covering all products described above, in accordance with chapter 2.2.2.1 from PCR 2019:14 v. 1.3.4 (The International EPD Programme, 2024). The product is not considered an identical product as the end product is sold to customers as different types of products.

Geographical scope

The input material is purchased from tier-1 suppliers in Sweden, which is where the use phase and end-of-life treatment is assumed to take place as well based on primary customer locations. Transportation and processing from tier-2 suppliers located in other regions of the world (e.g. USA, South Korea, and other parts of Europe) have also been accounted for.

LCA information

Declared unit

The declared unit is one unit elbow switch. The conversion factor to mass can be seen in the table above stating the weight per product variant.

Reference service life

RSL is not applicable as the LCA and subsequent EPD is based on a declared unit in accordance with PCR 2019:14 v. 1.3.4. However, as modules B1-B7 are included, an estimated product lifetime is included to account for the amount of replacements required in module B4. The estimated product lifetimes is 15 years, based on a study on the product where the micro-switch needs to be replaced after a set amount of interactions.

Time representativeness

Specific data collected for production taking place during the period 1st September 2023 – 1st September 2024. The generic data used from ecoinvent 3.10 and Industry data 2.0 are all still valid and have less than 6 years difference from the last update of the dataset to the publication of this EPD.

Database(s) and LCA software used

The LCA was modelled in SimaPro 9.6 using ecoinvent 3.10 (EN15804 system library) as the primary database.

Description of system boundaries

The studied system is a type b) EPD in PCR 2019:14 v. 1.3.4 (Cradle-to-gate with options module C1-C4, module D and optional modules A4, A5, and B1-B7).

A1-A3 Cradle-to-gate

Modules A1-A3 presents the production of the product variants covered by this EPD. All raw materials from suppliers are transported to JC Kontakter ABs manufacturing site in Gothenburg, Sweden. At the manufacturing site, the components are adjusted and assembled to the final product before being sent to end customer for installation.

The transportation from supplier to JC Kontakter ABs manufacturing facility is presented below:

Table 2: Material transport distances

Material	Country of origin	Distance (km)	Type of transport	Applicable product
Micro-switch	France	2 198	Diesel truck (+HVO100)	All
ABS frame	South Korea	24 691	Diesel truck (28) + Shipping (24 663)	
Terminal screws	Taiwan	22 901	Electric van (0.5) + Shipping (22 900)	
Cable lugs	Italy	7 617	Diesel truck (152) + Shipping (7 465)	
Retaining washers	Sweden	1	Electric van	
Springs	Czech Republic	1 035	Electric van (4.9) + Diesel truck (1 030)	
Stainless plate	USA	11 173	Electric van (32) + Diesel truck (372) + Shipping (10 779)	JCK107 and 110
Tape, stainless plate	Sweden	220	Hybrid diesel/electric truck	

In module A3, the electricity consumption, packaging material, consumables, and waste generated from manufacturing is included. The electricity consumption is based on the energy certificate provided by the electricity supplier for the reference time period of this EPD. The electricity consumption was modelled by taking the share of 42.5% nuclear power and 57.5% renewables. The GWP-GHG impact of the modelled electricity mix is 0.0285 kg CO_2-eq/kWh.

A4 Transport to customer

The transportation to customer will vary depending on the location, however, in this EPD the distance to the three largest customers was taken and the distance was averaged. The average distance was estimated to 246 km, and the transportation method applied is a EURO6 truck.

A5 Installation

No activity is modelled here as the installation is done manually by hand. However, the treatment of packaging waste is modelled here in accordance with PCR 2019:14 v.1.3.4, based on the Swedish scenario that 75% of cardboard is recycled and the remaining waste streams after recycling is sent to either landfill (1.4% of remaining material) or incineration (98.6%) based on the PEF R2 recycling rates (European Commission, 2021).

Modules B1, B2, B3, B5, and B7

There is no activity modelled for the use phase (module B1), as the electricity consumption of the product is modelled in module B6. For modules B2 (maintenance), B3 (repair), B5 (refurbishment), and B7 (water use), no activity is modelled as it is not relevant for the products.

