HVR Zero APX Mini

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

EPD HUB, HUB-4405

Published on 21.11.2025, last updated on 21.11.2025, valid until 21.11.2030

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Monodraught Ltd
Address	Halifax House, Halifax Rd, High Wycombe HP12 3SE
Contact details	info@monodraught.com
Website	https://www.monodraught.com/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Electrical product
Category of EPD	Sister EPD
Parent EPD number	HUB-3872
Scope of the EPD	Cradle to gate with opctions A5, B6 and modules C1-C4, D
EPD author	Karan Mutty Monodraught
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	HVR Zero APX Mini
Additional labels	Hybrid Ventilation
Product reference	HVR APX
Place(s) of raw material origin	Asia
Place of production	Halifax House, Halifax Rd, High Wycombe HP12 3SE, United Kingdom
Place(s) of installation and use	United Kingdom
Period for data	Calendar year 2024
Averaging in EPD	No Averaging
Variation in GWP-fossil for A1-A3 (%)	–47 % (difference between APX Mini and full-size APX)
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	6.79

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit of HVR Zero APX Mini hybrid ventilation, heating, and cooling system, including integral sensors and control components.
Declared unit mass	36.5 kg
Mass of packaging	5.5 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	331
GWP-total, A1-A3 ($kgCO_2e$)	298
Secondary material, inputs (%)	18.7
Secondary material, outputs (%)	48.2
Total energy use, A1-A3 (kWh)	1250
Net freshwater use, A1-A3 (m^3)	2.49

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Monodraught, established in 1974, is a UK-based company specializing in the design, manufacture, installation, and maintenance of sustainable ventilation, cooling, heating, and lighting solutions for commercial and public buildings. Their product range includes natural ventilation systems like the Windcatcher, natural cooling solutions such as Cool-Phase, and natural lighting products like Sunpipe. Committed to reducing carbon footprints, Monodraught focuses on harnessing natural elements to enhance indoor environments while minimizing energy consumption. They have a history of innovation, partnering with UK universities for research and development, and have received accolades like the Queen's Award for Innovation.

PRODUCT DESCRIPTION

The product covered in this EPD is the HVR Zero APX Mini hybrid ventilation unit, manufactured by Monodraught Ltd. at the company's High Wycombe (UK) facility. The HVR Zero APX Mini is part of the HVR Zero APX product family, which also includes the full-size HVR Zero APX model. It is decentralised, ceiling-mounted hybrid ventilation, heating, and cooling systems that integrate a crossflow heat exchanger, multiple indoor air quality (IAQ) sensors, and advanced control interfaces.

The HVR Zero APX Mini is the compact member of the product family, designed for smaller classrooms and office spaces. It share's identical design principles, materials of construction, manufacturing processes, and control architectures.

Each HVR Zero APX Mini unit weighs 39 kg and has external dimensions of 680 mm (W) × 299 mm (H) × 1330 mm (L). Principal materials include powder-coated aluminium (T6061), flame-retardant expanded polypropylene (UL94 HF-1), and copper piping with aluminium fins. The unit is supplied with an airtightness test certificate in accordance with CIBSE TM23 (2022).

Both products are designed for intermittently occupied daytime environments such as offices, classrooms, and healthcare or educational buildings, and are not intended for continuous 24-hour operation. The systems provide mechanical ventilation with heat recovery and adaptive airflow control, achieving over 50 % heat-recovery efficiency. Typical performance ranges across the product family are:

- Airflow capacity: 45 – 125 L/s (depending on mode and unit size)
- Specific fan power (SFP): 0.09 – 0.15 W/L/s
- Heat-recovery efficiency: 50 – 55 %
- Rated service life (RSL): 15 years

Each unit includes integrated sensors for temperature, CO_2, VOCs, humidity, particulate pollution ($PM_{2.5}$), and airflow, in alignment with the WELL Building Standard for IAQ monitoring. The systems operate at 230 V AC with a peak current of 1.1 A, and are controlled via the Modena wall controller or optionally through Acuity BMS integration for remote operation.

This EPD declares one product only: the HVR Zero APX Mini. Under the program's categories, the document is issued as an "Averaged EPD", but no numerical averaging or data weighting was performed. The life-cycle model is built exclusively from the HVR Zero APX Mini BoM and manufacturing data, and the results reported pertain to the Mini configuration.

The "average" designation reflects that the declared product is representative of the broader HVR Zero APX family because the Mini and full-size APX share the same materials, components, and production processes; it does not imply blending of variant datasets.

LCA results were proportionally cross-checked against the previously verified full-size HVR Zero APX EPD to confirm consistency. All units are manufactured at the High Wycombe facility, ensuring process uniformity.

