Environmental
Product
Declaration

According to ISO14025+EN15804 A2 (+indicators A1)

This declaration is for:
Walraven Aluminium Clamp for Flue Gas M6 80mm

Provided by:
J. van Walraven Holding B.V.

MRPI® registration:
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MRPI® REGISTRATION

1.1.00950.2025

DATE OF THIS ISSUE

15-5-2025

EXPIRY DATE

15-5-2030

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Anne Kees Jeeninga , Advies Lab Vof. The LCA study has been done by Arunkumar Kuppusamy, J. van Walraven Holding B.V.. The certificate is based on an LCA-dossier according to ISO14025+EN15804 A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043 GR
Amsterdam

PRODUCT

Walraven Aluminium Clamp for Flue Gas M6 80mm

DECLARED UNIT / FUNCTIONAL UNIT

1 Piece

DESCRIPTION OF PRODUCT

One-part aluminium clamp with pre-assembled threaded shoulder wood screw. Features a plastic connector resistant to temperatures up to 110 °C ideal for flue gas pipe applications.

VISUAL PRODUCT

MORE INFORMATION

https://www.walraven.com/int/products/standard-clamps/

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION
	CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration and data according to ISO14025+EN15804 A2 (+indicators A1) Internal: External: X
	Third party verifier: Anne Kees Jeeninga , Advies Lab Vof
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Product Description
The Walraven Aluminium Clamp for Flue Gas M6 80mm is a single-part aluminium clamp with a pre-assembled threaded shoulder wood screw, designed for efficient and reliable pipe fastening in flue gas applications.

Manufacturing Location
The clamp is produced at Walraven's certified manufacturing facility in the Horka, Czech Republic, ensuring compliance with environmental and quality standards.

Manufacturing Process Overview
The clamp body is formed from aluminium alloy, while the connector is molded from temperature-resistant plastic, capable of withstanding up to 110 °C. The threaded shoulder wood screw is pre-assembled during production, and the entire product is delivered fully assembled for immediate installation.

Electricity usage references:
Reference: 0569-pro & Elektriciteit, Nederlandse mix, bij consument, per kWh (73% grijs, 27% hernieuwbaar), Database: Ecoinvent v3.6 (Cut-off, NMD), GWP : 0.389 kg CO_2eq/kWh

Reference: market for electricity, low voltage | electricity, low voltage | Czech Republic, Database: Ecoinvent v3.6 (Cut-off, NMD), GWP : 0.936 kg CO2-eq/kWh

Environmental Performance
The clamp's lifecycle assessment covers modules A1-A5 (production through installation), B1, C1-C4 (use through end-of-life), and D (recycling benefits). Materials include aluminium (primary and secondary) and a plastic connector. The product contains no Substances of Very High Concern (SVHCs) and is modeled using Ecochain Helix v4.3.1 in accordance with EN15804+A2:2019, ISO 14040/44, and ISO 14025 standards.

Installation and Use Phase
Designed for quick manual installation, the clamp provides lightweight pipe support, particularly for flue gas systems. The plastic connector resists temperatures up to 110 °C, and the product is VOC-free, ensuring safe indoor use without emissions. The necessary internal transport of Czech Republic to Netherlands has been accounted in the production process of A1-A3.

End-of-Life Considerations
The clamp can be manually dismantled for recycling. Approximately 95% of the materials (aluminium and plastic) are recyclable, while 5% is assumed to go to landfill. Recycling of aluminium contributes positively to environmental impact reductions, reflected in Module D of the lifecycle assessment.

Packaging and Transport
Packaging is minimal and fully recyclable cardboard. Transport modeling assumes EURO 5/6 standard trucks operating at 50% capacity.

Compliance and Certifications
The product lifecycle has been assessed according to EN 15804 + A2, ISO 14025, and ISO 14040/44. Data sources include Nationale Milieudatabase v3.8 and Ecoinvent v3.6, with calculations following the NMD Bepalingsmethode v1.2 (2025).

