ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Adolf Würth GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AWU-20230267-IBD1
Issue date	12/09/2023
Valid to	12/09/2027

flexen® Exzenterblock Compact

Adolf Würth GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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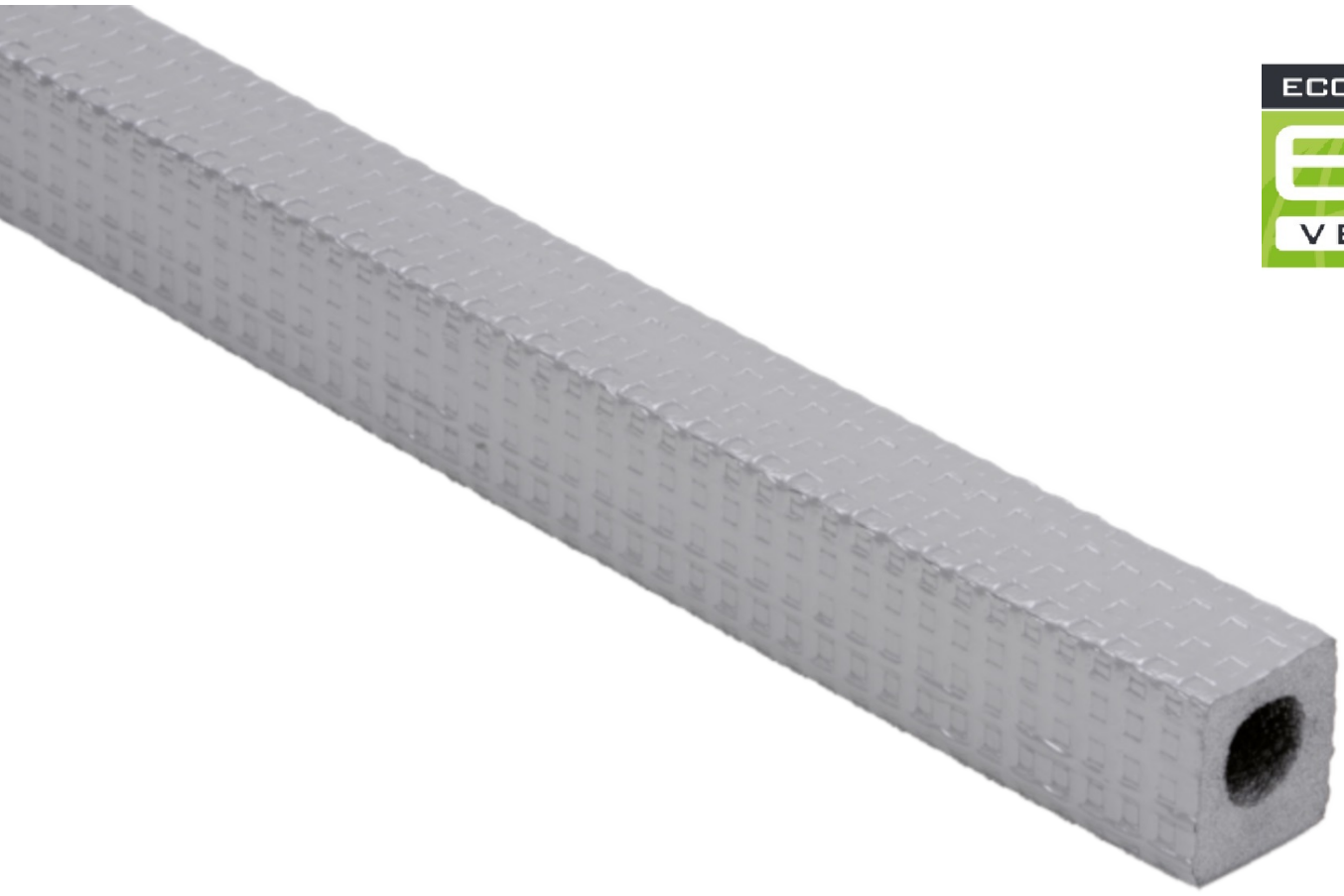

