ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	JACKON Insulation GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-JAC-20220371-CBA1-EN
Issue date	19/12/2023
Valid to	18/12/2028

JACKODUR EVO

Jackon Insulation GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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General Information

Jackon Insulation GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-JAC-20220371-CBA1-EN

This declaration is based on the product category rules:

Insulating materials made of foam plastics, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

19/12/2023

Valid to

18/12/2028

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

JACKODUR EVO

Owner of the declaration

JACKON Insulation GmbH
Carl-Benz-Straße 8
33803 Steinhagen
Germany

Declared product / declared unit

The declared unit is 1 m^3 of the XPS board, JACKODUR EVO.

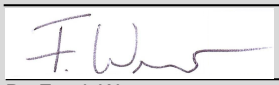
Scope:

JACKON Insulation, as data provider, produces the extruded polystyrene foam boards JACKODUR EVO containing CO_2 as blowing agent and use more than 5% post consumer recycled polystyrene (rGPPS) content plus approximately 28% reclaimed/recovered content via internal recycling. The data have been provided by one factory in Arendsee/Germany for the second half year 2022.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Dr. Frank Werner,
(Independent verifier)

Product

Product description/Product definition

JACKODUR EVO is an extruded polystyrene foam (XPS) produced according to *EN 13164* and available in board shape with a density range from 28 to 40 kg/m^3, 34.37 kg/m^3 in average (measured). It has specifically low values of thermal conductivity. The boards can be delivered in various compressive strength values from 300 to 700 kPa. To meet the need of various applications the boards are produced with different surfaces: with the extrusion skin, planed, grooved or with thermal embossing. JACKODUR EVO boards are supplied with different edge treatments such as butt edge, ship-lap and tongue and groove. **The EPD is related to an unlaminated product only; lamination and additional product treatment are not considered.** For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration EN 13164 Building insulation and the CE-marking.

Application

The variety of the performance properties of JACKODUR EVO make it suitable for use in a large number of applications such as: perimeter insulation, inverted roof insulation, insulation of pitched roofs, floor insulation including insulation of highly loaded industrial floors, insulation of thermal bridges for exterior walls, External Thermal Insulation Composite Systems (ETICS), insulation of cavity walls, agricultural building ceiling insulation, prefabricated elements e.g. building sandwich panels, insulation for building equipment and industrial installations (pipe sections, ...)

Technical Data

Acoustic properties are not relevant for JACKODUR EVO. For fire performance, these products achieve the fire classification Euroclass E according to *EN 13501-1*.

Constructional data

Name	Value	Unit
Gross density	28 - 40	kg/m^3
Compressive strength acc. to EN 826	0.3 - 0.7	N/mm^2
Tensile strength acc. to EN 1607	0.1 - 0.4	N/mm^2
Calculation value for thermal conductivity	0.032	W/(mK)
Water vapour diffusion resistance factor acc. to EN 12088	50 - 250	-

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 13164:2012+A1:2015* Thermal Insulation products for buildings.

Base materials/Ancillary materials

Name	Value	Unit
GPPS	70 - 95	%
rGPPS (post consumer)	5 - 30	%
Blowing agents	6 - 8	%
Polymeric flame retardant	2	%
Additives	0.5 - 1	%

JACKODUR EVO is made of polystyrene (90 to 95% by weight – CAS 9003-53-6), blown with carbon dioxide (CAS 124-38-9) and halogen-free co-blowing agents altogether up to 8% by weight.

For the production of JACKODUR EVO, internal production scrap is recycled. According to the Italien "Piano d'Azione Nazionale sul GREEN PUBLIC PROCUREMENT (PANGPP)" and the "Criteri ambientali minimi per l'affidamento del servizio di progettazione ed esecuzione dei Lavori di Interventi edilizi" the input of polystyrene is composed of:

1. GPPS 40 - 70 %
2. rGPPS (internal scrap) 25 - 35%
3. rGPPS (post-consumer) 5 - 30%

The brominated polymeric flame retardant is used to enable the foam to meet fire performance standards. Other additives are used, e.g. color pigments and processing aids in minor quantity.

Polystyrene is produced from oil and gas. Therefore, it is linked to the availability of these raw materials. Polystyrene is transported by road.

