ZAG EPD

Environmental Product Declaration

According to ISO 14025 and EN 15804

EUROTHERM EPS INSULATION (grey)

ECO PLATFORM EPD EN 15804 VERIFIED

Številka EPD	EPD-22/0003
EPD owner	JUB d.o.o., Dol pri Ljubljani 28, 1262 Dol pri Ljubljani
EPD Program operator	ZAG EPD
Issue date	15. 02. 2022
Valid until	15. 02. 2027

ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17

www.zag.si

General information	**EUROTHERM EPS INSULATION (grey)** Eurotherm EPS F-G (without rabbet, with rebate, with holes, with relief notches) Eurotherm Effect Plus
Program holder: Slovenian National Building And Civil Engineering Institute - ZAG Dimičeva 12 1000 Ljubljana http://www.zag.si	**Owner of the Environmental Product Declaration:** JUB d.o.o. Dol pri Ljubljani 28 1262 Dol pri Ljubljani https://www.jub.si/
Number of the Environmental Product Declaration: EPD-22/0003	**Declared unit:** 1 m^3 expanded polystyrene rigid foam
This Environmental Product Declaration is based on the Product Category Rules (PCR): Part B: Requirements on the EPD for Insulationg materrials made of foam plastics	**Scope:** A1-A3, A4-A5, C1-C4 and D
Issue date: 15. 02. 2022 **Valid until:** 15. 02. 2027	**Verification:** The CEN standard SIST EN 15804 serves as the core Product Category Rule (PCR) Independent verification of the EPD according to EN ISO 14025 ☐external ☒ internal
Production plant: JUB d.o.o. Nova vas 56 1385 Nova vas	**Title and the handwritten signature of verificator:** *Katja Malovrh Rebec, Ph.D.* Slovenian National Building And Civil Engineering Institute - ZAG Digitally signed by Katja MALOVRH REBEC Date: 2022.02.16 14:39:56 +01'00'
Title and the handwritten signature issuer: Digitalno podpisal FRANC CAPUDER Datum: 2022.02.16 14:59:43 +01'00' *mag. Franc Capuder, univ. dipl. inž. grad.* Slovenian National Building And Civil Engineering Institute - ZAG	**Title and handwritten signature of leading expert:** *Anja Lešek, mag.grad.* Anja Lešek Digitalno podpisal Anja Lešek Datum: 2022.02.16 14:14:55 +01'00' Slovenian National Building And Civil Engineering Institute - ZAG

1 Product

1.1 Product description

Grey Expanded Polystyrene (EPS) is a lightweight, rigid, plastic foam insulation material produced from solid beads of polystyrene. It is already present on the market from year 1954. It is suitable for many applications in construction and it is among most used materials for thermal and sound insulation of buildings. EPS has a lot of good properties, beside excellent unit weight/mechanical properties ratio, also characteristics of EPS don't change through time, it is chemical inert, EPS could be recycled, has very good thermal insulation properties, etc.

1.2 Technical Data

Basic characteristic of Eurotherm EPS insulation are summed up in Table 1.

Table 1: Overview of the products and their properties

Name	Value	Unit
Thermal conductivity acc. To EN 12667	0,031	W/mK
Tensile strength	150	kPa
Compresive strength at 10 % deformation	70-80	kPa
Bending strength	115-125	kPa

1.3 Application

The range of products considered in this EPD is used in construction for wall insulation, External Thermal Insulation Composite System (ETICS), pitched roof insulation and ceiling insulation.

1.4 Base materials

Insulation boards Eurotherm EPS are made of polystyrene. The pentane is used as a blowing agent (up to 6%). The pentane is released during the manufacturing and storage processes. For the preparation of the flame-retardant polystyrene granulate approx. 1,5% polymeric flame-retardant is added. Graphite is added to decrease EPS's thermal conductivity. Polymer FR is a brominated styrene-butadiene copolymer (CAS no. 1195978-93-8) that is not subjected to the REACH Regulation for substances of very high concern.

