

Owner: Sundolitt A/S  
No.: MD-22132-EN  
Issued: 03-02-2023  
Valid to: 03-02-2028

3<sup>rd</sup> PARTY VERIFIED

**EPD**

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



**Owner of declaration**  
Sundolitt A/S  
Krog Skolevej 3, 7190 Billund  
35909117



**Issued:**  
03-02-2023

**Valid to:**  
03-02-2028

**Program**  
EPD Danmark  
[www.epddanmark.dk](http://www.epddanmark.dk)



- Industry EPD  
 Product EPD

**Basis of calculation**  
This EPD is developed in accordance with the European standard EN 15804+A2.

**Comparability**  
EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database.

**Validity**  
This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

**Use**  
The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

**Declared product(s)**  
Sundolitt EPS and Sundolitt Climate EPS

Number of declared datasets/product variations: 2

**Production sites**  
Billund, Slangerup and Viborg, Denmark

Green energy certificates on electricity are used for module A3.

- EPD type**
- Cradle-to-gate with modules C1-C4 and D
  - Cradle-to-gate with options, modules C1-C4 and D
  - Cradle-to-grave and module D
  - Cradle-to-gate
  - Cradle-to-gate with options

**Product(s) use**  
The product is usually used in Denmark for heat insulation of buildings and comes in many dimensions with a range of thermal conductivity and compressive stress'. EPS insulation can be used almost anywhere in buildings: Slab floor, flooring, walls and roofs.

**Declared/ functional unit**  
1 m<sup>2</sup> of insulation material with a thickness designed to provide a thermal resistance (R-value) of 1 m<sup>2</sup>K/W within an expected service life for insulation materials.

**Year of production site data (A3)**  
2021

**EPD version**  
1<sup>st</sup> version, published 03-02-2023

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data, according to EN ISO 14025
<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier:  Ninkie Bendtsen

Martha Katrine Sørensen  
EPD Danmark

**Life cycle stages and modules (MND = module not declared)**

Product			Construction process		Use								End of life				Beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Re-use, recovery and recycling potential	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	MND	MND	MND	MND	MND	MND	MND	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	

# Product information

## Product description

The main product components are shown in the tables below.

### Sundolitt EPS:

Material	Weight-% of declared product
Expanded polystyrene (EPS)	100%

### Sundolitt Climate EPS:

Material	Weight-% of declared product
Expanded polystyrene (EPS) with graphite	100%

## Product packaging:

The composition of the sales- and transport packaging of the product is shown in the table below.

Material	Weight-% of packaging
LDPE foil	84
EPS bars and pallet	16

## Representativity

This declaration, including data collection and the modeled foreground system including results, represents the production of Sundolitt EPS and Sundolitt Climate EPS on the production sites located in Billund, Slangerup and Viborg, Denmark. Product specific data are based on average values from 2021. Background data are based on GaBi Professional 2022 and Ecoinvent 3.8 and are less than 4 years old. Generally, the used background datasets are of high quality, and all the datasets are only a couple of years old.

## Hazardous substances

Sundolitt EPS and Sundolitt Climate EPS does not contain substances listed on the "Candidate List of Substances of Very High Concern for authorisation"

(<http://echa.europa.eu/candidate-list-table>)

## Essential characteristics

Expanded polystyrene (EPS) is a common material used for thermal insulation of buildings, including floors, walls and roofs. It is a polymer foam, consisting of air-filled polystyrene cells. As 98% of the material is air, EPS provides good insulating properties at a low weight. Other characteristics of the material include low moisture absorption, long service life and high compressive strength. EPS is manufactured through permeating polystyrene beads with pentane, allowing the beads to expand when exposed to steam. This addition of a so-called blowing agent adds 4% - 6% w/w. In Sundolitt Climate EPS, graphite is in small amounts to further improve thermal insulation properties (4% w/w). The expanded polystyrene (EPS) beads are then fed into a block molding machine, where steam and pressure form large blocks of EPS.

The declared products are covered by harmonised technical specification DS/EN13163.

