

**ENVIRONMENTAL PRODUCT DECLARATION  
No. 04-06/2024**



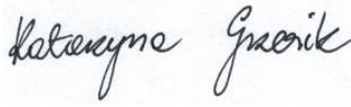
**PVC-U sewer pipes**



Owner of the declaration:	Kaczmarek Malewo Sp.K.
Program owner:	Łukasiewicz – Institute of Ceramics and Building Materials Center for Environmental Engineering
Program name	Environmental Product Declarations – B2B
Release Date:	<b>12.06.2024</b>
Declaration valid until:	<b>12.06.2029</b>

## 1. GENERAL INFORMATION

<b>Owner of the declaration:</b>  <b>Kaczmarek Malewo Sp.K.</b>	<b>Products covered by the declaration:</b>  <b>PVC-U sewer pipes</b>
<b>Program owner:</b> Łukasiewicz – Institute of Ceramics and Building Materials of the Centre for Environmental Engineering in Opole. <b><a href="http://www.icimb.pl/opole/">http://www.icimb.pl/opole/</a></b>	<b>Owner of the declaration:</b> Kaczmarek Malewo Sp.K. Malewo 1, 63-800 Gostyń Phone: +48 65 575 86 00 Email address: sekretariat@kaczmarek2.pl <b><a href="https://www.kaczmarek2.pl/">https://www.kaczmarek2.pl/</a></b>
<b>Date of issue:</b>  <b>12.06.2024</b>	<b>Declared unit:</b> <b>1 kg</b> (1 kg) of PVC-U sewer pipe.
<b>Declaration valid until:</b>  <b>12.06.2029</b>	<b>Scope:</b> The declaration includes PVC-U sewer pipes manufactured at the Kaczmarek Malewo SP.K. plant in Malewo.  The environmental declaration is based on average data provided by the manufacturer for one production plant for individual products covered by the declaration manufactured by Kaczmarek Malewo Sp.K.  The average values of the input and output streams were calculated based on data provided by the manufacturer from one production site. It contains information on the environmental impact of the declared products.  All data on the production cycle were collected by Kaczmarek Malewo Sp.K. from the period from 01/01/2022 to 31/12/2022 (12 months) and correspond to the production technology of the time. The life cycle assessment has been developed in accordance with the requirements of PN-EN ISO 15804+A2:2020, PN-EN ISO 14025 and PN-EN ISO 14040. The rules for product categorization have been adopted in accordance with the PN-EN 15804 standard.  The declaration owner is responsible for the information and the base evidence. The Łukasiewicz Research Network - Institute of Ceramics and Building Materials Center for Environmental Engineering is not responsible for the manufacturer's information and data and evidence regarding the life cycle assessment.  Declarations resulting from different programmes or not made in accordance with the standard may not be comparable

<b>Rules for product categorization (PCR)</b>	According to the standards: PN-EN ISO 15804+A2:2020-03 Sustainability of construction works. Environmental Product Declarations. Basic principles of categorization of construction products.
<b>Representativeness:</b>	Polish product, year 2022
<b>Claimed durability:</b>	100 years
<b>Reasons for performing LCA:</b>	B2B
<b>Life Cycle Analysis (LCA):</b>	LCA analysis includes modules A1-A3, A4, C1-C4 and D according to EN 15804+A2 (cradle-to-gate with options)
<b>The Łukasiewicz Institute of Ceramics and Building Materials, Environmental Engineering Division, provides access to the Type III environmental declaration for PVC-U sewer pipes of Kaczmarek Malewo Sp.K. to interested parties.</b>	
<p><b>Authors' team:</b> Katarzyna Kiprian, MSc. Eng. Ewa Głodek-Bucyk, PhD Patrik Okoń, MSc Eng.</p> <p><b>Approved:</b></p> <p> Joanna Poluszyńska, PhD Director of the Center for Environmental Engineering</p> <p> Ewa Głodek-Bucyk, PhD Leader of the Process Engineering Research Group</p>	<p><b>Review:</b></p> <p>CEN standard PN-EN 15804+A2 serves as the main PCR document. Independent verification of declarations and data in accordance with EN ISO 14025:2010</p> <p><input type="checkbox"/> Internal <input checked="" type="checkbox"/> External</p> <p> Katarzyna Grzesik, PhD, DSc, Eng.</p>