Name - Half parts	
Aluminium Clamp	
Extension screw	
Steel - Hollow pan head screw	
Plastic - POM (PolyOxyMethylene) - Anti loss washer	
Extension screw	
Threaded connector for aluminium clamp loose	

Total Weight	44 g

Component (> 1%)	(%)
Steel (combined)	72,05%
Aluminium	27,17%

SCOPE AND TYPE

This study involves conducting a comprehensive Life Cycle Assessment (LCA) for the Walraven Clamps, aiming to analyze all life cycle phases from Cradle to Grave (A1–D) using the best available data. The assessment follows the full scope of LCA, meaning the product is evaluated not as a standalone item, but as part of a broader system aggregated with other materials and processed into other products. Consequently, the clamp becomes an integral component of a Declared Unit.

The LCA is performed using the Ecochain Helix software, leveraging background data from authoritative sources such as the Dutch Nationale Milieu Database v3.8 (based on Ecoinvent 3.6) and adhering to the NMD Bepalingsmethode 1.2 (2025) standard. This rigorous methodology ensures a detailed and transparent examination of the environmental impact of the Walraven Clamps across their entire life cycle from the extraction of raw materials (Cradle) through production, installation, and use, to final disposal or recycling (Grave).

The system boundary includes all relevant stages, up to and including Module D (benefits and loads beyond the system boundary). It excludes operational energy use (B6) and water consumption (B7) during the use phase. The environmental impact is declared per one piece of Walraven Clamp, inclusive of ancillary materials, installation, internal transport, and waste processing.

The reference service life is assumed to be 50 years, based on internal product owner data and supported by the European Technical Assessment (ETA) for Walraven Clamps, which confirms a minimum working life of 50 years under appropriate usage and maintenance conditions.

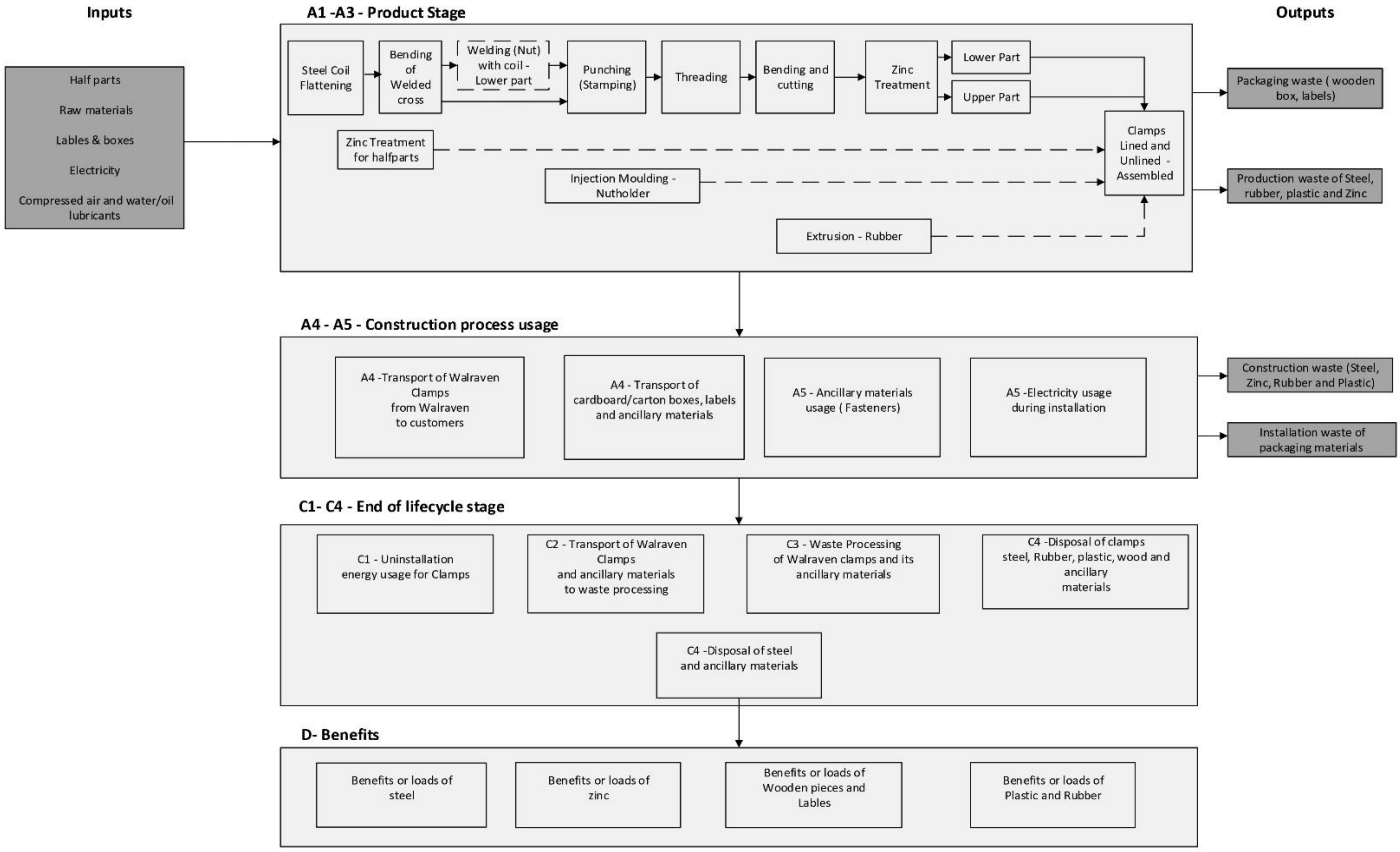
All significant inputs and outputs such as emissions, energy consumption, and material flows are accounted for. Materials representing less than 1% of the product's total weight may be excluded unless they are expected to contribute more than 5% to any environmental impact category. The cumulative environmental impact of excluded materials shall not exceed 5% for any given category.