B4 Replacement

Over the course of the product lifetime of 15 years, some parts of the product are replaced. The parts replaced are the micro-switch, cable lugs, terminal screws, retaining washers, and spring.

B6 Energy use

This chapter covers the electricity consumption during product usage. When the product is used, i.e. when a person presses the elbow switch, the micro-switch closes the circuit and an electrical signal is transferred through to open the door. The product itself does not use electricity, only opens/closes the circuit through the micro-switch. When the elbow switch is pressed, it is the only

time when electricity is transferred through the system for operating, whereas the remainder of the time the product is idle.

To calculate the electricity consumption during use of the product, the maximum power available is based on the specifications 24V and 6A (AC), resulting in 0.14 kW. Assuming the activation duration lasts approximately 2 seconds whenever the elbow switch is triggered, the energy consumption per usage is approximately 0.14 kW * 2/3600 hours = 0.00008 kWh. This value is used to model the electricity consumption per use.

C1 Deconstruction

The product is manually dismantled at the end-of-life and therefore no activity is modelled in this module.

C2 Transport to waste processing

The transportation to waste treatment facility is assumed to be 50km, however this value can vary significantly depending on where the customer is located.

C3 Waste processing for reuse, recovery and/or recycling

The waste pre-processing scenario is modelled based on the treatment of the frames (as they represent a significant portion of the product weight), prior to recycling. The ABS frames are assumed to be collected, sorted, and prepared for recycling as post-consumer thermoplastic. For JCK107 and 110, the steel plate was also modelled for pre-processing, considering the collection and treatment of metal scrap prior to post-consumer recycling. For the other materials, no pre-processing was assumed to be done prior to recycling and final disposal.

After the recycling stream of the materials are separated, the remaining materials are either sent to landfill, or incineration.

C4 Final disposal

Module C4 represents the landfilling and incineration of the remaining materials that was not sent to recycling. The end-of-life treatment for the materials are based on the PEF R2 recycling rates and final disposal for Sweden, as described for module A5 (treatment of product packaging waste). The corresponding rates of end-of-life treatment can be seen in the table below:

Table 3: Overview of end-of-life treatment for material types used as input in the products

Activity	Share of materials	Comment
Recycling	Ferro metals – 81.0%	Based on PEF R2 recycling rate.
	Plastics – 53.2%	Based on PEF R2 recycling rate.
Landfill	Ferro metals – 0.3%	Based on landfill rate for Sweden from PEF R2 recycling rate. Landfill rate is 1.4% of material not recycled. Therefore, the values in this table is calculated by taking the amount remaining after recycling and multiplying by 1.4%.
	Plastics – 0.6%	
Incineration	Ferro metals – 18.7%	Based on incineration rate for Sweden from PEF R2 recycling rate. Landfill rate is 98.6% of material not recycled. Therefore, the values in this table is calculated
	Plastics – 46.2%	

	by taking the amount remaining after recycling and multiplying by 98.6%.

D Benefits and loads beyond the product system

The scenario for module D is calculating the net benefits and loads of avoiding production of new ABS and steel based on the recycling rate of the materials described in chapter 4.3.13.

The D module is calculated with a formula originally proposed in EN 15804 and adjusted with a factor for material yield (Y) in PCR:2019:14.