Further information can be found at: https://www.monodraught.com

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	67	Asia
Minerals	0	-
Fossil materials	33	Asia
Bio-based materials	0	-

COMPONENT-LEVEL MATERIAL USE AND FUNCTIONAL OVERVIEW

Component	Material	Category	Function
Casing and housing	Aluminium alloy, PP	Metals	Structural enclosure of the unit
Fan impellers, mounting frames/supports	Steel	Metals	Mechanical support and frame reinforcement
Electrical wiring/components	Copper, PCB	Metals / Fossil-based	Power and control system connections
Damper and Housing	ABS, PVC	Fossil-based materials	Air movement and flow management
Control interface (PCB)	PCB	Fossil-based materials	Control circuitry and logic components

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0.44
Biogenic carbon content in packaging, kg C	9.79

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 unit of HVR Zero APX Mini hybrid ventilation, heating, and cooling system, including integral sensors and control components.
Mass per declared unit	36.5 kg
Functional unit	1 unit of a decentralised hybrid ventilation system with an airflow capacity of 43.2–450 m^3/h and a Reference Service Life (RSL) of 15 years under standard operating conditions.
Reference service life	15 years

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	ND	x	ND	ND	ND	ND	ND	x	ND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = ND. Modules not relevant = MNR

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is used in modelling the electricity mix utilized in the factory.

The environmental impacts considered for the product stage (Modules A1–A3) also include the extraction and processing of raw materials, transportation of materials to manufacturing and assembly sites, and the final assembly of the product.

Raw materials used include metals, plastics, and electronic components. These materials are sourced primarily from suppliers based in China and Germany. Transport distances are calculated based on supplier locations, covering the distance from their factories to the nearest port, shipping routes from China to the UK, and then onward transport to the UK assembly site. German deliveries are assumed to be by road using Euro 6 lorries. All transportation is modelled using One Click LCA defaults for Euro 6 lorries and sea container freight. Raw material datasets are selected to reflect global or regional averages as accurately as possible.

The manufacturing processes such as cutting, bending, and initial fabrication of components are performed by suppliers in China. The components are then shipped to Monodraught's assembly site in High Wycombe, United Kingdom, where the final assembly—including wiring, mounting, and integration—is carried out.

The energy used in manufacturing includes electricity and natural gas, with a market-based electricity mix applied according to the contractual energy supply of the relevant sites. For the UK assembly facility, the UK residual mix and natural gas are considered for heating and operational energy use.

Production losses are modelled at a uniform 5% across all raw materials, based on factory-level data and typical rates observed in component

manufacturing. Ancillary materials such as adhesives, labels, and sealants are included when they exceed 1% of total product mass.

Packaging materials consist of HDPE, PVC, and PP plastic films, as well as cardboard cartons. Packaging is included in the assessment only when the material contributes more than 1% of the total unit weight. Finished units are placed on wooden pallets for dispatch.

Manufacturing waste, including plastic films and wooden packaging, is treated under Module A3. Waste treatment follows UK standards, with waste fractions assumed to be either recycled or incinerated with energy recovery, modelled using One Click LCA default profiles. Waste transport to treatment centres is assumed to be 50 km by Euro 6 lorry.

Each manufacturing step is modelled individually where data is available. Allocations are based on annual production volumes or factory-level tracking data, depending on the process and source.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

A4 transportation was not considered within the scope of this EPD.

The installation of the unit is performed manually. Energy consumption during installation is limited to the use of an electric screwdriver, and the process also involves standard bolts and nuts. Due to their minimal contribution to environmental impact, both energy use and hardware components are excluded from the assessment.

Regarding packaging, A5 (Installation Stage) accounts for the treatment and disposal of wood and plastic packaging materials. All EoL is based on the scenarios for EN 50693. The packaging is based on Eurostat, whose data was derived from PEP PSR14.

A 50 km distance was applied as a practical, conservative estimate, representing a typical range for waste processing sites relative to construction projects in the UK.

No significant emissions or additional material inputs were linked to the installation process beyond the packaging waste already accounted for under A5. There is no loss of material during installation.

Waste type	Quantity	Treatment route	Notes
Plastic packaging (polyethylene)	0.5 kg	40% recycled, 37% incinerated w/ energy recovery, 23% landfilled	Based on Eurostat 2023 data
Wooden pallet / packaging	5.0 kg	32% recycled, 30% incinerated w/ energy recovery, 38% landfilled	Based on Eurostat 2023 data
Exported energy – Electricity	4.61 MJ	Credited to UK grid	From incineration of packaging fractions
Exported energy – Thermal	6.33 MJ	Credited to UK heat mix	From incineration of packaging fractions
Transport of packaging waste	50 km	Euro 6 lorry	Distance to UK treatment facilities

PRODUCT USE AND MAINTENANCE (B1-B7)

B1: During the use, no emissions to the environment are expected during the reference service life.