Further technical information can be obtained by contacting Sundolitt or on Sundolitt's website:

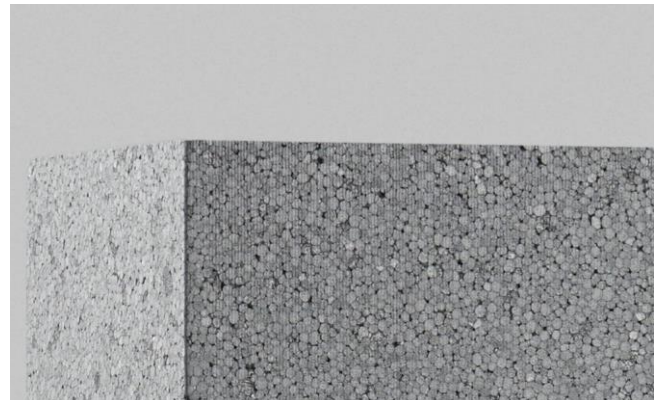
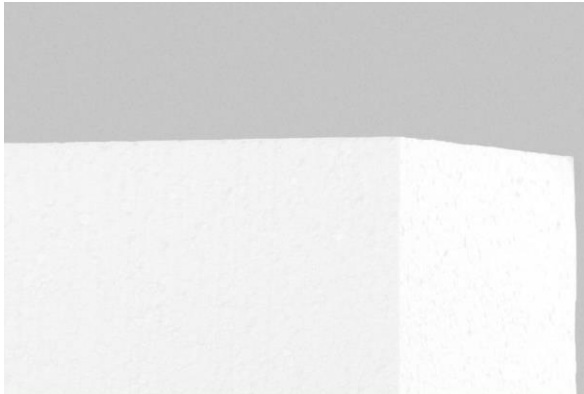
<https://www.sundolitt.com/en/>

## Reference Service Life (RSL)

The reference service life of EPS products varies depending on where in the building the products are used. In Denmark, the service life tables from BUILD<sup>1</sup> are used to determine the reference service life of EPS in various building contexts.

<sup>1</sup> [BUILD levetidstabel](#)

Picture of product(s)



## LCA background

**Declared unit**

The LCI and LCIA results in this EPD relates to 1 m<sup>2</sup> of insulation material with a thickness designed to provide a thermal resistance (R-value) of 1 m<sup>2</sup>K/W.

Name	Sundolitt EPS	Sundolitt Climate EPS	Unit
Declared unit	1	1	m <sup>2</sup>
Density	15	16	kg/m <sup>3</sup>
Thickness [mm]	38	31	mm
Volume pr. 1 m <sup>2</sup>	0.04	0.03	m <sup>3</sup>
Masse pr declared unit	0.56	0.50	kg
Conversion factor to 1 kg	1.8	2.0	-

Conversion factors to other thicknesses are presented under 'additional information'.

**Functional unit**

Not defined.

**PCR**

This EPD is developed according to the core rules for the product category of construction products in EN 15804+A2 and the complementary Product Category Rules (c-PCR) EN 16783:2017.

**Guarantee of Origin – certificates**

Foreground system:

The product is produced using electricity covered by certificates on green electricity from wind power. The electricity is used for the manufacturing at Sundolitt's three production sites in Denmark. No other energy processed are included in the foreground.

Background system:

Both upstream and downstream processes are modelled using grid mix.

### Conversion factors to other compressive stress [kPa] and thicknesses [mm]

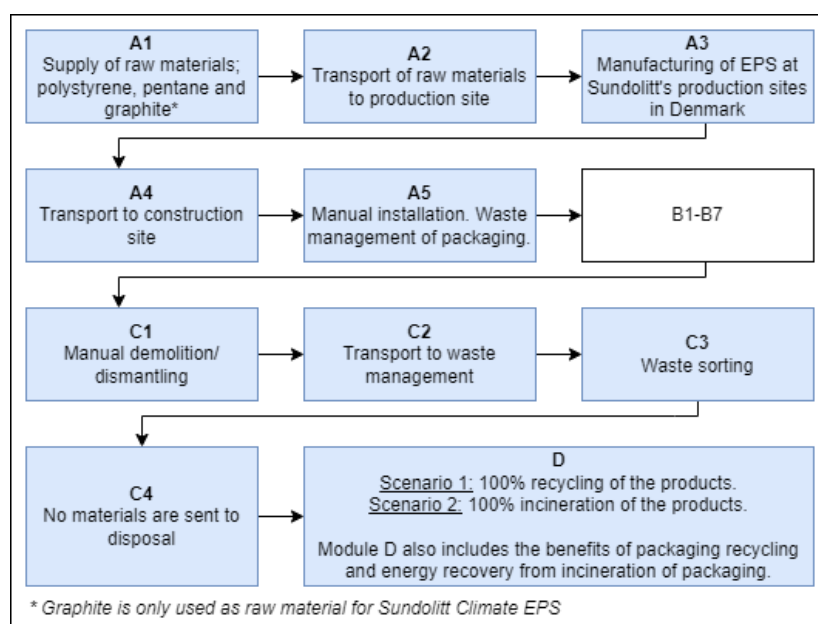
EPS with higher compressive stress will have a higher thermal resistance while an increased thickness also increases the thermal resistance. Since there is a linear relationship between the product composition of Sundolitt EPS and Sundolitt Climate EPS, the results in this EPD can be recalculated to other Sundolitt's other products using conversion factors.

