**Environmental**
**Product**
**Declaration**

According to ISO14025+EN15804 A2 (+indicators A1)

This declaration is for:
**Walraven Heavy Duty Clamp Stainless M12 98-106mm**

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

MRPI® registration:
**1.1.00955.2025**

Program operator:
**Stichting MRPI®**
Publisher:
**Stichting MRPI®**
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## COMPANY INFORMATION

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## MRPI® REGISTRATION

1.1.00955.2025

## 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 Heavy Duty Clamp Stainless M12 98-106mm

## DECLARED UNIT / FUNCTIONAL UNIT

1 Piece

## DESCRIPTION OF PRODUCT

Two-part heavy-duty clamp with two locking bolts and $CO_2$ welded connection nut. Made from stainless steel (AISI 316 / 1.4401) for high corrosion resistance.

## VISUAL PRODUCT

## MORE INFORMATION

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

| Ing. L. L. Oosterveen MSc. MBA<br>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)<br>Internal: External: X |
| | Third party verifier: Anne Kees Jeeninga , Advies Lab Vof |
| | [1] PCR = Product Category Rules |

## DETAILED PRODUCT DESCRIPTION

Product Description
The Walraven Heavy Duty Clamp Stainless M12 98-106mm is a high-performance, two-screw stainless steel pipe clamp designed for large-diameter piping systems in mechanical, industrial, and infrastructure applications. Constructed from premium-grade stainless steel 1.4401 (AISI 316) and featuring a welded connection nut, this unlined clamp delivers superior support, making it ideal for high-load or corrosive environments.

Manufacturing Location
The clamp is produced at Walraven's certified facility in the Cista, Czech Republic.

Manufacturing Process Overview
The clamp body is made from stainless steel 1.4401 (AISI 316), with locking bolts that include anti-loss washers. The connection nut is welded for secure fastening. The stainless steel surface requires no additional coating or zinc treatment due to its inherent corrosion resistance. The product is supplied fully pre-assembled to minimize on-site labor and installation time.

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 $CO_2$eq/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 exhibits exceptional corrosion resistance and chemical durability due to its AISI 316 stainless steel construction. Approximately 50.2% of the steel is recycled, contributing to material sustainability. The product is free of SVHCs under REACH, VOC-free, and safe for indoor applications. The reference service life (RSL) is estimated at 50 years under normal conditions. Lifecycle assessment follows EN 15804 standards (A1–A5, B1, C1–C4, D), using Ecochain Helix v4.3.1 with Ecoinvent v3.6 data. Waste efficiency is high, with a maximum 5% cutoff applied.

Installation and Use Phase
The clamp is delivered pre-assembled with the welded nut, eliminating the need for specialized tools. It is intended for structural pipe support where acoustic insulation is not required, making it suitable for pressure pipelines, HVAC systems, fire protection, and other industrial applications. The necessary internal transport of Czech Republic to Netherlands has been accounted in the production process of A1-A3.

End-of-Life Considerations
Components can be manually disassembled, and over 95% of materials are recoverable. Recycling credits for stainless steel are included in Module D calculations, reflecting the environmental benefits of material recovery.

Packaging and Transport
The clamp is packaged in recyclable cardboard designed to minimize volume. Transport modeling assumes EURO 5 or 6 trucks at 50% load factor.

Compliance and Certifications
Corrosion performance is validated per ISO 9227. The product's life cycle assessment and EPD comply with EN 15804 + A2, ISO 14025, and ISO 14040/44