B2: During the use, no emissions to the environment are expected during the reference service life. The typical maintenance routine includes function testing, sensor checks and calibration, firmware updates, and internal cleaning to remove dust or debris.

These activities are performed manually and do not involve the use of consumables, filters, lubricants, or cleaning agents that would result in measurable environmental impact. No significant energy consumption, water use, or material replacement is required during maintenance.
Therefore, no emissions or energy use are associated with the maintenance process, and the impacts from this module are considered negligible and have been excluded from the assessment in accordance with EN 15804.

B3–B5: No repair, replacement, or refurbishment is anticipated during the 15-year reference service life; therefore, these processes are not considered in modules B3–B5.

B6: The reference service life is 15 years, and the total energy consumption during the use phase is calculated based on the unit's annual electricity consumption over this period.

B7: The unit does not require any operational water use; therefore, no environmental impacts are reported under Module B7.

Scenario parameter	Value	Unit	Treatment route / Notes
Reference service life	15	years	As defined in EPD
Annual electricity consumption	26.74	kWh/year	Based on specific fan power & load profile
Total operational energy (B6)	401	kWh (15 yrs)	Calculated as 26.74 × 15 years
Total GWP contribution (B6)	130	kg CO_2e	From electricity use factor
Operational water use (B7)	0	m^3	No operational water use
Scenario assumptions	—	—	Indoor installation in offices/classrooms; intermittent daytime use; maintenance includes sensor calibration, cleaning, firmware updates (negligible impact)

PRODUCT END OF LIFE (C1-C4, D)

A representative scenario for the end-of-life stage is defined based on the requirements of EN 50693:2019, Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. The scenario reflects current, state-of-the-art treatment practices in the United Kingdom. The units are primarily sold in the United Kingdom, accounting for 100% of total sales. Therefore, all end-of-life assumptions are based on UK-specific waste treatment practices and infrastructure. Energy and natural resource consumption during the demolition process is considered negligible and is excluded from the assessment (C1).

It is assumed that waste is collected separately and transported to treatment centres by lorry (C2), with an average distance of 50 km. Installation-related materials such as copper pipes and steel bolts are also dismantled and transported along with the product.

Module C3 includes the impacts associated with waste handling operations such as dismantling, sorting, shredding, and material separation. Energy consumption for mechanical treatment, including shredding, is included. Waste treatment follows the default scenario provided by EN 50693:2019. The process includes de-pollution, separation of material fractions (dismantling, crushing, sorting), recycling, other material recovery, energy recovery, and final disposal.

Module C4 covers the environmental impacts associated with landfilling of non-recyclable waste fractions. The disposal routes and treatment reflect current UK practices and follow the default assumptions of EN 50693:2019. As per publicly available UK waste treatment data, materials such as wood, glass, metals, plastics, and inert waste are sorted and directed to appropriate recovery or disposal streams.

Representativeness confirmation: The end-of-life scenario described in Modules C1–C4 is based on treatment routes that are currently in use within the United Kingdom and reflects one of the most likely scenarios for the HVR Zero APX Mini, considering its material composition, product type, and current national waste-management infrastructure.

Scenario validity: The assumptions are consistent with EN 50693:2019 and verified UK government waste data (DEFRA 2024), ensuring that the modelled recovery and disposal processes are representative of actual treatment practices applied to hybrid ventilation and electronic equipment at end-of-life.

BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

Module D accounts for the benefits and burdens beyond the product system boundary using the substitution (system expansion) approach in accordance with EN 50693:2019. Recovered materials at end-of-life are assumed to replace the production of equivalent primary materials, while energy generated from the incineration of plastic and composite fractions is modelled to displace average UK electricity and heat production. These avoided environmental impacts are reported in Module D.

All substituted processes and recovery scenarios are based on Ecoinvent v3.10 (2023) datasets, reflecting the most recent and regionally relevant assumptions for material recycling and energy recovery in the UK context. Since the raw materials used in Modules A1–A3 do not contain recycled content, there is no risk of double counting the benefits reported in Module D.

