

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Penne chair



LAMMHULTS

The Norwegian EPD Foundation

Owner of the declaration:

Lammhults Möbel AB

Product:

Penne chair

Declared unit:

1 pcs

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR 026:2022 Part B for Furniture

Program operator:

The Norwegian EPD Foundation

Declaration number:

NEPD-7235-6638-EN

Registration number:

NEPD-7235-6638-EN

Issue date: 15.08.2024

Valid to: 15.08.2029

EPD software:

LCAno EPD generator ID: 484537

General information

Product

Penne chair

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 977 22 020
web: www.epd-norge.no

Declaration number:

NEPD-7235-6638-EN

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR 026:2022 Part B for Furniture

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Declared unit:

1 pcs Penne chair

Declared unit (cradle to gate) with option:

A1-A3,A4,A5,B2,B3,B4,C1,C2,C3,C4,D

Functional unit:

Penne chair, seat and back in polypropylene

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPD-Norway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Elisabet Amat, GREENIZE projects

(no signature required)

Owner of the declaration:

Lammhults Möbel AB
Contact person: Helena Kumlin
Phone: +46 472 26 95 00
e-mail: Helena.kumlin@lammhults.se

Manufacturer:

Lammhults Möbel AB

Place of production:

Lammhults Möbel AB
Växjövägen 41
SE-363 45 Lammhult, Sweden

Management system:

ISO 14001, 9001, 45001

Organisation no:

556058-2602

Issue date:

15.08.2024

Valid to:

15.08.2029

Year of study:

2023

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Lovisa Aiff

Reviewer of company-specific input data and EPD: Alexandra Lidnert

Approved:

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Penne, designed by Julia Läufer and Marcus Keichel, combines the spirit of Scandinavian chair design with the requirements of the modern contract furniture market. In accordance with the Lammhults design tradition, the chair was intended as an iconic piece of furniture and a real industrial product at the same time. Craftsmanship and technology meet in a unique concept.

Product specification

Legs of powder coated aluminium tubing Ø35 mm. Seat and back of moulded oak or ash or plastic in standard colours. Armrests are optional. Seat frame and armrests in matching color, for wooden seat and back specify desired plastic color of frame and armrests. Stackable incl. stacking protection. Linkable chair-chair or armchair-chair-armchair.

| Materials | kg | % | Recycled share in material (kg) | Recycled share in material (%) |
|-------------------------------|-------------|---------------|---------------------------------|--------------------------------|
| Metal - Aluminium | 0,81 | 18,14 | 0,00 | 0,00 |
| Metal - Steel | 0,29 | 6,46 | 0,00 | 0,00 |
| Metall | 0,04 | 0,99 | 0,00 | 0,00 |
| Plastic - Nylon (PA) | 1,70 | 38,07 | 0,00 | 0,00 |
| Plastic - Polyethylene (HDPE) | 0,03 | 0,58 | 0,00 | 0,00 |
| Plastic - Polyethylene (LDPE) | 0,04 | 0,94 | 0,00 | 0,00 |
| Plastic - Polypropylene (PP) | 1,45 | 32,64 | 0,00 | 0,00 |
| Powder coating | 0,10 | 2,18 | 0,00 | 0,00 |
| Total | 4,46 | 100,00 | 0,00 | |

| Packaging | kg | % | Recycled share in material (kg) | Recycled share in material (%) |
|------------------------------|-------------|---------------|---------------------------------|--------------------------------|
| Packaging - Cardboard | 0,42 | 28,99 | 0,00 | 0,00 |
| Packaging - Plastic | 0,03 | 2,20 | 0,00 | 0,00 |
| Packaging - Plastic straps | 0,02 | 1,17 | 0,00 | 0,00 |
| Recycled cardboard | 0,98 | 67,64 | 0,98 | 100,00 |
| Total incl. packaging | 5,91 | 100,00 | 0,98 | |

Technical data:

Height 79cm
 Width
 Chair: 51cm Armchair: 57cm
 Depth 50cm
 Seat height 46cm

Penne meets the requirements of EN 16139:2013, test level 1, and Möbelfakta.