This comprehensive approach ensures a scientifically sound and holistic understanding of the Walraven Clamp’s environmental footprint throughout its full life cycle.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x

X = Modules Assessed

ND = Not Declared



REPRESENTATIVENESS

The aggregation was done by choosing the reference product as Walraven Aluminium Clamp for Flue Gas M6 80mm. The remaining products which are aggregated in the same group by following the 20% allocation and worst case scenario as per the EN 15804+A2 and NMD Bepalingsmethode v1.2 (2025) are listed below:

Walraven 2S Clamp zinc plated M8/10 10-14mm
Walraven 2S Clamp zinc plated M8 20-24mm
Walraven 2S Clamp zinc plated M8 15-19mm
Walraven 2S Clamp zinc plated M8 10-14mm
Walraven Aluminium Clamp for Flue Gas M6 150mm

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADPE	kg Sb eq.	3,56E-04	3,33E-07	4,33E-06	3,60E-04	2,26E-08	1,80E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,76E-08	3,76E-08	5,25E-11	-5,92E-07
ADPF	MJ	2,81E+00	1,99E-01	5,67E+00	8,68E+00	1,35E-02	2,63E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,25E-02	1,49E-02	1,60E-04	-3,47E+00
GWP	kg CO2 eq.	1,89E-01	1,30E-02	4,21E-01	6,23E-01	8,83E-04	1,79E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,47E-03	1,23E-03	5,63E-06	-2,68E-01
ODP	kg CFC11 eq.	1,27E-08	2,31E-09	2,37E-08	3,88E-08	1,57E-10	1,51E-09	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,61E-10	1,50E-10	1,88E-12	-9,04E-09
POCP	kg ethene eq.	1,32E-04	7,88E-06	-1,21E-04	1,84E-05	5,33E-07	-5,91E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,88E-07	8,90E-07	6,00E-09	-1,39E-04
AP	kg SO2 eq.	9,09E-04	5,78E-05	1,42E-03	2,39E-03	3,88E-06	4,52E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,47E-06	7,22E-06	4,12E-08	-1,50E-03
EP	kg (PO4) 3 eq.	1,08E-04	1,13E-05	3,03E-04	4,23E-04	7,63E-07	1,50E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,27E-06	1,03E-06	7,95E-09	-1,26E-04