1. General Information

Adolf Würth GmbH & Co. KG

Programme holder

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

Declaration number

EPD-AWU-20230267-IBD1

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

12/09/2023

Valid to

12/09/2027

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

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

flexen® Exzenterblock Compact

Owner of the declaration

Adolf Würth GmbH & Co. KG
Reinhold-Würth-Str. 12-17
74653 Künzelsau
Germany

Declared product / declared unit

flexen® Exzenterblock Compact

Scope:

Product line flexen® Exzenterblock Compact Thermal insulation products for building equipment and industrial insulations made of Polythene-based, closed-cell foam pipe insulation with a robust protective coating (PEF) according to EN14313. This declaration
is an Environmental Product Declaration according to ISO14025 describing the specific environmental performance of the product produced in Belgium at the
site of Eynatten.
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

Vito D'Incognito,
(Independent verifier)

2. Product

2.1 Product description/Product definition

flexen® Exzenterblock Compact is the Professional Polyethylene-based closed-cell foam pipe insulation with a robust PE protective coating, containing recycled PE, for continuous energy saving and condensation control purposes.
flexen® Exzenterblock Compact with its rectangular and thin design, it is used in flooring.
For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) -
Thermal Insulation products for building equipment and industrial installations cf. PCR. Factory-made polyethylene foam (PEF) and the CE-marking. For the application and use, the respective national provisions apply.

2.2 Application

flexen® Exzenterblock Compact is used to insulate pipes for heating and plumbing.

- Polyethylene foam is a cost-efficient material with good insulating properties.
- Products made of PE foam, containing recycled PE, yield an excellent cost/performance ratio.
- Heat loss control and noise reduction in fresh-and waste water and heating system

2.3 Technical Data

Constructional data

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to *EN 14313* apply. Further data:

Name	Value	Unit
Gross density	34.3	kg/m^3
Thermal conductivity	0.04 - 0.042	W/(mK)
Reaction To Fire Acc.to EN 13501-1 depending on the thickness	E	
Max Service Temperature Acc. To EN 14707	100	°C
Min Service Temperature	0	°C
water absorption Acc. to EN 13472	WS005	-
traces quantities of water-soluble ions and pH-value Acc. to EN 13468	Cl < 20 – F < 4 - pH 5,8	-

2.4 Delivery status

The PE products are supplied as tubes. The tubes are delivered in lengths of 2 m packed in cardboard boxes. The insulating sleeves in the flexen® Exzenterblock Compact have a thickness ranging from 9 to 51mm and an inside diameter ranging from 15 to 42mm. These products are categorized according to thermal conductivity (Lambda*).
The category of product with lambda 0,040 (W/(mK)) (acc. to *EN ISO 8497* and *EN 12667*) includes flexen® Exzenterblock Compact with thickness 9 mm, while the category of product with lambda 0,042 (W/(mK)) (acc. to *EN12667*) includes flexen® Exzenterblock Compact with thicknesses from 25 to 51mm products.

2.5 Base materials/Ancillary materials

Base materials

flexen® Exzenterblock Compact is a flexible insulation material based on Polyethylene with a protecting coating of PE., which consists of around seven basic components. The following table displays the different elements of formula. This product contains substances listed in the candidate list (date: 08.07.2021) exceeding 0.1 percentage by mass: **No**.
This product contains other carcinogenic, mutagenic, reprotoxic (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.**

Name	Value	Unit
LDPE	40.40	%
Flame retardant	3.2	%
LLDPE	2.65	%
Pigment	3.15	%
Internally recycled PE	43.20	%
Volume stabilizer	1.3	%
Blowing Agent	6.10	%

PE and fillers give the aspect of the product. The blowing agent causes the expansion during manufacturing. And the flame retardants ensure the fire resistance. According the European Chemicals Regulation *REACH* Manufacturers, importers and downstream users must register their chemicals and are responsible for their safe use on their own. For its production only exclusively verifiably
registered and approved substances are used. flexen® Exzenterblock Compact does not contain Substances of Very High Concern (SVHC). Antimony trioxide and halogenated flame retardants are applied.