## **2. MANUFACTURER AND PRODUCT INFORMATION**

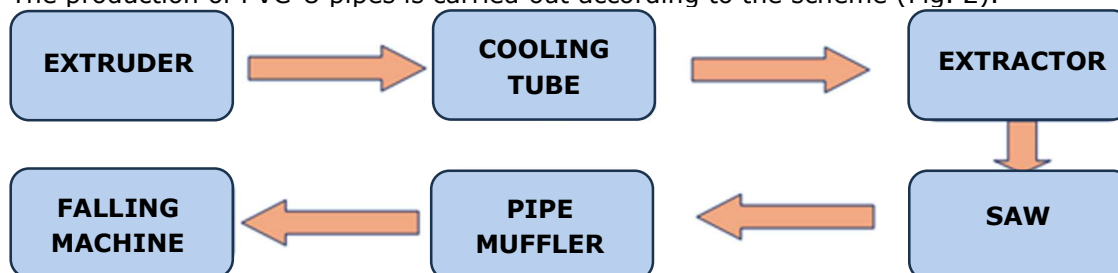


**Figure 1.** Production plant in Malewo.

The main profile of the company's activity is the production of plastic products. The history of the company dates back to 1985, when its activity began with the production of haberdashery film and technical technology made of softened PVC, was started by PPHT Barbara Kaczmarek Malewo, managed by four brothers. In the following years of activity, on the basis of the experience gained, the scope of production was introduced and expanded to include water, gas and sanitary sewage systems. For almost 40 years, the Kaczmarek Malewo company has been operating in Malewo in Wielkopolska. The production plant is shown in Figure 1. Thanks to the principles of loyalty, honesty and building success on trust, the company is still managed as a family. The company manufactures PVC-U and PE water supply systems, PE gas systems, PVC-U, PP and PE external sewage systems, PP internal sewage systems, as well as gutter systems, drainage systems, cable casing pipes, as well as manholes, tanks and retention and drainage boxes. The company's latest projects include the implementation of the production of tanks made of K2-Kan XXL structural pipes and PE water supply and sewage pipes with a diameter of up to DN1400. For the production of systems, the company uses the most modern production lines in Europe. All manufactured products meet quality standards. The official confirmation of the high quality of products is the ISO 9001 certificate: *production and distribution of plastic products for the construction of gas, water and sewage, sewage, gutter, cable, drainage and hollow slab installations.*

External sewer pipes made of poly (vinyl chloride) PVC-U are manufactured in accordance with the requirements of the PN-EN 1401-1 standard, intended for use in non-pressurized underground sanitary, drainage, combined or industrial sewage systems. PVC-U sewer pipes are solid pipes with smooth inner and outer surfaces. Ring stiffness of pipes in the range of  $SN=2 \div 16 \text{ kN/m}^2$ .

The production of PVC-U pipes is carried out according to the scheme (Fig. 2).



**Figure 2:** Process diagram of PVC-U sewer pipe

### Specifications:



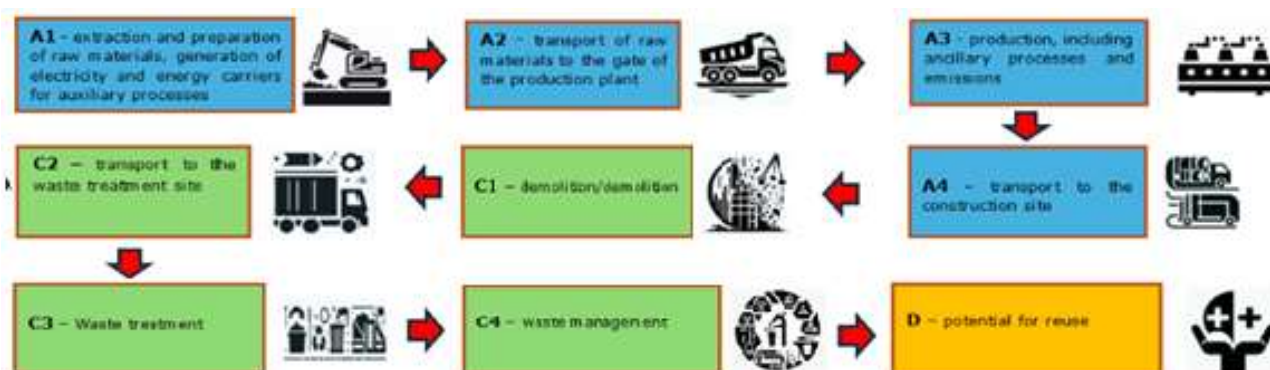
Material	Mass Participation [%]
Poly(vinyl chloride) PVC-U	81,40
Stabilizers	2,20
Fillers	16,40