Formula for calculating net benefits and loads for export of secondary materials (recycling of materials): $e_1 = \Sigma Y \bullet (M_{MR,out} - M_{MR,in}) \bullet (E_{MR\ after\ EoW\ out} - E_{VM\ Sub\ out} \bullet \frac{Q_{R,out}}{Q_{Sub}})$ (Eq.1)

No benefits or loads from export of energy. The difference between the secondary material (SM) is attributed as a bonus or load (All modules):

Table 4: Incoming and exiting secondary material

Product	Incoming post-consumer SM, in kg	Exiting SM, in g
JCK103, 105, 107, 109, 110 (ABS)	0	110
JCK203, 205, 209, 211, 212 (ABS)	0	118
JCK107, 110 (Steel plate)	0	55

System diagram

The studied system is a type b) EPD in PCR 2019:14 v. 1.3.4 (Cradle-to-gate with options module C1-C4, module D and optional modules A4, A5, and B1-B7). Module A1 is represented by the extraction and processing of raw materials and components prior to being transported (module A2) to JC Kontakter ABs manufacturing facility in Gothenburg. Module A3 represents the processing of the materials and assembly of the components to the final product before being packaged and sent to customer (A4). Module A5 consists solely of the waste treatment of the product packaging.

Modules B1-B7 represents the use phase of the product. Module C1-C4 includes the dismantling of the product (done manually so there is no activity modelled), transport to waste processing, waste processing and eventually the final disposal of the materials that are not recycled. See the figure below for an overview of the modules.