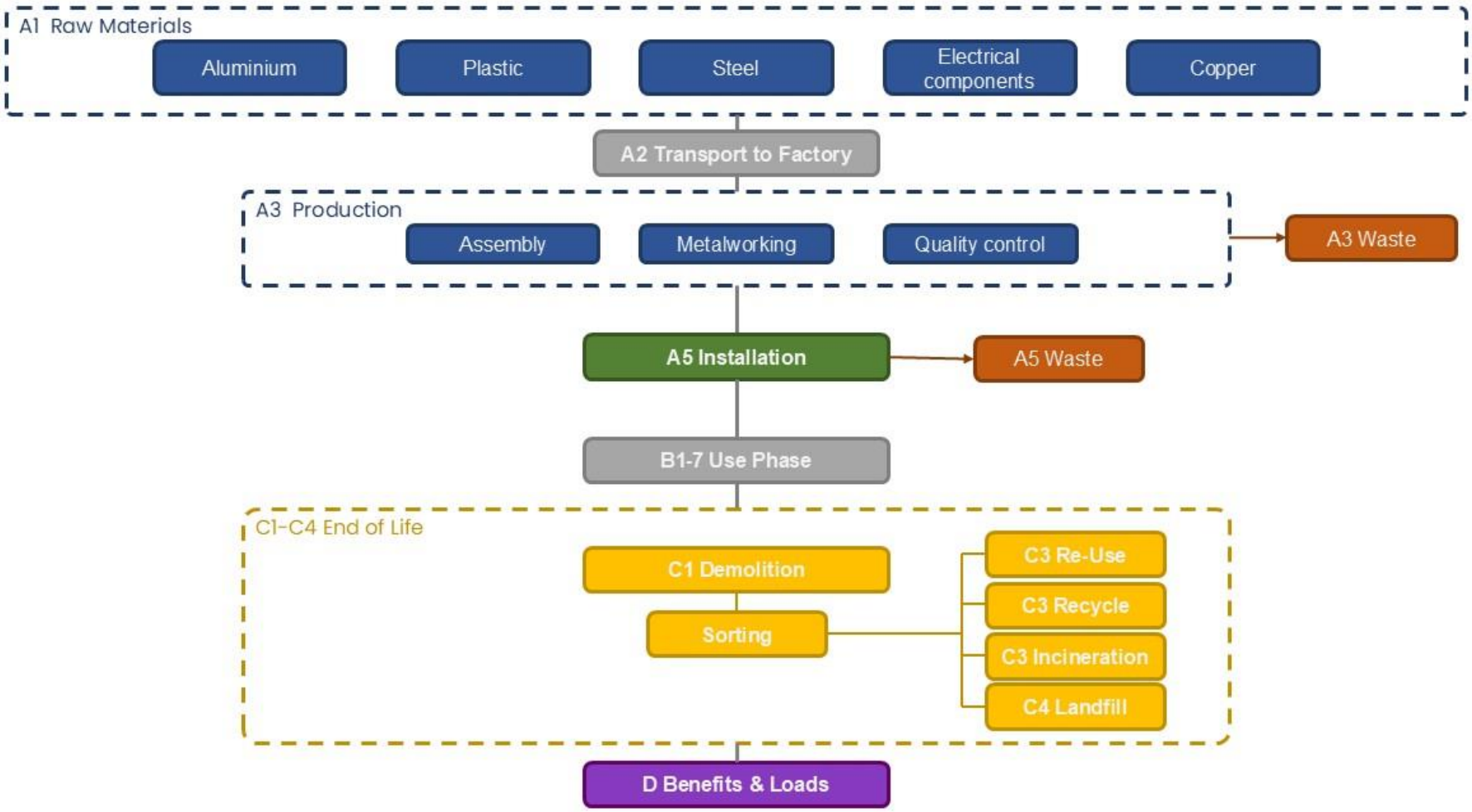
The system boundary for Module D lies outside the core product life cycle (Modules A–C) and includes only the net environmental benefits or burdens from material and energy recovery. These do not influence the direct product footprint but represent potential savings elsewhere in the economy.

The product system does not generate any allocated co-products during manufacturing or use. The energy recovered from incineration at the end-of-life stage is modelled as recovered output and credited accordingly, but it is not treated as a co-product requiring allocation. Therefore, no benefits or loads of allocated co-products are included in Module D.

