Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021, except those parts related to publish an EPD via a program operator, for the specific:
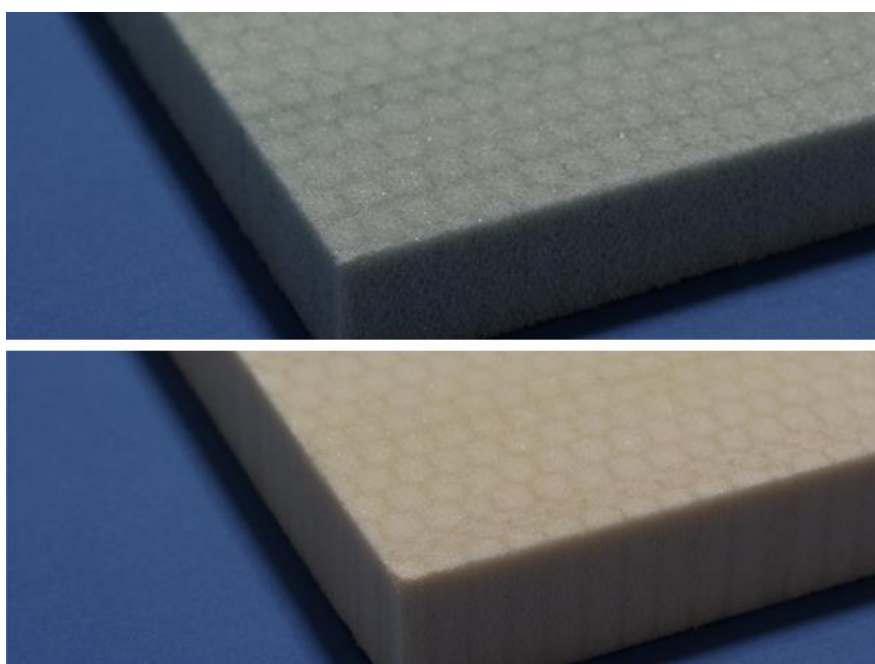
Divinycell P

from

Diab Group AB

Publication date	2023-11-24
Valid to	2028-11-24
EPD ID	Diab 23:001
Third party verifier:	Martin Erlandsson, IVL

The EPD owner has the sole ownership, liability, and responsibility for the EPD

General information

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Diab Group AB
Contact: Per Hökfelt, VP Sustainability & QEHS
Description of the organisation:
Diab is a global company that develops, manufactures and sells core materials for sandwich composite structures used in for example leisure boats, wind turbine blades and components for aircraft, trains, industrial applications and buildings. The core materials have a combination of characteristics such as low weight, high strength, insulation properties and chemical resistance.

The company has production units in Sweden, Italy, US, Lithuania, and China.

The market for core material is growing due to the underlying demand for energy efficiency, which is leading to a greater need for high-strength, lightweight solutions. Wind turbines, leisure boats and various applications requiring the combination of lightweight and high strength are the main application areas for the material.

Product-related or management system-related certifications: Diab is a world leader in high-performance composite core materials. Diab has developed composite core material development for over sixty years, supplying a wide range of markets including marine, wind energy, transport, aerospace and industry. Diab has ISO 9001- and 14001-certificates.

Name and location of production sites: [Diab produces PET core materials at two locations, in Longarone, Italy and in Laholm, Sweden.

Product information

Product name: Divinycell P, PX, PN, PNX, PY

Product identification PET foam is manufactured from the polymer Polyethylene Terephthalate, PET, which results in a thermoplastic foam.

Product description: PET core material is perfectly suited for a variety of sandwich applications to increase performance and reduce weight. Divinycell PN is used in industrial, transportation, marine and wind energy applications.

PET grade products are available in sheets from approximately 120 mm:s thickness down to 0,5 mm, further it can be milled and grooved to various structures according to customer request. All Divinycell PET grades has good thermal stability.

Datasheets for all specific grades are available for all Divinycell PET grades on the company's website www.diabgroup.com.

UN CPC code: 363 (semi-manufactures of plastics)

Geographical scope: The production occurs in Italy and Sweden. Since the PET core is used globally, the end-of-life scenario has been calculated with global data.

LCA information

Functional unit / declared unit: 1 kg Divinycell PET grades (Divinycell P, PX, PN, PNX, PY)

Reference service life: Minimum 25 years

Time representativeness: Data representative for production year 2021.

Database and LCA software used: Ecoinvent 3.8 and SimaPro 9.3

Description of system boundaries:
A1: Extraction and processing of raw materials and Generation of electricity, steam and heat from primary energy resources
A2: Transports from suppliers to Diab and in between production units
A3: Manufacturing of the product at Diab and packaging materials used. The PET is used in various sandwich constructions.
A5: Waste handling of packaging material
**C1:** The products are demolished and cut into manageable sizes before being sent off to landfill.
C2: Transportation of the material to landfill
C3: No reuse, recycling or recovery is considered.
C4: Currently, there is no reliable technology to separate the PET from the sandwich construction to be recycled. The PVC is therefore assumed to be landfilled.

