

Annex for double skin steel faced sandwich panels with a core made of polyurethane

- Polyurethane sandwich panel 40mm thickness
- Polyurethane sandwich panel 160mm thickness
- 1 kg steel sheet
- 1 m³ polyurethane core

to the

ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	European Association for Panels and Profiles e. V. (PPA-Europe)
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General information

This document is a public annex to the EPD with the declaration number EPD-PPA-20240128-CBG1-EN. It contains the LCA results for additional thicknesses of polyurethane sandwich panels (40mm, 160mm).

Additionally, the annex provides separate results for 1 kg of steel sheet used for the panel faces and 1 m³ of polyurethane rigid foam used as core of the panel..

The LCA data were based on production data from the year 2022.

The annex includes the individual results for steel sheet (1 kg) and PU core (1 m³). The PU core declared in this annex includes transportation of chemical components to production site, and production processes. The values for 1kg of steel sheet and 1 m³ of PU core can be used to estimate the LCA results for products with different thicknesses.

The following formula describes how results for different thicknesses can be estimated:

$$R_x = M_s * R_s + T_c * R_c$$

R_x = Results of different thickness sandwich panel at different indicators

M_s = Mass of steel

R_s = Results of 1kg steel

T_c = Thickness of PU core (in m)

R_c = Results of 1m³ PU core

The formula shall be used for all indicators and for the following modules : A1-A3, A4, A5, C2, C3, C4 and D.

Additionally, installation and deconstruction impacts (for A5 and C1) are mentioned separately and declared per m² of product. The user can directly use these results without scaling. The impacts from installation (A5) shall be summed with the scaled impacts from A5 in the polyurethane core results (EOL of packaging materials).

General information on sandwich panels

This annex contains the LCA results for:

- Polyurethane sandwich panel 40mm thickness
- Polyurethane sandwich panel 160mm thickness
- 1 kg steel sheet
- 1 m³ polyurethane core

Technical data for sandwich panel PU 40

Technical specifications for sandwich panels with a core made of polyurethane are:

- EN 14509
- EN 13165

Constructional data

Name	Value	Unit
Density of the insulation	36-43	kg/m ³
Thickness of the element, when the outer layers are flat, this is the overall height of the element (D); on heavily profiled elements, this is the continuous core thickness without profile (dc)	40	mm
Thickness of the inner layer	0.5	mm
Weight	10.18	kg/m ²
Thickness of the outer layer	0.6	mm

Composition of the sandwich panels

- Steel sheet 85%
- Core material 15%

Technical specifications for sandwich panels with a core made of polyurethane are:

- EN 14509
- EN 13165

Constructional data

Name	Value	Unit
Density of the insulation	36-43	kg/m ³
Thickness of the element, when the outer layers are flat, this is the overall height of the element (D); on heavily profiled elements, this is the continuous core thickness without profile (dc)	160	mm
Thickness of the inner layer	0.5	mm
Weight	16.35	kg/m ²
Thickness of the outer layer	0.6	mm

Composition of the sandwich panels

- Steel sheet 60%
- Core material 40%

Technical data for 1 kg steel sheet

- Steel sheet according to EN 10346: S280 GD to S350 GD with organic coating according to EN 10169.

Technical data for 1 m³ PU core

- Rigid polyurethane foam mainly made of isocyanate and polyol
- Density: 36-43 kg/m³

Technical data for sandwich panel PU 160

1. LCA: Calculation rules

Declared unit

Product name	Name	Value	Unit
PU 40	Declared unit	1	m ²
	Surface weight of the panel (total value)	10.18	kg/m ²
PU 160	Declared unit	1	m ²
	Surface weight of the panel (total value)	16.35	kg/m ²
Steel sheet	Declared unit	1	kg
PU Core	Declared unit	1	m ³

2. LCA: Scenarios and additional technical information

Information on describing the biogenic carbon content at factory gate

Product name	Name	Value	Unit
PU 40	Biogenic carbon content in accompanying packaging	0.047	kg C
PU 160	Biogenic carbon content in accompanying packaging	0.039	kg C
1 kg steel sheet	Biogenic carbon content in accompanying packaging	-	kg C
1m ³ PU core with aux	Biogenic carbon content in accompanying packaging	1.20	kg C

The following technical information is a basis for the declared modules.