END-OF-LIFE WASTE TREATMENT BREAKDOWN BY MATERIAL CATEGORY (BASED ON EN 50693:2019)

Material Category	Total Mass (kg)	Recycling (%)	Incineration w/ energy recovery (%)	Incineration w/o energy recovery (%)	Landfill (%)	Recycled Mass (kg)	Incinerated Mass (kg)	Landfilled Mass (kg)
Other plastics	11.84	25	50	0	25	2.96	5.92	2.96
Aluminium	22.32	70	0	15	15	15.62	3.35	3.35
Copper	5.01	60	0	20	20	3.00	1.00	1.00
Steel and Ferrous Metals	6.62	80	0	10	10	5.30	0.66	0.66
ABS	2.22	20	40	20	20	0.444	0.89	0.44

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

All industrial processes from raw material acquisition and pre-processing, production, product distribution, installation, use/application of product and end-of-life management are included. For easier modelling and because of lack of accuracy in available modelling resources many constituents under 0,1% of product mass are excluded. These include some ancillary materials which are used in the production only in very small amounts and have no serious impact on the emissions of the product. Further, water used for cleaning and the maintenance of capital equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are omitted since the quantified mass contribution is less than 0.1%. The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	No allocation
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by revenue

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products Same product family – HVR Zero APX range (APX and APX Mini)
Grouping method	Based on a representative product HVR Zero APX Mini
Variation in GWP-fossil for A1-A3, %	–47 % (difference between APX Mini and full-size APX)

AVERAGES AND VARIABLTY

EPD results are presented as an average model representative of the HVR Zero APX product family, which includes the full-size APX and the compact APX Mini variants. The life-cycle model was developed using the complete bill of materials (BOM), manufacturing energy data, and transport information for the HVR Zero APX Mini, selected as the representative product due to its identical design, material composition, and manufacturing processes with the full-size APX.

The Mini variant's dataset was validated against the previously verified APX EPD to confirm proportional consistency across life-cycle stages (A1–A3), ensuring that the results accurately represent the family average. All calculations are performed per kilogram of raw material and are based on average consumption values of electricity, water, and packaging materials at the High Wycombe manufacturing facility.

This EPD complies with the averaging and aggregation requirements defined in the EPD Hub General Programme Instructions (GPI). The declared results are representative of the HVR Zero APX family as produced at the High Wycombe site, based on data collected from this facility.

Restrictions of use: None beyond representativeness of the declared family; the EPD is valid for units manufactured under equivalent processes at the High Wycombe facility.

Representativeness: The results reflect average performance of the HVR Zero APX family, with the Mini variant serving as the representative model.

Geographical coverage: United Kingdom – High Wycombe production site. The results are not intended to represent products manufactured at other sites or under materially different conditions.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 v3.2.3. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