The results in this EPD relate to Sundolitt EPS and Sundolitt Climate EPS with a compressive stress of 80 kPa and with a thickness of 38 mm and 31 mm respectively. Thus, the conversion factor for these two products are 1.0 in the tables below. To recalculate the EPD results to a compressive stress of 60 kPa and a thickness of 38 mm and 31 mm, the EPD results should be multiplied with 0.9 and 0.7 for Sundolitt EPS and Sundolitt Climate EPS, respectively.

Sundolitt EPS		Thickness	
Product name	Compressive stress	38 mm	100 mm
S60	60 kPa	0.9	2.3
S80	80 kPa	1.0	2.6
S150	150 kPa	1.6	4.3
S250MX	250 kPa	2.3	6.1
S300MX	300 kPa	2.8	7.3
S400MX	400 kPa	3.4	9.0

Sundolitt Climate EPS		Thickness	
Product name	Compressive stress	31 mm	100 mm
C30	30 kPa	0.7	2.4
C60	60 kPa	0.8	2.6
C80	80 kPa	1.0	3.2
C150	150 kPa	1.5	4.9

### Flow diagram





## System boundary

This EPD is based on a cradle-to-gate with options LCA, in which 100 weight-% has been accounted for. The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804+A2, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of energy usage and mass for unit processes.

### Product stage (A1-A3) includes:

- A1 – Extraction and processing of raw materials
- A2 – Transport to the production site
- A3 – Manufacturing processes

The product stage comprises the acquisition of all raw materials, products and energy, transport to the production site, packaging, and waste processing up to the “end-of-waste” state or final disposal. The LCA results are declared in aggregated form for the product stage, which means, that the sub-modules A1, A2 and A3 are declared as one module A1-A3.

EPS is manufactured by using steam, making the polystyrene beads expand due to the release of pentane. The size of the beads is controlled and relates to the density of the end-product.

No solid waste is generated from the production of EPS products, as waste is immediately returned to production line. However, some solid waste is produced from the raw material packaging, e.g., cardboard.

The pentane content in the EPS products is highest right after production, where after it continues to decrease. After approximately one month almost all the pentane has been emitted from the products. The release of pentane is reported in module A3 since it relates to the production.

### Construction process stage (A4-A5) includes:

The EPS product is transported to the construction site by a EURO 5 diesel truck. A weighted average distance is calculated based on the distance from Sundolitt's three production sites in Denmark to three outlying areas in

Denmark: From Billund and Viborg to Skagen, Padborg and Copenhagen and from Slangerup to Copenhagen, Nakskov and Odense. The outlying areas are based on Sundolitt's current geographical area of deliveries. The weighted average distance is 208 km.

The EPS product is installed manually, thus, no environmental impacts are associated with the installation. 64% of the LDPE foil and EPS packaging is sent to recycling, as this is the recycling rate of packaging waste in Denmark according to Eurostat<sup>2</sup>. The remaining 38% of the LDPE foil and EPS packaging is incinerated and used for energy recovery.

### End of Life (C1-C4) includes:

The EPS product is dismantled manually, thus, no environmental impacts are associated with module C1. In scenario 1 (100% recycling), the dismantled EPS product is transported 60 km to a sorting facility by a EURO 5 diesel truck. In scenario 2 (100% incineration), the dismantled EPS product is transported 20 km to a incineration plant by a EURO 5 diesel truck.

In scenario 1 (100% recycling), the dismantled EPS reaches its end-of-waste stage at the sorting facility and it is therefore no longer viewed as waste. In scenario 2 (100% incineration), incineration of the dismantled EPS is included in module C3. Energy credits related to energy recovery from the incineration is included in module D.

### Re-use, recovery, and recycling potential (D) includes:

Scenario 1: 100% of the used EPS is sent to a recycling facility, where Sundolitt EPS substitutes polystyrene and Sundolitt Climate EPS substitute polystyrene and graphite in module D.

Scenario 2: Credits for energy recovery related to the incineration is included in module D.