Transport to the building site (A4)

The transport to building site A4 is standardized and can be scaled up to building level. Hence, it is considered to be 100 km.

Name	Value	Unit
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

Installation (A5)

The following packaging material is considered in A1-A3: polystyrene, polyethylene foil, cardboard and wooden pallet.

A5 covers the treatment of packaging material at the point of installation. Additionally, installation is done by diesel driven machinery with consumption of 0,233kg/m² panel.

Installation into the building (A5)

Product name	Name	Value	Unit
PU 40	Output substances following waste treatment on site	0.172	kg
PU 160	Output substances following waste treatment on site	0.178	kg
1kg steel sheet	Output substances following waste treatment on site	-	kg
1m ³ PU core with aux.	Output substances following waste treatment on site	4.34	kg

End of life (C1-C4)

Deconstruction done by the same machine, as for installation, with same consumption.

Product name	Name	Value	Unit
PU 40	Collected separately waste type	10.18	kg
	Recycling	8.56	kg
	Energy recovery	1.62	kg
	Landfilling	-	kg
PU 160	Collected separately waste type	16.35	kg
	Recycling	8.54	kg
	Energy recovery	7.81	kg
	Landfilling	-	kg
1kg steel sheet	Collected separately waste type	1	kg
	Recycling	1	kg
	Energy recovery	-	kg
	Landfilling	-	kg

1m ³ PU core with aux.	Collected separately waste type	43	kg
	Recycling	-	kg
	Energy recovery	43	kg
	Landfilling	-	kg

Reuse, recovery or recycling potential (D)

Resulting potential benefits and loads for the metal recycling are declared in module D.

3. 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	MND	MND	MND	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2 1m² polyurethane sandwich panel 40mm thickness

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	2,67E+01	7,38E-02	5,61E-02	8,26E-01	3,69E-02	4,76E+00	0,00E+00	-1,47E+01
GWP-fossil	[kg CO ₂ -Eq.]	2,67E+01	7,29E-02	2,68E-02	8,15E-01	3,64E-02	4,76E+00	0,00E+00	-1,47E+01
GWP-biogenic	[kg CO ₂ -Eq.]	2,99E-02	2,15E-04	2,93E-02	3,21E-03	1,08E-04	3,41E-04	0,00E+00	1,87E-02
GWP-luluc	[kg CO ₂ -Eq.]	1,12E-02	6,75E-04	-5,26E-07	7,53E-03	3,38E-04	7,61E-06	0,00E+00	-6,44E-03
ODP	[kg CFC11-Eq.]	2,11E-11	9,49E-15	2,22E-14	1,06E-13	4,74E-15	3,84E-13	0,00E+00	3,15E-11
AP	[mol H ⁺ -Eq.]	1,23E-01	9,36E-05	3,06E-05	4,77E-03	4,68E-05	2,80E-03	0,00E+00	-3,16E-02
EP-freshwater	[kg P-Eq.]	3,85E-05	2,67E-07	6,32E-09	2,97E-06	1,33E-07	1,04E-07	0,00E+00	-3,51E-06
EP-marine	[kg N-Eq.]	3,00E-02	3,17E-05	1,18E-05	2,33E-03	1,59E-05	1,36E-03	0,00E+00	-8,04E-03
EP-terrestrial	[mol N-Eq.]	3,25E-01	3,82E-04	1,49E-04	2,58E-02	1,91E-04	1,56E-02	0,00E+00	-8,88E-02
POCP	[kg NMVOC-Eq.]	9,17E-02	8,07E-05	3,04E-05	6,19E-03	4,03E-05	3,49E-03	0,00E+00	-2,57E-02
ADPE	[kg Sb-Eq.]	5,11E-04	4,80E-09	3,66E-11	5,36E-08	2,40E-09	3,66E-09	0,00E+00	5,85E-06
ADPF	[MJ]	3,48E+02	9,93E-01	3,06E-02	1,11E+01	4,97E-01	1,26E+00	0,00E+00	-1,24E+02
WDP	[m ³ world-Eq deprived]	1,31E+00	8,81E-04	9,53E-03	9,83E-03	4,41E-04	4,69E-01	0,00E+00	7,22E-02