System diagram:
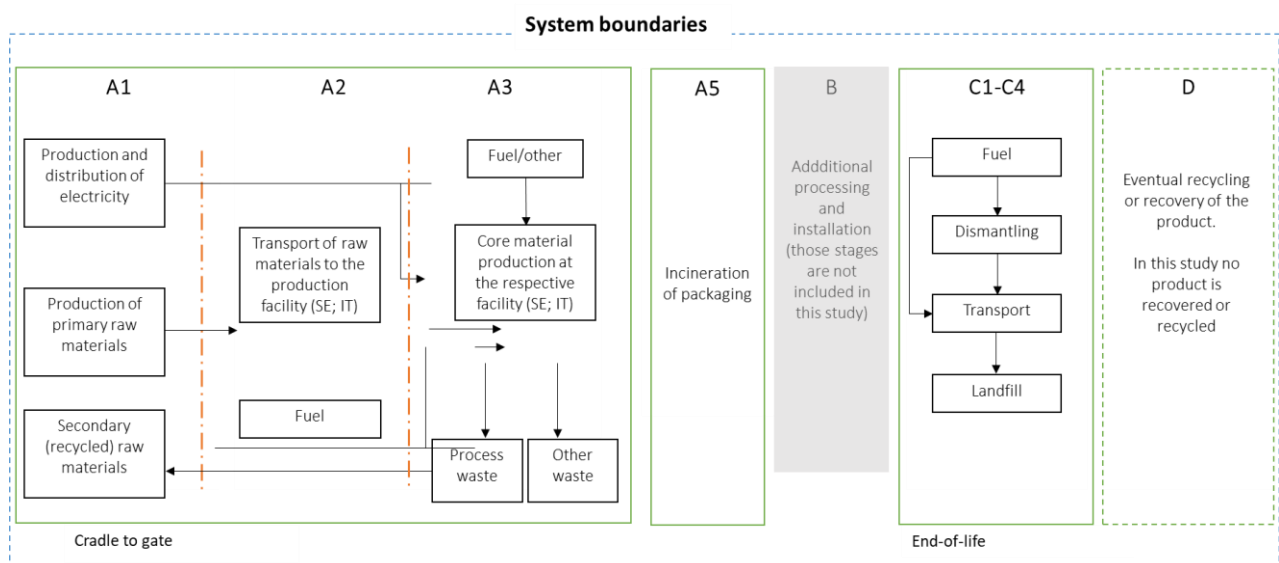
Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	x	x	x	ND	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x
Geography	SE, IT, GLO	SE, IT, GLO	SE, IT, GLO	-	GLO	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	22 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	+/- 20 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product components	%	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
PET	< 100	0	
Cyclopentane	< 5	0	
Additives	< 5	0	
TOTAL	100	0	
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Cardboard	0,021	0,021	0,011
TOTAL	0,021	0,021	

Diab declares that the product does not contain substances from the candidate list of SVHC for Authorization in levels above 0.1% by weight.

Scenario and technical information

Additional information for module A5, Installation in the building. In the calculations for Divinycell PET grades only handling of packaging material is included in the calculation.

Scenario information	Unit (expressed per functional unit or per declared unit)	
Ancillary materials for installation (specified by material)	kg	Not included in the calculations
Water use	m³	Not included in the calculations
Other resources use	kg	Not included in the calculations
Quantitative description of energy type (regional mix) and consumption during the installation process	kWh or MJ	Not included in the calculations
Waste materials on the building site before waste processing, generated by the product's installation	kg	Cardboard: 0,0256
Output materials as result of waste processing at the building site e.g. of collection for recycling for energy recovery, disposal	kg	Not included in the calculations
Direct emissions to ambient air, soil and water	kg	Not applicable

Additional information for module C, End-of-life.

In the end-of-life stage the product is separated from the construction and thereafter sent do landfill. Presently, there exists no methodology to separate the constituent materials and recycle the components separately. There is, however, ongoing research in the area. The assumption that all material is going to landfill is a conservative approach considering that polymers possess the potential for energy recovery. However, landfill remains the most likely scenario at the moment.

End-of-life (C1-C4)	Unit (per declared unit)	Weigh
Collection processes specified by type	kg collected separately	1
	kg collected with mixed construction waste	0
Recovery system specified by type	kg for re-use	0
	kg for recycling	0
	kg for energy recovery	0
Disposal specified by type	kg product or material for final deposition	1
Assumptions for scenario development e.g. transportation	km	200