The packaging materials, LDPE foil and EPS bars and pallet, reach the end-of-waste stage in module A5, and the benefits from recycling and incineration of the packaging materials are included in module D.

<sup>2</sup> [Packaging waste statistics - Statistics Explained \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

# LCA results

Environmental impacts per 1 m <sup>2</sup> of Sundolitt EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	1.23E+00	7.80E-03	1.13E-02	0.00E+00	2.21E-03	0.00E+00	0.00E+00	-1.13E+00	7.36E-04	1.79E+00	0.00E+00	-6.31E-01
GWP-fossil	[kg CO <sub>2</sub> eq.]	1.22E+00	7.82E-03	1.13E-02	0.00E+00	2.22E-03	0.00E+00	0.00E+00	-1.12E+00	7.39E-04	1.79E+00	0.00E+00	-6.28E-01
GWP-biogenic	[kg CO <sub>2</sub> eq.]	2.50E-03	-7.64E-05	-1.16E-08	0.00E+00	-2.16E-05	0.00E+00	0.00E+00	-6.50E-03	-7.21E-06	5.33E-05	0.00E+00	-2.78E-03
GWP-luluc	[kg CO <sub>2</sub> eq.]	3.65E-04	5.26E-05	2.66E-07	0.00E+00	1.49E-05	0.00E+00	0.00E+00	-7.97E-05	4.97E-06	1.74E-06	0.00E+00	-1.78E-04
ODP	[kg CFC 11 eq.]	1.11E-09	7.67E-16	4.79E-16	0.00E+00	2.17E-16	0.00E+00	0.00E+00	-3.96E-10	7.24E-17	7.10E-14	0.00E+00	-3.99E-10
AP	[mol H <sup>+</sup> eq.]	2.00E-03	2.54E-05	1.22E-06	0.00E+00	7.20E-06	0.00E+00	0.00E+00	-1.61E-03	2.40E-06	1.56E-04	0.00E+00	-1.16E-03
EP-freshwater	[kg P eq.]	1.77E-05	2.79E-08	2.45E-10	0.00E+00	7.91E-09	0.00E+00	0.00E+00	-5.66E-06	2.64E-09	1.66E-08	0.00E+00	-7.30E-06
EP-marine	[kg N eq.]	5.57E-04	1.16E-05	2.85E-07	0.00E+00	3.28E-06	0.00E+00	0.00E+00	-4.41E-04	1.09E-06	3.41E-05	0.00E+00	-3.60E-04
EP-terrestrial	[mol N eq.]	5.99E-03	1.30E-04	5.75E-06	0.00E+00	3.67E-05	0.00E+00	0.00E+00	-4.74E-03	1.22E-05	7.35E-04	0.00E+00	-3.63E-03
POCP	[kg NMVOC eq.]	2.09E-03	2.28E-05	7.93E-07	0.00E+00	6.47E-06	0.00E+00	0.00E+00	-1.69E-03	2.16E-06	1.01E-04	0.00E+00	-9.39E-04
ADPm <sup>1</sup>	[kg Sb eq.]	3.33E-07	7.87E-10	1.53E-11	0.00E+00	2.23E-10	0.00E+00	0.00E+00	-2.35E-07	7.44E-11	1.72E-09	0.00E+00	-2.27E-07
ADPF <sup>1</sup>	[MJ]	4.30E+01	1.03E-01	1.79E-03	0.00E+00	2.91E-02	0.00E+00	0.00E+00	-3.81E+01	9.68E-03	1.93E-01	0.00E+00	-7.38E+00
WDP <sup>1</sup>	[m <sup>3</sup> world eq. deprived]	1.33E-01	8.74E-05	1.02E-03	0.00E+00	2.48E-05	0.00E+00	0.00E+00	-8.94E-02	8.25E-06	1.45E-01	0.00E+00	-7.01E-02
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication - aquatic freshwater; EP-marine = Eutrophication - aquatic marine; EP-terrestrial = Eutrophication - terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential - minerals and metals; ADPF = Abiotic Depletion Potential - fossil fuels; WDP = Water Depletion Potential												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												
Disclaimer	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.												

