Fraunhofer Institute for Building Physics IBP

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Product Carbon Footprint Report

DEHNpatch DPA CL8 EA 4PPOE

Conducted on behalf of

DEHN SE

Conducted by

Fraunhofer IBP, Department Life Cycle Engineering

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1 Introduction

DEHN SE has committed itself to the development and production of sustainable products. As part of DEHN's commitment to continually improve the environmental performance of our products, we utilize Product Carbon Footprints (PCF) to better understand environmental impacts that occur at different stages in the product life cycle.

This document represents a summary report of a detailed PCF analysis based on the internationally accepted standards ISO 14067 [1], ISO 14040 [2], ISO 14044 [3] as well as EN 15804+A2 [4]. A Product Carbon Footprint measures the total greenhouse gas emissions directly or indirectly associated with a product throughout its entire life cycle or specific life cycle stages, e.g. from raw material extraction to production, distribution, use, and disposal. It is applied to assess a product's impact on climate change expressed in carbon dioxide equivalents (CO_2 eq.). A complete documentation of the underlying methodology is described in the DEHN PCF Background Report [5]. This PCF report contains the following chapters:

- Goal and Scope
- Life Cycle Inventory
- Product Carbon Footprint Results
- Interpretation
- Report Disclaimer
- References

2 Goal and Scope

The goal of this PCF report is to summarize and communicate the main results regarding the impact on climate change of the product "DEHNpatch DPA CL8 EA 4PPOE" to interested stakeholders.

2.1 Product Description

The PCF communicated with this document has been analyzed for the following product system:

- **Product name:** DEHNpatch DPA CL8 EA 4PPOE
- **Product description:** Universal, space-saving combined arrester of 19 mm in width and RJ45 connection system with status indication for simple maintenance.
- **Relevant Standards:** EN 61643-21
- **Reference flow:** One piece of the analyzed product

2.2 System Boundaries

The system boundaries comprise the modules A1-A3 (Product Stage) as well as C+D (End of Life Stage plus Benefits and Loads beyond the System Boundary) according to EN 15804+A2. The other life cycle phases are excluded from the scope of this PCF.

2.3 Impact Assessment Method

In accordance with the recommondation by the European Union [6], the impact on climate change communicated with this PCF report was calculated based on the following method:

- **Methodology:** Environmental Footprint
- **Reference package:** EF 3.1
- **Method name:** Climate Change (total)
- **Indicator:** Radiative forcing as Global Warming Potential (GWP100)
- **Reference unit:** kg CO_2-eq.

3 Life Cycle Inventory

3.1 Data Collection and Validation

The specific Bill-of-Materials was used as the main primary data source for the analysis comprising information on materials and losses. The remaining aspects were modelled based on secondary data [7]. Further company specific information were used to validate modelling assumptions, e.g. annual energy consumption at the production location. The Bill-of-Materials was checked for errors and plausibility by Fraunhofer IBP and revised by DEHN SE as required. Remaining data quality issues were assessed and documented (see chapter 5 Interpretation).

3.2 Calculation Method

Each item of the Bill-of-Materials is classified with regard to the material group it belongs to, e.g. aluminum components, printed wiring boards etc. For each material group, a dedicated modelling procedure is used to calculate the item-specific Carbon Footprint while respecting individual item properties, e.g. item-specific scrap rates.

3.3 Material Composition of the Analyzed Product

The following table depicts the composition of the analyzed product (DEHNpatch DPA CL8 EA 4PPOE) with regard to the main material groups it is composed of.

Table 1: Main material composition of the analyzed product

Material group	Mass share [floored %]
Copper Components	64
Packaging Materials	15
Electronic Components (Miscellaneous)	14
Other	4
Electronic Components (PWBs)	3

4 Product Carbon Footprint Results

The Carbon Footprint of the production of the analyzed product from cradle-to-gate (Life Cycle Phases A1-A3) is expected to amount to 3.2 kg CO2-eq. Appropriate recycling of all components of the analyzed product after its end-of-life and considering loads and benefits beyond the system boundary (Life Cycle Phases C+D) is expected to contribute additional -0.3 kg CO2-eq. to the overall result (assessed based on the avoided burden approach under current boundary conditions in the European Union). Hence, the total Product Carbon Footprint Result (i.e., the sum of all analyzed life cycle phases) amounts to 2.9 kg CO2-eq.