Poly (vinyl chloride) density PVC-U  $\geq 1400 \text{ kg/m}^3$

## 3. LCA: CALCULATION RULES

### System limitations

The life cycle analysis of the tested products includes modules A1-A3, A4, C1-C4 and D (Cradle to Gate with options) in accordance with EN 15804.





<b>Data collection period</b>	The data on the production process were provided in 2024 for the period 01.01.2022 - 31.12.2022.
<b>Declared Unit</b>	<b>1 kg</b> (1 kg) of PVC-U sewer pipe.
<b>Assumptions</b>	<p><b>A1</b> - extraction and consumption of raw materials refers to specific mass shares in the production process per declared unit of the product,</p> <p><b>A2</b> – distances from the place of obtaining raw materials to the production plant, individual for each raw material, means of transport varied depending on the method of delivery of raw materials,</p> <p><b>A3</b> – CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub> and dust emission values from the production process obtained as a result of measurements carried out at the plant, the rest estimated on the basis of fuel consumption.</p> <p><b>A4</b> - transport - data used for calculations are included in the developed scenario.</p> <p><b>C1 -C4</b> - After completion of use, the fittings are left buried in the ground.</p> <p><b>D</b> – refers to the impact and effects of the use of secondary material. The calculations are performed based on the developed scenario.</p>
<b>Cut-off criteria</b>	99% of all mass streams involved in the production process were taken into account. All energy used in the process has been taken into account in the environmental declaration.
<b>General data</b>	The data for the calculations come from Ecoinvent v. 3.9.2, KOBiZE. Emission factors for electricity were determined using the actual KOBiZE data. The Polish electricity emission factor used (Ecoinvent supplemented with current national data from KOBiZE) is 0.685 kg CO <sub>2</sub> /kWh. A detailed analysis of data quality was part of an external audit.
<b>Allocation</b>	All data on components manufactured in the plant of Kaczmarek Malewo Sp. K. in Malewo were provided by the manufacturer and were referred to the declared unit of the product – <b>1 kg</b> of PVC-U sewer pipe. The allocation rules used in this EPD are based on the general ICIMB-PCR A principles.

#### 4. LCA: SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

For the life cycle analysis of products covered by the cradle to gate with options environmental declaration, scenarios have been developed for modules A4, C1-C4 and D:

##### Module A4:

Transport is carried out by a vehicle with a load capacity of 16-32 tonnes that meets the EURO 6 emission standards, the average distance from the plant to the customer is 350 km.

##### Modules C1- C4:

Demolition/demolition, waste transport, waste processing, waste disposal.

At the end of its useful life, the PVC-U sewer pipe is left buried in the ground. As a result, none of the processes related to the demolition, transport, processing and disposal of waste take place, which means that the environmental impact of these modules is zero.

##### Module D

Module D is zero. This means that no potential benefits or burdens are anticipated for the reuse, recycling or recovery of materials at the end of a product's lifecycle.

#### 5. LCA: RESULTS

The table below shows the LCA modules taken into account in the calculation of the environmental impact categories for the products covered by the declaration.

DESCRIPTION OF SYSTEM BOUNDARIES (X – INCLUDED IN LCA, MND – UNDECLARED MODULE)																
Production stage			Construction Stage		Usage stage							End of life stage				Benefits and flows beyond the system boundaries
Mining and supply in raw materials	Transport	Production	Transport	Construction Process	Usufruct	Maintenance	Repair	Exchange	Renovation	Energy consumption	Water consumption	Demolition	Transport	Waste treatment	Waste management	Reuse potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

The following tables present the results of the LCA analysis for the PVC-U sewer pipe. Explanations of the abbreviations used to describe the impact category are provided below:

<b>GWP-total</b>	Global warming potential
<b>GWP-fossil</b>	Global warming potential fossil fuel
<b>GWP-biogenic</b>	Global warming potential biogenic
<b>GWP-luluc</b>	Global warming potential land use and land change
<b>ODP</b>	Depletion potential of the stratospheric ozone layer

