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Plastic profiles and elements



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Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A5, C1-C4 and D modules in accordance with EN 15804+A2
(Cradle-to-Gate with options)

Product standards: EN 13245-1:2010, EN 13245-2:2008, EN 13245-3:2010

The year of preparing the EPD: 2024

Service Life: 50 years for standard product

PCR: ITB-PCR A

Declared unit: 1 kg

Reasons for performing LCA: B2B

Representativeness: European, 2023

MANUFACTURER

MAKRO-PLAST Sp. z o. o. began its operations in 1994. Production was launched at the Białystok plant (Poland) at the turn of 1997 and 1998. In 2013, the company "MAKRO-PLAST" introduced a quality management system in the design, production and sale of plastic profiles. This is confirmed by the ISO 9001 certificate. In 2014, the production of plastic construction profiles was launched. From a company with a regional scope, the company has grown into one of the leading



Figure 1 Bird's eye view of MAKRO-PLAST Sp. z o. o.

manufacturers in the construction industry in Poland. The high quality of its products allows for the continuous expansion of sales markets. "MAKRO-PLAST" is a brand recognized in many countries around the world. The manufactured products are recognized not only in the whole of Europe, but also in the United States of America and Asian countries. Thanks to continuous improvement, the company can offer its customers innovative plastic products that meet the highest criteria set by its partners.

PRODUCTS DESCRIPTION AND APPLICATION

MAKRO-PLAST Sp. z o. o. is a manufacturer of various types of finishing strips, profiles and elements made of granulates based on polyvinyl chloride (covered by this EPD). The range of products manufactured includes the following products:

- finishing strips;
- profiles for external window and door roller shutters
- radiator covers (1.2 - 2,4m);
- seals;
- plastic elements.

The products are manufactured in various lengths and colours, and may also have different physical properties depending on the admixtures of the granulate used. The manufactured products can be used both inside and outside buildings, depending on their intended use. All additional technical information about the product is available on the [manufacturer's website](#).

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of product (averaged). Declared unit refer to various types of products. The same manufacturing process and the similarities of product allow a declared unit based on mass unit of products.

System boundary

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A5, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCRA . Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the

Type III Environmental Product Declaration No. 684/2024

calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the Plastic profiles and elements is a line process conducted in factory of MAKRO-PLAST Sp. z o. o. located in Białystok (Poland). Allocation was done on product mass basis. All impacts associated with the extraction and processing of raw materials used for the production of the declared product are allocated in module A1 of the LCA. Impacts from the global line production of MAKRO-PLAST Sp. z o. o. were inventoried and 100% were allocated to Plastic profiles and elements production. Water and energy consumption (electrical grid and LPG), associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

Minimum 99.0% input materials and 100% energy consumption (electricity, LPG) were inventoried in a processing plant and were included in the calculation. In the assessment, all available data from production have been considered, i.e. all raw materials/elements used as per formulation process, utilized thermal energy for heating, and electric power consumption. Thus, material and energy flows contributing less than 1 % of mass or energy have been considered. It can be assumed that the total sum of neglected processes does not exceed 1 % of energy usage and mass per modules A or D. Machines and facilities required during production are neglected. The packaging products (plastic packaging, paper and cardboard packaging, etc.) are included.

Modules A1 and A2: *Raw materials supply and transport*

Modules A1 and A2 represent the extraction and processing of raw materials (mainly PVC granulates) and transport to the production site. Paints, solvents, protective film are commonly used semi-finished products for the production of plastic profiles and elements. The PVC granulates used comes from both local and foreign suppliers. Module A2 (transport) includes truck transport and uses Polish and European averages for fuel data.

Module A3: *Production*

The production of the Plastic profiles and elements is carried out in factory of MAKRO-PLAST Sp. z o. o. in Białystok (Poland). The production includes the receipt of raw material deliveries for production, which are mainly PVC granulates. Then, the PVC granulate is melted and formed into specific shapes using a dedicated device. The finished products are marked, packaged, and then transferred to the recipient or sent to him. The diagram of the production process is shown in Figure 2.

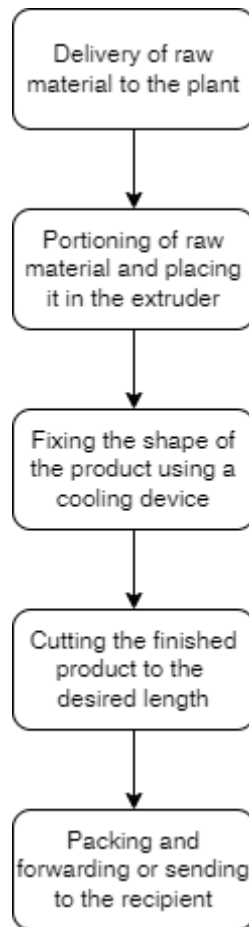


Figure 2. Diagram of the manufacturing process of plastic profiles and elements

A4-A5 Construction process stage

For the A4 transport, a transport distance of 100 km with truck is used. Packaging material is sent for either incineration or recycling according to EUROSTAT data for packaging waste. It was assumed that the products would be installed using electric power tools.

