

Environmental Product Declaration



In accordance with ISO 14025 for:

Transparent Plastic Sheets

NUDEC®PC Opal 493

from

NUDEC, S. A.



Programme:

The International EPD® System, www.environdec.com

Programme operator:

EPD International AB

EPD registration number:

S-P-05913

Publication date:

2022-04-28

Valid until:

2027-04-26

Programme information

Programme:	<p>The International EPD® System</p> <p>EPD International AB Box 210 60 SE-100 31 Stockholm Sweden</p> <p>www.environdec.com info@environdec.com</p>
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Product category rules (PCR): Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) 2018:10, version 1.01: UN CPC 36390, 31420.

PCR review was conducted by: International EPD® System Technical Committee. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com

Review chair: Lars-Gunnar Lindfors

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Third party verifier:

Tecnalia R&I Certificacion, SL

Auditor: Cristina Gazulla

info@tecnaliacertificacion.com

Accredited by: ENAC nº125/C-PR283 accreditation.

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. EPDs within the same product category but from different programmes may not be comparable.

Company information

Owner of the EPD:

NUDEC, S. A.

Description of the organisation:

Since it first started operating in 1980, NUDEC has strengthened its market positioning, year after year, thanks to the efforts of its employees. The quality and service the company offers have made us one of the most important manufacturers of plastic sheets in Europe, and our aim is to ensure that our clients continue to put their faith in us for many years to come.

The manufacture of transparent plastic sheets in different polymers - polyethylene terephthalate (PET), polyethylene terephthalate with glycol (PETG), polycarbonate (PC), polymethylmethacrylate (PMMA), styrene-acrylonitrile (SANuv) and polystyrene (PS) has made us internationally renowned specialists. To this end, we have extensive facilities and sophisticated extrusion lines, constantly adapting to new technological developments and market needs.

NUDEC has been certified in ISO 9001, ISO 14001, and is in progress for ISO 50001 (audit in June 2022). Reducing our environmental impact, optimizing our industrial process and manufacturing environmentally conscious products are the three key parts of NUDEC's environmental sustainability strategy.

NUDEC's commitment to the environment is not just focused on obtaining sustainable products; we understand that it is essential to account for the product's transformation process and its surrounding factors. And we have called this environmental responsibility Cyrclus Ecosys®. A set of actions and certifications which are focused on reducing greenhouse gas (GHG) emissions and incorporating a new consumption and production model, the circular economy, integrated into the Quality System (ISO 9001), Environmental Management (ISO 14001) and, in the near future, the Energy Management (ISO 50001).

We are also certified with the ISCC PLUS certified system. ISCC is a sustainability certification system which is used to establish traceability in the supply chains of renewable raw materials (only applicable to PC RW at the present time). By using this system, we contribute to the change towards the circular economy and bioeconomy, manifesting our contribution with the environmental responsibility.



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Product information

Product name

NUDEC®PC Opal 493 is a transparent plastic sheet.

Product description

The density of the products analysed is as follows:

PLASTIC SHEETS	DENSITY (g/cm ³)
PC Opal 493	1,20



NUDEC®PC Opal 493: These polycarbonate plastic sheets are outstanding for their impact strength and high temperature resistance. For this reason, they are often used for applications in sectors such as construction (roofing, cladding, antivandal urban furniture), security (shields and protective masks, vehicle armor, lamps

protection) or the industrial safety sector (protection for machinery, personal protective equipment).

There is also the possibility of manufacturing these sheets with a pattern and/or opaque colors, in order to be applied in the automotive industry, either as part of the auxiliary assembly or even as part of the automobile.

Applications:

- Machinery protection
- Riot shields
- Vending and recreational machines protection
- Lighting
- Security glazing
- Roofing
- Construction components
- Town furniture (anti-vandal)
- Caravan bodywork panels
- Motorhome parts
- Office walls dividers
- Cladding

UN CPC code: 36390 - Other plates, sheets, film, foil and strip, of plastics

LCA information

Declared unit: The declared unit is the baseline reference for which all information is collected, as established in the PCR, the declared unit is 1 m3 of sheets with its packaging as to be sent to the customer.

Reference service life: Not relevant for this EPD.