Market:

Available world wide

Reference service life, product

15 years (warranty 5 years)

Reference service life, building

LCA: Calculation rules

Declared unit:

1 pcs Penne chair

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

Specific data for the product composition are provided by the manufacturer. They represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on registered EPDs according to EN 15804, Ostfold Research databases, ecoinvent and other LCA databases. The data quality of the raw materials in A1 is presented in the table below.

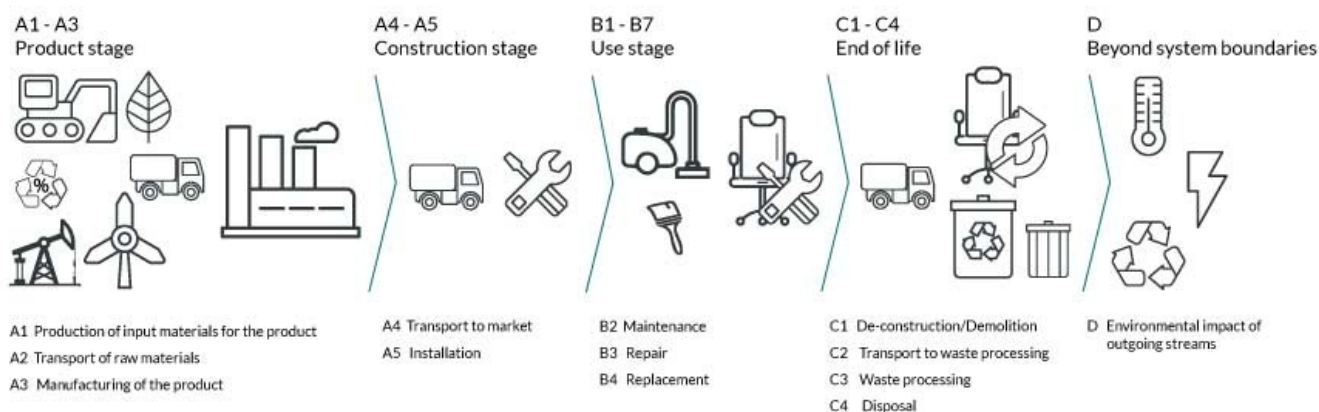
| Materials | Source | Data quality | Year |
|-------------------------------|------------------------|--------------|------|
| Metal - Aluminium | ecoinvent 3.6 | Database | 2019 |
| Metal - Steel | ecoinvent 3.6 | Database | 2019 |
| Metall | ecoinvent 3.6 | Database | 2019 |
| Packaging - Cardboard | Modified ecoinvent 3.6 | Database | 2019 |
| Packaging - Plastic | ecoinvent 3.6 | Database | 2019 |
| Packaging - Plastic straps | ecoinvent 3.6 | Database | 2019 |
| Plastic - Nylon (PA) | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polyethylene (HDPE) | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polyethylene (LDPE) | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polypropylene (PP) | ecoinvent 3.6 | Database | 2019 |
| Powder coating | Ecoinvent 3.6 | Database | 2019 |
| Recycled cardboard | Modified ecoinvent 3.6 | Database | 2019 |

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

| Product stage | | | Construction installation stage | | Use stage | | | | | | End of life stage | | | | Beyond the system boundaries | |
|---------------|-----------|---------------|---------------------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|------------------------------|------------------------------------|
| Raw materials | Transport | Manufacturing | Transport | 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 | X | X | X | MND | MND | MND | X | X | X | X | X |

System boundary:

The analysis is a cradle-to-cradle, A1-D, where some B-stages that were assumed to be neglectable are not included. The A1-A4 stages includes the extraction and production of raw materials, transportation to the production site, the production process itself, and an estimated transport distance to the market. A5 includes the generated waste from the packaging of the product after the assembly at the customer. The only B-stage that is assumed to be relevant is B2, which includes assumptions on how the customer takes care of the product according to Lammhults' care instructions. The C- and D-stages includes the use of materials and energy for deconstruction, the transport to waste management, the waste processes, disposal of materials that cannot be processed, and the potential of reuse, recovery, and recycling of the product.