1.5 Manufacturing process

Raw material, EPS granulate containing graphite, is transported from producer to the plant located in Nova vas, Slovenia. It is transported in special containers, granulate diameter is from 0.5 to 1.8 mm. Production of insulation boards entails a multi-stage production process. There are following manufacturing stages: pre-foaming, conditioning and final foaming (block or board moulding). During the pre-foaming heating by steam causes the foaming of the beads due to the pentane blowing agent. The pre-expanded granulate is than stored in air-permeable silos where it gain due to diffusing air necessary stability for further processing. Next stage is block foaming, where conditioned EPS granulate is filled into block mould and with introduced steam second expansion takes place. After short cooling time, the blocks are demoulded and deposited. The final

shape is achieved by hot wire cutting of the block to give desired board dimensions. Finally, the board edges could be trimmed to obtain the desired edge detail. The waste generated during the board cutting is subject of internal recycling and reused in production cycle. Also secondary material from other production processes is used. The share of recycled content in the product is 15 %. Another way to get final shape of EPS boards is to transport EPS granulate from silos to shape mould where after introducing steam and short cooling time single board with desired dimensions is produced.

1.6 Packaging

The boards are packed on 4 of 6 sides in PE film. For final palleting of finished products PE stretch film is used for wrapping. The PE film is recyclable and is collected by qualified disposal companies.

1.7 Further information

Additional information can be found at www.jub.si or at the homepages of the respective manufacturer.

2 LCA: Calculation rules

2.1 Declared unit

The declared unit is 1 m^3 expanded polystyrene rigid foam. The conversion factors are listed in the table below.

2.2 System boundary

Type of the EPD: cradle to gate - with options.

The analysis of the product life cycle includes production of the basic materials, transport of the basic materials, manufacture of the product and the packaging materials and is declared in module A1-A3.

The disposal of the packaging materials in module A4-A5.

Gained energy from incineration and recycling of the packing material is declared in module D, beyond the system boundary.

The use stage is not taken into account in the LCA calculations.

The end-of-life scenarios include the transport to end-of-life stage (C2) and three different scenarios.

EoL-scenario 1: 100% Material recycling: The effort of material treatment is considered in C3.

EoL-scenario 2: 100% incineration: The effort and emissions of an incineration process is declared in module C4. Resulting energy is declared in module D

EoL-scenario 3: 100% Material landfill.

2.3 Cut-off rules

All raw materials, their transport, water, energy and packing materials are included. No machine amortisation is considered.

2.4 Data quality

The applied European average polystyrene data set "EU-28: Expandable Polystyrene (EPS)- white and grey" - provided by /PlasticsEurope/ valid until 2022 - already include blowing agent and flame retardant as a defined recipe. Due to the limited variation of ingredients within the EPS production, this generic data set fulfills the requirement of an LCA in an adequate way.

2.5 Period under review

The data collected by the manufacturer was based on the yearly production amounts of the company. The reference year is 2021.

2.6 Allocation

The applied model does not include any allocations.

2.7 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

For life cycling modelling of the considered products, the GaBi 2021 has been used.

3 LCA: Scenarios and additional technical information

3.1 Characteristic product properties Biogenic Carbon

The biogenic carbon is only present in the packing material an is its values are summarized in Table 21.

Information on describing the biogenic Carbon Content at factory gate

Table 2: Biogenic carbon content

Name	Value	Unit
Biogenic Carbon Content in product	0	kg C
Biogenic Carbon Content in accompanying packaging	1,18	kg C

3.2 Technical information

The following technical information is the basic for the declared modules or can be used for the development of specific scenarios in the context of abuilding assessment. Undeclared modules are labelled with the abbreviation MND (Moduel Not Declared).

3.3 Transport to the building site (A4)

Transport to the building site was not cosidered in the scope of the study.

3.4 Installation into the building (A5)

The environemtal impacts of packing waste processing and disposal is considered.

3.5 Use stage (B1-B7)

Not included in the scope of the study.

3.6 End of life (C1-C4)

The end-of-life scenarios include the transport to end-of-life stage (C2) and three different scenarios.