2.6 Manufacture

The manufacturing process consists of a continuous extrusion. Solid pellets of thermoplastic resin are fed to a melting zone in which the resin is melted, to form a
flowable thermoplastic mass. The thermoplastic mass is then metered to a mixing zone where the thermoplastic mass is thoroughly mixed with a blowing agent under pressure. The mixture of thermoplastic resin and blowing agent is then forced through a die,
which imparts a shape to the thermoplastic mass, into a zone of lower pressure, such as atmospheric pressure. The blowing agent expands to form the cells of the foam and the thermoplastic foam is cooled through an inline water cooler.
The protection coating
"skin" is applied by co-extrusion. The "skin" is made with solid pellets of thermoplastic resin and some additives, which is, with the help of an extruder, applied around the foam. There is not a foaming agent used in this case. The die is positioned around the
"naked" foam and deposes a small thickness (± 0.1 mm) of PE film on the foam. At the end of this process the profiles are cut at dimension.
Quality assurance :
The manufacture is certified *ISO 9001* for the quality management. The product corresponds to the product standard *EN 14313* and has a Declaration of
Performance according to the DOP
WÜRTH_LE_0870509015_01_M_flexen_Exzenterblock_Compact (seewww.wuerth.de)

2.7 Environment and health during manufacturing

During all manufacturing steps the production follows the national guidelines and regulations from Belgium. Solar panels

are installed on the roof of the warehouses.

2.8 Product processing/Installation

flexen® Exzenterblock Compact can be installed using basic tools like knives. No special tools, or specific protection is necessary. When applying adhesives the information given in the relevant safety data sheets is to be heeded. The recommendations on how to use the product are described in the application manuals or video's. More details are listed on the Web Page WÜRTH (wuerth.de)

2.9 Packaging

flexen® Exzenterblock Compact, products are packed in cardboard boxes and transported on reusable pallets. The packaging material can be recycled. The pallets used to transport the products are taken back or exchanged when the flexen® Exzenterblock Compact is delivered, so the use of pallets is a close loop economy.

2.10 Condition of use

During the use of the product for the purpose for which they are intended, there are no modifications to the product during the use, except if due to extraordinary impact (see point 2.13).

2.11 Environment and health during use

There are no particular aspects of the material composition during the use. flexen® Exzenterblock Compact products are used in a wide range and variety of applications for which the product is intended. The PEF foams fulfil the German, Belgian and French regulations regarding the emission of VOC with emissions far below the most severe limit values. The Eurofin Product Testing institute, on the demand of the *CEFEP* (European group of PEF and FEF manufacturers) has made a wide range of tests for different PEF products from different manufacturers.
The insulation of heating pipes with flexen® Exzenterblock Compact allows a drastic reduction of CO_2 emission during the full service life of the installation. The quantification of this is not in the topic of this EPD, and has to be evaluated in the frame of the LCA from the complete installation

2.12 Reference service life

The function of flexen® Exzenterblock Compact is to ensure the insulation of heating and sanitary installations for a reference service life (RSL) of 50 years. This duration is based on the frequency of replacement of sanitary and heating piping in buildings. Although the insulation products are still effective after 50 years, it is assumed that when replacing the piping, the insulation is not reused and is disposed of with the piping. 50 years is the minimum Reference Service Life recommended in *EN16783*. Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

2.13 Extraordinary effects

Fire

Fire

According to flexen® Exzenterblock Compact are classified as EURO CLASS E and therefore have a limited speed of inflammation.

Fire protection

Name	Value
Building material class	E

Water

flexen® Exzenterblock Compact are closed cell foam and obtain the better water absorption class WS005 according to the product standard

Mechanical destruction

flexen® Exzenterblock Compact are flexible foam covered with a PE protective coating
flexen® Exzenterblock Compact are not UV resistant. The use is not recommended for outside applications without complementary UV protection

2.14 Re-use phase

In principle, if removed carefully, flexen® Exzenterblock Compact can be reused on any other piping system of similar dimensions. Any material not suitable for reuse is fully recyclable.

2.15 Disposal

flexen® Exzenterblock Compact are fully recyclable using the same recycling systems as those used for other forms of PE waste. Any non-recycled material should be disposed of the materials according to the local regulations, and by the *European Waste Catalogue* waste code 07 02 13 waste Plastic "Low Density Polyethylene"

2.16 Further information

Additional information about flexen® Exzenterblock Compact can be found on site WÜRTH (wuerth.de). Here specification clauses, data sheets and application manuals can be found.