This product contains substances listed in the candidate list of substances of very high concern (REACH Regulation, date:109.06.2023) exceeding 0.1 percentage by mass: **no**

This product contains other Carcinogenic, Mutagenic, Reptrotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): **no**

Reference service life

A reference service life (RSL) according to *ISO 15686* cannot be declared. The durability of JACKODUR EVO is normally at least as long as the lifetime of the building in which it is used (more than 80 years).

LCA: Calculation rules

Declared Unit

The declared unit is 1 m^3 of the XPS board, JACKODUR EVO.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	34.37	kg/m^3

JACKODUR EVO is available in several densities and thicknesses. For a product with a density or thickness different from the reference density of 34.37 kg/m^3, the environmental impacts may be calculated using the following equation:

$$I_{adap} = I_{ref} \times \frac{\rho_{adap}}{\rho_{ref}} \times \frac{d_{adap}}{d_{ref}}$$

I_{adap} – adapted Life Cycle Impact Assessment LCIA indicator or LCI parameter
I_{ref} – LCIA indicator or LCI parameter for reference density of 34.37 kg/m^3
ρ_{adap} – adapted density
ρ_{ref} – reference density 34.37 kg/m^3
d_{adap} – adapted board thickness
d_{ref} – thickness of reference board 100mm

System boundary
Type of EPD according to EN 15804: "cradle to gate with options, modules C1–C4, and module D". The following modules are declared: A1–A3, C, D and additional modules: A4 + A5.

Modules A1-A3
The product stage includes:

- Raw material supply (A1) comprises the production of virgin and recycled polystyrene granulate, blowing and co-blowing agents as well as flame retardants.
- The transport to the manufacturer is considered in module A2.
- The manufacturing of the XPS board (A3) comprises the provision of all materials, products and energy, as well as waste processing up to the end-of-waste state, including packaging of the product and the internal recycling process of the foam scrap.

Modules A4-A5
The construction process stage includes:

- Transport to the construction site (A4)
- Treatment of packaging material (A5) with benefit for potential avoided burdens due to energy substitution of electricity and thermal energy generation are declared in module D (D/1, D/2, and D/3).

Modules C1-C4 and D
The end-of-life stage includes:

- Manual dismantling (C1)
- Transport to EoL (C2)
- Waste processing & disposal (C) with three 100 % scenarios (scenario 1: thermal treatment (C3/1); scenario 2: recycling(C3/2); scenario 3: landfill (C4/3)).
- The resulting potential benefits for thermal and electrical energy from energy substitution from incineration (packaging material in A5 and the product in C3/1) and from recycling (C3/2) material benefit for the recycled material are considered in modules D/1 and D/2, respectively. This affects only the rate of primary materials (no secondary materials). The benefits in D/3 solely account for the avoided burdens calculated by the inversion of the electricity grid mix and thermal energy from natural gas during packaging treatment (A5). This is considered under European conditions.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

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. Background database: *Sphera LCA FE (GaBi ts)*, CUP 2023.1

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon
No biogenic carbon is declared in the product or packaging.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Note: 1 kg of biogenic carbon content is equivalent to 44/12 kg of CO_2

The values below refer to the declared unit of 1 m^3 JACKODUR EVO XPS product.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.42	l/100km
Transport distance	500	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported	35.016	kg/m^3

Installation into the building (A5)

Name	Value	Unit
Polyethylene foil (waste packaging to incineration)	0.434	kg
XPS pallets (waste packaging to incineration)	0.212	kg

End of life (C1-C4)
For the End of Life stage, three different scenarios are considered. One scenario with 100% incineration (C3/1), another with 100% recycling (C3/2) and one scenario with 100% landfill (C4/3) are calculated.

Name	Value	Unit
Collected separately waste type (XPS)	34.37	kg
Energy recovery (C3/1)	34.37	kg
Recycling (C3/2)	34.37	kg
Landfilling (C4/3)	34.37	kg

LCA: Results

The following tables display the environmentally relevant results according to *EN 15804* for 1 m^3 XPS board.
The three EoL scenarios are declared in modules C3/1 + D/1 (Scenario 1) and C3/2 + D/2 (Scenario 2) and C4/3 + D/3 (Scenario 3), where:

- C3/1 represents the thermal treatment of XPS-boards,
- C3/2 the recycling of XPS, and
- C4/3 the landfilling of XPS.