Additional environmental impacts per 1 m <sup>2</sup> of Sundolitt EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
PM	[Disease incidence]	1.42E-08	1.51E-10	7.11E-12	0.00E+00	4.28E-11	0.00E+00	0.00E+00	-1.03E-08	1.43E-11	9.05E-10	0.00E+00	-9.53E-09
IRP <sup>2</sup>	[kBq U235 eq.]	1.88E-02	2.88E-05	1.30E-05	0.00E+00	8.18E-06	0.00E+00	0.00E+00	-1.67E-02	2.73E-06	1.92E-03	0.00E+00	-2.86E-02
ETP-fw <sup>1</sup>	[CTUe]	2.23E+01	7.26E-02	9.48E-04	0.00E+00	2.06E-02	0.00E+00	0.00E+00	-2.17E+01	6.86E-03	8.89E-02	0.00E+00	-2.25E+00
HTP-c <sup>1</sup>	[CTUh]	4.87E-10	1.50E-12	7.70E-14	0.00E+00	4.24E-13	0.00E+00	0.00E+00	-4.53E-10	1.41E-13	9.71E-12	0.00E+00	-1.51E-10
HTP-nc <sup>1</sup>	[CTUh]	2.05E-08	9.28E-11	2.64E-12	0.00E+00	2.63E-11	0.00E+00	0.00E+00	-1.96E-08	8.77E-12	3.11E-10	0.00E+00	-5.46E-09
SQP <sup>1</sup>	-	2.57E+00	4.34E-02	6.01E-04	0.00E+00	1.23E-02	0.00E+00	0.00E+00	-7.68E-01	4.10E-03	5.85E-02	0.00E+00	-1.19E+01
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation - human health; ETP-fw = Eco toxicity - freshwater; HTP-c = Human toxicity - cancer effects; HTP-nc = Human toxicity - non cancer effects; SQP = Soil Quality (dimensionless)												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												
Disclaimers	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.												
	<sup>2</sup> 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 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.												

Resource use per 1 m <sup>2</sup> of Sundolitt EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
PERE	[MJ]	2.17E+00	7.11E-03	3.39E-04	0.00E+00	2.01E-03	0.00E+00	0.00E+00	-1.01E+00	6.71E-04	4.56E-02	0.00E+00	-8.79E+00
PERM	[MJ]	1.10E-01	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]	2.28E+00	7.11E-03	3.39E-04	0.00E+00	2.01E-03	0.00E+00	0.00E+00	-1.01E+00	6.71E-04	4.56E-02	0.00E+00	-8.79E+00
PENRE	[MJ]	4.30E+01	1.03E-01	1.79E-03	0.00E+00	2.92E-02	0.00E+00	0.00E+00	-3.82E+01	9.72E-03	1.93E-01	0.00E+00	-7.38E+00
PENRM	[MJ]	2.15E+01	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]	6.45E+01	1.03E-01	1.79E-03	0.00E+00	2.92E-02	0.00E+00	0.00E+00	-3.82E+01	9.72E-03	1.93E-01	0.00E+00	-7.38E+00
SM	[kg]	8.67E-03	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
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
FW	[m <sup>3</sup> ]	7.04E-03	8.21E-06	2.38E-05	0.00E+00	2.33E-06	0.00E+00	0.00E+00	-5.99E-03	7.75E-07	3.40E-03	0.00E+00	-3.42E-03
Caption	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 = Net use of fresh water												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.000000000112.												

Waste categories and output flows per 1 m <sup>2</sup> of Sundolitt EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
HWD	[kg]	2.88E-09	5.45E-13	1.24E-13	0.00E+00	1.54E-13	0.00E+00	0.00E+00	-2.76E-09	5.14E-14	1.82E-11	0.00E+00	-1.57E-09
NHWD	[kg]	9.54E-03	1.68E-05	4.40E-05	0.00E+00	4.75E-06	0.00E+00	0.00E+00	-9.13E-03	1.58E-06	6.45E-03	0.00E+00	-2.44E-02
RWD	[kg]	1.31E-04	1.91E-07	7.92E-08	0.00E+00	5.41E-08	0.00E+00	0.00E+00	-1.29E-04	1.80E-08	1.17E-05	0.00E+00	-2.44E-04

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
MFR	[kg]	1.70E-02	0.00E+00	5.95E-03	0.00E+00	0.00E+00	5.30E-01	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
EEE	[MJ]	9.31E-03	0.00E+00	2.33E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E+00	0.00E+00	0.00E+00
EET	[MJ]	1.66E-02	0.00E+00	4.15E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.72E+00	0.00E+00	0.00E+00
Caption	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												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.000000000112.												