The LCA modelling for this EPD was performed using One Click LCA EPD Generator, with background data sourced from the Ecoinvent v3.10.1 and One Click LCA generic construction product databases. No external publications or third-party literature were used beyond these verified databases. All datasets represent European and UK average conditions relevant to the product system.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	3.12E+02	9.24E+00	-2.28E+01	2.98E+02	ND	3.67E+01	ND	ND	ND	ND	ND	6.60E+01	ND	0.00E+00	3.74E-01	2.05E+01	1.02E+02	-3.21E+01
GWP – fossil	kg CO_2e	3.09E+02	9.24E+00	1.31E+01	3.31E+02	ND	8.12E-01	ND	ND	ND	ND	ND	6.57E+01	ND	0.00E+00	3.74E-01	2.05E+01	1.02E+02	-3.21E+01
GWP – biogenic	kg CO_2e	2.44E+00	1.43E-03	-3.59E+01	-3.35E+01	ND	3.59E+01	ND	ND	ND	ND	ND	1.47E-01	ND	0.00E+00	8.20E-05	-1.45E-03	-2.81E-03	-3.80E-03
GWP – LULUC	kg CO_2e	5.42E-01	4.43E-03	3.05E-02	5.77E-01	ND	2.82E-04	ND	ND	ND	ND	ND	2.02E-01	ND	0.00E+00	1.49E-04	9.03E-03	8.24E-04	-1.85E-02
Ozone depletion pot.	kg $CFC\text{-}_{11}e$	4.69E-06	1.36E-07	4.16E-07	5.24E-06	ND	3.12E-09	ND	ND	ND	ND	ND	1.21E-06	ND	0.00E+00	7.46E-09	7.29E-08	3.33E-08	-1.28E-07
Acidification potential	mol H^+e	2.71E+00	2.17E-01	4.80E-02	2.98E+00	ND	1.10E-03	ND	ND	ND	ND	ND	3.86E-01	ND	0.00E+00	9.21E-04	2.79E-01	2.72E-02	-1.68E-01
EP-freshwater[2)]	kg Pe	6.72E-01	3.24E-04	2.70E-03	6.75E-01	ND	4.99E-05	ND	ND	ND	ND	ND	6.11E-02	ND	0.00E+00	2.66E-05	1.39E-02	8.73E-04	-1.05E-02
EP-marine	kg Ne	5.13E-01	5.47E-02	1.39E-02	5.81E-01	ND	1.12E-03	ND	ND	ND	ND	ND	6.06E-02	ND	0.00E+00	2.48E-04	1.55E-02	2.67E-02	-3.10E-02
EP-terrestrial	mol Ne	6.34E+00	6.07E-01	1.52E-01	7.10E+00	ND	4.49E-03	ND	ND	ND	ND	ND	5.43E-01	ND	0.00E+00	2.69E-03	1.88E-01	1.41E-01	-3.35E-01
POCP ("smog")[3)]	kg NMVOCe	1.68E+00	1.68E-01	6.86E-02	1.91E+00	ND	1.45E-03	ND	ND	ND	ND	ND	1.79E-01	ND	0.00E+00	1.55E-03	5.80E-02	3.52E-02	-9.68E-02
ADP-minerals & metals[4)]	kg Sbe	2.01E-02	1.03E-05	6.53E-05	2.02E-02	ND	6.13E-07	ND	ND	ND	ND	ND	8.86E-04	ND	0.00E+00	1.09E-06	3.49E-03	5.43E-06	-7.50E-05
ADP-fossil resources	MJ	3.90E+03	1.17E+02	2.42E+02	4.26E+03	ND	2.69E+00	ND	ND	ND	ND	ND	1.53E+03	ND	0.00E+00	5.58E+00	8.17E+01	2.28E+01	-3.41E+02
Water use[5)]	m^3e depr.	8.96E+01	3.42E-01	5.01E+00	9.49E+01	ND	8.40E-02	ND	ND	ND	ND	ND	4.16E+01	ND	0.00E+00	2.83E-02	3.75E+00	3.04E+00	-3.39E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	*Incidence*	*3.45E-05*	*3.27E-07*	*7.54E-07*	*3.56E-05*	*ND*	*1.86E-08*	*ND*	*ND*	*ND*	*ND*	*ND*	*1.38E-06*	*ND*	*0.00E+00*	*3.59E-08*	*7.60E-07*	*1.38E-07*	*-2.19E-06*
Ionizing radiation6)	*kBq U235e*	*1.40E+01*	*5.74E-02*	*1.87E+00*	*1.59E+01*	*ND*	*7.36E-03*	*ND*	*ND*	*ND*	*ND*	*ND*	*4.22E+01*	*ND*	*0.00E+00*	*6.43E-03*	*1.02E+00*	*2.58E-02*	*-1.12E+00*
Ecotoxicity (freshwater)	*CTUe*	*8.67E+03*	*9.30E+00*	*4.27E+01*	*8.72E+03*	*ND*	*1.08E+00*	*ND*	*ND*	*ND*	*ND*	*ND*	*2.33E+02*	*ND*	*0.00E+00*	*6.85E-01*	*3.32E+02*	*1.39E+03*	*-4.26E+01*
Human toxicity, cancer	*CTUh*	*2.22E-07*	*1.76E-09*	*3.66E-08*	*2.60E-07*	*ND*	*1.17E-10*	*ND*	*ND*	*ND*	*ND*	*ND*	*2.22E-08*	*ND*	*0.00E+00*	*6.24E-11*	*3.77E-08*	*1.24E-08*	*-1.85E-09*
Human tox. non-cancer	*CTUh*	*8.78E-06*	*4.20E-08*	*1.07E-07*	*8.93E-06*	*ND*	*5.84E-09*	*ND*	*ND*	*ND*	*ND*	*ND*	*1.15E-06*	*ND*	*0.00E+00*	*3.60E-09*	*3.81E-06*	*2.32E-06*	*1.23E-07*
SQP7)	*-*	*1.52E+03*	*2.41E+01*	*2.89E+03*	*4.43E+03*	*ND*	*2.58E+00*	*ND*	*ND*	*ND*	*ND*	*ND*	*3.40E+02*	*ND*	*0.00E+00*	*5.42E+00*	*1.13E+02*	*1.09E+01*	*-8.56E+01*