Additional technical information:

<https://www.lammhults.se/products/chairs-armchairs/penne>

Lammhults Care & Maintenance: <https://issuu.com/lammhults/docs/lammhultscaremaintenance2205>

LCA: Scenarios and additional technical information














The following information describe the scenarios in the different modules of the EPD.














Some assumptions have been made regarding the products lifetime after leaving the factory gates. The product is assumed to be transported to the capital of each country sold/delivered to. An average distance (A4) to the customer has been calculated through this data. In the A5 phase, the packaging of the product becomes waste, and the impacts are added automatically according to assumptions made in the EPD tool on waste handling on-site. In the use stage, the assumption is that the customer takes care of the product by cleaning the product with a dry cloth or a slightly damp cloth with a few drops of very mild cleaning detergent. For the end-of-life stage of the product, it has been assumed that there is a 50 km distance from the customer to a waste terminal. The rest of the values are automatically filled in by the tool. For the D-stage, automatic values are filled in, according to generic data.

| Transport from production place to user (A4) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|--|---------------------------------------|---------------|-------------------------|-------|---------------------|
| Truck, 16-32 tonnes, EURO 6 (km) | 36,7 % | 548 | 0,043 | l/tkm | 23,56 |
| Assembly (A5) | | | | | |
| | Unit | Value | | | |
| Waste, packaging, cardboard, 100 % recycled, to average treatment (kg) | kg | 0,98 | | | |
| Waste, packaging, corrugated board box, 0 % recycled, to average treatment (kg) | kg | 0,42 | | | |
| Waste, packaging, PET straps, to average treatment - A5 (kg) | kg | 0,02 | | | |
| Waste, packaging, plastic film (LDPE), to average treatment - A5 (kg) | kg | 0,03 | | | |
| Maintenance (B2) | | | | | |
| | Unit | Value | | | |
| Household detergent, 5% soap solution (kg) | kg/DU | 0,00 | | | |
| Wastewater, average treatment (m3) | m3 | 0,00 | | | |
| Water, tap water (m3) | m3/DU | 0,00 | | | |
| Transport to waste processing (C2) | | | | | |
| | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
| Truck, 16-32 tonnes, EURO 6 (km) | 36,7 % | 50 | 0,043 | l/tkm | 2,15 |
| Waste processing (C3) | | | | | |
| | Unit | Value | | | |
| Waste treatment per kg Non-hazardous waste, incineration with fly ash extraction - C3 (kg) | kg | 1,84 | | | |
| Waste treatment per kg Polyethylene, PE, incineration with fly ash extraction - C3 (kg) | kg | 0,07 | | | |
| Waste treatment per kg Polypropylene (PP), incineration with fly ash extraction - C3 (kg) | kg | 1,45 | | | |
| Waste treatment per kg Scrap aluminium, incineration with fly ash extraction (kg) | kg | 0,81 | | | |
| Waste treatment per kg Scrap steel, incineration with fly ash extraction (kg) | kg | 0,29 | | | |
| Waste, materials to recycling (kg) | kg | 0,18 | | | |
| Disposal (C4) | | | | | |
| | Unit | Value | | | |
| Landfilling of ashes and residues from incineration of Scrap aluminium (kg) | kg | 0,72 | | | |
| Landfilling of ashes and residues from incineration of Scrap steel (kg) | kg | 0,19 | | | |
| Landfilling of ashes from incineration of Non-hazardous waste, process per kg ashes and residues - C4 (kg) | kg | 0,44 | | | |
| Landfilling of ashes from incineration of Polyethylene, PE, process per kg ashes and residues - C4 (kg) | kg | 0,00 | | | |
| Landfilling of ashes from incineration of Polypropylene, PP, process per kg ashes and residues - C4 (kg) | kg | 0,04 | | | |
| Benefits and loads beyond the system boundaries (D) | | | | | |
| | Unit | Value | | | |
| Substitution of electricity, in Norway (MJ) | MJ | 3,59 | | | |
| Substitution of primary aluminium with net scrap (kg) | kg | 0,08 | | | |
| Substitution of primary steel with net scrap (kg) | kg | 0,08 | | | |
| Substitution of thermal energy, district heating, in Norway (MJ) | MJ | 54,32 | | | |