3. LCA: Calculation rules

3.1 Declared Unit

The declaration refers to 1 m³ of produced insulation product. For the LCA calculations, as the product is foam and have some tolerances, the density declared is the average between the product categories. The thermal conductivity coefficient (Lambda-value) and R-value per 25 mm thickness per product brand is provided below as additional information and support for installers.

Declared unit

Name	Value	Unit
Gross density	34.3	kg/m^3
Declared unit	1	m^3
Conversion factor from 1 m³ to 1 linear meter	Value for 1 m divided section of the insulation pipe (m²)	m
Gross Density volume for 1 kg	0.02116	m³
Thermal Conductivity at 40°C	0.040 - 0.042	W/(mK)

Thermal Conductivity λ: 0.040 W/mK at (40°C)
R-value- thickness: 9 mm: +/- 3,5 (m²K)/W
Thermal Conductivity λ: 0.042 W/mK at (40°C)
R-value- thickness: 25 mm: +/- 3,355 (m²K)/W
depending on the pipe diameter.

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning the variability of the production process, geographical representativeness and the influence of background data and preliminary products compared to the environmental impacts caused by the actual production.

3.2 System boundary

The Data collection refers to the yearly production in 2021
Module A1 to A3:
The LCA
calculation covers the production of the raw materials, transport of these to
the plant, the mixing of raw materials according to the respective recipes,
manufacturing of the foam product and packaging for dispatch. All production
takes place exclusively in Eynatten, Belgium.
Module A4:
The type of transport included in the LCA model is a truck mix Euro Cargo 0-6 with diesel fuel. As the product is foam with a comparatively low density, the product volume is the limiting factor on loading. flexen® Exzenterblock Compact is rarely the only product loaded in trucks, they are usually grouped with other products of higher density according to the place of destination. trucks has been set to 10% of the mass payload capacity.
Module A5:
The LCA calculation covers the production of the raw materials, transport of these to
the plant, the mixing of raw materials according to the respective recipes,
manufacturing of the foam product and packaging for dispatch. All production
takes place exclusively in Eynatten, Belgium.
Module B1-B7:
The foam insulation products do not require maintenance, replacement or refurbishment while in use. The information modules B1 – B7 are not declared. Although the insulation of the piping flexen® Exzenterblock Compact contributes to a significant reduction of CO_2 emissions from the heating or cooling equipment, this is not taken into account
in this LCA. It should, however, be taken into account in the calculation of the environmental impacts of the complete heating and cooling systems or of the
complete building
Module C1:
As for the installation of the product, the disassembly is done manually and does not require any specific equipment. Disassembly is generally carried out at the same time as the replacement or removal of sanitary pipes. Consequently, there are no impacts associated with C1.
Module C2:
Transport at the end-of-life stage is modelled as a Euro Cargo 0-6 mix truck with diesel fuel. The average distance to either mechanical recycling is assumed to be 100 km.
Module C3:
The scenario that has been retained for this Life Cycle Assessment is the 100% recycling
Module C4:
As flexen® Exzenterblock Compact is fully recyclable, the legislation is pushing more in this direction and the overall pressure on plastic recycling is growing, therefore the scenario with 100% recycling is considered.
Module D:
The end-of-life scenarios for packaging material and product do not deliver any benefits for the next system. The recycling of cardboard is a closed cycle with the production process. The flexen® Exzenterblock Compact foam is fully recyclable and can be used as a direct one-for-one substitute for virgin PE-LD granulates, with only minor additive additions.

3.3 Estimates and assumptions

The LCA calculation is conducted using the *Gabi ts* - database. Not all necessary LCIs are included in the database. Where data were missing or were unavailable or where suppliers were unable to provide complete information, proxy datasets have been used.
The environmental burden for the production of pigments, flame retardants and volume stabilizers are approximated.

3.4 Cut-off criteria

Any glue and adhesive tapes used during the installation (A5) have not been included as
quantification of these materials is uncertain and their use by the various installers is too diverse, adhesives and glues are not required in all/most cases, but may be used for some applications. In this study no others cut-off criteria have been applied and all elementary incoming processes as well as all energy and water inputs and waste outputs have been counted.