Caption: 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: 1m² polyurethane sandwich panel 40mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	2,38E+01	7,23E-02	1,80E+00	8,06E-01	3,62E-02	2,37E-01	0,00E+00	8,19E+00
PERM	[MJ]	1,79E+00	0,00E+00	-1,79E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	2,56E+01	7,23E-02	1,03E-02	8,06E-01	3,62E-02	2,37E-01	0,00E+00	8,19E+00
PENRE	[MJ]	3,02E+02	9,97E-01	2,49E+00	1,11E+01	4,99E-01	4,53E+01	0,00E+00	-1,25E+02
PENRM	[MJ]	4,66E+01	0,00E+00	-2,46E+00	0,00E+00	0,00E+00	-4,41E+01	0,00E+00	0,00E+00
PENRT	[MJ]	3,49E+02	9,97E-01	3,05E-02	1,11E+01	4,99E-01	1,26E+00	0,00E+00	-1,25E+02
SM	[kg]	1,99E+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
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
FW	[m ³]	5,47E-02	7,92E-05	2,24E-04	8,83E-04	3,96E-05	1,10E-02	0,00E+00	-7,12E-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 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: 1m² polyurethane sandwich panel 40mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	6,61E-06	3,09E-12	3,24E-13	3,44E-11	1,54E-12	1,11E-10	0,00E+00	-1,87E-09
NHWD	[kg]	1,01E+00	1,52E-04	3,62E-03	1,70E-03	7,60E-05	2,40E-02	0,00E+00	-1,83E-01
RWD	[kg]	4,53E-03	1,87E-06	1,08E-06	2,08E-05	9,33E-07	5,16E-05	0,00E+00	-5,03E-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
MFR	[kg]	6,10E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,02E+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
EEE	[MJ]	0,00E+00	0,00E+00	7,05E-02	0,00E+00	0,00E+00	8,23E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	1,66E-01	0,00E+00	0,00E+00	1,47E+01	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

RESULTS OF THE LCA - additional impact categories according to EN 15804+A2-optional: polyurethane sandwich panel 40mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	1,91E-06	6,85E-10	1,76E-10	9,51E-08	3,42E-10	7,77E-09	0,00E+00	-4,51E-07
IRP	[kBq U235-Eq.]	5,32E-01	2,78E-04	1,15E-04	3,10E-03	1,39E-04	8,16E-03	0,00E+00	-2,51E-01
ETP-fw	[CTUe]	1,27E+02	7,06E-01	1,12E-02	7,87E+00	3,53E-01	4,24E-01	0,00E+00	-2,54E+01
HTP-c	[CTUh]	2,45E-08	1,44E-11	1,28E-12	1,61E-10	7,22E-12	3,27E-11	0,00E+00	-2,31E-08
HTP-nc	[CTUh]	3,41E-07	7,69E-10	1,74E-10	1,06E-08	3,84E-10	1,11E-09	0,00E+00	-6,92E-08
SQP	[-]	5,07E+01	4,15E-01	1,03E-02	4,63E+00	2,08E-01	2,75E-01	0,00E+00	4,31E+00

Caption	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
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RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m² polyurethane sandwich panel 160mm thickness