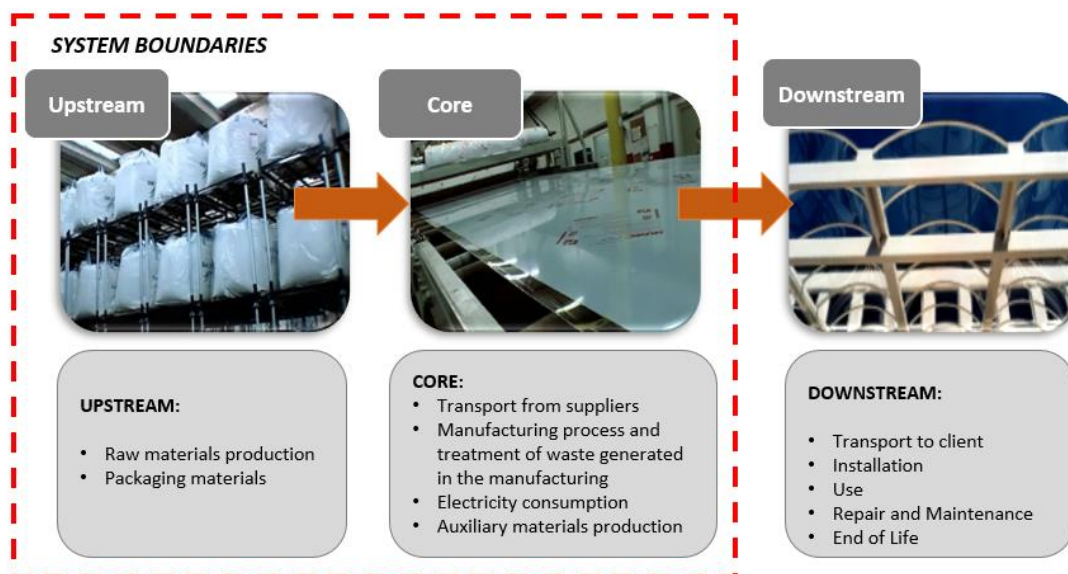
Geographical scope: The geographical scope of this EPD is global.

Time representativeness: The data collection from factory (primary data) and electricity mix are from 2020/01/01 to 2020/12/30. In this study, no datasets older than 10 years were used.

Database(s) and LCA software used: All the data used to model the process and obtain the Life Cycle Inventory are specific data and have been obtained by measurements made during the period from 2020/01/01 to 2020/12/30. They are representative of the different processes implemented during the manufacturing process. The data has been measured directly at the company's own premises. In addition, the most complete and highest quality European life cycle inventory database, Ecoinvent 3.6, has been used, as this database contains the most extensive and updated information, and its scope coincides with the geographical, technological, and temporal area of the project. The LCA was modelled with Simapro 9.1.1.1.

Description of system boundaries: According to the Product category rules (PCR): Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) 2018:10, version 1.01 the system boundary is cradle to gate, that includes upstream and core life cycle stages. The Downstream life cycle stage has been excluded from the LCA study due to the fact that there are many possible end of life scenarios for these products.

System diagram:



Manufacturing process

The manufacturing process of the plastic sheets begins with the dosing and mixing of the raw materials necessary to produce the product and continues with the extrusion of this mixture in the extruder and co-extruder. Once extruded is passed through the rollers and then submitted to a cooling process where a protective film is applied. Subsequently, sheets are cut into the required size by saw blades and stacked on a wooden pallet.

Once the product is finished, the final measurement is carried out and the pallet is marked and labeled for subsequent dispatch to the warehouse.

The transport of raw materials from each provider to the manufacturing site is carried out by road and ship, depending on their origin.

Author of the Life Cycle Assessment

IK ingenieria

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48970 Basauri, Bizkaia (Spain)

Data quality

The environmental impact of the plastic sheets has been calculated. It is based on the international standards established for the development of environmental product declarations, such as ISO 14025 for the preparation of the environmental product declaration, ISO 14040 and ISO 14044 for the preparation of the life cycle analysis and the Product Category Rules PCR - "2018:10: Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) 2018:10 (version 1.01) of the CPC 36390.

Data for raw material supply, transport to fabrication plant and production (upstream and core) is based on specific consumption data for the factory at Polinyà. SimaPro v9.1.1.1. software was used to prepare the life cycle analysis together with the Ecoinvent 3.6 database. Characterization factors from GPI 3.01.