3.5 Background data

The software system for life cycle engineering *GaBi 2021 life cycle database used in the GaBi 10 software environment (Service Pack 2021001000) developed by Thinkstep AG* was used to perform this LCA.

3.6 Data quality

All the foreground data requiring such energy or raw material coming from production were verified and cross-checked before being included in the model. Most of the life cycle inventories for the basic materials are contained in the *GaBi 10 software*. For electrical and thermal energy Belgium-specific grid mixes and Belgium-specific supply for natural gas were considered.

3.7 Period under review

The production data for the year 2021 were used for the realization of this study

3.8 Geographic Representativeness

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

3.9 Allocation

There is no co-product or by-product generated during the production of the products.
Due to the lack of specific data per production line and product, the energy has been allocated per overall produced volume of insulation foam.
Production waste
Most of the production waste from the process (machine start, end of production, non-conforming products, etc.) is recycled internally in order to be reused in the manufacturing process. These impacts are accounted for in A1-A3.
Installation and End-of-Life waste
Installation of the foam products is done by hand and requires no special equipment apart from a knife. Installation off-cut is not considered in this calculations. Any glue and adhesive tapes used during the installation phase were not included in the LCA

3.10 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.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.
If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.

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

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	5.08	kg C

The following technical scenario information is required for the declared modules and optional for non-declared modules. Modules for which no information is declared can be deleted; additional information can also be listed if necessary.

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

A5 is not declared including the disposal of the packaging material on the construction site, the amounts of packaging materials included in the LCA calculations must be declared as technical scenario information for Module A5.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.069	l/100km
Transport distance	453	km
Capacity utilisation (including empty runs)	10	%
Gross density of products transported	34.3	kg/m^3

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies to the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list of service life by *BNB* is declared.

Reference service life

Name	Value	Unit
Reference service life	50	a

End of life (C1-C4)

Name	Value	Unit
Recycling	34.3	kg

5. LCA: Results

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	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ flexen® Exzenterblock Compact

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
GWP-total	kg CO_2 eq	9.74E+01	2.72E+00	0	2.86E-01	3.69E+00	0	-8.51E+01
GWP-fossil	kg CO_2 eq	9.79E+01	2.73E+00	0	2.87E-01	3.64E+00	0	-8.44E+01
GWP-biogenic	kg CO_2 eq	-7.84E-01	-3.45E-02	0	-2.81E-03	5.08E-02	0	-7.21E-01
GWP-luluc	kg CO_2 eq	2.46E-01	2.44E-02	0	1.94E-03	1.41E-03	0	-1.17E-02
ODP	kg CFC11 eq	7.1E-08	3.43E-13	0	2.82E-14	1.51E-10	0	-5.17E-10
AP	mol H^+ eq	3.52E-01	3.21E-03	0	3.4E-04	5.22E-03	0	-1.17E-01
EP-freshwater	kg P eq	5.05E-04	9.64E-06	0	1.03E-06	2.44E-05	0	-1.58E-04
EP-marine	kg N eq	5.13E-02	1.09E-03	0	1.13E-04	2.08E-03	0	-3.43E-02
EP-terrestrial	mol N eq	5.4E-01	1.29E-02	0	1.35E-03	2.11E-02	0	-3.57E-01
POCP	kg NMVOC eq	1.96E-01	3.29E-03	0	3.43E-04	5.04E-03	0	-1.12E-01
ADPE	kg Sb eq	2.81E-01	1.74E-07	0	2.89E-08	2.12E-06	0	-2.15E-05
ADPF	MJ	3E+03	3.59E+01	0	3.77E+00	1.09E+02	0	-3.25E+03
WDP	m^3 world eq deprived	6.83E+00	3.19E-02	0	3.21E-03	2.63E-01	0	-1.44E+00

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: 1 m³ flexen® Exzenterblock Compact

