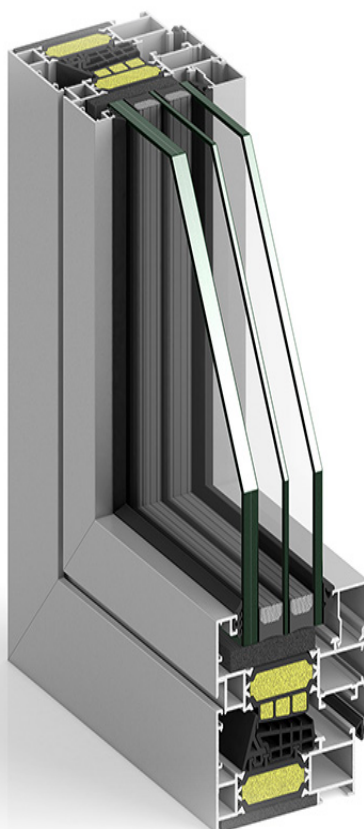


# ENVIRONMENTAL PRODUCT DECLARATION STRUGAL



In accordance with ISO 14025 and EN 15804-2012+A2:2019 for

**ALUMINIUM WINDOWS: STRUGAL S53RP+, STRUGAL S64RP, STRUGAL S64RP HO, STRUGAL S74RP, STRUGAL S74RP HO, STRUGAL S82RP, STRUGAL S82RP HO, STRUGAL S88RP and STRUGAL S140RP Infinity**



EPD Program  
Programme operator  
CPC Code  
Based on  
Declaration number  
Publication date  
Valid until  
Market coverage

The International EPD® System. [www.environdec.com](http://www.environdec.com)

EPD International AB

42120 Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium

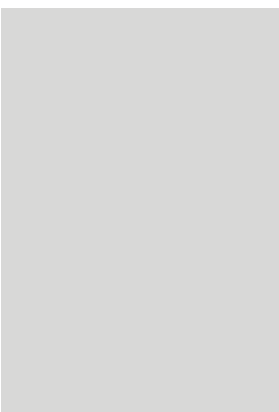
PCR 2019:14 Construction Products v1.0 and C-PCR-007 (to PCR 2019:14) Windows and Doors (EN 17213:2020) version:2020-04-09

S-P-05211

2022-01-10

2027-01-10

Worldwide



# STRUGAL

At STRUGAL, we have been providing innovative solutions for building and industry for over 40 years. With a marked commitment to our customers and our environment, we are a clear reference in aluminium carpentry systems and façades for architects and developers, always seeking the satisfaction of our customers and the well-being of the end user.

We are constantly innovating, both in technological investment, in manufacturing processes and in the design of new products, trying to be at the forefront of the sector, improving every day.

With 6 production plants, its own technological center and international presence, STRUGAL is a company with headquarters at Alcalá de Guadaira, Sevilla. We have more than 300,000 m<sup>2</sup> of facilities, 1,500 employees in our production plants, 18 distribution centres and offices. We offer solutions for architecture and industry.

We offer a wide variety of products for the building industry, such as aluminium profiles, aluminium finished windows, PVC finished windows, aluminium doors, solar protection systems and light fronts.

Our systems meet the highest expectations in terms of quality and design, and STRUGAL provides a comprehensive service to the manufacturer-installer. From the profile, an infinite number of finishes and a wide range of accessories, to the corresponding tests, complying at all times with the regulations in force.

# PRODUCT

## Product description

The products included in this EPD are aluminium windows assembled from extruded coated/anodised aluminium profiles with thermal break manufactured by STRUGAL. The window systems declared are specific to the different series designed by STRUGAL, which include hinged and sliding windows with different glazing.

The windows are used as enclosures for openings in building facades, although they can also be installed indoors.

## Composition

The windows consist of a frame assembled from coated/anodized aluminium profiles with thermal break. The thermal break is made by means of a reinforced polyamide strip sandwiched between two aluminium profiles. The leaf that houses the insulating glass unit (IGU) is also assembled from aluminium profiles.

Sash and frame are assembled using alignment brackets, joint brackets, fasteners, and other components known as fittings. Among these are also the systems that allow the opening of the leaf (handle, hinges, tilt-and-turn mechanism, etc.). To guarantee the air and water tightness of the window, gaskets made of EPDM and other plastic materials are installed.

The results of this EPD are representative for the following products: hinged windows, series STRUGAL S53RP+, STRUGAL S64RP, STRUGAL S64RP HO, STRUGAL S74RP, STRUGAL S74RP HO, STRUGAL S82RP, STRUGAL S82RP HO; and sliding windows, series STRUGAL S88RP and STRUGAL S140RP Infinity.

The technical data of the declared products as well as their composition are shown in the following tables. None of the declared window systems contain substances included in the list of Substances of Very High Concern with a concentration of more than 0.1% by weight.

	STRUGAL S53RP+	STRUGAL S64RP	STRUGAL S64RP HO	STRUGAL S74RP	S STRUGAL 74RP HO	STRUGAL S82RP	STRUGAL S82RP HO	STRUGAL S88RP	STRUGAL S140RP Infinity
Frame thickness (mm)	53	64	64	74	74	82	82	74	137
Thermal break (mm)	24	24	24	34	34	42	42	34	34
IGU	6/16Arg/ 33.1 BE	6/16Arg/ 33.1 BE	6/14Arg/ 33.1 BE	6/18Arg/ 44.1 BE	4/12Arg/4 /12Arg/4 BE	6/12Arg/4 /12Arg/33.1	6/14Arg/4 /14Arg/33.1	66.1/12Arg /44.1 BE	44.1/16Arg/ 44.1 BE
Thermal insulation, frame-sash (W/m <sup>2</sup> K) UNE-EN 10077-2	2,7	2,7	2,9	1,6	2	1,4	1,8	3,1	2,7
Thermal insulation (W/m <sup>2</sup> K) UNE-EN 10077-2	2,1	2,1	1,9	1,6	1,6	1,5	1,6	2,1	2
Air tightness UNE-EN 12207	Clase 4	Clase 4	Clase 4	Clase 4	Clase 4	Clase 4	Clase 4	Clase 4	Clase 3
Water tightness UNE-EN 12208	E1500	E2100	E1650	E2400	E2100	E2100	E1650	7A	7A
Acoustic insulation R <sub>w</sub> UNE-EN ISO 14351-1 (1)	34 dB	34 dB	34 dB	34 dB	34 dB	34 dB	34 dB	33 dB (2)	27 dB
Wind load resistance UNE-EN 12210	C5	C5	C5	C5	C5	C5	C5	C5	C3

(1) Annex B (2) UNE-EN ISO 10140-2

## Packaging

The windows are generally transported directly to the building site from carpentry in trucks or vans. These vehicles usually have an inverted “V” pallet, so that the windows are placed vertically during the journey. Windows are separated from each other by cardboard sheets or corners. The windows can be protected with plastic film and secured with straps or other elements. These packaging materials are included in the scope of this EPD.

## Reference service life and use phase

According to the recently approved standard EN 17213 a reference service life of 30 years is assumed without IGU replacement.

## Recycling and disposal

Aluminium products are highly recyclable. During aluminium profile production, all post-industrial scrap (extrusion drop-offs from cutting, unfit material and discards, etc.) is fed back into the billet production process. Proceed in the same way with the aluminum cutouts generated during the assembly of the window.

When an aluminium building product reaches the end of its life, it is systematically and selectively collected and sent to recycling facilities for secondary billet production. A collection rate for aluminium products next to 95% is well documented in construction sector and included as default value in EN 17213. Finally, recycling rate depends