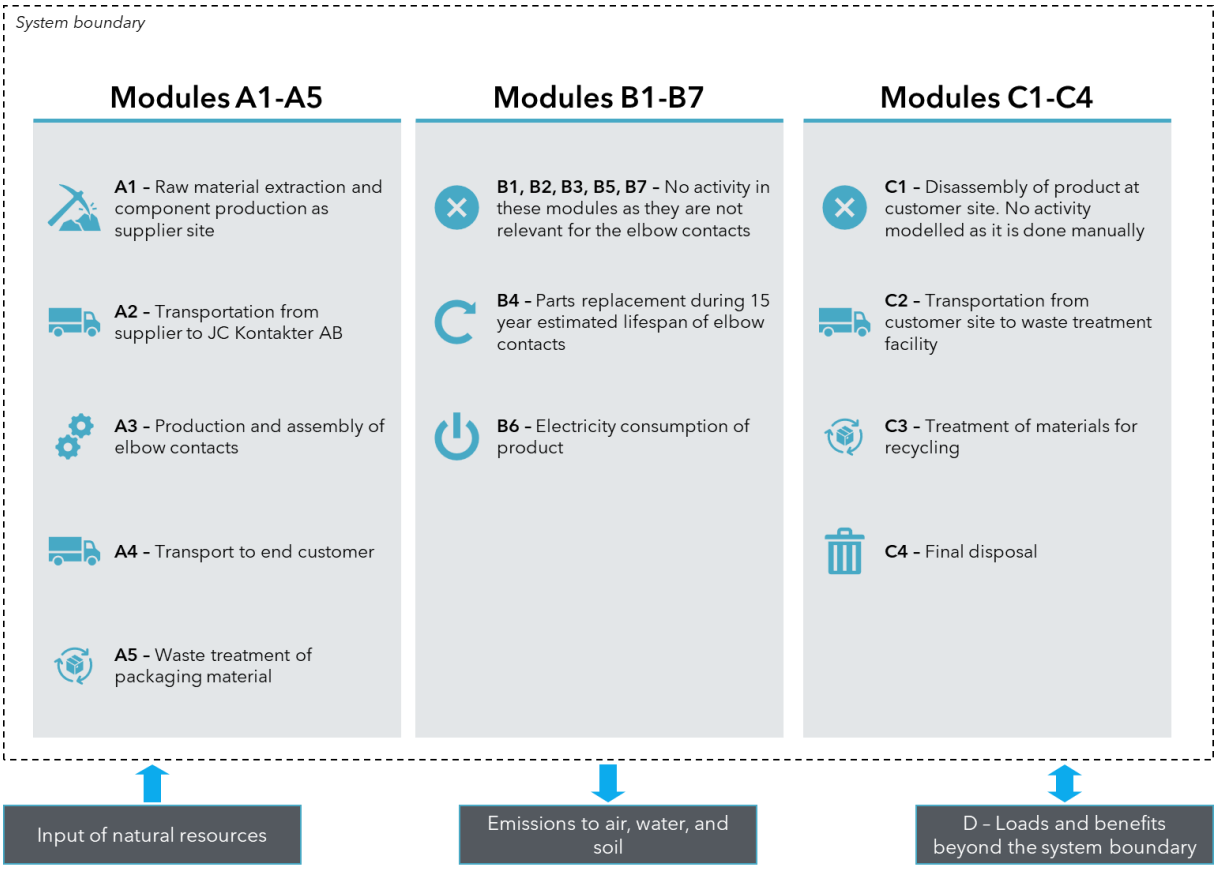

Figure 1: Included modules in the system boundary and exchange to nature

The system boundary to nature is set to include those processes that provide the material and energy inputs into the system and the following manufacturing, and transport processes up to the factory gate as well as the processing of any waste arising from the processes. Note that infrastructure is included as part of the ecoinvent 3.10 datasets, including e.g. infrastructure in electricity generation.

Assumptions

This chapter deals with general assumptions that are used throughout the LCA study.

- Road transports not under JC Kontakter ABs control are assumed to be performed by Euro 6 class vehicles.

Cut-off rules

The cut-off criteria are in accordance with PCR 2019:14 v. 1.3.4 (The International EPD Programme, 2024), therefore a maximum of 1% of the renewable and non-renewable primary energy use and max 1% of the total mass input of a specific unit are excluded. For a full module, the combined cut-off of all unit processes do not exceed 5%. Particular care should be taken to include materials or processes that have the potential to cause significant emissions into air, water, or soil for any of the declared LCIA categories. No cut-offs were implemented in this LCA except for the cut-off defined in the EN15804+A2:2019 EPD used as input, as they are indirectly included by extension in this LCA.

Allocation

The A3 flows for electricity and consumable consumptions were allocated based on the amount of units produced. Since the products have similar economic value, application of allocation based on amount of units produced is permitted in accordance with PCR 2019:14 v. 1.3.4 (The International EPD Programme, 2024).

The allocation is calculated by taking the total value of the electricity, measured by reading values from the devices, divided by the reported total amount of products processed at each device. Through this calculation, the amount of electricity per product is retrieved.

An allocation procedure for the consumables was used as well, where the lubricant for the sawing machine is divided over the total amount of JCK 207, 217, and 218 products over one year. This is a conservative assumption as there are other products that use the machine, however the amount of lubricant per declared unit is almost negligible and therefore considered acceptable.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

Table 5: Declared modules for the life cycle

Product stage				Construction process stage		Use Stage							End of life stage					Resource recovery stage
Raw Material Supply	Transport to manufacturing	Manufacturing	Transport to customer	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / Demolition	Transport to waste management	Waste processing	Final Disposal	Reuse – Recovery – Recycling - potential		
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**	
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Geography	GLO	GLO	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	
Specific data used	9.5%																	
Variation - Products	+44.4%																	
Variation - Sites	0%																	

X = Module declared
ND = Module not declared

The specific data was calculated by taking the GWP-GHG impacts from the energy flows covered in module A3 and dividing it by the total A1-A3 impact.

The variation between products is calculated by taking the GWP-GHG impact for modules A1-A3 for the weighted average and comparing with the highest GWP-GHG impact for all products covered in the LCA in accordance with PCR 2019:14 v.1.3.4. The variation in sites is set to 0% as the study only looks at one production site.

The variation in products is significantly higher than the 10% stated in PCR 2019:14 v. 1.3.4, however, for the products covered in this EPD, almost all the produced products are below the weighted average impact for products with ABS frame. Therefore, it is considered acceptable to cover the products in the same EPD.

Description of production activities

This chapter describes the production of the elbow switches of this EPD in further detail. All modules declared are represented by one or several datasets, with the exception of modules B1, B2, B3, B5, B7, and C1, which have no activities included.