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB eq.	2,72E-01	5,49E-03	-1,65E-02	2,61E-01	3,72E-04	4,38E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,20E-04	9,30E-04	2,55E-06	-2,54E-01
FAETP	kg DCB eq.	3,83E-03	1,60E-04	2,02E-03	6,01E-03	1,09E-05	2,22E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,81E-05	1,71E-05	6,04E-08	-1,62E-03
MAETP	kg DCB eq.	8,18E+00	5,76E-01	1,03E+01	1,90E+01	3,91E-02	3,42E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,51E-02	6,88E-02	2,16E-04	-1,23E+01
TETP	kg DCB eq.	1,70E-03	1,94E-05	2,03E-03	3,76E-03	1,31E-06	2,04E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,19E-06	2,94E-06	6,40E-09	3,08E-04
ECI	euro	4,01E-02	1,57E-03	2,94E-02	7,11E-02	1,06E-04	1,32E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,77E-04	1,94E-04	7,95E-07	-4,52E-02
ADPF	kg Sb eq.	1,35E-03	9,58E-05	2,73E-03	4,17E-03	6,49E-06	1,27E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,08E-05	7,17E-06	7,67E-08	-1,67E-03

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1,95E-01	1,32E-02	4,18E-01	6,26E-01	8,91E-04	1,76E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,49E-03	1,38E-05	5,74E-06	-2,78E-01
GWP-fossil	kg CO2 eq.	1,93E-01	1,31E-02	4,17E-01	6,23E-01	8,91E-04	1,75E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,48E-03	1,24E-03	5,74E-06	-2,77E-01
GWP-biogenic	kg CO2 eq.	5,09E-04	4,90E-06	6,73E-04	1,19E-03	3,32E-07	3,95E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,54E-07	-1,23E-03	3,36E-09	0,00E+00
GWP-luluc	kg CO2 eq.	5,50E-04	4,82E-06	4,35E-04	9,90E-04	3,26E-07	3,79E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,44E-07	7,65E-07	1,60E-09	-9,84E-04
ODP	kg CFC11 eq.	1,31E-08	2,90E-09	1,85E-08	3,46E-08	1,97E-10	1,26E-09	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,28E-10	1,78E-10	2,36E-12	-1,00E-08
AP	mol H+ eq.	1,10E-03	7,68E-05	1,70E-03	2,87E-03	5,17E-06	5,57E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,61E-06	9,13E-06	5,45E-08	-1,78E-03
EP-fresh water	kg PO4 eq.	1,06E-05	1,32E-07	7,01E-05	8,08E-05	8,99E-09	3,58E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,50E-08	4,41E-08	6,43E-11	-9,32E-06
EP-marine	kg N eq.	1,92E-04	2,70E-05	2,39E-04	4,58E-04	1,82E-06	9,83E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,03E-06	2,27E-06	1,87E-08	-2,68E-04
EP-terrestrial	mol N eq.	2,12E-03	2,98E-04	2,91E-03	5,33E-03	2,01E-05	1,21E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,34E-05	2,59E-05	2,07E-07	-2,99E-03
POCP	kg NMVOC eq.	6,98E-04	8,49E-05	3,78E-04	1,16E-03	5,73E-06	1,26E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,55E-06	7,42E-06	6,00E-08	-9,31E-04
ADP-minerals & metals	kg Sb eq.	3,56E-04	3,33E-07	4,33E-06	3,60E-04	2,26E-08	1,80E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,76E-08	3,76E-08	5,25E-11	-5,92E-07
ADP-fossil	MJ, net calorific value	2,50E+00	1,98E-01	6,13E+00	8,82E+00	1,34E-02	3,16E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,24E-02	1,49E-02	1,60E-04	-2,56E+00
WDP	m3 world eq. Deprived	6,64E-02	7,08E-04	9,11E-02	1,58E-01	4,81E-05	6,57E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,01E-05	-1,68E-04	7,19E-06	-2,67E-02

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenictotal
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
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 Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals & metals = Abiotic Depletion Potential for non-fossil resources [1]
ADP-fossil = Abiotic Depletion for fossil resources potential [1]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [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 experience with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease inci-dence	1,20E-08	1,18E-09	-6,73E-09	6,46E-09	8,00E-11	-7,19E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,33E-10	1,65E-10	1,06E-12	-2,12E-08
IRP	kBq U235 eq.	7,97E-03	8,30E-04	3,45E-02	4,34E-02	5,63E-05	2,01E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,38E-05	6,47E-05	6,58E-07	-3,32E-03
ETP-fw	CTUe	8,10E+00	1,77E-01	3,17E-01	8,59E+00	1,20E-02	7,65E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,00E-02	1,79E-01	1,04E-04	-7,27E+00
HTP-c	CTUh	7,26E-10	5,74E-12	-5,83E-10	1,49E-10	3,89E-13	-1,12E-11	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,48E-13	1,45E-12	2,41E-15	-3,75E-10
HTP-nc	CTUh	1,06E-08	1,93E-10	1,62E-10	1,09E-08	1,31E-11	3,82E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,18E-11	5,34E-11	7,40E-14	-3,38E-09
SQP	-	6,54E-01	1,72E-01	1,67E+00	2,50E+00	1,17E-02	1,05E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,94E-02	2,54E-02	3,37E-04	-4,45E-01

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans, cancer [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

Disclaimer [1]:

- 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.