	STRUGAL S53RP+	STRUGAL S64RP	STRUGAL S64RP HO	STRUGAL S74RP	S STRUGAL 74RP HO	STRUGAL S82RP	STRUGAL S82RP HO	STRUGAL S88RP	STRUGAL S140RP Infinity
<b>Aluminium profile</b>	<b>19.36 kg</b>	<b>22.12 kg</b>	<b>19.33 kg</b>	<b>23.43 kg</b>	<b>22.17 kg</b>	<b>24.62 kg</b>	<b>23.13 kg</b>	<b>19.23 kg</b>	<b>21.52 kg</b>
Aluminium	16.46	18.68	16.88	18.91	18.58	18.91	18.58	16.05	18.97
Polyamide + fiber glass	2.08	2.54	1.75	3.61	2.83	4.80	3.79	2.47	1.74
Coating powder	0.82	0.89	0.69	0.90	0.75	0.90	0.75	0.72	0.80
<b>IGU</b>	<b>39.80 kg</b>	<b>41.08 kg</b>	<b>43.65 kg</b>	<b>47.73 kg</b>	<b>44.92 kg</b>	<b>54.87 kg</b>	<b>59.14 kg</b>	<b>68.44 kg</b>	<b>59.13 kg</b>
Flat glass	18.59	19.20	20.57	19.20	27.42	32.00	34.28	39.42	27.87
Flat glass (low-e)	18.59	19.20	20.57	25.60	13.71	19.20	20.57	26.28	27.87
Aluminium	0.47	0.47	0.44	0.51	0.65	0.63	0.73	0.39	0.49
Polybutadiene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Zeolite	1.01	1.03	0.92	1.15	1.58	1.54	1.84	0.76	1.06
Argon	0.03	0.03	0.03	0.04	0.05	0.05	0.06	0.03	0.04
Polysulfide	0.60	0.60	0.54	0.68	0.93	0.91	1.08	0.45	0.63
PVB	0.51	0.53	0.57	0.53	0.57	0.53	0.57	1.09	1.15
<b>Gasket and fittings</b>	<b>4.90 kg</b>	<b>5.42 kg</b>	<b>5.41 kg</b>	<b>7.89 kg</b>	<b>7.17 kg</b>	<b>8.72 kg</b>	<b>7.60 kg</b>	<b>6.84 kg</b>	<b>13.20 kg</b>
EPDM	1.67	1.95	1.97	2.41	2.43	2.59	2.61	1.26	1.58
Zamak	1.25	1.18	1.18	1.14	1.14	1.14	1.14	0.27	1.31
Aluminium	1.02	1.12	1.12	1.17	1.14	1.17	1.14	0.83	2.48
Stainless steel	0.69	0.80	0.85	0.80	0.85	0.80	0.85	0.22	0.40
Steel	0.11	0.18	0.14	0.18	0.14	0.18	0.14	0.05	1.44
PA	0.08	0.03	0.03	0.03	0.03	0.03	0.03	0.08	0.63
Polyolefin	0.07	0.11	0.07	0.14	0.08	0.15	0.08	0	0
POM	6.50E-03	6.50E-03	6.50E-03	6.50E-03	6.50E-03	6.50E-03	6.50E-03	0.02	0
PVC	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.38	2.75
PP	0	0	0	0	0	0	0	1.65	1.92
TPE	0	0.04	0.04	0.04	0.04	0.04	0.04	0	6.00E-04
PIR	0	0	0	1.96	1.30	2.61	1.55	0	0.70
ABS	0	0	0	0	0	0	0	0.05	0
PE	0	0	0	0	0	0	0	0.02	0
<b>Secondary material</b>	<b>11.11 kg</b>	<b>12.61 kg</b>	<b>11.39 kg</b>	<b>12.76 kg</b>	<b>12.54 kg</b>	<b>12.76 kg</b>	<b>12.54 kg</b>	<b>10.83 kg</b>	<b>12.81 kg</b>
<b>Renewable material</b>	-	-	-	-	-	-	-	-	-
<b>Packaging</b>	<b>0.37 kg</b>								
Cardboard	0.16								
Plastic film	0.21								
Biogenic carbon	0.06 kg								

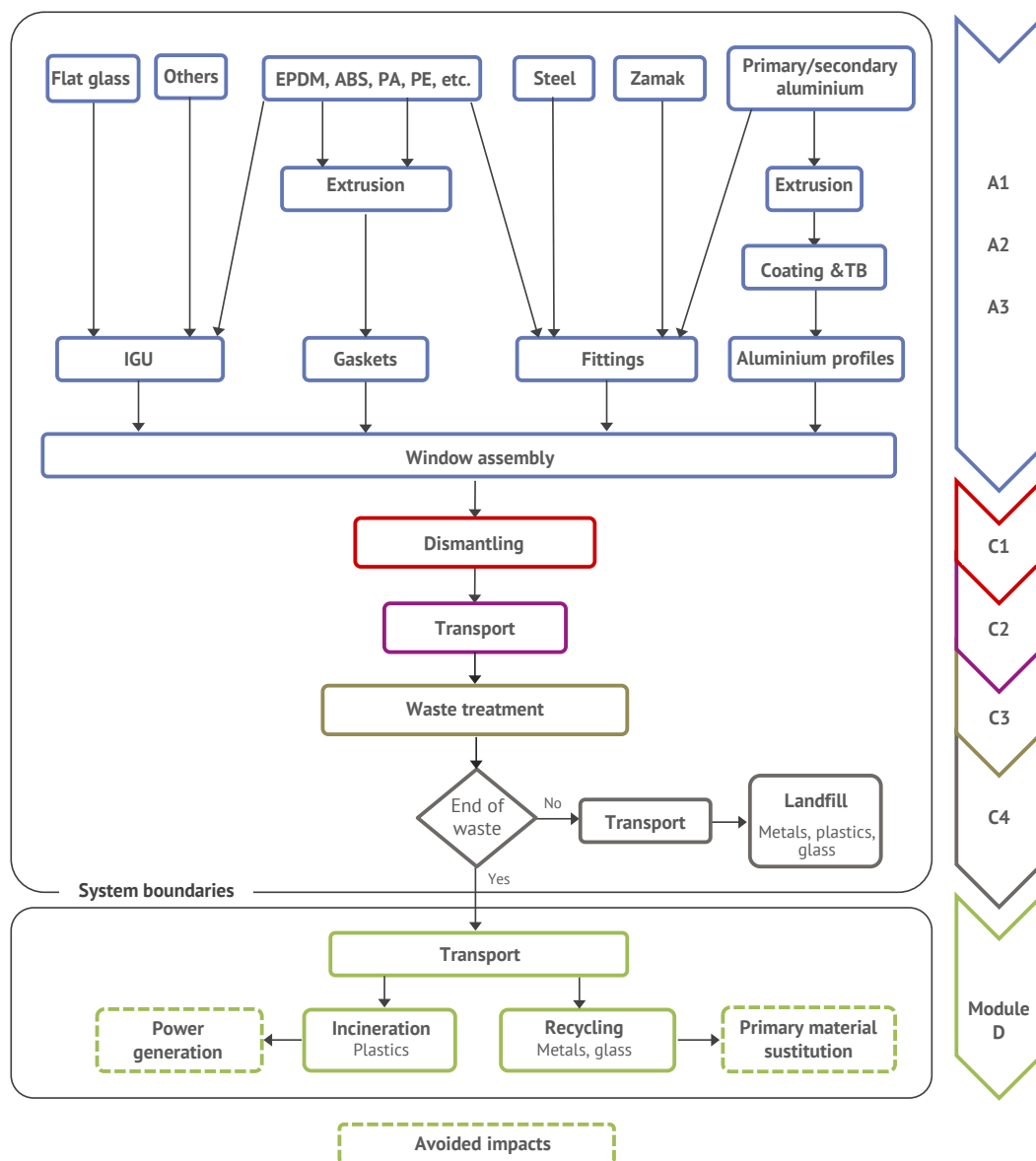
on smelting yield that includes metal losses during scrap preparation and melting.

Hence, aluminium supply at the beginning of the product system has a content of recycled material from post-industrial and post-consumer scrap with the consequent reduction of environmental burdens. In module D are reported only the net benefits of recycling, i.e. the burden savings at the end of life minus the benefits already considered in the module A1 due to secondary aluminium content. In this EPD, the scrap not collected at the end of life (5%) is sent to landfill.

For the rest of the components of the windows, i.e. IGU, fittings and gaskets, EoL scenarios have been setup according to default values specified in EN 17213.

## System boundaries

The scope of the study is set to be “Cradle-to-gate with options”. Processes included in the assessment are presented on the diagram below.



# LCA INFORMATION

## Declared unit

The declared unit is 1 m<sup>2</sup> of enclosure for façade openings (windows) with the technical characteristics shown on page 2 and a reference service life of 30 years. In accordance with EN 17213, the indicators declared in this EPD have been calculated on the basis of a standard window size of 1.23 m x 1.48 m. To obtain the environmental impacts and other parameters referring to 1 m<sup>2</sup> of product, these indicators were divided by the area of the window (1.84 m<sup>2</sup>).

## Goal and scope

This EPD evaluates the environmental impacts and parameters of 1 m<sup>2</sup> of window from cradle to gate with options (end of life and recycling). Hence, this is a cradle to gate EPD with C1-C2-C3-C4-D modules.

This EPD is the basis for B2B communication for customers and relevant stakeholders within the building sector.

## System boundaries

EThis EPD provides information on the production stage of the aluminium profiles (raw material supply, transport to plants and manufacturing), IGU, fittings and gaskets and their end-of-life. Recycling potential of aluminium and others materials with burdens saving due to use in a second product systems is also reported. The information is presented in a modular way separated in the following stages.

### A1-3 - Cradle to gate

The aggregation of the modules A1, A2 and A3 is allowed by EN 15804. This rule is applied in this EPD and denoted by A1-3. This module represents the manufacture and packaging of aluminium profiles (including extraction and processing of raw materials and the transport to production sites), the production of the rest of the components of the windows (IGU, fittings and gaskets), the transport of these components and the windows assembly. Packaging of windows is also included in this module.

### C1 - De-construction

No information was found in the life cycle databases consulted for the dismantling operations of windows, nor was there a bibliography regarding the inputs or residues generated during these operations. Then there is no contribution on impact categories of this module. In order to make the results tables lighter, this module is not shown.

Stage	Production			Construction		Use							End-of-life				Resource recovery
Module	Raw materials supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse, recovery or recycling potentials
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Declared module	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	ES	-	-	-	-	-	-	-	-	-	ES	ES	ES	ES	EU
Specific data	97%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND - Not declared

## C2 - Transport to waste processing

A distance of 200 km has been assumed for the transport to scrap dealers. Transport is calculated on the basis of a scenario with the parameters described in the attached table.

## C3 - Waste processing for reuse, recovery and/or recycling

It has been assumed that during the scrapping operations the same electricity is consumed as during the assembly of windows.