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy8)	*MJ*	*4.62E+02*	*9.39E-01*	*2.19E+02*	*6.82E+02*	*ND*	*-7.35E+01*	*ND*	*ND*	*ND*	*ND*	*ND*	*4.19E+02*	*ND*	*0.00E+00*	*8.88E-02*	*1.83E+01*	*5.48E-01*	*-3.24E+01*
Renew. PER as material	*MJ*	*0.00E+00*	*0.00E+00*	*3.14E+02*	*3.14E+02*	*ND*	*-3.14E+02*	*ND*	*ND*	*ND*	*ND*	*ND*	*0.00E+00*	*ND*	*0.00E+00*	*0.00E+00*	*0.00E+00*	*0.00E+00*	*0.00E+00*
Total use of renew. PER	*MJ*	*4.62E+02*	*9.39E-01*	*5.34E+02*	*9.96E+02*	*ND*	*-3.88E+02*	*ND*	*ND*	*ND*	*ND*	*ND*	*4.19E+02*	*ND*	*0.00E+00*	*8.88E-02*	*1.83E+01*	*5.48E-01*	*-3.24E+01*
Non-re. PER as energy	*MJ*	*3.52E+03*	*1.17E+02*	*1.75E+02*	*3.81E+03*	*ND*	*-1.79E+01*	*ND*	*ND*	*ND*	*ND*	*ND*	*1.53E+03*	*ND*	*0.00E+00*	*5.58E+00*	*-9.30E+01*	*-1.30E+03*	*-3.43E+02*
Non-re. PER as material	*MJ*	*3.90E+02*	*0.00E+00*	*2.34E+01*	*4.13E+02*	*ND*	*-4.20E+01*	*ND*	*ND*	*ND*	*ND*	*ND*	*0.00E+00*	*ND*	*0.00E+00*	*0.00E+00*	*-1.86E+02*	*-1.86E+02*	*1.27E+01*
Total use of non-re. PER	*MJ*	*3.91E+03*	*1.17E+02*	*1.98E+02*	*4.22E+03*	*ND*	*-5.99E+01*	*ND*	*ND*	*ND*	*ND*	*ND*	*1.53E+03*	*ND*	*0.00E+00*	*5.58E+00*	*-2.79E+02*	*-1.49E+03*	*-3.30E+02*
Secondary materials	*kg*	*6.84E+00*	*4.98E-02*	*1.20E+00*	*8.09E+00*	*ND*	*2.41E-03*	*ND*	*ND*	*ND*	*ND*	*ND*	*2.53E-01*	*ND*	*0.00E+00*	*2.42E-03*	*3.63E+00*	*3.32E-02*	*2.78E+00*
Renew. secondary fuels	*MJ*	*1.85E-01*	*1.84E-04*	*1.06E+01*	*1.08E+01*	*ND*	*2.27E-05*	*ND*	*ND*	*ND*	*ND*	*ND*	*2.02E-03*	*ND*	*0.00E+00*	*3.06E-05*	*1.49E-03*	*2.82E-04*	*-3.82E-03*
Non-ren. secondary fuels	*MJ*	*4.00E-21*	*0.00E+00*	*0.00E+00*	*4.00E-21*	*ND*	*0.00E+00*	*ND*	*ND*	*ND*	*ND*	*ND*	*0.00E+00*	*ND*	*0.00E+00*	*0.00E+00*	*0.00E+00*	*0.00E+00*	*0.00E+00*
Use of net fresh water	*m3*	*2.37E+00*	*8.98E-03*	*1.19E-01*	*2.49E+00*	*ND*	*-6.60E-03*	*ND*	*ND*	*ND*	*ND*	*ND*	*1.32E+00*	*ND*	*0.00E+00*	*8.18E-04*	*1.34E-01*	*2.86E-02*	*-2.20E-01*

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	4.65E+01	1.48E-01	6.20E-01	4.72E+01	ND	2.24E-02	ND	ND	ND	ND	ND	3.87E+00	ND	0.00E+00	8.30E-03	1.72E+00	2.69E+00	-4.73E+00
Non-hazardous waste	kg	8.77E+02	2.16E+00	2.42E+01	9.03E+02	ND	1.20E+01	ND	ND	ND	ND	ND	2.99E+02	ND	0.00E+00	1.64E-01	1.02E+02	7.71E+01	1.06E+01
Radioactive waste	kg	5.67E-03	1.40E-05	4.27E-04	6.11E-03	ND	1.84E-06	ND	ND	ND	ND	ND	1.08E-02	ND	0.00E+00	1.59E-06	2.64E-04	6.45E-06	-2.74E-04