Assumptions

The modularity principle, as well as the polluter-payer principle have been followed. The following assumptions have been made in this EPD:

- It does not include the manufacturing processes of the capital goods or spare parts and/or maintenance with a life of more than three years.
- The environmental impact of infrastructure for general management, office, and headquarters operations is not included.
- The impact caused by people (common activities, travel for work...) will not be considered.
- It does not include the consumption of natural gas for sanitary hot water from showers and heating system for the comfort of people.
- The processes associated with fuel production are intrinsically included in the indicators in ECOINVENT's database used in carrying out the LCA.
- The environmental impact of external transport has been calculated using lorries from the ECOINVENT 3.6 database, EURO 5. These lorries have been selected to reflect the most realistic scenario possible.

Cut-off rules

The PCR indicate that Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included. This cut-off rule does not apply for hazardous materials and substances. No such cut-off criteria have been taken into account in this study.

Allocation

Where necessary, such as waste generation and energy consumption, an allocation based in mass has been used.

Content declaration (per 1kg of product)

Product

Materials / chemical substances	NUDEC®PC Opal 493	
	Weight, kg	%
Polycarbonate	>0,98	>98%
Additives	<0,02	<2%
TOTAL	1	100%

NUDEC®PC may contain traces as residual impurity of Bisphenol-A (CAS n°: 80-05-7) upon 100 ppm. Concerning the rest of the Substance of High Concern (SVHC) published on the ECHA list on 19th January of 2021, NUDEC®PC complies with the REACH regulation (1907/2006/EC), as it does not contain more than 0,1% (w/w) of these substances.

Packaging

The product is transported to the customers packed in pallets protected with cardboard and plastic film.

Environmental performance

Potential environmental impact

PARAMETER		UNIT	NUDEC®PC Opal 493		
			Upstream	Core	TOTAL
Global warming potential (GWP)	Fossil	kg CO2 eq.	1,11E+04	4,04E+02	1,15E+04
	Biogenic	kg CO2 eq.	6,73E+00	1,98E+01	2,66E+01
	Land use and land transformation	kg CO2 eq.	2,57E-01	1,92E+00	2,18E+00
	TOTAL	kg CO2 eq.	1,11E+04	4,26E+02	1,15E+04
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1,23E-05	8,17E-05	9,39E-05
Acidification potential (AP)		kg SO2 eq.	3,33E+01	1,24E+00	3,46E+01
Eutrophication potential (EP)		kg PO43- eq.	2,68E+00	1,79E-01	2,85E+00
Photochemical oxidant formation potential (POFP)		kg NMVOC eq.	2,58E+01	1,20E+00	2,70E+01
Abiotic depletion potential – Elements		kg Sb eq.	3,67E-03	5,28E-03	8,95E-03
Abiotic depletion potential – Fossil resources		MJ, net calorific value	1,27E+05	5,88E+03	1,32E+05
Water scarcity potential		m3 eq.	2,71E+03	1,83E+02	2,89E+03

Use of resources

PARAMETER		UNIT	NUDEC®PC Opal 493		
			Upstream	Core	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	8,29E+02	1,71E+03	2,54E+03
	Used as raw materials	MJ, net calorific value	2,50E+03	0,00E+00	2,50E+03
	TOTAL	MJ, net calorific value	3,33E+03	1,71E+03	5,04E+03
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	9,50E+04	9,36E+03	1,04E+05
	Used as raw materials	MJ, net calorific value	4,15E+04	0,00E+00	4,15E+04
	TOTAL	MJ, net calorific value	1,37E+05	9,36E+03	1,46E+05
Secondary material		kg	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m3	7,35E+01	2,74E+00	7,63E+01

Waste production and output flows

Waste production

PARAMETER	UNIT	NUDEC®PC Opal 493		
		Upstream	Core	TOTAL
Hazardous waste disposed	kg	2,51E-03	8,37E-02	8,62E-02
Non-hazardous waste disposed	kg	1,36E+02	1,72E+02	3,09E+02
Radioactive waste disposed	kg	1,35E+02	1,72E+02	3,07E+02

Output flows

PARAMETER	UNIT	NUDEC®PC Opal 493		
		Upstream	Core	TOTAL
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	3,11E+01	3,11E+01
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00