Environmental impacts per 1 m <sup>2</sup> of Sundolitt Climate EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	1.12E+00	6.90E-03	5.44E-03	0.00E+00	1.97E-03	0.00E+00	0.00E+00	-1.02E+00	6.58E-04	1.59E+00	0.00E+00	-5.56E-01
GWP-fossil	[kg CO <sub>2</sub> eq.]	1.12E+00	6.92E-03	5.44E-03	0.00E+00	1.98E-03	0.00E+00	0.00E+00	-1.02E+00	6.60E-04	1.59E+00	0.00E+00	-5.53E-01
GWP-biogenic	[kg CO <sub>2</sub> eq.]	1.65E-03	-6.76E-05	6.90E-08	0.00E+00	-1.93E-05	0.00E+00	0.00E+00	-5.78E-03	-6.44E-06	4.73E-05	0.00E+00	-2.46E-03
GWP-luluc	[kg CO <sub>2</sub> eq.]	3.31E-04	4.66E-05	2.76E-07	0.00E+00	1.33E-05	0.00E+00	0.00E+00	-6.99E-05	4.44E-06	1.54E-06	0.00E+00	-1.56E-04
ODP	[kg CFC 11 eq.]	1.04E-09	6.79E-16	6.94E-16	0.00E+00	1.94E-16	0.00E+00	0.00E+00	-3.17E-10	6.47E-17	6.30E-14	0.00E+00	-3.19E-10
AP	[mol H <sup>+</sup> eq.]	1.85E-03	2.25E-05	2.22E-06	0.00E+00	6.43E-06	0.00E+00	0.00E+00	-1.47E-03	2.14E-06	1.39E-04	0.00E+00	-1.02E-03
EP-freshwater	[kg P eq.]	1.68E-05	2.47E-08	4.89E-10	0.00E+00	7.06E-09	0.00E+00	0.00E+00	-4.64E-06	2.35E-09	1.47E-08	0.00E+00	-6.10E-06
EP-marine	[kg N eq.]	4.98E-04	1.02E-05	8.47E-07	0.00E+00	2.93E-06	0.00E+00	0.00E+00	-3.86E-04	9.75E-07	3.02E-05	0.00E+00	-3.16E-04
EP-terrestrial	[mol N eq.]	5.35E-03	1.15E-04	9.97E-06	0.00E+00	3.28E-05	0.00E+00	0.00E+00	-4.16E-03	1.09E-05	6.52E-04	0.00E+00	-3.20E-03
POCP	[kg NMVOC eq.]	1.88E-03	2.02E-05	2.19E-06	0.00E+00	5.77E-06	0.00E+00	0.00E+00	-1.49E-03	1.92E-06	8.92E-05	0.00E+00	-8.24E-04
ADPm <sup>1</sup>	[kg Sb eq.]	2.99E-07	6.97E-10	2.04E-11	0.00E+00	1.99E-10	0.00E+00	0.00E+00	-2.03E-07	6.64E-11	1.52E-09	0.00E+00	-1.94E-07
ADPf <sup>1</sup>	[MJ]	3.86E+01	9.07E-02	2.35E-03	0.00E+00	2.59E-02	0.00E+00	0.00E+00	-3.39E+01	8.65E-03	1.71E-01	0.00E+00	-6.47E+00
WDP <sup>1</sup>	[m <sup>3</sup> world eq. deprived]	1.16E-01	7.73E-05	6.05E-04	0.00E+00	2.21E-05	0.00E+00	0.00E+00	-7.57E-02	7.37E-06	1.29E-01	0.00E+00	-6.09E-02
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication - aquatic freshwater; EP-marine = Eutrophication - aquatic marine; EP-terrestrial = Eutrophication - terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential - minerals and metals; ADPf = Abiotic Depletion Potential - fossil fuels; WDP = Water Depletion Potential												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												
Disclaimer	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.												