These results are summarized in Table 2. Figure 1 gives further details on the contribution of each material group to the overall Product Carbon Footprint, distinguished by the analyzed Life Cycle Phases.

Table 2: Product Carbon Footprint Results

Impact Assessment Method	A1-A3	C+D	Total
EF 3.1: Climate Change (total) in kg CO2-eq.	3.2	-0.3	2.9

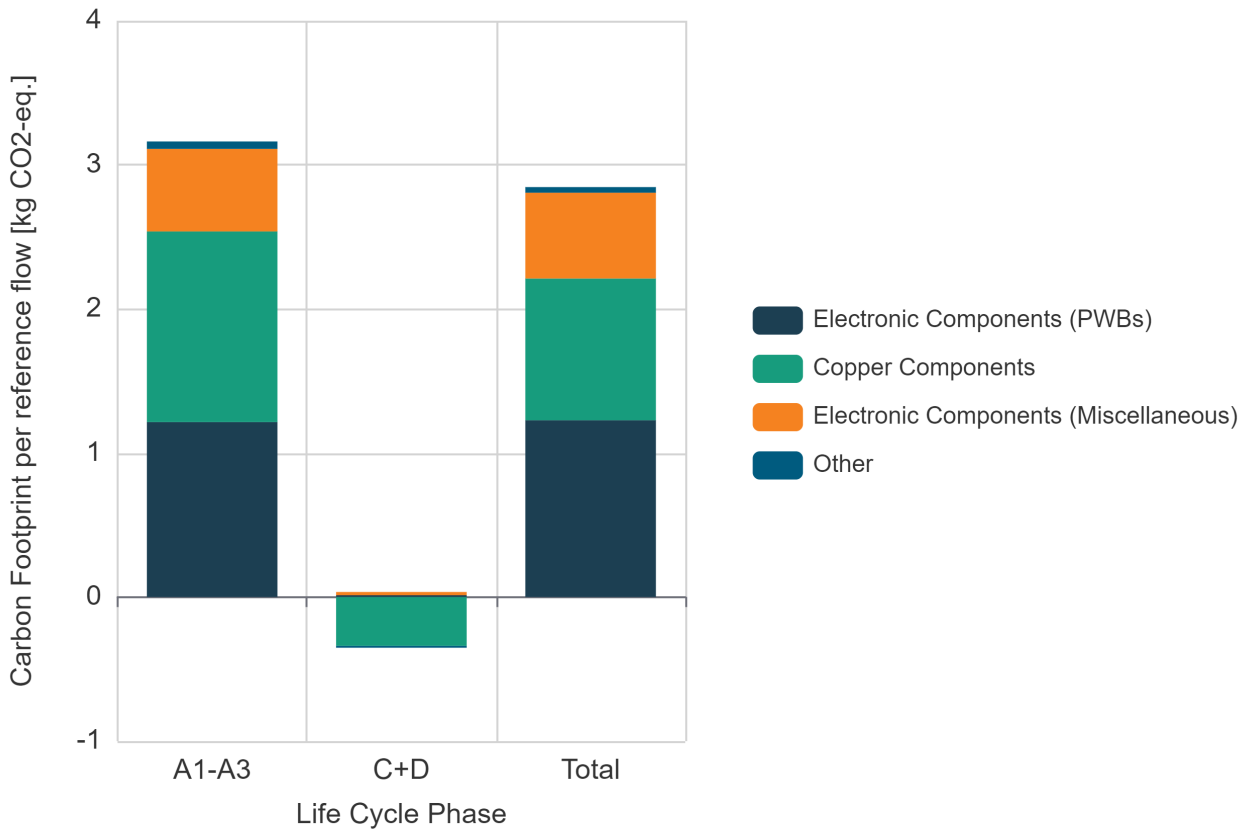

Figure 1: Contribution of main material groups to the Product Carbon Footprint (PCF)

With 43 %, the material group "Electronic Components (PWBs)" is the largest contributor to the PCF. Further contributors with a contribution to the total PCF of at least 5% are the material groups Copper Components and Electronic Components (Miscellaneous).