| Name - Half parts | |
|---|---|
| Steel - HD Clamp | |

| Total Weight | 529 g |
|---|---|

| Component (> 1%) | ( %) |
|---|---|
| Steel (combined) | 97,09% |

## 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.

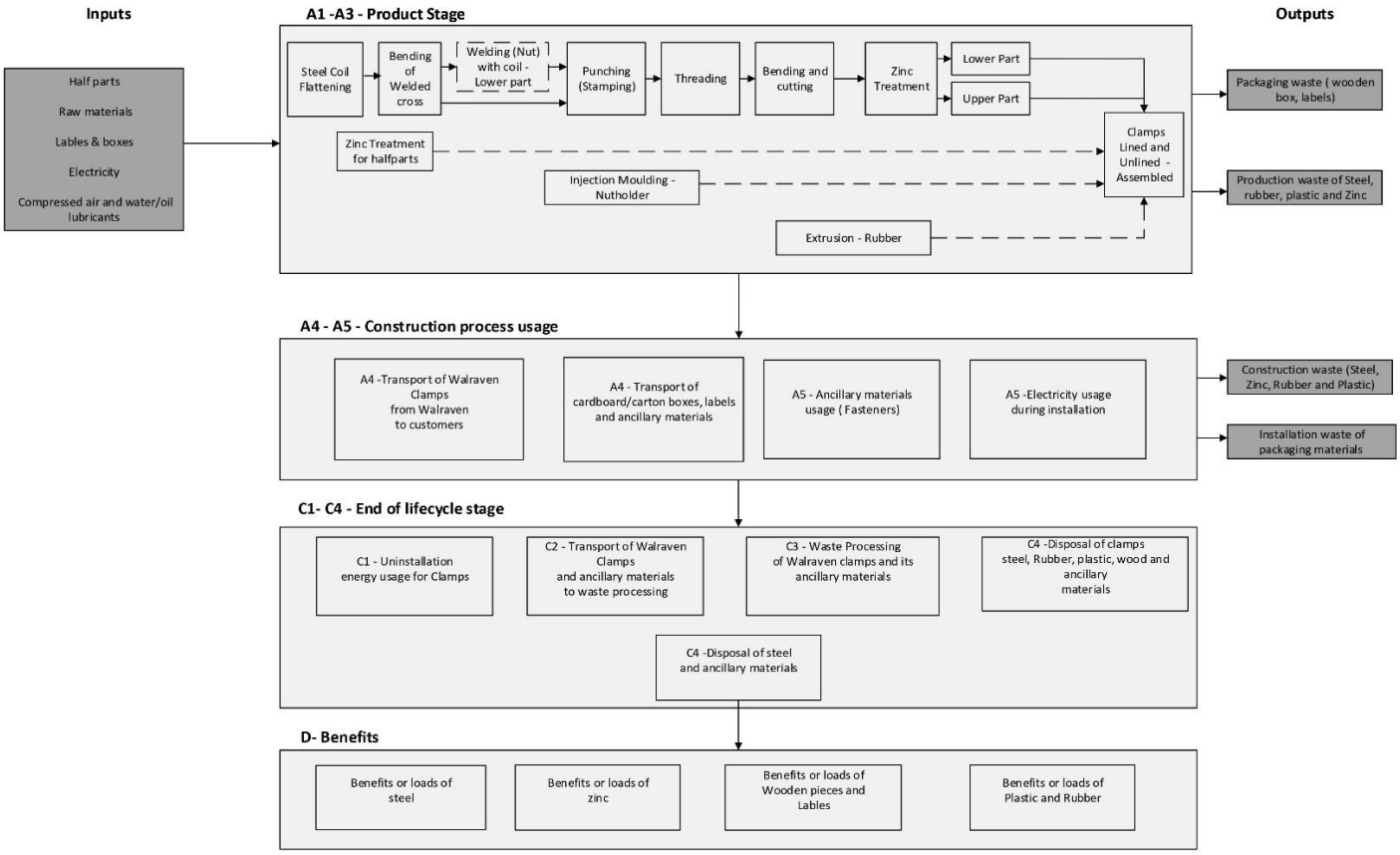
All significant inputs and outputs such as emissions, energy consumption, and material flows are accounted for. Materials representing less than 1% of the product's total weight may be excluded unless they are expected to contribute more than 5% to any environmental impact category. The cumulative environmental 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


Inputs
A1 -A3 - Product Stage
Outputs
Half parts
Raw materials
Lables & boxes
Electricity
Compressed air and water/oil lubricants
Steel Coil Flattening
Bending of Welded cross
Welding (Nut) with coil - Lower part
Punching (Stamping)
Threading
Bending and cutting
Zinc Treatment
Lower Part
Upper Part
Zinc Treatment for halfparts
Injection Moulding - Nutholder
Extrusion - Rubber
Clamps Lined and Unlined - Assembled
Packaging waste ( wooden box, labels)
Production waste of Steel, rubber, plastic and Zinc
A4 - A5 - Construction process usage
A4 -Transport of Walraven Clamps from Walraven to customers
A4 - Transport of cardboard/carton boxes, labels and ancillary materials
A5 - Ancillary materials usage ( Fasteners)
A5 -Electricity usage during installation
Construction waste (Steel, Zinc, Rubber and Plastic)
Installation waste of packaging materials
C1- C4 - End of lifecycle stage
C1 - Uninstallation energy usage for Clamps
C2 - Transport of Walraven Clamps and ancillary materials to waste processing
C3 - Waste Processing of Walraven clamps and its ancillary materials
C4 -Disposal of clamps steel, Rubber, plastic, wood and ancillary materials
C4 -Disposal of steel and ancillary materials
D- Benefits
Benefits or loads of steel
Benefits or loads of zinc
Benefits or loads of Wooden pieces and Lables
Benefits or loads of Plastic and Rubber