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Indicator	Unit	Results per functional or declared unit									
		A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	3.48E+00	5.83E-02	9.14E-02	**3.63E+00**	7.05E-04	9.93E-01	3.32E-02	0.00E+00	1.05E-02	0.00E+00
GWP-biogenic	kg CO_2 eq.	1.65E-02	3.74E-04	3.13E-02	**4.82E-02**	3.34E-02	3.51E-04	2.83E-05	0.00E+00	1.07E-04	0.00E+00
GWP-luluc	kg CO_2 eq.	2.20E-03	6.48E-05	1.65E-04	**2.43E-03**	2.39E-07	9.91E-05	1.31E-05	0.00E+00	1.07E-05	0.00E+00
GWP-total	kg CO_2 eq.	3.49E+00	5.88E-02	1.23E-01	**3.68E+00**	3.41E-02	9.93E-01	3.33E-02	0.00E+00	1.06E-02	0.00E+00
ODP	kg CFC 11 eq.	1.46E-05	1.01E-08	5.91E-09	**1.46E-05**	5.82E-11	2.12E-07	7.69E-09	0.00E+00	3.20E-09	0.00E+00
AP	mol H^+ eq.	1.43E-02	4.03E-04	3.30E-04	**1.51E-02**	5.89E-06	1.03E-02	1.35E-04	0.00E+00	8.90E-05	0.00E+00
EP-freshwater	kg P eq.	6.72E-04	1.64E-05	1.88E-05	**7.08E-04**	8.34E-08	3.08E-05	2.14E-06	0.00E+00	3.05E-06	0.00E+00
EP-marine	kg N eq.	2.63E-03	1.06E-04	1.22E-04	**2.86E-03**	3.01E-06	4.57E-03	4.06E-05	0.00E+00	3.07E-05	0.00E+00
EP-terrestrial	mol N eq.	2.73E-02	1.14E-03	9.99E-04	**2.95E-02**	2.63E-05	5.01E-02	4.44E-04	0.00E+00	3.34E-04	0.00E+00
POCP	kg NMVOC eq.	9.88E-03	3.33E-04	2.95E-04	**1.05E-02**	6.48E-06	1.38E-02	1.36E-04	0.00E+00	9.66E-05	0.00E+00
ADP-minerals & metals*	kg Sb eq.	3.74E-04	2.10E-07	4.02E-07	**3.74E-04**	1.89E-09	5.11E-07	1.16E-07	0.00E+00	3.44E-08	0.00E+00
ADP-fossil*	MJ	7.57E+01	9.17E-01	1.65E+00	**7.83E+01**	4.81E-03	1.36E+01	5.03E-01	0.00E+00	2.47E-01	0.00E+00
WDP*	m^3	5.62E+03	6.55E-03	3.07E-01	**5.62E+03**	7.85E-04	2.13E-02	1.50E-03	0.00E+00	1.08E-02	0.00E+00
Acronyms	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 = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact – additional mandatory and voluntary indicators

Indicator	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
					Results per functional or declared unit						
GWP-GHG[1]	kg CO_2 eq.	3.48E+00	5.84E-02	9.16E-02	**3.63E+00**	7.05E-04	9.93E-01	3.33E-02	0.00E+00	1.05E-02	0.00E+00

Use of resources

Indicator	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
					Results per functional or declared unit						
PERE	MJ	4.21E+00	2.74E-02	2.27E-01	**4.47E+00**	0.00E+00	7.66E-02	7.08E-03	0.00E+00	4.19E-03	0.00E+00
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	4.21E+00	2.74E-02	2.27E-01	**4.47E+00**	0.00E+00	7.66E-02	7.08E-03	0.00E+00	4.19E-03	0.00E+00
PENRE	MJ	4.06E+01	9.70E-01	1.75E+00	**4.33E+01**	0.00E+00	1.45E+01	5.34E-01	0.00E+00	2.63E-01	0.00E+00
PENRM	MJ	4.18E+01	0.00E+00	3.13E-01	**4.21E+01**	-3.13E-01	0.00E+00	0.00E+00	0.00E+00	-4.18E+01	0.00E+00
PENRT	MJ	8.23E+01	9.70E-01	2.06E+00	**8.54E+01**	-3.13E-01	1.45E+01	5.34E-01	0.00E+00	-4.15E+01	0.00E+00
SM	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
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
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
FW	m³	0.00E+00	0.00E+00	8.34E-04	**8.34E-04**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Acronyms: 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water;
* Energy stored as material in the product and the packing material is direct balanced out and not reported (<5%).

Waste production and output flows

Waste production

Results per functional or declared unit										
Indicator	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed	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
Non-hazardous waste disposed	kg	0.00E+00	0.00E+00	7.12E-02	**7.12E-02**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
Radioactive waste disposed	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

Results per functional or declared unit										
Indicator	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	1.89E-02	**1.89E-02**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	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
Materials for energy recovery	kg	0.00E+00	0.00E+00	5.34E-02	**5.34E-02**	2.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	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
Exported energy, thermal	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

Information on biogenic carbon content

Results biogenic carbon content		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0,009*

* The inherent energy is assumed to be direct balanced out and therefore not reported as RPEM.

Differences versus previous versions

- Updating calculations according to the new standard EN 15804:2012+A2:2019
- New production site in Sweden has been added
- Change to renewable electricity at the Italian site.

References

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14 Construction products (EN 15804:A2) (1.3.0)

Ecoinvent 3.8 database, http://www.ecoinvent.org/

LCA software SimaPro Analyst 9.3.0.3

Domhagen, M., (2023) LCA of Divinycell PET, IPN and PES core materials, Methodology report for the development of EPDs.