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO2-Eq.]	3,93E+01	1,19E-01	1,46E-01	8,26E-01	5,93E-02	1,40E+01	0,00E+00	-1,96E+01
GWP-fossil	[kg CO2-Eq.]	3,93E+01	1,17E-01	6,99E-02	8,15E-01	5,85E-02	1,40E+01	0,00E+00	-1,96E+01
GWP-biogenic	[kg CO2-Eq.]	2,03E-02	3,46E-04	7,63E-02	3,21E-03	1,73E-04	1,00E-03	0,00E+00	3,95E-03
GWP-luluc	[kg CO2-Eq.]	2,00E-02	1,09E-03	-1,37E-06	7,53E-03	5,43E-04	2,24E-05	0,00E+00	-7,73E-03
ODP	[kg CFC11-Eq.]	2,31E-11	1,52E-14	5,77E-14	1,06E-13	7,62E-15	1,13E-12	0,00E+00	1,27E-11
AP	[mol H+-Eq.]	1,53E-01	1,50E-04	7,99E-05	4,77E-03	7,52E-05	8,24E-03	0,00E+00	-3,93E-02
EP-freshwater	[kg P-Eq.]	9,27E-05	4,28E-07	1,65E-08	2,97E-06	2,14E-07	3,07E-07	0,00E+00	-8,97E-06
EP-marine	[kg N-Eq.]	3,81E-02	5,10E-05	3,07E-05	2,33E-03	2,55E-05	4,00E-03	0,00E+00	-1,03E-02
EP-terrestrial	[mol N-Eq.]	4,09E-01	6,13E-04	3,89E-04	2,58E-02	3,07E-04	4,60E-02	0,00E+00	-1,14E-01
POCP	[kg NMVOC-Eq.]	1,18E-01	1,30E-04	7,92E-05	6,19E-03	6,48E-05	1,03E-02	0,00E+00	-3,22E-02
ADPE	[kg Sb-Eq.]	5,37E-04	7,72E-09	9,55E-11	5,36E-08	3,86E-09	1,08E-08	0,00E+00	8,45E-06
ADPF	[MJ]	6,78E+02	1,60E+00	7,97E-02	1,11E+01	7,98E-01	3,70E+00	0,00E+00	-1,95E+02
WDP	[m ³ world-Eq deprived]	2,85E+00	1,42E-03	2,48E-02	9,83E-03	7,08E-04	1,38E+00	0,00E+00	-7,29E-02

Caption	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
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RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m² polyurethane sandwich panel 160mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	3,66E+01	1,16E-01	1,46E+00	8,06E-01	5,81E-02	6,96E-01	0,00E+00	-7,31E+00
PERM	[MJ]	1,43E+00	0,00E+00	-1,43E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	3,80E+01	1,16E-01	2,69E-02	8,06E-01	5,81E-02	6,96E-01	0,00E+00	-7,31E+00
PENRE	[MJ]	5,22E+02	1,60E+00	3,65E+00	1,11E+01	8,01E-01	1,57E+02	0,00E+00	-1,97E+02
PENRM	[MJ]	1,57E+02	0,00E+00	-3,57E+00	0,00E+00	0,00E+00	-1,54E+02	0,00E+00	0,00E+00
PENRT	[MJ]	6,79E+02	1,60E+00	7,95E-02	1,11E+01	8,01E-01	3,70E+00	0,00E+00	-1,97E+02
SM	[kg]	2,09E+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
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
FW	[m ³]	1,27E-01	1,27E-04	5,83E-04	8,83E-04	6,36E-05	3,24E-02	0,00E+00	-1,87E-02

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 = Use of net fresh water
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RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² polyurethane sandwich panel 160mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	7,02E-06	4,96E-12	8,45E-13	3,44E-11	2,48E-12	3,27E-10	0,00E+00	-5,14E-09
NHWD	[kg]	1,21E+00	2,44E-04	9,43E-03	1,70E-03	1,22E-04	7,04E-02	0,00E+00	-3,44E-01
RWD	[kg]	8,07E-03	3,00E-06	2,82E-06	2,08E-05	1,50E-06	1,52E-04	0,00E+00	-4,98E-03
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	1,20E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,35E+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
EEE	[MJ]	0,00E+00	0,00E+00	1,84E-01	0,00E+00	0,00E+00	2,42E+01	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	4,32E-01	0,00E+00	0,00E+00	4,33E+01	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
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RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² polyurethane sandwich panel 160mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	2,24E-06	1,10E-09	4,60E-10	9,51E-08	5,50E-10	2,29E-08	0,00E+00	-5,39E-07
IRP	[kBq U235-Eq.]	9,09E-01	4,47E-04	3,01E-04	3,10E-03	2,24E-04	2,40E-02	0,00E+00	-1,04E+00
ETP-fw	[CTUe]	3,28E+02	1,13E+00	2,93E-02	7,87E+00	5,67E-01	1,25E+00	0,00E+00	-4,18E+01
HTP-c	[CTUh]	2,90E-08	2,32E-11	3,33E-12	1,61E-10	1,16E-11	9,61E-11	0,00E+00	-2,74E-08
HTP-nc	[CTUh]	5,30E-07	1,23E-09	4,54E-10	1,06E-08	6,17E-10	3,26E-09	0,00E+00	-9,07E-08
SQP	[-]	7,28E+01	6,67E-01	2,68E-02	4,63E+00	3,33E-01	8,08E-01	0,00E+00	-5,88E+00