EoL-scenario 1: 100% Material recycling: The effort of material treatment is considered in C4.

EoL-scenario 2: 100% incineration: The effort and emissions of an incineration process is declared in module C4.

EoL-scenario 3: 100% Material landfill.

3.7 Reuse, recovery and recycling potential (D) relevant scenario information

In the module D the potential benefits of recycling and energy recovery from incinerations are considered throughout the entire lifecycle (module A1-A3, A4-A5, C1-C4) .

4 LCA: Results

Table 3: Selected phases of the LCA

SYSTEM BOUNDARY																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Production	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / 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
☒	☒	☒	☒	☒	MNA	MNA	MNA	MNA	MNA	MNA	MNA	☒	☒	☒	☒	☒
The modules of the product lifecycle, which are included in EPD are marked by "X", modules not included are marked with a "MNA" = module not assessed, "MND" = module od indicator nor declared, "MNR" = module not relevant																

4.1 Indicators of environmental impacts

According to the standard EN 15804, the environmental impacts are presented with thirteen indicators (table 4).

Table 4: Abbreviations and units of indicators of environmental impacts

Indicators of environmental impacts	Abbreviation	Unit
global warming potential total	GWP-total	kg CO_2 equiv
global warming potential fossil fuels	GWP-fossil	kg CO_2 equiv
global warming potential biogenic	GWP-biogenic	kg CO_2 equiv
global warming potential land use and land use change	GWP-luluc	kg CO_2 equiv
depletion potential of the stratospheric ozone layer	ODP	kg CFC 11 equiv
acidification potential, accumulated exceedance	AP	mol H^+ equiv
eutrophication potential, fraction of nutrients reaching freshwater end compartment	EP-freshwater	kg PO_4^- equiv
eutrophication potential, fraction of nutrients reaching marine end compartment	EP-marine	kg N equiv
eutrophication potential, accumulated exceedance	EP-terrestrial	kg N equiv
formation potential of tropospheric ozone	POCP	kg NMVOC equiv
abiotic depletion potential for non-fossil resources	APD-minerals&metals	kg Sb equiv
abiotic depletion for fossil resources potential	APD-fossil	MJ, net calorific value
water (user)m deprivation potential, deprivation-weighted water consumption	WDP	m^3 world equiv deprived

The environmental impact indicators for the product are shown in Table 5:

Table 5: Indicators of environmental impacts

Indicator	Unit	A1-A3	A4	A5	C2	C3 rec	C3 inc	C3 land	C4 rec	C4 inc	C4 land	D rec	D inc	D land
GWP-total	[kg CO_2 eq.]	38,81	0,03	5,89	0,05	0,00	0,00	0,00	0,00	54,50	1,15	-35,90	-25,17	-2,20
GWP-fossil	[kg CO_2 eq.]	43,54	0,03	0,51	0,05	0,00	0,00	0,00	0,00	54,49	1,16	-35,78	-25,10	-2,19
GWP-biogenic	[kg CO_2 eq.]	-4,75	0,00	5,38	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	-0,13	-0,06	-0,01
GWP-luluc	[kg CO_2 eq.]	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	0,00
ODP	[kg CFC 11 eq.]	1,46E-09	4,41E-18	1,25E-15	6,72E-18	0	0	0	0	3,78E-15	2,79E-15	-3,3E-09	-2E-09	-2E-09
AP	[mol H^+ eq.]	0,136255	0,00011	0,00087	0,000165	0	0	0	0	0,004789	0,003468	-0,10936	-0,04391	-0,00397
EP-freshwater	[kg PO_4 eq.]	0,000139	1,03E-07	8E-07	1,56E-07	0	0	0	0	5,06E-07	0,000214	-0,00012	-3,1E-05	-7,6E-06
EP-marine	[kg N eq.]	0,025765	5,05E-05	0,000278	7,56E-05	0	0	0	0	0,001051	0,000787	-0,02021	-0,00791	-0,00074
EP-terrestrial	[kg N eq.]	0,276222	0,000565	0,004028	0,000845	0	0	0	0	0,02252	0,008625	-0,21659	-0,08432	-0,0079
POCP	[kg NMVOC eq.]	0,098693	9,86E-05	0,000756	0,000148	0	0	0	0	0,003099	0,002516	-0,0819	-0,02576	-0,00273
APD-minerals&metals	[kg Sb eq.]	4,19E-06	2,63E-09	1,81E-08	4,01E-09	0	0	0	0	5,72E-08	7,97E-08	-2,9E-06	-3,6E-06	-2,9E-07
APD-fossil	[MJ]	1303,143	0,46	1,794845	0,700708	0	0	0	0	6,178543	16,87982	-1108,91	-405,366	-39,0829
WDP	[m^3]	11,92167	0,0003	0,601737	0,000457	0	0	0	0	4,410919	-0,01426	-7,25118	-0,43627	-0,2182