Modules D/1, D/2 and D/3 include benefits and loads beyond the system boundary for the incineration of packaging materials and the burning of the product during EoL scenario 1, recycling of the product in scenario 2, and landfilling of the product in scenario 3 respectively.
Module D/3 includes only benefits and loads beyond the system boundary of the treatment of packaging materials. No benefits are declared from landfilling the XPS product.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	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**
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/3	D/1	D/2	D/3
GWP-total	kg CO_2 eq	1.04E+02	1.27E+00	2.09E+00	0	1.25E-01	1.15E+02	4.4E+00	2.44E+00	-4.73E+01	-6.83E+01	-1.01E+00
GWP-fossil	kg CO_2 eq	1.03E+02	1.26E+00	2.09E+00	0	1.23E-01	1.15E+02	4.35E+00	2.44E+00	-4.72E+01	-6.8E+01	-1E+00
GWP-biogenic	kg CO_2 eq	4.79E-01	1.31E-04	6.93E-05	0	1.29E-05	3.65E-03	4.72E-02	3.19E-03	-5.58E-02	-2.71E-01	-1.19E-03
GWP-luluc	kg CO_2 eq	1.71E-02	1.16E-02	2.21E-06	0	1.14E-03	1.38E-04	4.68E-04	1.95E-03	-2.91E-03	-4.07E-03	-6.19E-05
ODP	kg CFC11 eq	1.42E-10	1.63E-13	9.79E-14	0	1.6E-14	5.32E-12	7.94E-11	3.97E-12	-2.29E-10	-6.95E-11	-4.88E-12
AP	mol H^+ eq	1.44E-01	1.61E-03	1.97E-04	0	1.58E-04	1.01E-02	9.19E-03	7.09E-03	-4.95E-02	-1.06E-01	-1.05E-03
EP-freshwater	kg P eq	1.13E-04	4.59E-06	2.33E-08	0	4.5E-07	1.27E-06	1.61E-05	4.55E-04	-2.45E-05	-8.05E-05	-5.21E-07
EP-marine	kg N eq	4.19E-02	5.46E-04	4.21E-05	0	5.36E-05	2.22E-03	2.2E-03	1.62E-03	-1.61E-02	-2.92E-02	-3.42E-04
EP-terrestrial	mol N eq	4.58E-01	6.57E-03	9.31E-04	0	6.45E-04	4.75E-02	2.3E-02	1.78E-02	-1.73E-01	-3.16E-01	-3.68E-03
POCP	kg NMVOC eq	2.84E-01	1.39E-03	1.25E-04	0	1.36E-04	6.52E-03	5.87E-03	5.16E-03	-4.57E-02	-1.14E-01	-9.72E-04
ADPE	kg Sb eq	3.44E-05	8.26E-08	9.1E-10	0	8.11E-09	4.93E-08	6.67E-07	6.25E-08	-1.38E-06	-2.04E-06	-2.93E-08
ADPF	MJ	2.79E+03	1.71E+01	2.44E-01	0	1.68E+00	1.3E+01	9.06E+01	3.53E+01	-9.03E+02	-2.25E+03	-1.92E+01
WDP	m^3 world eq deprived	4.97E+00	1.52E-02	1.85E-01	0	1.49E-03	9.39E+00	9.59E-01	-3.34E-02	-1.98E+00	-1.39E+01	-4.2E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/3	D/1	D/2	D/3
PERE	MJ	7.72E+01	1.24E+00	6.25E-02	0	1.22E-01	3.37E+00	5.41E+01	3.18E+00	-7.09E+01	-4.62E+01	-1.51E+00
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	7.72E+01	1.24E+00	6.25E-02	0	1.22E-01	3.37E+00	5.41E+01	3.18E+00	-7.09E+01	-4.62E+01	-1.51E+00
PENRE	MJ	1.6E+03	1.72E+01	2.89E+01	0	1.68E+00	1.18E+03	9.06E+01	3.53E+01	-9.03E+02	-2.26E+03	-1.92E+01
PENRM	MJ	1.19E+03	0	-2.86E+01	0	0	-1.17E+03	-1.17E+03	0	0	0	0
PENRT	MJ	2.79E+03	1.72E+01	2.44E-01	0	1.68E+00	1.3E+01	-1.08E+03	3.53E+01	-9.03E+02	-2.26E+03	-1.92E+01
SM	kg	2.39E+00	0	0	0	0	0	0	0	0	3.04E+01	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.37E-01	1.36E-03	4.32E-03	0	1.34E-04	2.2E-01	4.37E-02	3.48E-04	-1.18E-01	-3.46E-01	-2.52E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/3	D/1	D/2	D/3
HWD	kg	1.79E-07	5.31E-11	5.35E-12	0	5.21E-12	2.71E-10	-7.09E-09	2.97E-09	-9.9E-08	-1.09E-07	-2.1E-09
NHWD	kg	9.03E-01	2.62E-03	9.57E-03	0	2.57E-04	6.62E-01	6.63E-02	3.42E+01	-2.18E-01	-5.5E-01	-4.64E-03
RWD	kg	5.06E-02	3.21E-05	1.47E-05	0	3.15E-06	7.82E-04	1.44E-02	4.18E-04	-7.96E-02	-1.31E-02	-1.69E-03
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	3.44E+01	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	4.22E+00	0	0	2.08E+02	0	0	0	0	0
EET	MJ	0	0	7.5E+00	0	0	3.71E+02	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/3	D/1	D/2	D/3
PM	Disease incidence	1.11E-06	1.18E-08	1.16E-09	0	1.16E-09	5.87E-08	7.74E-08	6.87E-08	-4.42E-07	-7.2E-07	-9.41E-09
IR	kBq U235 eq	4.41E+00	4.79E-03	2.36E-03	0	4.7E-04	1.26E-01	2.4E+00	6.18E-02	-1.19E+01	-2.1E+00	-2.54E-01
ETP-fw	CTUe	1.48E+03	1.21E+01	1.14E-01	0	1.19E+00	6.34E+00	3.99E+01	3.36E+01	-1.5E+02	-1.3E+03	-3.19E+00
HTP-c	CTUh	2.87E-08	2.48E-10	1.29E-11	0	2.44E-11	6.46E-10	1.33E-09	1.55E-09	-5.64E-09	-2.64E-08	-1.2E-10
HTP-nc	CTUh	1.29E-06	1.32E-08	3.89E-10	0	1.3E-09	2E-08	3.28E-08	1.29E-07	-2.64E-07	-1.07E-06	-5.6E-09
SQP	SQP	6.18E+01	7.14E+00	7.7E-02	0	7.01E-01	4.13E+00	3.55E+01	3.06E+00	-6.99E+01	-3.22E+01	-1.49E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Literature References