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
PERE	MJ	4.94E+02	2.61E+00	0	2.61E-01	6.74E+01	0	-2.44E+02
PERM	MJ	0	ND	ND	ND	ND	ND	ND
PERT	MJ	4.94E+02	2.61E+00	0	2.61E-01	6.74E+01	0	-2.44E+02
PENRE	MJ	1.2E+03	3.61E+01	0	3.79E+00	1.09E+02	0	-3.26E+03
PENRM	MJ	1.82E+03	ND	ND	ND	ND	ND	ND
PENRT	MJ	3.02E+03	3.61E+01	0	3.79E+00	1.09E+02	0	-3.26E+03
SM	kg	1.26E+01	ND	ND	ND	ND	ND	ND
RSF	MJ	0	ND	ND	ND	ND	ND	ND
NRSF	MJ	0	ND	ND	ND	ND	ND	ND
FW	m^3	5.48E-01	2.86E-03	0	3.02E-04	3.09E-02	0	-3.85E-01

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: 1 m³ flexen® Exzenterblock Compact

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
HWD	kg	7.83E-04	1.12E-10	0	2E-11	1.16E-08	0	-3.04E-07
NHWD	kg	4.03E+00	5.5E-03	0	6.17E-04	1.45E-01	0	-8.99E-01
RWD	kg	1.3E-01	6.75E-05	0	7.03E-06	2.54E-02	0	-2.72E-02
CRU	kg	ND	ND	ND	ND	ND	ND	ND
MFR	kg	ND	ND	1.26E+01	ND	4.73E+01	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND

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: 1 m³ flexen® Exzenterblock Compact

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
PM	Disease incidence	1.72E-05	2.42E-08	0	2.6E-09	4.16E-08	0	-8.81E-07
IR	kBq U235 eq	1.09E+01	1.01E-02	0	1.06E-03	1.77E+00	0	-2.69E+00
ETP-fw	CTUe	1.64E+03	2.55E+01	0	2.67E+00	4.25E+01	0	-1.55E+03
HTP-c	CTUh	4.27E-08	5.22E-10	0	5.51E-11	1.05E-09	0	-3.81E-08
HTP-nc	CTUh	3.34E-06	2.8E-08	0	3.02E-09	3.25E-08	0	-1.77E-06
SQP	SQP	3.01E+02	1.5E+01	0	1.6E+00	6.87E+01	0	-1.66E+02

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 theuncertainties on these results are high as there is limited experience with the indicator. This EPD was created using a software tool.

6. LCA: Interpretation

The use of internal recycled material in flexen® Exzenterblock Compact reduces the need for raw materials and avoids wasting resources. flexen® Exzenterblock Compact has a very low density, which means that little raw material is needed for high insulation efficiency, which results in significant energy savings. In addition, flexen® Exzenterblock Compact is largely made of low-density polyethylene, so it is fully recyclable and can be recycled when it reaches the end of its life. As there is a variation in density between the different references of the flexen® Exzenterblock Compact range, a sensitivity analysis has been performed. The results of the LCA are given for 1m^3 of product calculated with an average weighted foam density of 34,4 kg/m³. For the lowest density, the impacts are lowered by 12,4 % and for the highest density the impacts should be majored by 10,9 %. Most references are very close to the average density, but all impact factors can be recalculated based on the product's density. When we analyse the complete life cycle, we see that the most impacting part for all environmental impact factors is the production module and more particularly the raw materials part. With regard to global warming for the complete life cycle, more than 94% comes from the production module 1,6% from transport to the places of installation and 3,9% comes from the end of life. A more in-depth analysis of the production module A1 to A3 shows that the production of raw materials and their transport account for almost 95% of the impact Global Warming Potential. As the flexen® Exzenterblock Compact is fully recyclable; the choice for the end of life was that of 100% recycling. This avoids the use of new raw materials and or the exploitation of renewable or non-renewable resources. The end of life in 100% landfill has a slight impact, especially from the point of view of climate change. However, the 100% incineration scenario has the greatest impact because during incineration there is a significant release of carbon dioxide. The insulation with flexen® Exzenterblock Compact of the sanitary and heating piping contributes to a significant reduction of CO_2 emissions from the heating or cooling equipment, this is not considered in this LCA. It should, however, be taken into account in the calculation of environmental impacts of the complete heating and cooling systems or of the complete building. One way to continue to reduce the environmental impact of the flexen® Exzenterblock Compact would be to continue to diversify our energy sources by switching more and more to renewable energies. To this end, after having greatly increased the number of photovoltaic panels, the production plant will acquire a cogeneration system. Looking for more eco-responsible suppliers must also be put in place, as well as finding raw materials manufactured locally to avoid long-distance transport as much as possible. An analysis of the plant's carbon footprint, which is currently being carried out, should enable to identify areas for improvement and find solutions to achieve the goal of zero carbon.