4.2 Indicators of raw material use

The results of the raw materials use are in accordance with the standard EN 15804, shown with ten indicators (table 6). Indicators include the use of renewable and non-renewable energy, the use of renewable and non-renewable material resources and the use of water.

Table 6: Abbreviations and units of indicators of raw material use

Indicators of raw material use	Abbreviation	Unit
use of renewable primary energy excludind renewable primary energy resources used as raw materials	PERE	MJ, net calorific value

use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value
total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value
use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value
use of non-renewable primary energy sources used as raw materials	PENRM	MJ, net calorific value
total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value
use of secondary materials	SM	kg
use of renewable secondary fuels	RSF	MJ, net calorific value
use of non-renewable secondary fuels	NRSF	MJ, net calorific value
net use fresh water	FW	m^3

The indicators of the use of raw materials for the product are shown in Table 7.

Table 7: Indicators of raw material use

Indicator	Unit	A1-A3	A4	A5	C2	C3 rec	C3 inc	C3 land	C4 rec	C4 inc	C4 land	D rec	D inc	D land
PERE	[MJ]	1,08E+02	2,57E-02	4,13E-01	3,91E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E+00	1,23E+00	-1,93E+01	-8,18E+01	-6,75E+00
PERM	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	1,08E+02	2,57E-02	4,13E-01	3,91E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E+00	1,23E+00	-1,93E+01	-8,18E+01	-6,75E+00
PENRE	[MJ]	1,30E+03	4,60E-01	1,80E+00	7,01E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,18E+00	1,69E+01	-1,11E+03	-4,05E+02	-3,91E+01
PENRM	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	1,30E+03	4,60E-01	1,80E+00	7,01E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,18E+00	1,69E+01	-1,11E+03	-4,05E+02	-3,91E+01
SM	[kg]	-1,39E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m3]	3,08E-01	2,94E-05	1,42E-02	4,47E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,03E-01	1,56E-04	-1,73E-01	-6,97E-02	-9,92E-03

4.3 Other indicators of environmental impacts

According to the standard EN 15804, the results for other environmental information (waste disposal data) are presented with three indicators, and the results of the output flows from the system are based on four indicators (table 8).

Table 8: *Abbreviations and units of other indicators of environmental impacts*

Indicators for other environmental information	Abbreviation	Units
hazardous waste disposal	HWD	kg
non-hazardous waste disposal	NHWD	kg
radioactive waste disposal	RWD	kg
Output flow indicators	Abbreviation	Units
components for re-use	CRU	kg
material for recycling	MFR	kg
materials for energy recovery	MER	kg
exported energy	EE	MJ on the energy carrier

Indicators for other environmental information and output flow indicators for the product are shown in Table 9.