Additional environmental impacts per 1 m <sup>2</sup> of Sundolitt Climate EPS													
Parameter	Unit	100% Recycling								100% Incineration			
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
PM	[Disease incidence]	1.63E-08	1.34E-10	1.49E-11	0.00E+00	3.82E-11	0.00E+00	0.00E+00	-1.26E-08	1.27E-11	8.03E-10	0.00E+00	-8.37E-09
IRP <sup>2</sup>	[kBq U235 eq.]	1.69E-02	2.55E-05	1.39E-05	0.00E+00	7.30E-06	0.00E+00	0.00E+00	-1.46E-02	2.43E-06	1.70E-03	0.00E+00	-2.52E-02
ETP-fw <sup>1</sup>	[CTUe]	1.99E+01	6.43E-02	1.37E-03	0.00E+00	1.84E-02	0.00E+00	0.00E+00	-1.93E+01	6.13E-03	7.88E-02	0.00E+00	-1.97E+00
HTP-c <sup>1</sup>	[CTUh]	4.36E-10	1.33E-12	8.50E-14	0.00E+00	3.79E-13	0.00E+00	0.00E+00	-4.04E-10	1.26E-13	8.61E-12	0.00E+00	-1.32E-10
HTP-nc <sup>1</sup>	[CTUh]	1.84E-08	8.21E-11	7.13E-12	0.00E+00	2.35E-11	0.00E+00	0.00E+00	-1.75E-08	7.83E-12	2.76E-10	0.00E+00	-4.81E-09
SQP <sup>1</sup>	-	2.48E+00	3.84E-02	6.82E-04	0.00E+00	1.10E-02	0.00E+00	0.00E+00	-6.41E-01	3.66E-03	5.19E-02	0.00E+00	-1.05E+01
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation - human health; ETP-fw = Eco toxicity - freshwater; HTP-c = Human toxicity - cancer effects; HTP-nc = Human toxicity - non cancer effects; SQP = Soil Quality (dimensionless)												
	The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												
Disclaimers	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.												
	<sup>2</sup> 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 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.												

Resource use per 1 m <sup>2</sup> of Sundolitt Climate EPS													
Parameter	Unit	100% Recycling					100% Incineration						
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
PERE	[MJ]	1.98E+00	6.29E-03	4.43E-04	0.00E+00	1.80E-03	0.00E+00	0.00E+00	-8.75E-01	5.99E-04	4.04E-02	0.00E+00	-7.76E+00
PERM	[MJ]	9.68E-02	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]	2.08E+00	6.29E-03	4.43E-04	0.00E+00	1.80E-03	0.00E+00	0.00E+00	-8.75E-01	5.99E-04	4.04E-02	0.00E+00	-7.76E+00
PENRE	[MJ]	3.87E+01	9.11E-02	2.35E-03	0.00E+00	2.60E-02	0.00E+00	0.00E+00	-3.39E+01	8.68E-03	1.72E-01	0.00E+00	-6.48E+00
PENRM	[MJ]	1.89E+01	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]	5.77E+01	9.11E-02	2.35E-03	0.00E+00	2.60E-02	0.00E+00	0.00E+00	-3.39E+01	8.68E-03	1.72E-01	0.00E+00	-6.48E+00
SM	[kg]	7.62E-03	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
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
FW	[m <sup>3</sup> ]	6.28E-03	7.26E-06	1.43E-05	0.00E+00	2.08E-06	0.00E+00	0.00E+00	-5.30E-03	6.92E-07	3.01E-03	0.00E+00	-3.00E-03
Caption	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 = Net use of fresh water The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												

Waste categories and output flows per 1 m <sup>2</sup> of Sundolitt Climate EPS													
Parameter	Unit	100% Recycling					100% Incineration						
		A1-A3	A4	A5	C1	C2	C3	C4	D	C2	C3	C4	D
HWD	[kg]	2.56E-09	4.82E-13	1.91E-13	0.00E+00	1.38E-13	0.00E+00	0.00E+00	-2.42E-09	4.59E-14	1.61E-11	0.00E+00	-1.38E-09
NHWD	[kg]	8.48E-03	1.48E-05	5.23E-04	0.00E+00	4.24E-06	0.00E+00	0.00E+00	-8.03E-03	1.41E-06	5.72E-03	0.00E+00	-2.15E-02
RWD	[kg]	1.18E-04	1.69E-07	8.94E-08	0.00E+00	4.84E-08	0.00E+00	0.00E+00	-1.15E-04	1.61E-08	1.04E-05	0.00E+00	-2.15E-04
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
MFR	[kg]	1.46E-02	0.00E+00	4.84E-03	0.00E+00	0.00E+00	4.70E-01	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
EEE	[MJ]	5.92E-03	0.00E+00	7.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E+00	0.00E+00	0.00E+00
EET	[MJ]	1.06E-02	0.00E+00	1.31E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E+00	0.00E+00	0.00E+00
Caption	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 The numbers are declared in scientific notation, e.g., 1.95E+02. This number can also be written as: 1.95*10 <sup>2</sup> or 195, while 1.12E-11 is the same as 1.12*10 <sup>-11</sup> or 0.0000000000112.												