The end-of-waste (EoW) criteria are applied as described in Annex B of EN 15804+A2:2019. No burdens are declared for material that has reached the EoW point for flows exiting the system boundaries for JC Kontakter AB. As these flows are generally part of modules A1-A3, they must be dealt with through allocation unless it can be avoided. However, since there is no waste generated in these modules that exit the system boundary, there is no allocation required.

Raw materials and components are sent from various supplier sites to the JC Kontakter's production facility in Gothenburg Sweden. The components are either sanded or cut into the correct specifications depending on the product, e.g. sanding the steel plate to specification. The components are then assembled together to produce the elbow contact.

Once the product is assembled, it is packaged into cardboard boxes and sent to be transported to the customers. The cable waste from the manufacturing process is collected and sold to companies specialized in recycling.

The end-of-life phase is modelled using relevant scenarios combined with generic datasets representative of the region, in this case Sweden.

Content declaration

Below is an overview of the purchased materials that end up in the final product, presented as amount per declared unit. Each product covered in this EPD is presented below. The values presented are the average amounts, as well as the ranges which are presented in parentheses. The ranges for certain product components are based on the lowest value and the highest value.

Table 6: Overview of input material, pre- and post-consumer scrap, and biogenic content in material

Product components	Weight, g	Post-consumer, recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/declared unit
Acrylonitrile-butadiene-styrene copolymer (ABS)	216 (206-221)	0%	0%	0
Copper	1.4	0%	0%	0
Polyvinyl chloride (PVC)	0.8	0%	0%	0
Silicon	2.5	0%	0%	0
Brass	2.5	0%	0%	0
Galvanized steel	3.0	0%	0%	0
Tin	<0.1	0%	0%	0
Steel, low-alloyed	0.7	0%	0%	0
Stainless steel	16 (0-103)	0%	0%	0
Total product weight	242 (216-321)			

No Substances of Very High Concern (SVHC) in accordance with the Candidate List of SVHC from the European Chemicals Agency that constitutes more than 0.1% of the weight of the product is included in the products. For packaging material, see the table below:

Table 7: Overview of packaging material used for end products

Packaging materials	Weight, g	Weight-% (versus product)	Biogenic material, kg C/product
Corrugated board	38.7	12-18%	0.14
EU Pallet	8.3	3-4%	0.03
Total weight of packaging	47	19 (15-22%)	0.17

Results of performance indicators

When analysing the results, the impacts from all modules should be considered. The estimated impact results provide an indication, but should be seen as relative statement, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity non-cancer, and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is due to the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological, and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making processes.

Mandatory LCIA indicator results

This chapter presents all results that are mandatory to present in the LCA end EPD report of an EPD according to EN 15804+A2. All results shown are per declared unit and represent the weighted average. All referenced emission factors are based on the environmental footprint package 3.1 (E.F. 3.1).

The results for A1-A3 should not only be analysed at face value without considering the impacts represented by module C.

Module D presents negative values for almost all indicators, indicating a potential benefit of recycling the material used for the frames in the product as opposed to producing new frames, based on the scenario described previously.

Table 8: Mandatory impact category results for weighted average results. Results are presented per declared unit.