Table 9: Other indicators of environmental impacts

Indicator	Unit	A1-A3	A4	A5	C2	C3 rec	C3 inc	C3 land	C4 rec	C4 inc	C4 land	D rec	D inc	D land
HWD	[kg]	1,39E-02	2,32E-11	3,56E-10	3,53E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,10E-09	3,04E-09	-1,28E-02	-6,24E-08	-5,09E-09
NHWD	[kg]	6,48E-01	6,84E-05	7,61E-02	1,04E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,97E-01	1,61E+01	-5,32E-01	-1,43E-01	-1,08E-02
RWD	[kg]	2,48E-02	5,57E-07	1,24E-04	8,48E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,51E-04	1,96E-04	-1,06E-02	-3,39E-02	-2,75E-03
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

4.4 Additional impact categories and indicators

According to the standard EN 15804, the results for additional impact categories and indicators are presented with six indicators (table 10).

Table 10: *Abbreviations and units of additional impact categories and indicators*

Indicators for additional impact	Abbreviation	Unit
potential incidence of disease due to PM emissions	PM	disease incidence
potential human exposure efficiency relative to U235	IRP	kBq U235 equiv
potential comparative toxic unit for ecosystems	ETP-fw	CTUe
potential comparative toxic unit for humans-cancerogenic	HTP-c	CTUh
potential comparative toxic unit for humans-non-cancerogenic	HTP-nc	CTUh
potential soil quality index	SQP	-

Indicators for additional impact are shown in Table 11.

Table 11: Additional impact

Indicator	Unit	A1-A3	A4	A5	C2	C3 rec	C3 inc	C3 land	C4 rec	C4 inc	C4 land	D rec	D inc	D land
PM	[disease incidence]	1,59E-06	5,85E-10	4,62E-09	9,26E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,81E-08	3,40E-08	-7,82E-07	-3,11E-07	-2,99E-08
IRP	[kBq U235 eq.]	9,55E+00	7,97E-05	1,99E-02	1,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,58E-02	2,81E-02	-1,66E+01	-1,09E+01	-8,81E+00
ETP-fw	[CTUe]	2,96E+03	3,32E-01	7,53E-01	5,06E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,78E+00	1,60E+01	-2,67E+03	-7,90E+01	-7,68E+00
HTP-c	[CTUh]	1,34E-08	6,70E-12	4,49E-11	1,02E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,98E-10	7,19E-10	-1,28E-08	-6,49E-09	-2,39E-09
HTP-nc	[CTUh]	4,20E-07	3,93E-10	1,75E-09	6,04E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,65E-09	6,02E-08	-3,28E-07	-1,32E-07	-1,15E-08
SQP	[-]	9,01E+02	1,58E-01	4,58E-01	2,40E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,73E+00	1,15E+00	-3,54E+00	-5,14E+01	-4,25E+00

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It dose not considereffects 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.

Disclaimer 2 – for the indicators ADPE, ADPF, WDP, ETP-fw, HTP-c, HTP-nc, SQP
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.

5 Interpretation of results

The presented results show that the product stage (i.e. modules A1-A3) contributes the most to the environmental footprint of Eurotherm EPS products.

A potential environmental benefit has also been calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all considered environmental impact categories. The potential benefits are presented in module D.

The results further show that the majority of the raw resources are used within the product stage (i.e. modules A1-A3) of Eurotherm EPS products. While construction process stage (i.e. modules A4 and A5), and end-of-life stage (modules C2 and C4) consume minor amount of raw materials. A potential environmental benefit has been calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all considered raw material use impact categories.

The presented results show that for Eurotherm EPS products, the potential benefits are expressed in terms of benefits from the incineration process, recycling and minor benefits are associated with the landfilling process.
Finally, the presented results show that there are generally no significant impacts in terms of other environmental information and output flows. A potential environmental benefits have been calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all considered waste categories and other output flows. The presented results show that there are no significant potential benefits in terms of waste categories and other output flows.

6 References

1. Gabi 2021. Sphera.
2. EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
3. EN ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework (EN ISO 14040:2006)
4. EN ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines (EN ISO 14044:2006)
5. EN ISO 14025:2010 Environmental labels and declarations - Type III environmental

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The data specified in the EPD are calculated on the basis of the data provided by the manufacturer. In the event that the manufacturer's information is incorrect, calculations do not apply.