Modules C and D: End-of-life (EoL)

It is assumed that at the end of life, 100 % of plastic profiles and elements are demounted using electric tools. Materials recovered from dismantled products are recycled, incinerated (module C3) and landfilled (module C4) according to the realistic treatment practice (mass allocation) of industrial waste what is presented in Table 5. 50 % of plastic waste processing while the remaining part is forwarded to landfill in the form of mixed construction and demolition wastes. A potential credits resulting from the recycling of plastic are presented in module D. Utilization of packaging material which constitute less than 0.1 % of the total system flows was not taken into consideration.

Table 1. End-of-life scenario for a plastic profiles and elements

Material	Waste processing		Landfilling
	Material recovery (reuse, recycling)	Energy recovery (incineration)	
Plastic	30%	20%	50%

Type III Environmental Product Declaration No. 684/2024

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by MAKRO-PLAST Sp. z o. o. and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The background data for the processes come from the following resources database Ecoinvent v. 3.10 and Plastic Europe for PVC (2023). Specific (LCI) data quality analysis was a part of the input data verification.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, emission of substances to water contributing to oxygen depletion, emission of gases that contribute to the creation of ground-level ozone, abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method.

Additional information

Polish electricity (Ecoinvent v 3.10 supplemented by actual national KOBiZE data) emission factor used is 0.685 kg CO₂/kWh (National for 2023). As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of Plastic profiles and elements produced in Poland. The following life cycle modules (Table 2) were included in the analysis. The following Tables 3-6 show the environmental impacts of the life cycle of selected modules (A1-A5+C1-C4+D).

Table 2 System boundaries for the environmental characteristic of the product.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-recovery-recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
MD	MD	MD	MD	MD	MND	MND	MND	MND	MND	NMD	MND	MD	MD	MD	MD	MD

Type III Environmental Product Declaration No. 684/2024

Table 3 Life cycle assessment (LCA) results of the product – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.20E+00	6.57E-02	3.64E-01	2.63E+00	1.67E-02	3.43E-03	4.11E-03	1.67E-02	5.91E-01	5.32E-03	-1.29E+00
Greenhouse potential - fossil	eq. kg CO ₂	2.19E+00	6.54E-02	3.28E-01	2.58E+00	1.66E-02	3.43E-03	4.11E-03	1.66E-02	5.90E-01	5.26E-03	-2.45E-01
Greenhouse potential - biogenic	eq. kg CO ₂	7.51E-03	2.40E-04	3.53E-02	4.31E-02	5.68E-05	1.00E-04	1.20E-04	5.68E-05	8.70E-04	5.31E-05	-1.17E-04
Global warming potential - land use and land use change	eq. kg CO ₂	2.09E-04	2.64E-05	6.58E-04	8.93E-04	6.52E-06	1.20E-06	1.44E-06	6.52E-06	2.04E-05	5.33E-06	-1.07E-05
Stratospheric ozone depletion potential	eq. kg CFC 11	1.15E-06	1.51E-08	6.34E-09	1.17E-06	3.85E-09	7.00E-11	8.40E-11	3.85E-09	1.07E-09	1.60E-09	-2.41E-08
Soil and water acidification potential	eq. mol H ⁺	1.11E-02	2.68E-04	7.32E-04	1.21E-02	6.75E-05	3.80E-05	4.56E-05	6.75E-05	1.12E-02	4.44E-05	-2.65E-04
Eutrophication potential - freshwater	eq. kg P	6.45E-04	4.60E-06	4.36E-04	1.09E-03	1.12E-06	6.50E-06	7.80E-06	1.12E-06	4.11E-06	1.53E-06	-3.23E-06
Eutrophication potential - seawater	eq. kg N	1.42E-03	8.11E-05	2.42E-04	1.74E-03	2.04E-05	5.50E-06	6.60E-06	2.04E-05	5.85E-03	1.53E-05	-4.78E-05
Eutrophication potential - terrestrial	eq. mol N	1.92E-02	8.85E-04	1.65E-03	2.17E-02	2.22E-04	4.65E-05	5.58E-05	2.22E-04	6.41E-02	1.67E-04	-5.17E-04
Potential for photochemical ozone synthesis	eq. kg NMVOC	5.70E-03	2.70E-04	6.26E-04	6.59E-03	6.80E-05	1.30E-05	1.56E-05	6.80E-05	1.58E-02	4.82E-05	-2.45E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	5.62E-06	2.33E-07	6.26E-07	6.48E-06	5.89E-08	1.67E-08	2.00E-08	5.89E-08	2.96E-07	1.78E-08	-1.76E-07
Abiotic depletion potential - fossil fuels	MJ	5.69E+01	9.71E-01	5.21E+00	6.30E+01	2.47E-01	5.80E-02	6.96E-02	2.47E-01	1.39E-01	1.22E-01	-3.38E+00
Water deprivation potential	eq. m ³	3.72E+00	4.62E-03	6.76E-02	3.79E+00	1.14E-03	1.20E-03	1.44E-03	1.14E-03	1.87E-02	7.06E-04	-2.21E-03