## REPRESENTATIVENESS

The aggregation was done by choosing the reference product as Walraven Heavy Duty Clamp Stainless M12 98-106mm. 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 & NMD Bepalingsmethode v1.2 (2025) are listed below:

Walraven HD500 Clamp BUP 1/2" 148-154mm
Walraven Heavy Duty Clamp Stainless M12 98-106mm
Walraven Industrial Saddle hot dip galvanized 168.3mm 6"
Walraven Split Band Clip DIN 3567 (hdg) Type A  61 (57
Walraven HD500 Clamp BUP M10/12 148-154mm
Walraven Split Band Clip DIN 3567 (untreated) Type A 61 (57 - 61 mm)
Walraven 434 Clamp stainless steel 1" PE-Pipe 250mm
Walraven Heavy Duty Clamp epoxy coated 3/8" 1/2" 250mm
Walraven HD500 Clamp BUP M8/10 15-19mm
Walraven HD500 Clamp BUP 1/2" 125-133mm
Walraven HD500 Clamp BUP 1/2" 53-58mm
Walraven HD500 Clamp BUP 1/2" 132-140mm
Walraven HD500 Clamp BUP M10/12 125-133mm
Walraven HD500 Clamp BUP M10/12 132-140mm
Walraven Heavy Duty Clamp Stainless M12 DN80 3" 86-92mm
Walraven HD500 Clamp BUP M10/12 116-123mm
Walraven HD500 Clamp BUP M8/10 53-58mm
Walraven HD500 Clamp BUP 1/2" 47-52mm
Walraven Heavy Duty Clamp Stainless M12 79-85mm

## 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. | 1,81E-02 | 2,07E-06 | 7,67E-06 | 1,81E-02 | 2,71E-07 | 9,04E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 4,52E-07 | 6,90E-07 | 1,21E-09 | -2,52E-07 |
| ADPF | MJ | 3,06E+01 | 1,24E+00 | 8,75E+00 | 4,55E+04 | 1,62E-01 | 1,83E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,71E-01 | 1,68E-01 | 3,69E-03 | -4,47E+00 |
| GWP | kg CO2 eq. | 2,06E+00 | 8,11E-02 | 6,66E-01 | 2,81E+00 | 1,06E-02 | 1,25E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,77E-02 | 1,23E-02 | 1,30E-04 | -3,48E-01 |
| ODP | kg CFC11 eq. | 1,73E-07 | 1,44E-08 | 3,79E-08 | 2,25E-07 | 1,88E-09 | 1,10E-08 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,14E-09 | 1,54E-09 | 4,34E-11 | -1,21E-08 |
| POCP | kg ethene eq. | 1,75E-03 | 4,90E-05 | -3,97E-04 | 1,40E-03 | 6,41E-06 | 3,36E-05 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,07E-05 | 1,08E-05 | 1,39E-07 | -7,57E-04 |
| AP | kg SO2 eq. | 1,13E-02 | 3,57E-04 | 2,26E-03 | 1,39E-02 | 4,67E-05 | 6,47E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 7,78E-05 | 1,21E-04 | 9,52E-07 | -1,18E-03 |
| EP | kg (PO4) 3 eq. | 1,60E-03 | 7,01E-05 | 5,05E-04 | 2,18E-03 | 9,17E-06 | 1,04E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,53E-05 | 1,54E-05 | 1,84E-07 | -1,40E-04 |

Toxicity indicators and ECI (Dutch market)