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

| Environmental impact | | | | | | | |
|--|------------------------|-----------|----------|----------|----------|----|--|
| Indicator | Unit | A1-A3 | A4 | A5 | B2 | B3 | |
|  GWP-total | kg CO ₂ -eq | 3,61E+01 | 5,29E-01 | 2,41E+00 | 6,33E-04 | 0 | |
|  GWP-fossil | kg CO ₂ -eq | 3,80E+01 | 5,29E-01 | 2,66E-02 | 4,54E-04 | 0 | |
|  GWP-biogenic | kg CO ₂ -eq | -2,01E+00 | 2,19E-04 | 2,38E+00 | 2,31E-05 | 0 | |
|  GWP-luluc | kg CO ₂ -eq | 8,58E-02 | 1,88E-04 | 7,80E-06 | 1,56E-04 | 0 | |
|  ODP | kg CFC11 -eq | 1,83E-06 | 1,20E-07 | 5,02E-09 | 4,90E-11 | 0 | |
|  AP | mol H+ -eq | 2,12E-01 | 1,52E-03 | 1,12E-04 | 3,31E-06 | 0 | |
|  EP-FreshWater | kg P -eq | 1,53E-03 | 4,23E-06 | 1,94E-07 | 8,26E-07 | 0 | |
|  EP-Marine | kg N -eq | 4,64E-02 | 3,01E-04 | 3,99E-05 | 1,65E-06 | 0 | |
|  EP-Terrestrial | mol N -eq | 4,15E-01 | 3,36E-03 | 4,02E-04 | 8,09E-06 | 0 | |
|  POCP | kg NMVOC -eq | 1,25E-01 | 1,29E-03 | 1,16E-04 | 1,91E-06 | 0 | |
|  ADP-minerals&metals ¹ | kg Sb-eq | 3,63E-03 | 1,46E-05 | 5,73E-07 | 1,64E-08 | 0 | |
|  ADP-fossil ¹ | MJ | 5,95E+02 | 8,00E+00 | 3,34E-01 | 7,06E-03 | 0 | |
|  WDP ¹ | m ³ | 7,30E+03 | 7,74E+00 | 4,59E-01 | 1,07E-01 | 0 | |