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP - Fossil	kg CO2 eq	1.73E+00	1.13E-02	1.76E-02	0.00E+00	0.00E+00	0.00E+00	2.45E-01	0.00E+00	4.04E-05	0.00E+00	0.00E+00	3.89E-05	6.57E-02	2.37E-01	-3.91E-01
GWP- Biogenic	kg CO2 eq	5.34E-03	7.64E-06	3.86E-02	0.00E+00	0.00E+00	0.00E+00	1.65E-02	0.00E+00	7.83E-07	0.00E+00	0.00E+00	2.86E-07	1.81E-02	1.03E-04	0.00E+00
GWP- Land use and LU change	kg CO2 eq	8.37E-03	3.77E-06	2.86E-06	0.00E+00	0.00E+00	0.00E+00	3.63E-04	0.00E+00	3.35E-07	0.00E+00	0.00E+00	1.30E-08	4.93E-05	8.93E-07	-8.73E-06
GWP - total	kg CO2 eq	1.75E+00	1.13E-02	5.61E-02	0.00E+00	0.00E+00	0.00E+00	2.62E-01	0.00E+00	4.15E-05	0.00E+00	0.00E+00	3.92E-05	8.39E-02	2.37E-01	-3.91E-01
Ozone depletion	kg CFC11 eq	3.50E-08	2.25E-10	1.87E-11	0.00E+00	0.00E+00	0.00E+00	1.31E-08	0.00E+00	1.60E-12	0.00E+00	0.00E+00	7.75E-13	1.05E-09	7.79E-11	-1.86E-10
Acidification	mol H+ eq	1.21E-02	2.36E-05	1.19E-05	0.00E+00	0.00E+00	0.00E+00	2.19E-03	0.00E+00	2.71E-07	0.00E+00	0.00E+00	8.11E-08	2.32E-04	5.11E-05	-1.38E-03
Eutrophication, freshwater	kg P eq	7.26E-05	8.84E-08	3.07E-08	0.00E+00	0.00E+00	0.00E+00	2.76E-05	0.00E+00	1.07E-09	0.00E+00	0.00E+00	3.04E-10	1.60E-06	4.97E-08	-6.18E-06
Eutrophication, marine	kg N eq	2.46E-03	5.52E-06	5.79E-06	0.00E+00	0.00E+00	0.00E+00	1.89E-04	0.00E+00	7.64E-08	0.00E+00	0.00E+00	1.90E-08	7.41E-05	2.51E-05	-2.16E-04
Eutrophication, terrestrial	mol N eq	3.11E-02	6.11E-05	5.54E-05	0.00E+00	0.00E+00	0.00E+00	2.35E-03	0.00E+00	1.03E-06	0.00E+00	0.00E+00	2.10E-07	7.41E-04	2.57E-04	-2.15E-03
Photochemical ozone formation	kg NMVOC eq	8.54E-03	3.92E-05	1.45E-05	0.00E+00	0.00E+00	0.00E+00	7.53E-04	0.00E+00	2.31E-07	0.00E+00	0.00E+00	1.35E-07	3.01E-04	6.45E-05	-1.01E-03
Resource use, minerals, and metals[1]	kg Sb eq	2.80E-05	3.68E-08	2.78E-09	0.00E+00	0.00E+00	0.00E+00	2.26E-05	0.00E+00	1.42E-10	0.00E+00	0.00E+00	1.27E-10	3.59E-07	9.79E-09	-8.16E-07
Resource use, fossils[1]	MJ	5.42E+01	1.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.59E+00	0.00E+00	9.98E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.43E+00
Water use[1]	m3 depriv.	3.68E+00	8.98E-04	1.15E-03	0.00E+00	0.00E+00	0.00E+00	2.67E+00	0.00E+00	1.31E-04	0.00E+00	0.00E+00	6.14E-07	3.08E-03	4.45E-04	-2.21E-01

[1] The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.

Additional LCIA indicator results

This chapter presents all indicators that are mandatory to present in the LCA report but optional to present in the EPD according to EN 15804+A2.

Table 9: Additional impact category results for weighted average results. Results are presented per declared unit