Disclaimer [2]:

- 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 experience with the indicator.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 en A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	7,85E-05	5,02E-07	-7,74E-06	7,13E-05	3,40E-08	4,02E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,67E-08	3,81E-08	2,40E-10	9,10E-06
NHWD	kg	4,44E-02	1,26E-02	3,37E-02	9,07E-02	8,52E-04	2,18E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,42E-03	5,35E-04	1,09E-03	-5,10E-02
RWD	kg	7,26E-06	1,30E-06	2,89E-05	3,75E-05	8,82E-08	1,69E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,47E-07	8,59E-08	1,05E-09	-3,92E-06
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	2,64E-04	2,64E-04	0,00E+00	1,32E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	1,60E-05	1,60E-05	0,00E+00	8,01E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	4,68E-02	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	9,23E-04	9,23E-04	0,00E+00	4,61E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	1,20E-04	9,00E-04
ETE	MJ	0,00E+00	0,00E+00	5,37E-04	5,37E-04	0,00E+00	2,68E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,23E-04

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	2,50E-01	2,48E-03	6,87E-01	9,40E-01	1,68E-04	3,12E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,80E-04	1,32E-03	1,30E-06	-3,18E-01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,50E-01	2,48E-03	6,87E-01	9,40E-01	1,68E-04	3,12E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,80E-04	1,32E-03	1,30E-06	-3,18E-01
PENRE	MJ	2,66E+00	2,10E-01	6,61E+00	9,48E+00	1,43E-02	3,41E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,38E-02	1,58E-02	1,70E-04	-2,72E+00
PENRM	MJ	2,90E-03	0,00E+00	0,00E+00	2,90E-03	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	2,66E+00	2,10E-01	6,61E+00	9,48E+00	1,43E-02	3,41E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,38E-02	1,58E-02	1,70E-04	-2,72E+00
SM	kg	2,94E-02	0,00E+00	7,72E-05	2,95E-02	0,00E+00	3,86E-06	ND	ND	ND	ND	ND	ND	ND	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	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NSRF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	2,26E-03	2,41E-05	1,14E-02	1,37E-02	1,64E-06	6,04E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,73E-06	-1,73E-06	1,71E-07	-1,59E-03

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials
PERM = Use of renewable primary energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable 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
NSRF = Use of non-renewable secondary fuels
FW = Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
BCCpa	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Data Quality

Data flows have been modeled to reflect actual production as closely as possible. Primary data from Walraven's Czech production site was prioritized for all core manufacturing processes. In cases where supplier-specific information was unavailable, validated background datasets from the Dutch Nationale Milieudatabase v3.8, based on Ecoinvent 3.6, were used.

For Module A1, material composition data was obtained directly from Walraven. Module A2 includes actual transport distances of all raw materials to the production site. Module A3 encompasses energy consumption, emissions, and waste data for the 2023/2024 production year. All data was selected to meet the quality standards defined in EN15804+A2:2019.

Data Collection Period

The dataset represents production processes used during 2023/2024.

Methodology and Reproducibility

This LCA follows EN 15804+A2:2019, ISO 14040, ISO 14044, ISO 14025, and NMD Bepalingsmethode v1.2 (2025). Modeling and calculations were carried out using Ecochain Helix version 4.3.1. The study includes life cycle stages A1–A3 (raw material extraction, transport, and manufacturing), A4–A5 (distribution and installation), C1–C4 (end-of-life: demolition, transport, treatment, disposal), and D (benefits and loads beyond the system boundary such as recycling).

Inventory and Allocation

All relevant inputs, including materials, energy, emissions, and waste streams, are included. Allocation of shared resources such as electricity and auxiliary materials was performed using mass-based allocation in line with EN15804. No secondary materials were used in production, and any excluded flows are within the standard cut-off limit of 5% of total mass or energy per module.