Caption	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
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RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2 1 kg steel sheet

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	2,70E+00	7,25E-03			3,62E-03	0,00E+00	0,00E+00	-1,70E+00
GWP-fossil	[kg CO ₂ -Eq.]	2,70E+00	7,16E-03			3,58E-03	0,00E+00	0,00E+00	-1,70E+00
GWP-biogenic	[kg CO ₂ -Eq.]	1,54E-03	2,12E-05			1,06E-05	0,00E+00	0,00E+00	3,76E-03
GWP-luluc	[kg CO ₂ -Eq.]	1,09E-03	6,64E-05			3,32E-05	0,00E+00	0,00E+00	-8,31E-04
ODP	[kg CFC11-Eq.]	1,99E-12	9,32E-16			4,66E-16	0,00E+00	0,00E+00	5,94E-12
AP	[mol H ⁺ -Eq.]	6,42E-03	9,20E-06			4,60E-06	0,00E+00	0,00E+00	-3,86E-03
EP-freshwater	[kg P-Eq.]	2,11E-06	2,62E-08			1,31E-08	0,00E+00	0,00E+00	-9,00E-08
EP-marine	[kg N-Eq.]	1,57E-03	3,12E-06			1,56E-06	0,00E+00	0,00E+00	-9,72E-04
EP-terrestrial	[mol N-Eq.]	1,70E-02	3,75E-05			1,88E-05	0,00E+00	0,00E+00	-1,08E-02
POCP	[kg NMVOC-Eq.]	5,01E-03	7,93E-06			3,96E-06	0,00E+00	0,00E+00	-3,15E-03
ADPE	[kg Sb-Eq.]	6,65E-05	4,72E-10			2,36E-10	0,00E+00	0,00E+00	7,78E-07
ADPF	[MJ]	2,50E+01	9,76E-02			4,88E-02	0,00E+00	0,00E+00	-1,20E+01
WDP	[m ³ world-Eq deprived]	8,15E-02	8,66E-05			4,33E-05	0,00E+00	0,00E+00	3,09E-02

Caption	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
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RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg steel sheet

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	2,02E+00	7,10E-03			3,55E-03	0,00E+00	0,00E+00	2,31E+00
PERM	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	2,02E+00	7,10E-03			3,55E-03	0,00E+00	0,00E+00	2,31E+00
PENRE	[MJ]	2,52E+01	9,80E-02			4,90E-02	0,00E+00	0,00E+00	-1,22E+01
PENRM	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	2,52E+01	9,80E-02			4,90E-02	0,00E+00	0,00E+00	-1,22E+01
SM	[kg]	1,85E-01	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
NRSF	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m ³]	3,05E-03	7,78E-06			3,89E-06	0,00E+00	0,00E+00	5,58E-05

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 = Use of net fresh water
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RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg steel sheet