## C4 - Final disposal

End of life scenarios, routes for final disposal, recovery rates and efficiencies in recycling for all components are modelled based on default figures provided by EN 17213 (see attached table).

## D - Allocation by reuse, recovery or recycling

For aluminium profiles, module D report the environmental burden of recycled scrap generated at the end of life minus that used at the production stage. Scrap inputs to the production stage are subtracted from scrap to be recycled at end of life in order to obtain the net scrap output from the product system. This remaining net scrap is then sent to recycling. Loads and benefits are assessed at the point of functional equivalence, i.e. where the substitution of primary aluminium takes place.

This criteria is also applied in the case of other metals and glass that are sent to recycling.

For clarity in the results tables, only modules with a non-zero contribution to the impact categories and parameters stated in this EPD are shown.

## Time representativeness

All primary information used for the development of this EPD is based on production data for aluminium profiles manufactured in 2018, 2019 and 2020 by STRUGAL at its facilities. Data for IGU, hardware, seals and other environmental aspects generated during window assembly are based on information updated to 2020.

## Database(s) and LCA software used

For all processes included in the LCA study, the Ecoinvent 3.6 database has been used.

The LCA study was carried out using a model based on excel templates. For the life cycle impact assessment (LCIA) of the above mentioned processes, the characterisation factors of the EC-JRC EF 2.0 method available at <http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>.

## Data Quality

All the activity data pertaining to the nuclear processes were collected through surveys and meetings held with the technical managers of STRUGAL. Data were collected on production, consumption of raw materials and energy and the generation of waste, effluents and emissions. These inventories represent the average production of the aluminium profiles manufactured by STRUGAL and the window systems

### Parameters, C2 module

Transport by road <sup>(1)</sup>	Lorry, 17.3 t max payload
Diesel consumption (l/km)	0.221
Distance (km)	200
Volume capacity utilization	100%
Mass capacity utilisation	67%

(1) Technology mix, Euro 0, 1, 2, 3, 4

### Parameters, C3 module

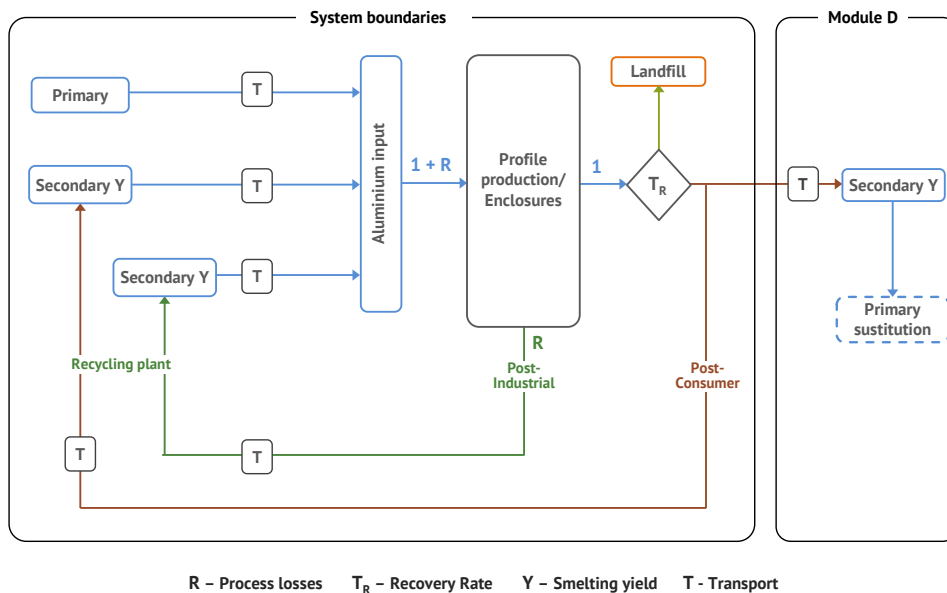
Energy carrier	Electricity, low voltage {ES}
Consumption (kWh) <sup>(1)</sup>	1.27

(1) For declared unit

### Parameters, C4 and D modules

Recovery rate for metals (recycling)	95%
Recovery rate for glass (recycling)	30%
Recovery rate for plastics (energy valorization)	95%
Metals and plastics to landfill	5%
Glass to landfill	70%
Efficiency for materials recycling	90%
Efficiency for energy valorization	60%





analysed. For those processes that are not under the control of the organisation, first-hand data from the aluminium sector were used to achieve the required accuracy, consistency and representativeness.

Specific regional databases have been used to include electricity, natural gas or diesel consumption in the life cycle inventory. For transport, raw material production or end-of-life processes, databases were chosen according to their technological and geographical representativeness of the actual process. Technological and geographical representativeness is ensured for all concerns included in the LCA, including those of greatest relevance to the final result. For example, for climate change, the technological representativeness of the processes that contribute 92% of the total value has been qualified as very good or good according to Annex E of the UNE EN 15804 standard. The environmental databases used are less than 3 years old.

## Estimates and Assumptions

During the preparation of the inventories, it was possible to distinguish the energy consumption assigned to the main stages of production of aluminium profiles: extrusion, coating and anodising. The electricity consumed in the incorporation of the TBB, in packaging, as well as in other common plant services, has been assigned to the total number of tonnes extruded. This assumption does not entail a significant loss of precision, as its impact on the final result has been found to be very low.

The surface treatments chosen to complete the coating and anodising processes are the most complete and those that require the use of the greatest amount of chemical products per square metre of surface treated, thus meeting a conservative criterion.

Information has been collected from STRUGAL's aluminium billet suppliers. In all cases, the geographical area of the manufacturer and the recycling content of all of them was taken into account. This recycling content amounts to 67%, which reduces the environmental impact of the incoming aluminium. This value also allows the balance of aluminium leaving the limits of the system to calculate the avoided impacts of module D.

All the aluminium scrap produced during the manufacturing of profiles together with the offcuts generated during the assembly of the windows (post-industrial scrap) is sent for recycling. Although this recycling process is in most cases carried out at a different location from where the scrap is generated, it has been modelled in all cases as an effective closed cycle as there is no loss of inherent properties of the aluminium during the process. In addition, the scrap is used in the production of the same products that generate it. Due to this circumstance, no load allocation has been carried out and it has been considered that the windows are the only product generated in module A1-3,



with no other co-product. In this way, all post-industrial aluminium scrap is free of charge when it enters the system again. In any case, it does include the transport to recycling of the scrap generated by STRUGAL and in the carpentries.

The materials and weight of the fittings and seals were obtained from the breakdown of the STRUGAL window systems. Not only the materials they are made of but also the manufacturing process such as extrusion or injection moulding in the case of plastic components or forging or machining in the case of metal components have been taken into account. In the case of UVA, the weight of some components such as glass, aluminium, zeolite, argon and sealants have been modelled from geometric calculations based on specifications together with density values obtained from material databases. Environmental aspects such as water and electricity consumed, or glass offcuts generated during the manufacturing of IGU, have been obtained from the ecoinvent database.

The assembly of the windows is not carried out by STRUGAL, but by carpentry companies, which have a production scale ranging from a few tens of windows per month to hundreds of windows per month. The aluminium profiles, fittings and seals are first transported to distribution centres and then, on request, to the carpentry shops. The assembly of the window requires the cutting and milling of the aluminium profiles. These operations are carried out dry, so no lubricants are used, while the shavings and offcuts are sent for recycling. The electricity consumed in these operations and the end of life of the aluminium profile packaging as well as the manufacture of the final window packaging materials have been included in the analysis. IGU is only installed once the window has been installed in the building and therefore follows a different route to the rest of the components, being sent directly to the building site from the glaziers.

In order to obtain the net aluminium output of the system at the end of the profiles' useful life, the scrap input at the production stage is subtracted from the scrap sent for recycling at the end of its useful life. In Module D, the environmental burdens and benefits of recycling the net scrap leaving the system are allocated. These environmental aspects have been assessed up to the point of functional equivalence (the point at which the replacement of primary aluminium takes place), i.e. the production of secondary aluminium billet. In this recycling process, the performance of the melting furnaces for each of the scrap fractions (anodised, coated and with TBB) has been taken into account.