5 Interpretation

A previous hotspot analysis showed that the most siginficant impacts on the quality of the Product Carbon Footprint results are related to the uncertainty regarding (1) the mass of certain items in the Bill-of-Materials, and (2) the material losses in the manufacturing of these items. To reduced the uncertainty regarding these two sources, specific data validation and improvement measures were implemented in the data collection procedure [5]. As part of these measures the data quality of the primary data on item mass and item specific material losses were rated from very poor to very good following the precision definitions of the ILCD data quality rating system [8]. When the quality of the underlying data could not be determined, the category "unknown" was assigned. The following diagram depicts the Product Carbon Footprint aggregated by the data quality ratings of the underyling primary data on item mass and item specific material loss. For the Product Carbon Footprint of the analyzed product (DEHNpatch DPA CL8 EA 4PPOE), the expected overall data quality is "very poor".

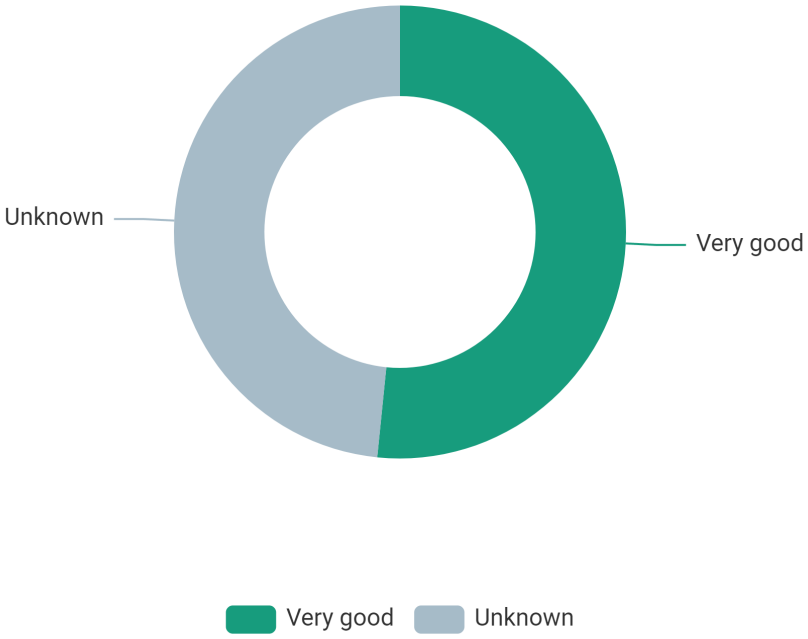

Figure 2: Share of the Product Carbon Footprint related to data quality of the underlying information on materials and material losses

The secondary data used in this study was classified by the data provider [7] as valid until at least the end of 2026. It is not recommended to use the PCF results after this date.

6 Report Disclaimer

This report was automatically generated. All its contents are based on a detailed PCF study conducted by Fraunhofer IBP on behalf of DEHN SE to the best of our knowledge and with due diligence. Fraunhofer IBP, its legal representatives and/or contractors do not guarantee that the contents of this report are proven, completely usable for specific purposes or otherwise free of errors. Use of this report is solely at the user's own risk. By no means shall Fraunhofer IBP and its legal representatives and/or contractors be liable for any damages, whether direct or indirect, resulting from the use of the report.

7 References

[1] Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification (ISO 14067:2018): German and English version EN ISO 14067:2018, 14067:2019-02, DIN EN ISO, Berlin, Feb. 2019.

[2] Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006 + Amd 1:2020): German version EN ISO 14040:2006 + A1:2020, 14040:2021-02, DIN EN ISO, Berlin.

[3] Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006 + Amd 1:2017 + Amd 2:2020): German version EN ISO 14044:2006 + A1:2018 + A2:2020, 14044:2021-02, DIN EN ISO, Berlin.

[4] Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products, 15804+A2:2022-11, EN, Nov. 2022.

[5] Background Report on the DEHN SE PCF Calculation Methodoloy, internal report (not published), prepared by Fraunhofer IBP on behalf of DEHN SE, 2024.

[6] EU Recomendation on impact methods EF 3.1 - Environmental Footprint reference packages online available at https://eplca.jrc.ec.europa.eu/LCDN/developerEF.html, last checked 2024-09-17

[7] Sphera Solutions GmbH, Managed LCA Content (GaBi Databases). Leinfelden-Echterdingen, 2023.

[8] General guide for Life Cycle Assessment (2010): ILCD Data Quality Criteria, online available at https://eplca.jrc.ec.europa.eu/ilcd.html, last checked 2024-09-17