Data Sources

Primary data from the Walraven facility includes material types (aluminum, steel, zinc, POM), energy use, packaging, and transport logistics. Where primary data was not available, representative datasets from Ecoinvent 3.6 and NMD v3.8 were applied. Upstream and downstream processes, including coating, shipping, waste treatment, and energy recovery in Module D, were modeled using verified secondary datasets. All assumptions and references are documented in the project report and Ecochain software.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Modules A1 to A3 – Product Stage
Modules A1 to A3 represent the cradle-to-gate phase. In Module A1, the sourcing and processing of raw materials are modeled based on 2023/2024 data. The primary components of the Walraven Aluminium Clamp for Flue Gas M6 80mm, plastic (POM), and a polypropylene threaded connector. Aluminum used has a 26% primary and 74% secondary content; steel components are modeled with 57% primary and 43% secondary input, as per NMD v3.8 and Ecoinvent v3.6 conventions.

Module A2 covers transportation of these raw materials to the Walraven production site in the Czech Republic. Although transport distances vary per material (e.g., aluminum 300 km, steel 1140 km, plastic up to 20,000 km by ship), all transport modeling follows EN 15804+A2 assumptions with a 50% load factor. Freight emissions are calculated using truck and shipping datasets from the NMD database.

Module A3 includes the production process impacts at the Czech facility. Inputs include electricity (Czech grid mix), lubricating oil, and energy used for zinc treatment. Production waste includes steel and aluminum scrap, which is partially recycled on-site. Manufacturing losses and auxiliary material consumption are considered. All processes are modeled based on primary operational data.

Module A4 – Transport to Site
Transportation of the finished clamp to the construction site is modeled using a standard average distance of 150 km, with 50% load factor assumptions, in accordance with EN 15804+A2 and Bepalingsmethode v1.2. The transport dataset 0001-tra&Transport, vrachtwagen is used from NMD v3.8.

Module A5 – Installation Phase
Installation is assumed to be manual with no energy requirement. A standard 5% material loss is applied due to on-site inefficiencies. Waste from this stage includes steel, plastic, and aluminum offcuts. Steel waste is sent 100 km to landfill or recycling; plastics and other non-metal components are incinerated at AVI plants located 100 km from the site. Waste treatment and transport are modeled per standard C2–C4 scenarios from Bepalingsmethode v1.2 (2025).

End-of-Life Scenario Fixed Values used:

Material	Leave	Landfill	Incineration (AVI)	Recycling	Reuse
Steel, Zinc	0%	5%	0%	95%	0%
Rubber/Plastic	0%	0%	100%	0%	0%
Aluminum	0%	0%	100%	0%	0%

End-of-Life: Modules C1–C4
Module C1 assumes that the clamp is manually deconstructed, with negligible energy input. Module C2 models the transportation of waste materials after use, with steel and zinc transported 50 km to recycling or landfill, while plastic and aluminum are transported 100 km to AVI incineration facilities.

Module C3 addresses the treatment of all waste streams. Steel and zinc undergo sorting and pressing for recycling. Aluminum and plastic are fully incinerated with energy recovery, ensuring that resource recovery and emissions are accounted for. Module C4 considers final disposal, with 5% of steel and zinc directed to landfill, while all aluminum and plastic residues are completely incinerated.

Benefits Beyond the System Boundary: Module D
Module D evaluates environmental credits from material recovery and energy substitution. Steel is credited for avoided virgin material production with a substitution efficiency of 52%, derived from 95% recycling minus 43% secondary content. Aluminum and plastic (POM/PP) benefits are modeled using avoided burden methodology, assuming full energy recovery from incineration processes.

This EPD follows EN 15804+A2:2019 + AC:2021 standards and is modeled using NMD v3.8 and Ecoinvent v3.6 datasets. It applies a modular LCA approach and provides a comprehensive assessment of end-of-life processing, recycling potential, and the associated environmental benefits in accordance with the Dutch Bepalingsmethode v1.2 (2025).

DECLARATION OF SVHC

No substances that are listed in the latest “Candidate List of Substances of Very High Concern for authorisation” are included in the product that exceeds the limit for registration

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