# RESULTS

## STRUGAL S53RP+

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	111	1.50	0.351	0.313	-21.5	114	1.48	0.351	0.310	-21.0
	CC-total	kg CO <sub>2</sub> eq	114	1.51	0.358	0.322	-22.3	117	1.50	0.358	0.318	-21.8
	CC-fossil	kg CO <sub>2</sub> eq	113	1.51	0.354	0.321	-21.7	116	1.49	0.354	0.318	-21.2
	CC-biogenic	kg CO <sub>2</sub> eq	0.368	8.11E-04	1.23E-03	2.06E-04	-0.209	0.702	8.03E-04	1.23E-03	2.03E-04	-0.207
	CC-luluc	kg CO <sub>2</sub> eq	0.496	5.37E-04	3.15E-03	1.06E-04	-0.434	0.532	5.32E-04	3.15E-03	1.06E-04	-0.420
	OD	kg CFC-11 eq	2.49E-03	3.43E-07	3.92E-08	8.00E-08	-3.10E-06	1.13E-05	3.40E-07	3.92E-08	7.99E-08	-3.03E-06
	A	mol H <sup>+</sup> eq	0.813	4.33E-03	3.12E-03	1.56E-03	-0.190	0.819	4.29E-03	3.12E-03	1.55E-03	-0.187
	EAF	kg P eq	6.53E-03	1.21E-05	1.59E-05	2.85E-06	-1.18E-03	4.42E-03	1.19E-05	1.59E-05	2.85E-06	-1.16E-03
	EAM	kg N eq	0.126	8.58E-04	4.67E-04	4.87E-04	-2.71E-02	0.128	8.50E-04	4.67E-04	4.85E-04	-2.67E-02
	ET	mol N eq	1.32	9.60E-03	5.25E-03	5.20E-03	-0.310	1.36	9.50E-03	5.25E-03	5.19E-03	-0.307
	POF	kg NMVOC eq	0.399	3.68E-03	1.41E-03	1.60E-03	-0.094	0.400	3.64E-03	1.41E-03	1.60E-03	-0.092
	AD-non fossil	kg Sb eq	5.85E-02	4.17E-05	1.20E-06	6.34E-06	-4.57E-02	5.60E-02	4.12E-05	1.20E-06	6.33E-06	-4.57E-02
ADDITIONAL ENVIRONMENTAL IMPACTS	AD-fossil	MJ	1494	22.8	8.22	5.49	-403	1575	22.6	8.22	5.48	-395
	WU	m <sup>3</sup> eq	38.6	6.46E-02	0.240	0.110	-5.31	40.5	6.39E-02	0.240	0.110	-5.31
	PM	Disease incidence	2.49E-03	9.59E-08	7.96E-09	2.94E-08	-1.71E-06	8.03E-06	9.50E-08	7.96E-09	2.94E-08	-1.68E-06
	IR	kBq U235 eq	5.89	0.100	8.86E-02	2.31E-02	-2.89	7.24	0.099	8.86E-02	2.31E-02	-2.84
	EF	CTUe	4194	18.4	5.69	4.76	-684	5478	18.2	5.69	4.67	-680
	HT-c	CTUh	2.48E-03	5.12E-10	1.28E-10	1.54E-10	-6.40E-08	1.88E-07	5.07E-10	1.28E-10	1.54E-10	-6.23E-08
	HT-nc	CTUh	2.49E-03	1.94E-08	4.19E-09	3.96E-09	-8.98E-07	3.78E-05	1.92E-08	4.19E-09	3.94E-09	-8.81E-07
	LU	Dimensionless	424	16.0	1.87	7.00	-60.1	447	15.8	1.87	6.98	-59.9

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S53RP+

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	238	3.27E-01	1.93	6.87E-02	-126	254	3.23E-01	1.93	6.86E-02	-123
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	238	3.27E-01	1.93	6.88E-02	-126	254	3.24E-01	1.93	6.87E-02	-123
	PENRE	MJ	1593	24.2	8.51	5.83	-427	1678	24.0	8.51	5.82	-419
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1593	24.2	8.51	5.83	-427	1678	24.0	8.51	5.82	-419
	SM	kg	7.97	0	0	0	0	7.96	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	m³ eq	913	1.30	6.53	0.35	-308	944	1.29	6.53	0.35	-300
WASTE	HWD	kg	8.46E-02	0	0	0	1.64E-02	8.16E-02	0	0	0	1.56E-02
	NHWD	kg	27.0	1.11	0	15.1	-5.87	26.6	1.10	0	15.1	-5.70
	RWD	kg	7.11E-02	0	0	0	-2.53E-03	6.93E-02	0	0	0	-2.48E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	4.56	0	17.8	0	0	4.54	0	17.4	0	0
	MER	kg	0	0	1.22	0	0	0	0	1.22	0	0
	EE-e	MJ	0	0	36.8	0	0	0	0	36.8	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S64RP

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	122	1.63	0.352	0.331	-23.9	125	1.61	0.352	0.328	-23.4
	CC-total	kg CO <sub>2</sub> eq	126	1.64	0.359	0.341	-24.8	129	1.63	0.359	0.337	-24.2
	CC-fossil	kg CO <sub>2</sub> eq	125	1.64	0.355	0.340	-24.1	128	1.63	0.355	0.336	-23.5
	CC-biogenic	kg CO <sub>2</sub> eq	0.381	8.83E-04	1.23E-03	2.09E-04	-0.219	0.738	8.74E-04	1.23E-03	2.06E-04	-0.216
	CC-luluc	kg CO <sub>2</sub> eq	0.552	5.84E-04	3.16E-03	1.12E-04	-0.490	0.591	5.79E-04	3.16E-03	1.11E-04	-0.476
	OD	kg CFC-11 eq	2.70E-03	3.73E-07	3.94E-08	8.38E-08	-3.42E-06	1.22E-05	3.70E-07	3.94E-08	8.37E-08	-3.35E-06
	A	mol H <sup>+</sup> eq	0.884	4.72E-03	3.12E-03	1.63E-03	-0.207	0.891	4.67E-03	3.12E-03	1.62E-03	-0.203
	EAF	kg P eq	7.11E-03	1.31E-05	1.60E-05	2.99E-06	-1.30E-03	4.82E-03	1.30E-05	1.60E-05	2.98E-06	-1.27E-03
	EAM	kg N eq	0.137	9.34E-04	4.69E-04	5.09E-04	-2.92E-02	0.139	9.24E-04	4.69E-04	5.07E-04	-2.88E-02
	ET	mol N eq	1.43	1.04E-02	5.27E-03	5.42E-03	-0.333	1.46	1.03E-02	5.27E-03	5.41E-03	-0.329
	POF	kg NMVOC eq	0.434	4.00E-03	1.41E-03	1.67E-03	-0.102	0.434	3.96E-03	1.41E-03	1.67E-03	-0.100
	AD-non fossil	kg Sb eq	5.59E-02	4.53E-05	1.21E-06	6.69E-06	-4.30E-02	5.33E-02	4.49E-05	1.21E-06	6.68E-06	-4.30E-02
	AD-fossil	MJ	1647	24.8	8.25	5.76	-447	1732	24.6	8.25	5.75	-438
	WU	m <sup>3</sup> eq	43.0	7.02E-02	0.240	0.114	-5.57	45.0	6.96E-02	0.240	0.114	-5.57
ADDITIONAL ENVIRONMENTAL IMPACTS	PM	Disease incidence	2.70E-03	1.04E-07	8.02E-09	3.07E-08	-1.87E-06	8.78E-06	1.03E-07	8.02E-09	3.07E-08	-1.84E-06
	IR	kBq U235 eq	6.45	0.108	8.88E-02	2.42E-02	-3.23	7.89	0.107	8.88E-02	2.42E-02	-3.17
	EF	CTUe	4465	20.0	5.70	5.05	-688	5835	19.8	5.70	4.96	-684
	HT-c	CTUh	2.69E-03	5.57E-10	1.29E-10	1.65E-10	-7.08E-08	2.09E-07	5.51E-10	1.29E-10	1.64E-10	-6.90E-08
	HT-nc	CTUh	2.70E-03	2.11E-08	4.21E-09	4.17E-09	-9.61E-07	4.06E-05	2.09E-08	4.21E-09	4.15E-09	-9.43E-07
	LU	Dimensionless	459	17.4	1.88	7.29	-63.4	484	17.2	1.88	7.27	-63.1

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S64RP

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	265	3.55E-01	1.94	7.23E-02	-142	281	3.52E-01	1.94	7.21E-02	-139
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	265	3.56E-01	1.94	7.24E-02	-142	281	3.52E-01	1.94	7.22E-02	-139
	PENRE	MJ	1756	26.4	8.54	6.11	-473	1845	26.1	8.54	6.10	-464
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1756	26.4	8.54	6.11	-473	1845	26.1	8.54	6.10	-464
	SM	kg	9.03	0	0	0	0	9.02	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	m³ eq	1017	1.41	6.55	0.37	-347	1051	1.40	6.55	0.37	-338
WASTE	HWD	kg	9.41E-02	0	0	0	1.96E-02	9.09E-02	0	0	0	1.88E-02
	NHWD	kg	29.9	1.21	0	15.7	-6.58	29.4	1.20	0	15.6	-6.40
	RWD	kg	8.01E-02	0	0	0	-2.82E-03	7.81E-02	0	0	0	-2.77E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	4.99	0	19.6	0	0	4.96	0	19.1	0	0
	MER	kg	0	0	1.40	0	0	0	0	1.40	0	0
	EE-e	MJ	0	0	42.0	0	0	0	0	42.0	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S64RP HO