Table 4 Life cycle assessment (LCA) results of the product – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA

Type III Environmental Product Declaration No. 684/2024

Table 5 Life cycle assessment (LCA) results of the the product - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.13E+00	1.47E-02	1.23E+00	3.37E+00	3.54E-03	4.30E-03	5.16E-03	3.54E-03	5.04E-02	2.14E-03	-7.80E-03
Consumption of renewable primary energy resources used as raw materials	MJ	3.59E-02	0.00E+00	0.00E+00	3.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.16E+00	1.47E-02	1.23E+00	3.41E+00	3.54E-03	4.30E-03	5.16E-03	3.54E-03	5.04E-02	2.14E-03	-7.80E-03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.93E+01	9.71E-01	5.04E+00	6.53E+01	2.47E-01	5.82E-02	6.98E-02	2.47E-01	1.39E-01	1.31E-01	-3.75E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.62E-01	0.00E+00	0.00E+00	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E+01	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	5.95E+01	9.71E-01	5.23E+00	6.57E+01	2.47E-01	5.82E-02	6.98E-02	2.47E-01	1.39E-01	1.31E-01	-3.75E+00
Consumption of secondary materials	kg	2.92E-03	3.34E-04	7.59E-04	4.01E-03	8.27E-05	5.30E-06	6.36E-06	8.27E-05	7.47E-04	0.00E+00	0.00E+00
Consumption of renew. secondary fuels	MJ	3.02E-04	3.59E-06	5.00E-06	3.10E-04	9.11E-07	2.95E-08	3.55E-08	9.11E-07	9.69E-06	0.00E+00	0.00E+00
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-05	5.63E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m ³	5.62E-02	1.26E-04	3.09E-03	5.94E-02	3.10E-05	1.58E-05	1.89E-05	3.10E-05	2.56E-04	1.90E-05	-4.53E-05

Table 6 Life cycle assessment (LCA) results of the product – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	A4	A5	C2	C3	C4	D
Hazardous waste	kg	3.94E-02	1.12E-03	1.23E-02	5.28E-02	2.77E-04	6.00E-07	7.20E-07	2.77E-04	2.85E-03	1.91E-07	-3.38E-06
Non-hazardous waste	kg	5.31E-02	2.03E-02	2.13E+00	2.20E+00	4.92E-03	3.12E-05	3.74E-05	4.92E-03	4.24E-02	5.01E-01	-1.80E-03
Radioactive waste	kg	3.18E-06	7.77E-08	2.43E-05	2.76E-05	1.84E-08	4.35E-08	5.22E-08	1.84E-08	9.40E-07	7.39E-07	-6.89E-07
Components for re-use	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
Materials for recycling	kg	3.48E-04	3.02E-06	3.02E-02	3.06E-02	7.64E-07	6.00E-08	7.20E-08	7.64E-07	2.72E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	1.50E-07	2.45E-08	5.91E-08	2.33E-07	6.18E-09	5.25E-10	6.30E-10	6.18E-09	7.56E-08	0.00E+00	0.00E+00
Exported Energy	MJ	5.56E-03	0.00E+00	7.53E-02	8.08E-02	0.00E+00	1.73E-04	2.08E-04	0.00E+00	3.30E-01	0.00E+00	0.00E+00

Type III Environmental Product Declaration No. 684/2024

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: PhD. Eng. Halina Prejzner LCI audit and verification: Filip Poznański, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products (v 1.6, 2023)
- EN 13245-1:2010 Plastics - Unplasticized poly(vinyl chloride) (PVC-U) profiles for building applications - Part 1: Designation of PVC-U profiles
- EN 13245-2:2008 Plastics - Unplasticized poly(vinyl chloride) (PVC-U) profiles for building applications - Part 2: PVC-U profiles and PVC-UE profiles for internal and external wall and ceiling finishes
- EN 13245-3:2010 Plastics - Unplasticized poly(vinyl chloride) (PVC-U) profiles for building applications - Part 3: Designation of PVC-UE profiles
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBIZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2023
- https://pvc.org/wp-content/uploads/2023/06/230628_Eco-profile-PVC_june23.pdf
- <https://ecoinvent.org/>

LCA, LCI, weryfikacja danych wejściowych
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CERTIFICATE No 684/2024 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Plastic profiles and elements

Manufacturer:

MAKRO-PLAST Sp. z o.o.

ul. Kujawska 53/1, 15-548 Białystok, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

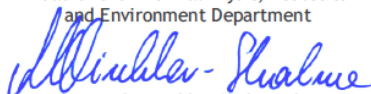
Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

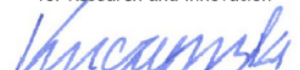
This certificate, issued on 21st October 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
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Krzysztof Kuczyński, PhD

Warsaw, October 2024