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	disease inc.	1.23E-07	8.30E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	7.61E-09	0.00E+00	3.13E-12	0.00E+00	0.00E+00	2.27E-12	3.90E-09	2.29E-10	-1.98E-08
Ionising radiation[2]	kBq U-235 eq	9.86E-01	7.35E-05	7.45E-06	0.00E+00	0.00E+00	0.00E+00	6.80E-02	0.00E+00	3.57E-04	0.00E+00	0.00E+00	2.53E-07	1.09E-03	4.39E-05	-6.52E-04
Ecotoxicity, freshwater[1]	CTUe	9.60E+00	4.34E-02	7.56E-02	0.00E+00	0.00E+00	0.00E+00	3.36E+00	0.00E+00	1.60E-04	0.00E+00	0.00E+00	1.49E-04	5.36E-01	5.16E-01	-1.05E+00
Human toxicity, cancer[1]	CTUh	8.72E-09	8.04E-11	2.24E-11	0.00E+00	0.00E+00	0.00E+00	3.08E-09	0.00E+00	2.01E-13	0.00E+00	0.00E+00	2.76E-13	8.36E-10	4.16E-11	-5.71E-10
Human toxicity, non-cancer[1]	CTUh	3.41E-08	1.03E-10	2.12E-10	0.00E+00	0.00E+00	0.00E+00	1.90E-08	0.00E+00	7.57E-13	0.00E+00	0.00E+00	3.44E-13	7.35E-10	5.43E-10	-7.30E-10
Land use[1]	Pt	6.85E+01	9.62E-02	8.11E-03	0.00E+00	0.00E+00	0.00E+00	1.36E+00	0.00E+00	3.31E-03	0.00E+00	0.00E+00	3.31E-04	6.90E-01	1.13E-02	1.46E-01

GWP-GHG according to IPCC 2021

This chapter presents the results according to IPCC 2021 without any biogenic uptake.

Table 10: GWP-GHG results for weighted average results. Results are presented per declared unit.

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP - GHG	kg CO2 eq	1.74E+00	1.13E-02	1.76E-02	0.00E+00	0.00E+00	0.00E+00	2.45E-01	0.00E+00	4.07E-05	0.00E+00	0.00E+00	3.90E-05	6.57E-02	2.37E-01	-3.91E-01

Use of resources

This chapter presents the use of material and energy resources by the product system. The results are based on option A in annex 3, guidance to calculating the primary energy use indicators as described in PCR 2019:14 v.1.3.4 (The International EPD Programme, 2024). As described in the PCR, in option A the energy use as raw materials is declared as input to the module where it enters the product system and as an equally large output from the product system where it exits the product system. Outputs in the form of waste is reported as an input in the indicator for energy used as energy carriers. Note that the results presented below is based on background data from the EN 15804 library in SimaPro 9.6.

Table 11: Use of resources for weighted average results. Results are presented per declared unit

Impact category		Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Primary Energy Resources - Renewable	Use as energy carrier	MJ	2.10E+01	2.73E-03	4.05E-04	0.00E+00	0.00E+00	0.00E+00	1.14E+00	0.00E+00	9.87E-04	0.00E+00	0.00E+00	9.41E-06	4.80E-02	2.25E-03	-1.06E-01
	Used as raw materials	MJ	6.44E-01	0.00E+00	-6.44E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total	**MJ**	**2.17E+01**	**2.73E-03**	**-6.43E-01**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**1.14E+00**	**0.00E+00**	**9.87E-04**	**0.00E+00**	**0.00E+00**	**9.41E-06**	**4.80E-02**	**2.25E-03**	**-1.06E-01**
Primary Energy Resources - Non-Renewable	Use as energy carrier	MJ	5.42E+01	1.59E-01	1.86E-05	0.00E+00	0.00E+00	0.00E+00	3.60E+00	0.00E+00	9.98E-03	0.00E+00	0.00E+00	4.64E-08	1.88E-04	3.47E-06	-8.43E+00
	Used as raw materials	MJ	2.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.90E+00	0.00E+00
	Total	**MJ**	**5.71E+01**	**1.59E-01**	**1.86E-05**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**3.60E+00**	**0.00E+00**	**9.98E-03**	**0.00E+00**	**0.00E+00**	**4.64E-08**	**1.88E-04**	**-2.90E+00**	**-8.43E+00**
Other categories	Secondary Material	kg	5.73E-02	7.39E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.84E-03

[2] 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Renewable Secondary Fuels	MJ	1.03E-02	9.34E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-04	0.00E+00	1.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.06E-05
Non-Renewable Secondary Fuels	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net Use of Fresh Water	m³	9.07E-02	2.21E-05	3.46E-05	0.00E+00	0.00E+00	0.00E+00	6.34E-02	0.00E+00	3.21E-06	0.00E+00	0.00E+00	3.45E-08	1.26E-04	2.50E-04	-5.19E-03

Waste production

This chapter presents all the waste that is generated in the product system. Since ecoinvent is used as the main database, the waste management is contained within the system boundaries and no waste generation is reported[3].