<b>AP</b>	Acidification potential of land and water
<b>EP-freshwater</b>	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
<b>EP-marine</b>	Eutrophication potential, fraction of nutrients reaching marine end compartment
<b>EP-terrestrial</b>	Eutrophication potential, Accumulated Exceedance
<b>POCP</b>	Formation potential of tropospheric ozone photochemical oxidants
<b>ADP-minerals&amp;metals</b>	Abiotic depletion potential for nonfossil resources
<b>ADP-fossil</b>	Abiotic depletion potential for fossil resources
<b>WDP</b>	Water (user) deprivation potential
<b>PM</b>	Potential incidence of disease due to PM emissions
<b>IRP</b>	Potential Human exposure efficiency relative to U235
<b>ETP-fw</b>	Potential comparative Toxic Unit for ecosystems
<b>HTP-c</b>	Potential comparative Toxic Unit for humans (cancerogenic)
<b>HTP-nc</b>	Potential comparative Toxic Unit for humans (non-cancerogenic)
<b>SQP</b>	Potential soil quality index
<b>PERE</b>	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
<b>PERM</b>	Use of renewable primary energy resources used as raw materials
<b>PERT</b>	Total use of renewable primary energy resources
<b>PEN-RE</b>	Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials
<b>RE</b>	Use of non-renewable primary energy resources used as raw materials
<b>PENRT</b>	Total use of non-renewable primary energy resources
<b>SM</b>	Use of secondary material
<b>RSF</b>	Use of renewable fuels
<b>NRSF</b>	Use of non-renewable secondary fuels
<b>FW</b>	Use of net fresh water



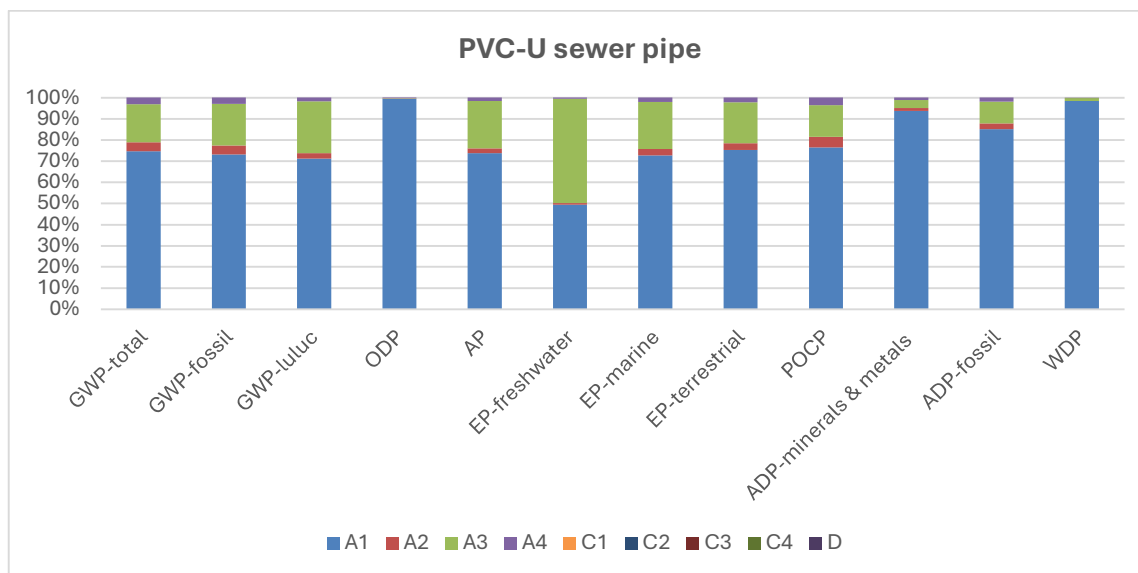
MAIN IMPACT INDICATORS: 1 kg of PVC-U sewer pipes										
Life cycle stage										
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.65E+00	9.43E-02	3.99E-01	6.64E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-fossil	kg CO2 eq.	1.63E+00	9.42E-02	4.37E-01	6.63E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-biogenic	kg CO2 eq.	1.88E-02	8.83E-05	-3.92E-02	6.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-luluc	kg CO2 eq.	1.26E-03	4.57E-05	4.31E-04	3.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
A	kg CFC11 eq.	8.66E-07	2.00E-09	1.47E-09	1.41E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AP	mol H+ eq.	6.63E-03	2.01E-04	2.01E-03	1.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EP-freshwater	kg PO4 eq.	5.18E-04	6.52E-06	5.17E-04	4.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EP-marine	kg N eq.	1.25E-03	5.06E-05	3.81E-04	3.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EP-terrestrial	mol N eq.	1.21E-02	5.14E-04	3.11E-03	3.62E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POCP	kg NMVOC eq.	4.86E-03	3.11E-04	9.63E-04	2.19E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADP-minerals & metals	kg Sb eq.	1.89E-05	3.00E-07	7.72E-07	2.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADP-fossil	MJ	4.21E+01	1.30E+00	5.11E+00	9.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WDP	WDP (m3) world. ekw	2.71E+00	5.45E-03	3.66E-02	3.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADDITIONAL IMPACT INDICATORS: 1 kg of PVC-U sewer pipe										
Life cycle stage										
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	5.49E-08	6.84E-09	7.50E-09	4.82E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
IRP	kBq U235 eq.	2.48E-01	1.76E-03	7.17E-03	1.24E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETP-fw	CTUe	5.18E-04	6.52E-06	5.17E-04	4.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTP-c	CTUh	4.33E-10	2.19E-11	2.12E-11	1.55E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTP-nc	CTUh	1.57E-08	3.37E-10	5.27E-10	2.38E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SQP	-	3.82E+00	7.87E-01	1.33E+00	5.55E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
INDICATORS DESCRIBING RESOURCE CONSUMPTION: 1 kg of PVC-U sewer pipes										
Life cycle stage										
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
PERE	MJ	1.18E+00	2.25E-02	4.31E-01	6.59E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERMIAN	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.18E+00	2.25E-02	4.31E-01	6.59E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PEN-RE	MJ	4.21E+01	8.33E-01	5.72E+00	9.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	4.21E+01	8.33E-01	5.72E+00	9.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Kg	0.00E+00	0.00E+00	2.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	1.36E-02	3.26E-04	6.34E-04	1.46E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