BIOGENIC CARBON CONTENT AT FACTORY GATE			
Parameter	Unit	1 m <sup>2</sup> of Sundolitt EPS	1 m <sup>2</sup> of Sundolitt Climate EPS
Biogenic carbon content in product	[kg C]	0.0	0.0
Biogenic carbon content in accompanying packaging	[kg C]	0.0	0.0
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO <sub>2</sub>		

# Additional information

## LCA interpretation

The raw material, polystyrene, is the main contributor to the environmental impacts, as polystyrene account for the maximum contribution for 15 and 12 out of 19 impact categories for scenario 1 (100% recycling) and scenario 2 (100% incineration), respectively. For scenario 2 (100% incineration), the incineration of EPS at end-of-life account for the maximum contribution for 3 out of 19 impact categories. For both scenarios, module A1 account for the maximum contribution to the majority of the 19 impact categories.

## Technical information on scenarios

### Transport to the building site (A4)

Scenario information	Value	Unit
Fuel type	Diesel	-
Vehicle type	EURO 5, 24.7 ton payload	-
Transport distance	208	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported, Sundolitt EPS	15	kg/m <sup>3</sup>
Gross density of products transported, Sundolitt Climate EPS	16	kg/m <sup>3</sup>

### Installation of the product in the building (A5)

Scenario information	Sundolitt EPS	Sundolitt Climate EPS	Unit
Energy type and consumption	0	0	kWh
Waste materials	0.01	0.01	kg
Direct emissions to air, soil, or water	0	0	kg

### End of life (C1-C4)

Scenario information	Scenario 1: 100% recycling		Scenario 1: 100% incineration		Unit
	Sundolitt EPS	Sundolitt Climate EPS	Sundolitt EPS	Sundolitt Climate EPS	
Collected separately	0.56	0.5	0.56	0.5	kg
For recycling	0.53	0.47	0.0	0.0	kg
For energy recovery	0.0	0.0	0.53	0.47	kg

### Re-use, recovery and recycling potential (D)

Scenario information/Materiel	100% recycling		100% incineration		Unit
	Sundolitt EPS	Sundolitt Climate EPS	Sundolitt EPS	Sundolitt Climate EPS	
<b>Packaging waste from installation (A5)</b>					
Substitution of LDPE from recycling of LDPE foil	0.005	0.004	0.005	0.004	kg
Substitution of heat and electricity generation from LDPE foil incineration	0.003	0.003	0.003	0.003	kg
- Heat generation	0.008	0.008	0.008	0.008	MJ
- Electricity generation	0.004	0.004	0.004	0.004	MJ
Substitution of primary polystyrene from recycling of EPS packaging	0.001	0.001	0.001	0.001	kg
Substitution of heat and electricity generation from EPS incineration	0.001	0.0005	0.001	0.0005	kg
- Heat generation	0.006	0.005	0.006	0.005	MJ
- Electricity generation	0.003	0.003	0.003	0.003	MJ
<b>End of life of the product</b>					
Substitution of primary polystyrene	0.53	0.45	0	0	kg
Substitution of primary graphite	0	0.02	0	0	kg
Substitution of heat and electricity generation from incineration of waste EPS	0	0	0.53	0.47	kg
- Heat generation	0	0	5.72	5.07	MJ
- Electricity generation	0	0	3.21	2.85	MJ

#### Indoor air

*The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.1.*

#### Soil and water

*The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.2.*

## References

<b>Publisher</b>	 <a href="http://www.epddanmark.dk">www.epddanmark.dk</a>
<b>Program operator</b>	Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup <a href="http://www.teknologisk.dk">www.teknologisk.dk</a>
<b>LCA-practitioner</b>	Rikke Bernberg and Freja Jeppesen COWI A/S Parallelsvej 2 2800 Kgs. Lyngby
<b>LCA software / background data</b>	GaBi Professional 2022 and Ecoinvent v3.8
<b>3<sup>rd</sup> party verifier</b>	Ninkie Bendtsen NIRAS A/S Sortemosevej 19 3450 Allerød

### General program instructions

General Program Instructions, version 2.0, spring 2020  
[www.epddanmark.dk](http://www.epddanmark.dk)

### EN 15804

DS/EN 15804 + A2:2019 - "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

### EN 16783

E N 16783:2017, "Thermal insulation products – Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations"

### EN 15942

DS/EN 15942:2011 – " Sustainability of construction works – Environmental product declarations – Communication format business-to-business"

### ISO 14025

DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures"

### ISO 14040

DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework"

### ISO 14044

DS/EN ISO 14044:2008 – " Environmental management – Life cycle assessment – Requirements and guidelines"