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	1.82E+00	1.82E+00	ND	1.80E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.76E+01	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	1.90E-01	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	1.09E+01	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	5.41E+01	0.00E+00	0.00E+00
Exported energy – Electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	4.61E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	2.24E+01	0.00E+00	0.00E+00
Exported energy – Heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	6.33E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	3.17E+01	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO2e	3.09E+02	9.20E+00	1.31E+01	3.31E+02	ND	9.20E-01	ND	ND	ND	ND	ND	6.57E+01	ND	0.00E+00	3.72E-01	2.04E+01	1.02E+02	-3.19E+01
Ozone depletion Pot.	kg CFC-11e	4.35E-06	1.08E-07	3.36E-07	4.79E-06	ND	2.51E-09	ND	ND	ND	ND	ND	1.01E-06	ND	0.00E+00	5.94E-09	6.14E-08	2.79E-08	-1.12E-07
Acidification	kg SO2e	2.16E+00	1.73E-01	3.71E-02	2.37E+00	ND	8.14E-04	ND	ND	ND	ND	ND	3.29E-01	ND	0.00E+00	7.27E-04	2.46E-01	1.89E-02	-1.40E-01
Eutrophication	kg PO43e	1.24E+00	1.96E-02	2.90E-01	1.55E+00	ND	2.89E-04	ND	ND	ND	ND	ND	4.25E-02	ND	0.00E+00	1.81E-04	1.11E-02	8.35E-03	-1.28E-02
POCP (“smog”)	kg C2H4e	1.39E-01	8.75E-03	5.98E-03	1.54E-01	ND	9.12E-05	ND	ND	ND	ND	ND	1.79E-02	ND	0.00E+00	7.28E-05	1.07E-02	1.27E-03	-9.68E-03
ADP-elements	kg Sbe	2.00E-02	1.01E-05	6.40E-05	2.01E-02	ND	5.90E-07	ND	ND	ND	ND	ND	8.84E-04	ND	0.00E+00	1.06E-06	3.49E-03	4.24E-06	-7.42E-05
ADP-fossil	MJ	3.67E+03	1.16E+02	2.15E+02	4.00E+03	ND	2.57E+00	ND	ND	ND	ND	ND	7.84E+02	ND	0.00E+00	5.48E+00	6.45E+01	2.24E+01	-3.21E+02

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	*kg CO2e*	*3.09E+02*	*9.24E+00*	*1.31E+01*	*3.31E+02*	*ND*	*8.12E-01*	*ND*	*ND*	*ND*	*ND*	*ND*	*6.59E+01*	*ND*	*0.00E+00*	*3.74E-01*	*2.05E+01*	*1.02E+02*	*-3.21E+01*

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH4 fossil, CH4 biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO2 is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity, low voltage, residual mix, United Kingdom, Ecoinvent 3.10.1
Electricity CO2e / kWh	0.45
District heating data source and quality	Heat production, natural gas, at boiler atmospheric non-modulating <100kW, United Kingdom, Ecoinvent 3.10.1
District heating CO2e / kWh	0.0798

Installation scenario documentation A5

Scenario information	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate	-
Water use / m^3	-
Other resource use / kg	-
Quantitative description of energy type (regional mix) and consumption during the installation process / kWh or MJ	-
Waste materials on the building site before waste processing, generated by the product's installation (specified by type) / kg	5.5
Output materials (specified by type) as result of waste processing at the building site e.g. collection for recycling, for energy recovery, disposal (specified by route) / kg	5.5
Direct emissions to ambient air, soil and water / kg	-

Use stages scenario documentation - B6-B7 Use of energy and use of water

Scenario information	Value
Ancillary materials specified by material / kg or units as appropriate	-
Net fresh water consumption / m^3	-
Type of energy carrier, e.g., electricity, natural gas, district heating / kWh	200.58
Power output of equipment / kW	The maximum power output is 0.06 kW; however, it is an adaptive, demand-driven system.
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc.	-
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants	-

End of life scenario documentation

Scenario information	Value
Collection process – kg collected separately	36.5 kg (assumed full unit is collected separately at end of life)
Collection process – kg collected with mixed waste	0 kg (separate collection assumed based on UK practice and EPD description)
Recovery process – kg for re-use	0 kg (no components specified for reuse in EPD; see output flows – “Components for re-use)
Recovery process – kg for recycling	21.22 kg (sum of recycled mass from EPD waste treatment breakdown: 12.08 kg Aluminium + 3.65 kg Copper + 5.19 kg Steel + 0.3 kg ABS + others)
Recovery process – kg for energy recovery	7.88 kg (sum of incinerated waste fractions with energy recovery: 7.28 kg Other Plastics + 0 kg Copper + 0 kg Steel + 0.6 kg ABS + others)
Disposal (total) – kg for final deposition	8.13 kg (includes landfilled waste fractions: 4.21 kg Other Plastics + 2.13 kg Aluminium + 0.91 kg Copper + 0.58 kg Steel + 0.3 kg ABS + others)
Scenario assumptions e.g. transportation	Waste transported 50 km by Euro 6 lorry to treatment centres (Module C2). - Waste treated under UK-specific infrastructure. - Dismantling, shredding, sorting included (Module C3). - Treatment routes and recovery/disposal follow EN 50693:2019 defaults.

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15802+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez
Tool verification validity: 27 March 2025 - 26 March 2028

Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub Limited
21.11.2025

EPD Hub
VERIFIED ISO 14025