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	8,47E-07	3,03E-13			1,52E-13	0,00E+00	0,00E+00	-1,52E-11
NHWD	[kg]	1,21E-01	1,49E-05			7,47E-06	0,00E+00	0,00E+00	-2,16E-02
RWD	[kg]	2,58E-04	1,83E-07			9,17E-08	0,00E+00	0,00E+00	2,65E-04
CRU	[kg]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	6,10E-02	0,00E+00			0,00E+00	1,00E+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
EEE	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+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
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**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 kg steel sheet**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	9,00E-08	6,73E-11			3,36E-11	0,00E+00	0,00E+00	-5,68E-08
IRP	[kBq U235-Eq.]	2,50E-02	2,73E-05			1,37E-05	0,00E+00	0,00E+00	2,22E-02
ETP-fw	[CTUe]	4,82E+00	6,93E-02			3,47E-02	0,00E+00	0,00E+00	-2,41E+00
HTP-c	[CTUh]	3,18E-09	1,42E-12			7,09E-13	0,00E+00	0,00E+00	-2,98E-09
HTP-nc	[CTUh]	3,37E-08	7,55E-11			3,78E-11	0,00E+00	0,00E+00	-7,65E-09
SQP	[-]	2,11E+00	4,08E-02			2,04E-02	0,00E+00	0,00E+00	1,38E+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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m³ PU core with auxiliary processes

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO2-Eq.]	1,43E+02	3,12E-01	6,81E+00		1,56E-01	9,48E+01	0,00E+00	-3,74E+01
GWP-fossil	[kg CO2-Eq.]	1,39E+02	3,08E-01	3,26E+00		1,54E-01	9,48E+01	0,00E+00	-3,72E+01
GWP-biogenic	[kg CO2-Eq.]	3,80E+00	9,10E-04	3,55E+00		4,55E-04	6,80E-03	0,00E+00	-2,01E-01
GWP-luluc	[kg CO2-Eq.]	9,28E-02	2,85E-03	-6,39E-05		1,43E-03	1,52E-04	0,00E+00	-2,39E-03
ODP	[kg CFC11-Eq.]	6,52E-11	4,01E-14	2,69E-12		2,00E-14	7,65E-12	0,00E+00	-2,82E-10
AP	[mol H+-Eq.]	2,42E-01	3,95E-04	3,72E-03		1,98E-04	5,59E-02	0,00E+00	-4,55E-02
EP-freshwater	[kg P-Eq.]	5,75E-04	1,13E-06	7,68E-07		5,63E-07	2,08E-06	0,00E+00	-5,72E-05
EP-marine	[kg N-Eq.]	7,32E-02	1,34E-04	1,43E-03		6,70E-05	2,71E-02	0,00E+00	-1,34E-02
EP-terrestrial	[mol N-Eq.]	7,58E-01	1,61E-03	1,81E-02		8,06E-04	3,12E-01	0,00E+00	-1,43E-01
POCP	[kg NMVOC-Eq.]	3,69E-01	3,41E-04	3,69E-03		1,70E-04	6,96E-02	0,00E+00	-3,73E-02
ADPE	[kg Sb-Eq.]	1,81E-05	2,03E-08	4,45E-09		1,01E-08	7,29E-08	0,00E+00	-2,55E-06
ADPF	[MJ]	3,83E+03	4,20E+00	3,71E+00		2,10E+00	2,51E+01	0,00E+00	-6,80E+02
WDP	[m ³ world-Eq deprived]	1,69E+01	3,72E-03	1,16E+00		1,86E-03	9,34E+00	0,00E+00	-3,38E+00

Caption: 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: 1m³ polyurethane core with auxiliary processes

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	1,90E+02	3,05E-01	1,45E+02		1,53E-01	5,10E+00	0,00E+00	-1,89E+02
PERM	[MJ]	1,44E+02	0,00E+00	-1,43E+02		0,00E+00	-3,80E-01	0,00E+00	0,00E+00
PERT	[MJ]	3,33E+02	3,05E-01	1,25E+00		1,53E-01	4,72E+00	0,00E+00	-1,89E+02
PENRE	[MJ]	2,46E+03	4,21E+00	3,11E+02		2,11E+00	1,10E+03	0,00E+00	-6,80E+02
PENRM	[MJ]	1,38E+03	0,00E+00	-3,07E+02		0,00E+00	-1,08E+03	0,00E+00	0,00E+00
PENRT	[MJ]	3,84E+03	4,21E+00	3,70E+00		2,11E+00	2,51E+01	0,00E+00	-6,80E+02
SM	[kg]	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
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m ³]	7,95E-01	3,35E-04	2,72E-02		1,67E-04	2,20E-01	0,00E+00	-1,56E-01