| Indicator | Unit | B4 | C1 | C2 | C3 | C4 | D |
|--|------------------------|----|----|----------|-----------|----------|-----------|
|  GWP-total | kg CO ₂ -eq | 0 | 0 | 4,83E-02 | 8,22E+00 | 1,36E-02 | -1,17E+00 |
|  GWP-fossil | kg CO ₂ -eq | 0 | 0 | 4,83E-02 | 8,22E+00 | 1,36E-02 | -1,14E+00 |
|  GWP-biogenic | kg CO ₂ -eq | 0 | 0 | 2,00E-05 | 1,28E-04 | 8,79E-06 | -4,12E-03 |
|  GWP-luluc | kg CO ₂ -eq | 0 | 0 | 1,72E-05 | 7,88E-05 | 3,78E-06 | -2,50E-02 |
|  ODP | kg CFC11 -eq | 0 | 0 | 1,09E-08 | 3,23E-08 | 3,80E-09 | -2,29E-02 |
|  AP | mol H+ -eq | 0 | 0 | 1,39E-04 | 1,20E-03 | 8,87E-05 | -8,06E-03 |
|  EP-FreshWater | kg P -eq | 0 | 0 | 3,86E-07 | 3,34E-06 | 1,43E-07 | -6,19E-05 |
|  EP-Marine | kg N -eq | 0 | 0 | 2,74E-05 | 5,08E-04 | 3,13E-05 | -1,57E-03 |
|  EP-Terrestrial | mol N -eq | 0 | 0 | 3,07E-04 | 5,30E-03 | 3,46E-04 | -1,71E-02 |
|  POCP | kg NMVOC -eq | 0 | 0 | 1,18E-04 | 1,29E-03 | 9,95E-05 | -5,31E-03 |
|  ADP-minerals&metals ¹ | kg Sb-eq | 0 | 0 | 1,33E-06 | 1,32E-06 | 2,10E-07 | -3,44E-06 |
|  ADP-fossil ¹ | MJ | 0 | 0 | 7,30E-01 | 1,08E+00 | 2,83E-01 | -1,47E+01 |
|  WDP ¹ | m ³ | 0 | 0 | 7,06E-01 | -1,17E+01 | 7,17E-01 | -4,79E+02 |







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 = 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







"Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Remarks to environmental impacts

| Additional environmental impact indicators | | | | | | | |
|---|-------------------|----------|----------|----------|----------|----|--|
| Indicator | Unit | A1-A3 | A4 | A5 | B2 | B3 | |
|  PM | Disease incidence | 2,80E-06 | 3,24E-08 | 1,67E-09 | 3,60E-11 | 0 | |
|  IRP ² | kgBq U235 -eq | 2,68E+00 | 3,50E-02 | 1,43E-03 | 4,49E-05 | 0 | |
|  ETP-fw ¹ | CTUe | 8,84E+02 | 5,93E+00 | 4,39E-01 | 1,66E-02 | 0 | |
|  HTP-c ¹ | CTUh | 3,54E-08 | 0,00E+00 | 1,30E-11 | 1,00E-12 | 0 | |
|  HTP-nc ¹ | CTUh | 6,48E-07 | 6,48E-09 | 5,46E-10 | 2,70E-11 | 0 | |
|  SQP ¹ | dimensionless | 4,69E+02 | 5,59E+00 | 2,41E-01 | 7,94E-03 | 0 | |


| Indicator | Unit | B4 | C1 | C2 | C3 | C4 | D |
|---|-------------------|----|----|----------|----------|----------|-----------|
|  PM | Disease incidence | 0 | 0 | 2,96E-09 | 7,59E-09 | 1,58E-09 | -2,16E-07 |
|  IRP ² | kgBq U235 -eq | 0 | 0 | 3,19E-03 | 3,51E-03 | 1,15E-03 | -6,97E-02 |
|  ETP-fw ¹ | CTUe | 0 | 0 | 5,41E-01 | 1,63E+01 | 2,04E-01 | -4,04E+01 |
|  HTP-c ¹ | CTUh | 0 | 0 | 0,00E+00 | 4,73E-10 | 9,00E-12 | -2,74E-09 |
|  HTP-nc ¹ | CTUh | 0 | 0 | 5,91E-10 | 1,12E-08 | 2,55E-10 | -3,67E-08 |
|  SQP ¹ | dimensionless | 0 | 0 | 5,10E-01 | 1,96E-01 | 6,02E-01 | -3,02E+01 |











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)

"Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. 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 | | | | | | | | |
|---|-------|----------------|----------|----------|-----------|----------|----|--|
| Indicator | | Unit | A1-A3 | A4 | A5 | B2 | B3 | |
|  | PERE | MJ | 1,72E+02 | 1,15E-01 | 5,63E-03 | 2,28E-03 | 0 | |
|  | PERM | MJ | 1,24E+01 | 0,00E+00 | -1,24E+01 | 0,00E+00 | 0 | |
|  | PERT | MJ | 1,84E+02 | 1,15E-01 | -1,24E+01 | 2,28E-03 | 0 | |
|  | PENRE | MJ | 5,06E+02 | 8,00E+00 | 3,34E-01 | 7,27E-03 | 0 | |
|  | PENRM | MJ | 9,03E+01 | 0,00E+00 | -1,75E+00 | 0,00E+00 | 0 | |
|  | PENRT | MJ | 5,96E+02 | 8,00E+00 | -1,42E+00 | 7,27E-03 | 0 | |
|  | SM | kg | 9,82E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0 | |
|  | RSF | MJ | 6,44E-01 | 4,10E-03 | 1,84E-04 | 6,56E-05 | 0 | |
|  | NRSF | MJ | 1,09E+00 | 1,46E-02 | 7,42E-04 | 6,55E-05 | 0 | |
|  | FW | m ³ | 5,62E-01 | 8,55E-04 | 1,58E-04 | 1,02E-03 | 0 | |




| Indicator | | Unit | B4 | C1 | C2 | C3 | C4 | D |
|---|-------|----------------|----|----|----------|-----------|----------|-----------|
|  | PERE | MJ | 0 | 0 | 1,04E-02 | 8,28E-02 | 6,00E-03 | -3,13E+01 |
|  | PERM | MJ | 0 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | PERT | MJ | 0 | 0 | 1,04E-02 | 8,28E-02 | 6,00E-03 | -3,13E+01 |
|  | PENRE | MJ | 0 | 0 | 7,30E-01 | 1,27E+00 | 2,83E-01 | -1,47E+01 |
|  | PENRM | MJ | 0 | 0 | 0,00E+00 | -8,85E+01 | 0,00E+00 | 0,00E+00 |
|  | PENRT | MJ | 0 | 0 | 7,30E-01 | -8,73E+01 | 2,83E-01 | -1,47E+01 |
|  | SM | kg | 0 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | RSF | MJ | 0 | 0 | 3,74E-04 | 2,09E-03 | 1,57E-04 | -3,24E-03 |
|  | NRSF | MJ | 0 | 0 | 1,34E-03 | 0,00E+00 | 9,64E-03 | -1,56E+00 |
|  | FW | m ³ | 0 | 0 | 7,80E-05 | 2,09E-03 | 2,56E-04 | -5,24E-02 |

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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed






| End of life - Waste | | | | | | | | |
|---|------|------|----------|----------|----------|----------|----|--|
| Indicator | | Unit | A1-A3 | A4 | A5 | B2 | B3 | |
|  | HWD | kg | 4,81E-01 | 4,13E-04 | 0,00E+00 | 1,72E-05 | 0 | |
|  | NHWD | kg | 4,85E+00 | 3,89E-01 | 1,45E+00 | 1,18E-04 | 0 | |
|  | RWD | kg | 1,67E-03 | 5,45E-05 | 0,00E+00 | 3,91E-08 | 0 | |






| Indicator | | Unit | B4 | C1 | C2 | C3 | C4 | D |
|---|------|------|----|----|----------|----------|----------|-----------|
|  | HWD | kg | 0 | 0 | 3,76E-05 | 0,00E+00 | 1,33E+00 | 2,49E-03 |
|  | NHWD | kg | 0 | 0 | 3,55E-02 | 1,84E+00 | 8,82E-02 | -3,57E-01 |
|  | RWD | kg | 0 | 0 | 4,97E-06 | 0,00E+00 | 2,26E-06 | -6,21E-05 |