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	114	1.57	0.354	0.343	-22.4	116	1.56	0.354	0.340	-22.0
	CC-total	kg CO <sub>2</sub> eq	117	1.59	0.362	0.352	-23.2	119	1.58	0.362	0.349	-22.8
	CC-fossil	kg CO <sub>2</sub> eq	116	1.59	0.357	0.352	-22.6	118	1.58	0.357	0.349	-22.2
	CC-biogenic	kg CO <sub>2</sub> eq	0.353	8.54E-04	1.24E-03	2.31E-04	-0.213	0.638	8.47E-04	1.24E-03	2.29E-04	-0.210
	CC-luluc	kg CO <sub>2</sub> eq	0.506	5.65E-04	3.18E-03	1.17E-04	-0.445	0.537	5.61E-04	3.18E-03	1.17E-04	-0.434
	OD	kg CFC-11 eq	2.09E-03	3.61E-07	3.96E-08	8.83E-08	-3.25E-06	1.15E-05	3.58E-07	3.96E-08	8.82E-08	-3.19E-06
	A	mol H <sup>+</sup> eq	0.839	4.56E-03	3.15E-03	1.71E-03	-0.201	0.845	4.53E-03	3.15E-03	1.71E-03	-0.199
	EAF	kg P eq	6.21E-03	1.27E-05	1.61E-05	3.15E-06	-1.22E-03	4.44E-03	1.26E-05	1.61E-05	3.15E-06	-1.20E-03
	EAM	kg N eq	0.128	9.03E-04	4.73E-04	5.34E-04	-2.87E-02	0.130	8.96E-04	4.73E-04	5.33E-04	-2.84E-02
	ET	mol N eq	1.38	1.01E-02	5.32E-03	5.72E-03	-0.329	1.40	1.00E-02	5.32E-03	5.71E-03	-0.326
	POF	kg NMVOC eq	0.412	3.87E-03	1.43E-03	1.76E-03	-0.099	0.413	3.84E-03	1.43E-03	1.76E-03	-0.098
	AD-non fossil	kg Sb eq	5.53E-02	4.38E-05	1.22E-06	7.02E-06	-4.31E-02	5.32E-02	4.35E-05	1.22E-06	7.01E-06	-4.31E-02
	AD-fossil	MJ	1520	24.0	8.29	6.05	-425	1590	23.8	8.29	6.05	-418
	WU	m <sup>3</sup> eq	37.4	6.80E-02	0.242	0.121	-5.68	39.0	6.74E-02	0.242	0.120	-5.69
ADDITIONAL ENVIRONMENTAL IMPACTS	PM	Disease incidence	2.09E-03	1.01E-07	8.15E-09	3.24E-08	-1.80E-06	8.36E-06	1.00E-07	8.15E-09	3.24E-08	-1.77E-06
	IR	kBq U235 eq	5.99	0.105	8.93E-02	2.55E-02	-3.06	7.14	0.104	8.93E-02	2.55E-02	-3.01
	EF	CTUe	4162	19.3	5.74	5.18	-685	5257	19.2	5.74	5.10	-682
	HT-c	CTUh	2.08E-03	5.39E-10	1.30E-10	1.67E-10	-6.52E-08	1.97E-07	5.34E-10	1.30E-10	1.67E-10	-6.38E-08
	HT-nc	CTUh	2.09E-03	2.04E-08	4.24E-09	4.36E-09	-9.08E-07	3.28E-05	2.02E-08	4.24E-09	4.35E-09	-8.94E-07
	LU	Dimensionless	441	16.8	1.92	7.70	-64.4	461	16.7	1.92	7.69	-64.2

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S64RP HO

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	244	3.44E-01	1.95	7.58E-02	-131	257	3.41E-01	1.95	7.56E-02	-128
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	244	3.44E-01	1.95	7.59E-02	-131	257	3.42E-01	1.95	7.57E-02	-128
	PENRE	MJ	1620	25.5	8.59	6.43	-450	1694	25.3	8.59	6.42	-443
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1620	25.5	8.59	6.43	-450	1694	25.3	8.59	6.42	-443
	SM	kg	8.19	0	0	0	0	8.18	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	m³ eq	943	1.37	6.58	0.38	-322	970	1.36	6.58	0.38	-315
WASTE	HWD	kg	8.55E-02	0	0	0	1.71E-02	8.30E-02	0	0	0	1.65E-02
	NHWD	kg	28.2	1.17	0	16.6	-6.06	27.8	1.16	0	16.6	-5.92
	RWD	kg	7.24E-02	0	0	0	-2.66E-03	7.09E-02	0	0	0	-2.62E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	4.75	0	18.6	0	0	4.72	0	18.2	0	0
	MER	kg	0	0	1.40	0	0	0	0	1.40	0	0
	EE-e	MJ	0	0	42.2	0	0	0	0	42.2	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)



# STRUGAL S74RP

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	135	1.80	0.357	0.386	-25.8	138	1.79	0.357	0.383	-25.2
	CC-total	kg CO <sub>2</sub> eq	138	1.82	0.365	0.398	-26.7	141	1.80	0.365	0.394	-26.1
	CC-fossil	kg CO <sub>2</sub> eq	137	1.82	0.360	0.398	-26.0	140	1.80	0.360	0.394	-25.4
	CC-biogenic	kg CO <sub>2</sub> eq	0.369	9.78E-04	1.25E-03	2.61E-04	-0.232	0.729	9.69E-04	1.25E-03	2.58E-04	-0.228
	CC-luluc	kg CO <sub>2</sub> eq	0.564	6.47E-04	3.20E-03	1.30E-04	-0.522	0.604	6.42E-04	3.20E-03	1.30E-04	-0.507
	OD	kg CFC-11 eq	2.74E-03	4.14E-07	4.00E-08	9.78E-08	-3.72E-06	1.32E-05	4.10E-07	4.00E-08	9.76E-08	-3.65E-06
	A	mol H <sup>+</sup> eq	0.966	5.22E-03	3.17E-03	1.89E-03	-0.227	0.972	5.18E-03	3.17E-03	1.89E-03	-0.224
	EAF	kg P eq	7.39E-03	1.45E-05	1.62E-05	3.49E-06	-1.38E-03	5.06E-03	1.44E-05	1.62E-05	3.48E-06	-1.36E-03
	EAM	kg N eq	0.153	1.03E-03	4.78E-04	5.90E-04	-3.20E-02	0.155	1.02E-03	4.78E-04	5.89E-04	-3.16E-02
	ET	mol N eq	1.58	1.16E-02	5.38E-03	6.30E-03	-0.367	1.61	1.15E-02	5.38E-03	6.29E-03	-0.363
	POF	kg NMVOC eq	0.477	4.43E-03	1.44E-03	1.94E-03	-0.111	0.477	4.39E-03	1.44E-03	1.94E-03	-0.110
	AD-non fossil	kg Sb eq	5.47E-02	5.02E-05	1.25E-06	7.80E-06	-4.16E-02	5.20E-02	4.98E-05	1.25E-06	7.79E-06	-4.16E-02
	AD-fossil	MJ	1820	27.5	8.36	6.70	-488	1905	27.3	8.36	6.69	-479
ADDITIONAL ENVIRONMENTAL IMPACTS	WU	m <sup>3</sup> eq	50.3	7.78E-02	0.243	0.133	-6.18	52.3	7.71E-02	0.243	0.133	-6.18
	PM	Disease incidence	2.74E-03	1.16E-07	8.34E-09	3.58E-08	-2.04E-06	9.66E-06	1.15E-07	8.34E-09	3.58E-08	-2.00E-06
	IR	kBq U235 eq	6.81	0.120	8.99E-02	2.82E-02	-3.54	8.26	0.119	8.99E-02	2.82E-02	-3.48
	EF	CTUe	4736	22.1	5.80	5.93	-710	6121	22.0	5.80	5.84	-707
	HT-c	CTUh	2.73E-03	6.17E-10	1.32E-10	1.85E-10	-7.39E-08	2.15E-07	6.11E-10	1.32E-10	1.85E-10	-7.21E-08
	HT-nc	CTUh	2.74E-03	2.33E-08	4.29E-09	4.87E-09	-9.96E-07	4.12E-05	2.31E-08	4.29E-09	4.85E-09	-9.78E-07
	LU	Dimensionless	505	19.2	1.96	8.50	-70.5	529	19.1	1.96	8.49	-70.2

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S74RP

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	275	3.94E-01	1.97	8.41E-02	-153	291	3.90E-01	1.97	8.39E-02	-149
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	275	3.94E-01	1.97	8.42E-02	-153	291	3.91E-01	1.97	8.40E-02	-149
	PENRE	MJ	1941	29.2	8.65	7.12	-516	2031	28.9	8.65	7.11	-507
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1941	29.2	8.65	7.12	-516	2031	28.9	8.65	7.11	-507
	SM	kg	9.14	0	0	0	0	9.13	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	m³ eq	1047	1.57	6.63	0.42	-375	1080	1.55	6.63	0.42	-366
WASTE	HWD	kg	9.52E-02	0	0	0	2.12E-02	9.19E-02	0	0	0	2.04E-02
	NHWD	kg	31.5	1.34	0	18.3	-7.00	31.1	1.33	0	18.2	-6.82
	RWD	kg	8.15E-02	0	0	0	-3.08E-03	7.94E-02	0	0	0	-3.02E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	5.33	0	21.3	0	0	5.30	0	20.9	0	0
	MER	kg	0	0	1.65	0	0	0	0	1.65	0	0
	EE-e	MJ	0	0	49.8	0	0	0	0	49.8	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S74RP HO