Additional information

NUDEC®PC Opal 493 SPECIFICATIONS	Code	Value
PHYSICAL		
Density [g/cm³]	ISO 1183	1,2
MECHANICAL		
Tensile strength @ yield [MPa]	ISO 527	60
Tensile strength @ breakage [MPa]	ISO 527	72
Elongation @ yield [%]	ISO 527	150
Elasticity modulus in traction [MPa]	ISO 527	2.300
Resistance to flexion [MPa]	ISO 178	97
Charpy impact test with notch [kJ/m²]	ISO 179	55
Charpy impact test [kJ/m²]	ISO 179	No breakage
Rockwell hardness, M/R scale []	-	950
Ball pressure hardness [MPa]	ISO 2039	72/118
OPTICAL		
Light transmission [%]	ASTM D-1003	87-91
Refractive index []	ASTM D-542	1.59
THERMAL		
Maximum service temperature [°C]	-	120
VICAT Softening temperature (10N) [°C]	ISO 306	-
VICAT Softening temperature (50N) [°C]	ISO 306	151
Heat deflection temperature, HDT A (1.8MPa) [°C]	ISO 75-2	143
Heat deflection temperature, HDT B (0.45MPa) [°C]	ISO 75-2	146
Coefficient of linear thermal expansion [x10-5/°C]	ISO 75-2	6,8

These data correspond to raw material values

References

- General Programme Instruction of the International EPD®System. Version 3.01.
- ISO 14020:2000 Environmental labels and declarations-General principles.
- ISO 14025:2010 Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
- ISO 14040:2006 Environmental Management-Life Cycle Assessment-Principles and framework.
- ISO 14044:2006 Environmental Management-Life Cycle Assessment-Requirements and guidelines.
- Product category rules (PCR): Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) 2018:10, version 1.01: UN CPC 36390, 31420.

VERIFICATION STATEMENT CERTIFICATE CERTIFICADO DE DECLARACIÓN DE VERIFICACIÓN

Certificate No. / Certificado nº: EPD05203

TECNALIA R&I CERTIFICACION S.L., confirms that independent third-party verification has been conducted of the Environmental Product Declaration (EPD) on behalf of:

TECNALIA R&I CERTIFICACION S.L., confirma que se ha realizado verificación de tercera parte independiente de la Declaración Ambiental de Producto (DAP) en nombre de:

NUDEC, S.A.
Pintor Vila Cinca, 24-28
P. I. Can Humet de Dalt
08213 POLINYÀ (Barcelona) - SPAIN

for the following product(s):
para el siguiente(s) producto(s):

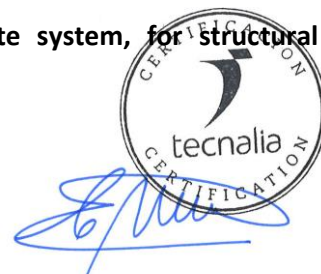
NUDEC®PC Opal 493 - Transparent Plastic Sheets.
NUDEC®PC Opal 493 – Placas transparentes.

with registration number **S-P-05913** in the International EPD® System (www.environdec.com)
con número de registro **S-P-05913** en el Sistema Internacional EPD® (www.environdec.com)

it's in conformity with:
es conforme con:

- **ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations.**
- **General Programme Instructions for the International EPD® System v.3.01.**
- **PCR 2018:10 Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) version 1.01.**
- **UN CPC 36390 Other plates, sheets, film, foil and strip, of plastics.**

Issued date / Fecha de emisión: 28/04/2022
Update date / Fecha de actualización: 28/04/2022
Valid until / Válido hasta: 26/04/2027
Serial Nº / Nº Serie: EPD0520300-E



Carlos Nazabal Alsua
Manager

This certificate is not valid without its related EPD.
Este certificado no es válido sin su correspondiente EPD.

El presente certificado está sujeto a modificaciones, suspensiones temporales y retiradas por TECNALIA R&I CERTIFICACION.
This certificate is subject to modifications, temporary suspensions and withdrawals by TECNALIA R&I CERTIFICACION.

El estado de vigencia del certificado puede confirmarse mediante consulta en www.tecnaliacertificacion.com.
The validity of this certificate can be checked through consultation in www.tecnaliacertificacion.com.

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Nº 125/C-PR283