7. Requisite evidence

7.1. VOC emissions

Eurofins Product Testing A/S has tested a wide range and variety of typical PEF (Polyethylene foam) products marketed in the EU from *CEFEP* (European Group of PEF/FEF manufacturers) Based on the loading factor 0.05m²/m^3 (determined after consideration of the real-life applications of PEF products (in living rooms) and recommendations by the experts of the test institute) all results were found to be clearly below the limit values. For all samples below 100mg/m^3

TVOC after 28 days. Certificates are available on request. 7.1 VOC emissions
For products used in indoor applications.
Test procedure to AgBB diagram indicating the measuring agency, date and results as a range of values. At least the following must be declared:

7.2 Leaching
According to *EN 13468* the content of water-soluble chloride ions for flexen® Exzenterblock Compact is <20mg/kg

8. References

EN 1602
EN 1602: 2013: Thermal insulating products for building applications - Determination of the apparent density

EN ISO 8497
EN ISO 8497: Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes

ISO 9001
ISO 9001: 2015: Quality management systems.

EN13472
EN 13472: Thermal insulating products for building equipment and
industrial installations - Determination of short term water absorption by
partial immersion of preformed pipe insulation

EN 13468
EN 13468: Thermal insulating products for building equipment and
industrial installations - Determination of trace quantities of water-soluble
chloride, fluoride, silicate, and sodium ions and pH

EN 13501-1
EN 13501-1:2007+A1: 2013 Fire classification of construction products and building elements - Classification using test data from reaction to fire tests

ISO 14001
ISO 14001: 2015 Environmental management systems.

EN ISO 14025
EN ISO 14025: 2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

ISO 14040
ISO 14040: Environmental management — Life cycle assessment — Principles and framework

ISO 14044
ISO 14044: Environmental management — Life cycle assessment — Requirements and guidelines

EN 14707
EN 14707: 2012: Thermal insulating products for building equipment and industrial installations. Determination of maximum service temperature for preformed pipe insulation

EN 15804
EN 15804: 2012-04 + A1 2014: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

CEN/TR 15941
CEN/TR 15941: Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data

CEN TS 16516
CEN TS 16516: AgBB, ISO 16000-3, /ISO 16000-6/, /ISO16000-9/, /ISO 16000-11/ Construction products - Assessment of release of dangerous substances. Determination of emissions into indoor air

EN 16783: 2017
EN 16783: 2017 Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations.

Candidate List Substances of Very High Concern
SVCH: date: 08.07.2021) exceeding 0.1 percentage by mass

CEFEP
CEFEP: European group of PEF and FEF manufacturers

Eurostat
European Statistics: Recovery rates for packaging waste Paper and cardboard packaging for the European Union 27 countries 2014
http://ec.europa.eu/eurostat/home

Eurofins
Eurofins: Eurofins Scientific is a group of international life sciences
companies which provide a unique range of analytical testing services to
clients across multiple industries, http://www.eurofins.com

Gabi ts
GaBi 10 GaBi Software-System and Database for Life Cycle Engineering Copyright © 1992-2021 Sphera Solutions Gmbh Version: 10.5.0.78 DB Schema 8007

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): General Instructions for the EPD Programme of Institut Bauen und Umwelt e.V., Version 2.0 2021.

Product Category Rules for Building-Related Products and Services
Institute Construction and Environment e.V. (IBU)
Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report
Version 1.7

PCR Guidance-Texts for Building-Related Products and Services
From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)
Part B: Requirements on the EPD for Insulating materials made of foam plastics
Version 1.6 (Template) Version 1.2 (PCR specific)

REACH
According the European Chemicals Regulation *REACH* manufacturers,
importers and downstream users must register their chemicals and are
responsible for their safe use.

Sphera

Sphera Solutions Gmbh. GaBi 10 LCI documentation.
GaBi Databases (sphera.com) Stuttgart
The literature referred to in the Environmental Product Declaration must be listed in full.Standards already fully quoted in the EPD do not need to be listed here again.
The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

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