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	129	1.71	0.354	0.363	-24.7	131	1.69	0.354	0.360	-24.2
	CC-total	kg CO <sub>2</sub> eq	132	1.73	0.362	0.374	-25.6	135	1.71	0.362	0.370	-25.1
	CC-fossil	kg CO <sub>2</sub> eq	131	1.72	0.357	0.373	-24.8	134	1.71	0.357	0.370	-24.4
	CC-biogenic	kg CO <sub>2</sub> eq	0.334	9.27E-04	1.24E-03	2.39E-04	-0.223	0.652	9.19E-04	1.24E-03	2.36E-04	-0.220
	CC-luluc	kg CO <sub>2</sub> eq	0.557	6.14E-04	3.18E-03	1.22E-04	-0.499	0.592	6.09E-04	3.18E-03	1.22E-04	-0.486
	OD	kg CFC-11 eq	2.29E-03	3.92E-07	3.96E-08	9.19E-08	-3.55E-06	1.29E-05	3.89E-07	3.96E-08	9.18E-08	-3.49E-06
	A	mol H <sup>+</sup> eq	0.925	4.95E-03	3.15E-03	1.77E-03	-0.217	0.932	4.91E-03	3.15E-03	1.77E-03	-0.214
	EAF	kg P eq	6.85E-03	1.38E-05	1.61E-05	3.28E-06	-1.33E-03	4.93E-03	1.37E-05	1.61E-05	3.27E-06	-1.31E-03
	EAM	kg N eq	0.144	9.80E-04	4.73E-04	5.52E-04	-3.06E-02	0.146	9.72E-04	4.73E-04	5.51E-04	-3.02E-02
	ET	mol N eq	1.51	1.10E-02	5.32E-03	5.89E-03	-0.350	1.54	1.09E-02	5.32E-03	5.88E-03	-0.347
	POF	kg NMVOC eq	0.456	4.20E-03	1.43E-03	1.82E-03	-0.106	0.457	4.17E-03	1.43E-03	1.82E-03	-0.105
	AD-non fossil	kg Sb eq	5.42E-02	4.76E-05	1.22E-06	7.37E-06	-4.16E-02	5.19E-02	4.72E-05	1.22E-06	7.36E-06	-4.16E-02
	AD-fossil	MJ	1728	26.1	8.29	6.30	-468	1807	25.9	8.29	6.30	-461
ADDITIONAL ENVIRONMENTAL IMPACTS	WU	m <sup>3</sup> eq	46.2	7.38E-02	0.242	0.124	-6.07	48.1	7.32E-02	0.242	0.124	-6.07
	PM	Disease incidence	2.29E-03	1.10E-07	8.15E-09	3.36E-08	-1.93E-06	9.28E-06	1.09E-07	8.15E-09	3.36E-08	-1.89E-06
	IR	kBq U235 eq	6.54	0.114	8.93E-02	2.66E-02	-3.42	7.84	0.113	8.93E-02	2.65E-02	-3.37
	EF	CTUe	4980	21.0	5.74	5.54	-694	6199	20.8	5.74	5.45	-691
	HT-c	CTUh	2.28E-03	5.85E-10	1.30E-10	1.76E-10	-7.10E-08	2.18E-07	5.80E-10	1.30E-10	1.76E-10	-6.94E-08
	HT-nc	CTUh	2.29E-03	2.21E-08	4.24E-09	4.58E-09	-9.64E-07	3.63E-05	2.19E-08	4.24E-09	4.56E-09	-9.49E-07
	LU	Dimensionless	479	18.2	1.92	7.96	-67.6	502	18.1	1.92	7.95	-67.4

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S74RP HO

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	269	3.73E-01	1.95	7.91E-02	-147	284	3.70E-01	1.95	7.90E-02	-144
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	269	3.74E-01	1.95	7.92E-02	-147	284	3.71E-01	1.95	7.91E-02	-144
	PENRE	MJ	1843	27.7	8.59	6.69	-495	1926	27.5	8.59	6.69	-487
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1843	27.7	8.59	6.69	-495	1926	27.5	8.59	6.69	-487
	SM	kg	9.00	0	0	0	0	8.99	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	m³ eq	1038	1.48	6.58	0.40	-361	1068	1.47	6.58	0.40	-354
WASTE	HWD	kg	9.36E-02	0	0	0	2.00E-02	9.09E-02	0	0	0	1.93E-02
	NHWD	kg	31.0	1.27	0	17.1	-6.69	30.7	1.26	0	17.0	-6.54
	RWD	kg	7.96E-02	0	0	0	-2.97E-03	7.79E-02	0	0	0	-2.92E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	5.11	0	20.1	0	0	5.08	0	19.7	0	0
	MER	kg	0	0	1.65	0	0	0	0	1.65	0	0
	EE-e	MJ	0	0	49.7	0	0	0	0	49.7	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S82RP

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	146	1.98	0.362	0.438	-27.1	149	1.96	0.362	0.434	-26.6
	CC-total	kg CO <sub>2</sub> eq	150	2.00	0.370	0.451	-28.1	154	1.98	0.370	0.447	-27.5
	CC-fossil	kg CO <sub>2</sub> eq	149	1.99	0.365	0.451	-27.3	152	1.98	0.365	0.447	-26.8
	CC-biogenic	kg CO <sub>2</sub> eq	0.370	1.07E-03	1.26E-03	3.12E-04	-0.244	0.730	1.06E-03	1.26E-03	3.09E-04	-0.240
	CC-luluc	kg CO <sub>2</sub> eq	0.571	7.10E-04	3.24E-03	1.47E-04	-0.544	0.611	7.04E-04	3.24E-03	1.47E-04	-0.529
	OD	kg CFC-11 eq	2.74E-03	4.54E-07	4.07E-08	1.11E-07	-3.95E-06	1.41E-05	4.50E-07	4.07E-08	1.11E-07	-3.88E-06
	A	mol H <sup>+</sup> eq	1.042	5.73E-03	3.22E-03	2.15E-03	-0.243	1.048	5.68E-03	3.22E-03	2.15E-03	-0.240
	EAF	kg P eq	7.59E-03	1.59E-05	1.64E-05	3.96E-06	-1.45E-03	5.26E-03	1.58E-05	1.64E-05	3.96E-06	-1.42E-03
	EAM	kg N eq	0.169	1.13E-03	4.88E-04	6.71E-04	-3.43E-02	0.171	1.12E-03	4.88E-04	6.69E-04	-3.39E-02
	ET	mol N eq	1.71	1.27E-02	5.48E-03	7.18E-03	-0.395	1.75	1.26E-02	5.48E-03	7.17E-03	-0.390
	POF	kg NMVOC eq	0.516	4.86E-03	1.47E-03	2.21E-03	-0.119	0.516	4.82E-03	1.47E-03	2.21E-03	-0.117
	AD-non fossil	kg Sb eq	5.50E-02	5.50E-05	1.28E-06	8.80E-06	-4.16E-02	5.23E-02	5.46E-05	1.28E-06	8.79E-06	-4.16E-02
	AD-fossil	MJ	1976	30.2	8.47	7.60	-516	2061	29.9	8.47	7.59	-507
ADDITIONAL ENVIRONMENTAL IMPACTS	WU	m <sup>3</sup> eq	58.2	8.53E-02	0.246	0.152	-6.56	60.2	8.46E-02	0.246	0.152	-6.56
	PM	Disease incidence	2.74E-03	1.27E-07	8.66E-09	4.08E-08	-2.19E-06	1.05E-05	1.26E-07	8.66E-09	4.07E-08	-2.15E-06
	IR	kBq U235 eq	7.04	0.132	9.11E-02	3.20E-02	-3.72	8.49	0.131	9.11E-02	3.20E-02	-3.65
	EF	CTUe	5195	24.3	5.89	6.75	-738	6580	24.1	5.89	6.65	-734
	HT-c	CTUh	2.73E-03	6.76E-10	1.35E-10	2.04E-10	-7.65E-08	2.21E-07	6.71E-10	1.35E-10	2.04E-10	-7.47E-08
	HT-nc	CTUh	2.74E-03	2.56E-08	4.36E-09	5.52E-09	-1.03E-06	4.13E-05	2.54E-08	4.36E-09	5.50E-09	-1.01E-06
	LU	Dimensionless	536	21.1	2.04	9.71	-76.1	561	20.9	2.04	9.70	-75.8

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

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(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.

# STRUGAL S82RP

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	281	4.32E-01	1.99	9.50E-02	-160	297	4.28E-01	1.99	9.49E-02	-156
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	281	4.32E-01	1.99	9.51E-02	-160	297	4.29E-01	1.99	9.50E-02	-156
	PENRE	MJ	2109	32.0	8.77	8.07	-546	2199	31.8	8.77	8.06	-536
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	2109	32.0	8.77	8.07	-546	2199	31.8	8.77	8.06	-536
	SM	kg	9.14	0	0	0	0	9.13	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	m³ eq	1066	1.72	6.71	0.47	-392	1100	1.70	6.71	0.47	-383
WASTE	HWD	kg	9.56E-02	0	0	0	2.23E-02	9.23E-02	0	0	0	2.15E-02
	NHWD	kg	32.8	1.47	0	21.0	-7.32	32.4	1.45	0	21.0	-7.14
	RWD	kg	8.18E-02	0	0	0	-3.24E-03	7.97E-02	0	0	0	-3.18E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	5.63	0	23.0	0	0	5.60	0	22.5	0	0
	MER	kg	0	0	1.75	0	0	0	0	1.75	0	0
	EE-e	MJ	0	0	52.7	0	0	0	0	52.7	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S82RP HO