Table 12: Waste generated exiting the system boundary. Results are presented per declared unit.

Waste production	Unit	All modules
Hazardous Waste Disposed	Kg	0.00+00
Non-Hazardous Waste Disposed	Kg	0.00+00
Radioactive Waste Disposed	Kg	0.00+00

Output flows

This chapter presents flows that exit the system boundary that are not waste.

Table 13: Other flows exiting the system boundary for weighted average results. Results are presented per declared unit.

Waste production	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for reuse	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	1.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	3.21E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	2.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	1.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[3] A detailed description of this can be read at the bottom of this page: https://www.environdec.com/resources/indicators

Biogenic carbon content

This chapter presents the carbon content in the products and the packaging, for details about the biogenic content in the product see chapter content declaration.

Variation in impact indicators

This chapter presents the variation in each impact indicator result in accordance with PCR 2019:14 v.1.3.4. The largest impact per indicator is compared to the weighted average results.

Table 14: Variation in impact indicators

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP - Fossil	kg CO2 eq	145%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	87%
GWP-Biogenic	kg CO2 eq	182%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	112%	102%	N/A
GWP- Land use and LU change	kg CO2 eq	115%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	107%	-209%
GWP - total	kg CO2 eq	143%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	102%	87%
Ozone depletion	kg CFC11 eq	124%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	102%	-32%
Acidification	mol H+ eq	137%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	82%
Eutrophication, freshwater	kg P eq	147%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	75%
Eutrophication, marine	kg N eq	137%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	102%	81%
Eutrophication, terrestrial	mol N eq	134%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	79%
Photochemical ozone formation	kg NMVOC eq	138%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	84%
Resource use, minerals, and metals	kg Sb eq	152%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	106%	102%	0%
Resource use, fossils	MJ	120%	132%	N/A	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	N/A	N/A	N/A	91%
Water use	m3 depriv.	106%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	91%
Particulate matter	disease inc.	151%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	113%	82%
Ionising radiation	kBq U-235 eq	110%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	101%	-29%
Ecotoxicity, freshwater	CTUe	173%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	102%	63%
Human toxicity, cancer	CTUh	280%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	102%	105%	-60%
Human toxicity, non-cancer	CTUh	142%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	104%	102%	4%
Land use	Pt	121%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	108%	133%	216%
GWP - GHG	kg CO2 eq	144%	132%	100%	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	101%	102%	87%

The table above also shows a higher difference compared to the 10% threshold defined in PCR 2019:14 v.1.3.4, however, as mentioned in chapter 3.2.3, approximately 84% of the products covered present lower indicator results than the weighted average, and it is therefore considered acceptable to group the products in this manner.

Additional Environmental Information

In order to evaluate the GWP-GHG results of each product covered in this LCA and subsequent EPD, conversion factors for each variant of the product is presented below, in accordance with PCR 2019:14 v. 1.3.4. The conversion factors N/A at some modules represent the omittance of any activity modelling in the module, therefore the factor would be 0 divided by 0 and mathematically incorrect.

Table 15: Conversion factors for each product variation.

Product	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
JCK103, 105, 109	Kg CO2 eq	0.88	0.89	1.00	N/A	N/A	N/A	1.00	N/A	1.00	N/A	N/A	1.00	0.94	0.95	0.87
JCK107, 110	Kg CO2 eq	1.44	1.32	1.00	N/A	N/A	N/A	1.00	N/A	1.00	N/A	N/A	1.00	1.00	0.96	1.42
JCK203, 205, 209, 211, 212	Kg CO2 eq	0.92	0.95	1.00	N/A	N/A	N/A	1.00	N/A	1.00	N/A	N/A	1.00	1.01	1.02	0.93

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