<b>INDICATORS DESCRIBING OUTPUT STREAMS AND WASTE: 1 kg of PVC-U sewer pipes</b>											
Indicator	Unit (referenced to DU)	Life cycle stage									
		A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Amount of hazardous waste	Kg	HV	HV	2.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Amount of non-hazardous waste	Kg	HV	HV	2.46E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Amount of radioactive waste	Kg	HV	HV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Reusable components	Kg	HV	HV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recyclable materials	Kg	HV	HV	2.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Energy Recovery Materials	Kg	HV	HV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported Energy	MJ/energy carrier	HV	HV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

<b>BIOGENIC CARBON</b>	
<b>Biogenic carbon content in the product (kg C<sub>org</sub>)</b>	<b>0.00E+00</b>
<b>Biogenic carbon content per package (kg C<sub>org</sub>)</b>	<b>1.56E-02</b>

## 6. INTERPRETATION OF RESULTS

Figure 3 shows a diagram of the contributions of individual life cycle modules to the basic categories of impact of the PVC-U sewer pipe:



**Figure 3** Shares of life cycle modules on the main categories of impacts – PVC-U sewer pipe.

## LITERATURE

- ✓ PN-EN ISO 14025:2014-04, Environmental labels and declarations -- Type III environmental declarations -- Rules and procedures.
- ✓ PN-EN 15804+A2:2020, Sustainability of building structures -- Environmental product declarations -Basic principles of categorization of construction products.
- ✓ PN-EN ISO 14040:2009 Environmental management. Life Cycle Assessment. Principles and structure.
- ✓ PN-EN ISO 14044:2009, Environmental management. Life Cycle Assessment. Requirements and guidelines.
- ✓ EN 15942:2012, Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ The Act of 14 December 2012 on Waste, Journal of Laws. 2013, item 21.
- ✓ Act of 27 April 2001. Environmental Protection Law Journal of Laws 2024.54, consolidated text.
- ✓ Data from the company's website: <https://www.kaczmarek2.pl/>

Explanatory material can be obtained by contacting the representative directly Kaczmarek Malewo Sp.K.