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	144	2.00	0.365	0.458	-26.4	146	1.99	0.365	0.455	-25.9
	CC-total	kg CO <sub>2</sub> eq	147	2.02	0.373	0.471	-27.3	150	2.01	0.373	0.468	-26.9
	CC-fossil	kg CO <sub>2</sub> eq	146	2.02	0.368	0.471	-26.6	149	2.00	0.368	0.467	-26.1
	CC-biogenic	kg CO <sub>2</sub> eq	0.367	1.09E-03	1.27E-03	3.36E-04	-0.242	0.685	1.08E-03	1.27E-03	3.33E-04	-0.239
	CC-luluc	kg CO <sub>2</sub> eq	0.564	7.18E-04	3.26E-03	1.56E-04	-0.517	0.599	7.13E-04	3.26E-03	1.56E-04	-0.505
	OD	kg CFC-11 eq	2.29E-03	4.59E-07	4.10E-08	1.18E-07	-3.88E-06	1.43E-05	4.56E-07	4.10E-08	1.18E-07	-3.82E-06
	A	mol H <sup>+</sup> eq	1.042	5.80E-03	3.25E-03	2.29E-03	-0.243	1.049	5.76E-03	3.25E-03	2.29E-03	-0.241
	EAF	kg P eq	7.14E-03	1.61E-05	1.65E-05	4.21E-06	-1.41E-03	5.21E-03	1.60E-05	1.65E-05	4.20E-06	-1.39E-03
	EAM	kg N eq	0.166	1.15E-03	4.93E-04	7.13E-04	-3.45E-02	0.168	1.14E-03	4.93E-04	7.11E-04	-3.42E-02
	ET	mol N eq	1.73	1.28E-02	5.54E-03	7.65E-03	-0.398	1.76	1.27E-02	5.54E-03	7.64E-03	-0.394
	POF	kg NMVOC eq	0.514	4.92E-03	1.49E-03	2.36E-03	-0.118	0.515	4.88E-03	1.49E-03	2.35E-03	-0.117
	AD-non fossil	kg Sb eq	5.46E-02	5.57E-05	1.31E-06	9.32E-06	-4.16E-02	5.24E-02	5.53E-05	1.31E-06	9.31E-06	-4.16E-02
	AD-fossil	MJ	1923	30.5	8.54	8.07	-506	2002	30.3	8.54	8.07	-498
ADDITIONAL ENVIRONMENTAL IMPACTS	WU	m <sup>3</sup> eq	53.7	8.63E-02	0.248	0.163	-6.68	55.6	8.58E-02	0.248	0.163	-6.68
	PM	Disease incidence	2.29E-03	1.28E-07	8.84E-09	4.34E-08	-2.18E-06	1.05E-05	1.27E-07	8.84E-09	4.34E-08	-2.14E-06
	IR	kBq U235 eq	6.97	0.133	9.17E-02	3.40E-02	-3.62	8.26	0.132	9.17E-02	3.40E-02	-3.57
	EF	CTUe	5430	24.6	5.94	6.99	-742.407	6650	24.4	5.94	6.91	-739.275
	HT-c	CTUh	2.28E-03	6.84E-10	1.37E-10	2.13E-10	-7.33E-08	2.24E-07	6.80E-10	1.37E-10	2.13E-10	-7.18E-08
	HT-nc	CTUh	2.29E-03	2.59E-08	4.41E-09	5.83E-09	-1.00E-06	3.65E-05	2.57E-08	4.41E-09	5.81E-09	-9.85E-07
	LU	Dimensionless	541	21.3	2.08	10.4	-78.0	563	21.2	2.08	10.3	-77.8

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.



# STRUGAL S82RP H0

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	278	4.37E-01	2.01	1.01E-01	-153	293	4.34E-01	2.01	1.00E-01	-150
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	278	4.37E-01	2.01	1.01E-01	-153	293	4.35E-01	2.01	1.01E-01	-150
	PENRE	MJ	2052	32.4	8.84	8.57	-535	2135	32.2	8.84	8.57	-528
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	2052	32.4	8.84	8.57	-535	2135	32.2	8.84	8.57	-528
	SM	kg	9.00	0	0	0	0	8.99	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	m³ eq	1062	1.74	6.76	0.49	-377	1092	1.73	6.76	0.49	-370
WASTE	HWD	kg	9.40E-02	0	0	0	2.08E-02	9.12E-02	0	0	0	2.01E-02
	NHWD	kg	33.0	1.48	0	22.5	-7.03	32.6	1.47	0	22.5	-6.88
	RWD	kg	8.02E-02	0	0	0	-3.16E-03	7.85E-02	0	0	0	-3.11E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	5.68	0	22.8	0	0	5.66	0	22.4	0	0
	MER	kg	0	0	1.75	0	0	0	0	1.75	0	0
	EE-e	MJ	0	0	52.6	0	0	0	0	52.6	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S88RP

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	129	2.04	0.374	0.577	-26.1	132	2.03	0.374	0.574	-25.7
	CC-total	kg CO <sub>2</sub> eq	133	2.06	0.382	0.593	-26.9	135	2.05	0.382	0.590	-26.5
	CC-fossil	kg CO <sub>2</sub> eq	132	2.06	0.377	0.592	-26.2	134	2.05	0.377	0.589	-25.8
	CC-biogenic	kg CO <sub>2</sub> eq	0.430	1.11E-03	1.30E-03	4.52E-04	-0.199	0.715	1.10E-03	1.30E-03	4.50E-04	-0.197
	CC-luluc	kg CO <sub>2</sub> eq	0.477	7.34E-04	3.33E-03	1.99E-04	-0.466	0.508	7.29E-04	3.33E-03	1.99E-04	-0.455
	OD	kg CFC-11 eq	2.22E-03	4.69E-07	4.21E-08	1.48E-07	-4.00E-06	1.46E-05	4.66E-07	4.21E-08	1.48E-07	-3.94E-06
	A	mol H <sup>+</sup> eq	0.968	5.92E-03	3.33E-03	2.79E-03	-0.266	0.972	5.88E-03	3.33E-03	2.79E-03	-0.263
	EAF	kg P eq	6.33E-03	1.65E-05	1.69E-05	5.27E-06	-1.33E-03	4.44E-03	1.64E-05	1.69E-05	5.27E-06	-1.30E-03
	EAM	kg N eq	0.151	1.17E-03	5.09E-04	8.50E-04	-3.71E-02	0.153	1.16E-03	5.09E-04	8.49E-04	-3.68E-02
	ET	mol N eq	1.63	1.31E-02	5.72E-03	9.18E-03	-0.433	1.66	1.30E-02	5.72E-03	9.17E-03	-0.430
	POF	kg NMVOC eq	0.474	5.02E-03	1.54E-03	2.85E-03	-0.124	0.474	4.99E-03	1.54E-03	2.85E-03	-0.122
	AD-non fossil	kg Sb eq	1.67E-02	5.69E-05	1.37E-06	1.21E-05	-1.01E-02	1.45E-02	5.65E-05	1.37E-06	1.21E-05	-1.01E-02
	AD-fossil	MJ	1782	31.2	8.73	10.05	-554	1848	31.0	8.73	10.04	-547
ADDITIONAL ENVIRONMENTAL IMPACTS	WU	m <sup>3</sup> eq	44.5	8.82E-02	0.253	0.192	-8.70	46.0	8.76E-02	0.253	0.192	-8.70
	PM	Disease incidence	2.22E-03	1.31E-07	9.39E-09	5.35E-08	-2.08E-06	9.61E-06	1.30E-07	9.39E-09	5.34E-08	-2.05E-06
	IR	kBq U235 eq	6.25	0.136	9.37E-02	4.25E-02	-4.29	7.39	0.135	9.37E-02	4.25E-02	-4.24
	EF	CTUe	3890	25.1	6.10	8.71	-523	4985	24.9	6.10	8.63	-520
	HT-c	CTUh	2.21E-03	6.99E-10	1.43E-10	2.47E-10	-5.38E-08	1.59E-07	6.95E-10	1.43E-10	2.47E-10	-5.23E-08
	HT-nc	CTUh	2.21E-03	2.64E-08	4.54E-09	7.37E-09	-7.09E-07	3.28E-05	2.63E-08	4.54E-09	7.36E-09	-6.95E-07
	LU	Dimensionless	500	21.8	2.21	12.55	-91.7	518	21.7	2.21	12.53	-91.5

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

(1) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(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.

# STRUGAL S88RP

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	238	4.46E-01	2.05	1.26E-01	-154	251	4.43E-01	2.05	1.26E-01	-151
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	238	4.47E-01	2.05	1.27E-01	-154	251	4.44E-01	2.05	1.26E-01	-151
	PENRE	MJ	1904	33.1	9.04	10.67	-584	1973	32.9	9.04	10.66	-576
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	1904	33.1	9.04	10.67	-584	1973	32.9	9.04	10.66	-576
	SM	kg	7.81	0	0	0	0	7.81	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	m³ eq	881	1.78	6.90	0.58	-403	907	1.76	6.90	0.58	-396
WASTE	HWD	kg	7.84E-02	0	0	0	1.99E-02	7.57E-02	0	0	0	1.92E-02
	NHWD	kg	27.5	1.52	0	26.3	-6.15	27.2	1.51	0	26.2	-6.01
	RWD	kg	7.09E-02	0	0	0	-3.58E-03	6.92E-02	0	0	0	-3.53E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	5.81	0	21.6	0	0	5.79	0	21.2	0	0
	MER	kg	0	0	3.42	0	0	0	0	3.42	0	0
	EE-e	MJ	0	0	103	0	0	0	0	103	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

**WASTE CATEGORIES.** **HWD:** Hazardous waste disposed; **NHWD:** Non-hazardous waste disposed; **RWD:** Radioactive waste disposed.