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 = Use of net fresh water

**RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:
1m³ polyurethane core with auxiliary processes**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1,87E-06	1,30E-11	3,93E-11		6,52E-12	2,21E-09	0,00E+00	-3,87E-08
NHWD	[kg]	1,50E+00	6,42E-04	4,39E-01		3,21E-04	4,77E-01	0,00E+00	-3,25E-01
RWD	[kg]	3,86E-02	7,89E-06	1,31E-04		3,94E-06	1,03E-03	0,00E+00	-5,27E-02
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00	8,55E+00		0,00E+00	1,64E+02	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	2,01E+01		0,00E+00	2,93E+02	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

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1m³ polyurethane core with auxiliary processes**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	3,54E-06	2,89E-09	2,14E-08		1,45E-09	1,55E-07	0,00E+00	-3,87E-07
IRP	[kBq U235-Eq.]	4,06E+00	1,18E-03	1,40E-02		5,88E-04	1,63E-01	0,00E+00	-8,72E+00
ETP-fw	[CTUe]	2,40E+03	2,98E+00	1,36E+00		1,49E+00	8,45E+00	0,00E+00	-1,46E+02
HTP-c	[CTUh]	4,31E-08	6,10E-11	1,55E-10		3,05E-11	6,51E-10	0,00E+00	-7,33E-09
HTP-nc	[CTUh]	2,05E-06	3,25E-09	2,12E-08		1,62E-09	2,21E-08	0,00E+00	-2,32E-07
SQP	[-]	2,30E+03	1,75E+00	1,25E+00		8,77E-01	5,48E+00	0,00E+00	-1,25E+02

Caption	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
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RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2 1m² polyurethane sandwich panel: Additional results from installation and deconstruction

Core Indicator	Unit	A5	C1
GWP-total	[kg CO ₂ -Eq.]	8,26E-01	8,26E-01
GWP-fossil	[kg CO ₂ -Eq.]	8,15E-01	8,15E-01
GWP-biogenic	[kg CO ₂ -Eq.]	3,21E-03	3,21E-03
GWP-luluc	[kg CO ₂ -Eq.]	7,53E-03	7,53E-03
ODP	[kg CFC11-Eq.]	1,06E-13	1,06E-13
AP	[mol H ⁺ -Eq.]	4,77E-03	4,77E-03
EP-freshwater	[kg P-Eq.]	2,97E-06	2,97E-06
EP-marine	[kg N-Eq.]	2,33E-03	2,33E-03
EP-terrestrial	[mol N-Eq.]	2,58E-02	2,58E-02
POCP	[kg NMVOC-Eq.]	6,19E-03	6,19E-03
ADPE	[kg Sb-Eq.]	5,36E-08	5,36E-08
ADPF	[MJ]	1,11E+01	1,11E+01
WDP	[m ³ world-Eq deprived]	9,83E-03	9,83E-03

Caption	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
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RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m² polyurethane sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
PERE	[MJ]	8,06E-01	8,06E-01
PERM	[MJ]	0,00E+00	0,00E+00
PERT	[MJ]	8,06E-01	8,06E-01
PENRE	[MJ]	1,11E+01	1,11E+01
PENRM	[MJ]	0,00E+00	0,00E+00
PENRT	[MJ]	1,11E+01	1,11E+01
SM	[kg]	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00
FW	[m ³]	8,83E-04	8,83E-04

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 = Use of net fresh water
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RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² polyurethane sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
HWD	[kg]	3,44E-11	3,44E-11
NHWD	[kg]	1,70E-03	1,70E-03
RWD	[kg]	2,08E-05	2,08E-05
CRU	[kg]	0,00E+00	0,00E+00
MFR	[kg]	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00
EET	[MJ]	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
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RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² polyurethane sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
PM	[Disease Incidence]	9,51E-08	9,51E-08
IRP	[kBq U235-Eq.]	3,10E-03	3,10E-03
ETP-fw	[CTUe]	7,87E+00	7,87E+00
HTP-c	[CTUh]	1,61E-10	1,61E-10
HTP-nc	[CTUh]	1,06E-08	1,06E-08
SQP	[-]	4,63E+00	4,63E+00

Caption	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
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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.