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

Further References

Biocide regulation
Ordinance on Biocide Products No. 528/2012

CPR
Regulation (EU) No. 305/2011 of the European Parliament and of the Council, harmonized conditions for the marketing of construction products

EN 12088
2013-06: Thermal insulation products for building applications – Determination of long-term water absorption by diffusion

EN 12667
2001-05: Thermal performance of buildings materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

EN 13164
EN 13164: 2012 + A1: 201, Thermal insulation products for buildings – Factory-made extruded polystyrene foam (XPS) products – Specification

EN 13501-1
EN 13501-1 + A1: 2018, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

EN 1607
2013-05 Thermal insulating products for building applications – Determination of tensile strength perpendicular to face

EN 826
2013-05: Thermal insulation products for building applications – Determination of compression behaviour

IBU PCR PART A
Product category rules for building- related productsand services. Part A, PCR - Part A: Calculation Rules for theLife Cycle Assessment and Requirements on the Project Reportaccording to EN 15804+A2:2019, version 1.3, Institut Bauenund Umwelt e.V., 2022
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IBU PCR Part B
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www.ibu-epd.com

ISO 14025
DIN EN ISO 14025:2011-10,
Environmentaldesignations and declarations – Type III Environmental Declarations – Basic principles and procedures

ISO 15686
ISO 15686-2:2012-05, Buildings and constructed assets - Service life planning - Part 2: Service life prediction procedures

PANGPP
Action plan for the environmental sustainability of consumption in the Public Administration sector, National Action Plan on Green Public Procurement, MINIMUM ENVIRONMENTAL CRITERIA FOR THE AWARDING OF THE DESIGN AND EXECUTION OF BUILDING WORK SERVICES

REACH
Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals

Sphera LCA FE (GaBi ts)
Life Cycle Assessment for Experts (LCA FE) CUP 2023.1, Sphera Solutions GmbH, GaBi Software System and Database for Life Cycle Engineering CUP Version: 2023.1, University of Stuttgart, Leinfelden Echterdingen

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