**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# STRUGAL S140RP INFINITY

## COATED

## ANODIZED

			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
BASIC ENVIRONMENTAL IMPACTS	CC-2013	kg CO <sub>2</sub> eq	158	2.06	0.366	0.549	-34.9	161	2.05	0.366	0.546	-34.5
	CC-total	kg CO <sub>2</sub> eq	162	2.08	0.374	0.565	-36.1	165	2.07	0.374	0.562	-35.6
	CC-fossil	kg CO <sub>2</sub> eq	161	2.08	0.369	0.565	-35.2	164	2.07	0.369	0.561	-34.7
	CC-biogenic	kg CO <sub>2</sub> eq	0.430	1.12E-03	1.28E-03	3.75E-04	-0.292	0.767	1.11E-03	1.28E-03	3.73E-04	-0.290
	CC-luluc	kg CO <sub>2</sub> eq	0.634	7.41E-04	3.27E-03	1.86E-04	-0.656	0.671	7.36E-04	3.27E-03	1.86E-04	-0.643
	OD	kg CFC-11 eq	2.49E-03	4.73E-07	4.11E-08	1.37E-07	-5.03E-06	1.68E-05	4.70E-07	4.11E-08	1.37E-07	-4.97E-06
	A	mol H <sup>+</sup> eq	1.134	5.98E-03	3.26E-03	2.54E-03	-0.322	1.141	5.94E-03	3.26E-03	2.53E-03	-0.320
	EAF	kg P eq	7.99E-03	1.66E-05	1.65E-05	4.87E-06	-1.90E-03	5.88E-03	1.65E-05	1.65E-05	4.87E-06	-1.88E-03
	EAM	kg N eq	0.175	1.18E-03	4.94E-04	7.68E-04	-4.55E-02	0.177	1.18E-03	4.94E-04	7.66E-04	-4.52E-02
	ET	mol N eq	1.90	1.32E-02	5.56E-03	8.22E-03	-0.523	1.94	1.31E-02	5.56E-03	8.21E-03	-0.519
	POF	kg NMVOC eq	0.567	5.07E-03	1.49E-03	2.57E-03	-0.155	0.568	5.04E-03	1.49E-03	2.57E-03	-0.153
	AD-non fossil	kg Sb eq	6.15E-02	5.74E-05	1.31E-06	1.16E-05	-4.78E-02	5.91E-02	5.70E-05	1.31E-06	1.16E-05	-4.78E-02
	AD-fossil	MJ	2121	31.5	8.55	9.32	-714	2203	31.2	8.55	9.31	-706
	WU	m <sup>3</sup> eq	49.8	8.90E-02	0.249	0.167	-11.51	51.8	8.84E-02	0.249	0.167	-11.51
ADDITIONAL ENVIRONMENTAL IMPACTS	PM	Disease incidence	2.49E-03	1.32E-07	8.89E-09	4.87E-08	-2.49E-06	1.14E-05	1.31E-07	8.89E-09	4.87E-08	-2.46E-06
	IR	kBq U235 eq	7.43	0.138	9.19E-02	3.95E-02	-5.65	8.79	0.137	9.19E-02	3.94E-02	-5.60
	EF	CTUe	5318	25.3	5.96	8.28	-934	6610	25.2	5.96	8.19	-931
	HT-c	CTUh	2.48E-03	7.06E-10	1.38E-10	2.47E-10	-8.88E-08	2.37E-07	7.01E-10	1.38E-10	2.46E-10	-8.72E-08
	HT-nc	CTUh	2.49E-03	2.67E-08	4.42E-09	6.93E-09	-1.24E-06	3.91E-05	2.65E-08	4.42E-09	6.91E-09	-1.23E-06
	LU	Dimensionless	584	22.0	2.09	11.2	-110.7	607	21.9	2.09	11.2	-110.5

**ENVIRONMENTAL IMPACTS.** **CC-2013:** Climatic Change according to EN 15804:2012+A1:2013; **CC-total:** Climatic Change - total; **CC-fossil:** Climatic Change - fossil; **CC-biogenic:** Climate change - biogenic; **CC-luluc:** Climate change - land use and land use change; **OD:** Ozone depletion; **A:** Acidification ; **EAF:** Eutrophication aquatic freshwater; **EAM:** Eutrophication aquatic marine; **ET:** Eutrophication terrestrial; **POF:** Photochemical ozone formation; **AD- non fossil:** Abiotic resource depletion - minerals and metals (1); **AD-fossil:** Abiotic resource depletion - fossils (1); **WU:** Water use (1); **PM:** Particulate matter emissions (1); **IR:** Ionising radiation (2); **EF:** Ecotoxicity - freshwater (1); **HT-c:** Human toxicity, cancer effects (1); **HT-nc:** Human toxicity, non-cancer effects (1); **LU:** Land use (1).

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STRUGAL S140RP INFINITY

			COATED					ANODIZED				
			A1-3	C2	C3	C4	D	A1-3	C2	C3	C4	D
RESOURCE USE	PERE	MJ	298	4.50E-01	2.01	1.19E-01	-210	313	4.47E-01	2.01	1.19E-01	-207
	PERM	MJ	0	0	0	0	0	0	0	0	0	0
	PERT	MJ	298	4.51E-01	2.01	1.19E-01	-210	313	4.48E-01	2.01	1.19E-01	-207
	PENRE	MJ	2263	33.4	8.85	9.90	-752	2349	33.2	8.85	9.89	-744
	PENRM	MJ	0	0	0	0	0	0	0	0	0	0
	PENRT	MJ	2263	33.4	8.85	9.90	-752	2349	33.2	8.85	9.89	-744
	SM	kg	9.60	0	0	0	0	9.59	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	m³ eq	1154	1.79	6.77	0.57	-549	1185	1.78	6.77	0.57	-541
WASTE	HWD	kg	9.82E-02	0	0	0	2.44E-02	9.52E-02	0	0	0	2.36E-02
	NHWD	kg	36.4	1.53	0	22.6	-8.76	36.0	1.52	0	22.6	-8.60
	RWD	kg	8.38E-02	0	0	0	-4.68E-03	8.19E-02	0	0	0	-4.63E-03
OUTPUT FLOWS	CRU	kg	0	0	0	0	0	0	0	0	0	0
	MFR	kg	6.00	0	23.4	0	0	5.97	0	22.9	0	0
	MER	kg	0	0	4.19	0	0	0	0	4.19	0	0
	EE-e	MJ	0	0	126	0	0	0	0	126	0	0
	EE-t	MJ	0	0	0	0	0	0	0	0	0	0

**RESOURCE USE.** **PERE:** Renewable primary energy as energy carrier; **PERM:** Renewable primary energy resource as material utilization; **PERT:** Total use of renewable primary energy resources; **PENRE:** Non-renewable primary energy as energy carrier; **PENRM:** Non-renewable primary energy as material utilization; **PENRT:** Total use of non-renewable primary energy resources; **SM:** Use of secondary materials; **RSF:** Use of renewable secondary fuels; **NRSF:** Use of non-renewable secondary fuels; **FW:** Use of net fresh water.

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**OUTPUT FLOWS.** **CRU:** Components for re-use; **MFR:** Materials for recycling; **MER:** Materials for energy recovery; **EE-e:** Exported energy (electricity); **EE-t:** Exported energy (thermal)

# VERIFICATION

This EPD is in accordance with ISO 14025 and with the requirements set by the basic product category rules for construction products 15804:2012+A2:2019 and by the general rules of The International EPD® System programme. The specifications of the EN 17213 standard for environmental product declarations for windows and doors have also been met. The results shown in this EPD are based on the LCA report for STRUGAL products EPD dated 5 November 2021 according to ISO 14044.

This EPD does not contain comparative claims and its results are not comparable with other EPDs where these do not comply with the requirements set out in EN 15804. On the other hand, EPD with the same product category, but from different programmes, may not be comparable. This EPD is representative of the products covered.

The holder of this Declaration is responsible for its contents and for keeping the supporting documentation on which the statements and data contained therein are based for the period of validity of this Declaration.

EPD Programme	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com		
EPD registration number	S-P-05211		
EPD owner	STRUGAL		
Declared unit	1 m <sup>2</sup> of window		
System boundaries	Cradle to gate with options		
Published	2022 - 01 - 10		
Valid until	2027 - 01 - 10		
Reference year for data	2018-2019-2020		
Geographical scope	Wordwide		
Product group classification	UN CPC Code: 42120 Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium		
Product Category Rules	PCR 2019:14 Construction Products v1.0 and C-PCR-007 (to PCR 2019:14) Windows and Doors (EN 17213:2020) version: 2020-04-09. PCR moderator: Martin Erlandsson, IVL Swedish Environmental Research Institute, martin.erlandsson@ivl.se		
PCR review was conducted by	Technical Committee of The International EPD® System		
Independent verification of the declaration and data, according to ISO 14025:2006	<input checked="" type="checkbox"/> External	<input type="checkbox"/> Internal	<input type="checkbox"/> EPD®
Third-party verifier	Lorena Pereda Centro Tecnológico de Miranda de Ebro www.ctme.es		
EPD prepared by	IDNÓVAM Innovación y desarrollo para el ambiente info@idnovam.com		

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