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

*Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed

| End of life - Output flow | | | | | | | | |
|--|-----|------|----------|----------|----------|----------|----|--|
| Indicator | | Unit | A1-A3 | A4 | A5 | B2 | B3 | |
|  | CRU | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0 | |
|  | MFR | kg | 3,29E-01 | 0,00E+00 | 1,33E+00 | 0,00E+00 | 0 | |
|  | MER | kg | 4,87E-01 | 0,00E+00 | 4,36E-06 | 0,00E+00 | 0 | |
|  | EEE | MJ | 2,40E-01 | 0,00E+00 | 8,03E-02 | 0,00E+00 | 0 | |
|  | EET | MJ | 3,63E+00 | 0,00E+00 | 1,21E+00 | 0,00E+00 | 0 | |

| Indicator | | Unit | B4 | C1 | C2 | C3 | C4 | D |
|---|-----|------|----|----|----------|----------|----------|----------|
|  | CRU | kg | 0 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | MFR | kg | 0 | 0 | 0,00E+00 | 1,82E-01 | 0,00E+00 | 0,00E+00 |
|  | MER | kg | 0 | 0 | 0,00E+00 | 4,46E+00 | 0,00E+00 | 0,00E+00 |
|  | EEE | MJ | 0 | 0 | 0,00E+00 | 2,53E+00 | 0,00E+00 | 0,00E+00 |
|  | EET | MJ | 0 | 0 | 0,00E+00 | 3,83E+01 | 0,00E+00 | 0,00E+00 |

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

*Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed

| Biogenic Carbon Content | | |
|---|------|---------------------|
| Indicator | Unit | At the factory gate |
| Biogenic carbon content in product | kg C | 0,00E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 6,50E-01 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

| Electricity mix | Source | Amount | Unit |
|---------------------------|---------------|--------|---------------------------|
| Electricity, Sweden (kWh) | ecoinvent 3.6 | 54,94 | g CO ₂ -eq/kWh |

Dangerous substances

The product contains no substances given by the REACH Candidate list.

Indoor environment

Additional Environmental Information

Key Environmental Indicators

| Key environmental indicators | Unit | A1-A3 | A4 | A1-C4 | A1-D |
|------------------------------|------------------------|--------|------|--------|--------|
| GWPtotal | kg CO ₂ -eq | 36,09 | 0,53 | 47,31 | 46,14 |
| Total energy consumption | MJ | 678,96 | 8,13 | 689,84 | 642,30 |
| Amount of recycled materials | % | 8,45 | | | |

Additional environmental impact indicators required in NPCR Part A for construction products

| Indicator | Unit | A1-A3 | A4 | A5 | B2 | B3 |
|-----------|------------------------|----------|----------|----------|----------|----|
| GWPIOBC | kg CO ₂ -eq | 4,66E+01 | 5,29E-01 | 2,66E-02 | 6,32E-04 | 0 |

| Indicator | Unit | B4 | C1 | C2 | C3 | C4 | D |
|-----------|------------------------|----|----|----------|----------|----------|-----------|
| GWPIOBC | kg CO ₂ -eq | 0 | 0 | 4,83E-02 | 6,24E+00 | 1,74E-02 | -1,17E+00 |

GWPI-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Variants and Options

Key environmental indicators (A1-A3) for variants of this EPD






| Variants | Weight (kg) | GWPtotal (kg CO ₂ -eq) | Total energy consumption (MJ) | Amount of recycled materials (%) |
|---------------------------------------|-------------|-----------------------------------|-------------------------------|----------------------------------|
| Penne chair with wooden seat and back | 5,90 | 34,61 | 752,47 | 13,35 |

Key environmental indicators (A1-A3) for options for this EPD

| Options | Weight (kg) | GWPtotal (kg CO ₂ -eq) | Total energy consumption (MJ) | Amount of recycled materials (%) |
|----------------|-------------|-----------------------------------|-------------------------------|----------------------------------|
| Penne armrests | 0,71 | 3,43 | 64,46 | 31,46 |

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