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HTP | kg DCB eq. | 3,60E+00 | 3,42E-02 | -9,52E-02 | 3,54E+00 | 4,47E-03 | 1,67E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 7,45E-03 | 1,49E-02 | 5,89E-05 | -2,18E-01 |
| FAETP | kg DCB eq. | 5,77E-02 | 9,97E-04 | 3,32E-03 | 6,20E-02 | 1,31E-04 | 3,27E-03 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,18E-04 | 2,78E-04 | 1,40E-06 | 2,70E-03 |
| MAETP | kg DCB eq. | 1,15E+02 | 3,59E+00 | 1,77E+01 | 1,37E+02 | 4,69E-01 | 7,07E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 7,82E-01 | 1,21E+00 | 4,99E-03 | 2,26E+00 |
| TETP | kg DCB eq. | 2,31E-02 | 1,21E-04 | 3,46E-03 | 2,66E-02 | 1,58E-05 | 2,25E-03 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,63E-05 | 4,64E-05 | 1,48E-07 | 1,82E-02 |
| ECI | euro | 5,10E-01 | 9,78E-03 | 4,02E-02 | 5,60E-01 | 1,28E-03 | 2,61E-02 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,13E-03 | 2,75E-03 | 1,84E-05 | -4,34E-02 |
| ADPF | kg Sb eq. | 1,47E-02 | 5,97E-04 | 4,21E-03 | 2,19E+01 | 7,81E-05 | 8,82E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,30E-04 | 8,09E-05 | 1,77E-06 | -2,15E-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. | 2,12E+00 | 8,19E-02 | 6,54E-01 | 2,85E+00 | 1,07E-02 | 1,26E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,79E-02 | 1,36E-03 | 1,33E-04 | -3,73E-01 |
| GWP-fossil | kg CO2 eq. | 2,10E+00 | 8,18E-02 | 6,52E-01 | 2,84E+00 | 1,07E-02 | 1,25E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,78E-02 | 1,24E-02 | 1,33E-04 | -3,73E-01 |
| GWP-biogenic | kg CO2 eq. | 9,22E-03 | 3,05E-05 | 1,27E-03 | 1,05E-02 | 3,99E-06 | 5,55E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 6,66E-06 | -1,11E-02 | 7,76E-08 | 0,00E+00 |
| GWP-luluc | kg CO2 eq. | 3,82E-03 | 3,00E-05 | 7,95E-04 | 4,65E-03 | 3,92E-06 | 2,47E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 6,54E-06 | 1,39E-05 | 3,70E-08 | 2,76E-04 |
| ODP | kg CFC11 eq. | 1,74E-07 | 1,81E-08 | 2,87E-08 | 2,21E-07 | 2,36E-09 | 1,10E-08 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,94E-09 | 1,79E-09 | 5,46E-11 | -9,11E-09 |
| AP | mol H+ eq. | 1,38E-02 | 4,75E-04 | 2,68E-03 | 1,70E-02 | 6,21E-05 | 7,94E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,04E-04 | 1,51E-04 | 1,26E-06 | -1,44E-03 |
| EP-fresh water | kg PO4 eq. | 1,65E-04 | 8,25E-07 | 1,23E-04 | 2,89E-04 | 1,08E-07 | 1,38E-05 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,80E-07 | 8,47E-07 | 1,49E-09 | -1,32E-05 |
| EP-marine | kg N eq. | 2,81E-03 | 1,67E-04 | 3,52E-04 | 3,33E-03 | 2,19E-05 | 1,58E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,65E-05 | 3,32E-05 | 4,33E-07 | -2,67E-04 |
| EP-terrestrial | mol N eq. | 3,13E-02 | 1,84E-03 | 4,38E-03 | 3,76E-02 | 2,41E-04 | 1,77E-03 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 4,02E-04 | 3,86E-04 | 4,78E-06 | -3,12E-03 |
| POCP | kg NMVOC eq. | 9,84E-03 | 5,26E-04 | 1,59E-04 | 1,05E-02 | 6,89E-05 | 4,35E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,15E-04 | 1,05E-04 | 1,39E-06 | -2,12E-03 |
| ADP-minerals & metals | kg Sb eq. | 1,81E-02 | 2,07E-06 | 7,67E-06 | 1,81E-02 | 2,71E-07 | 9,04E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 4,52E-07 | 6,90E-07 | 1,21E-09 | -2,52E-07 |
| ADP-fossil | MJ, net calorific value | 2,95E+01 | 1,23E+00 | 1,01E+01 | 4,08E+01 | 1,62E-01 | 1,94E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,69E-01 | 1,72E-01 | 3,71E-03 | -2,61E+00 |
| WDP | m3 world eq. Deprived | 1,10E+00 | 4,41E-03 | 1,82E-01 | 1,29E+00 | 5,78E-04 | 6,10E-02 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 9,63E-04 | 1,74E-03 | 1,66E-04 | -7,12E-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 | 1,22E-07 | 7,35E-09 | -2,06E-08 | 1,08E-07 | 9,62E-10 | 4,56E-09 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,60E-09 | 1,89E-09 | 2,44E-11 | -2,16E-08 |
| IRP | kBq U235 eq. | 1,59E-01 | 5,17E-03 | 6,32E-02 | 2,27E-01 | 6,77E-04 | 1,18E-02 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,13E-03 | 8,59E-04 | 1,52E-05 | 6,38E-03 |
| ETP-fw | CTUe | 2,07E+02 | 1,10E+00 | -2,66E+00 | 2,05E+02 | 1,44E-01 | 9,69E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,40E-01 | 7,41E-01 | 2,41E-03 | -1,25E+01 |
| HTP-c | CTUh | 1,22E-08 | 3,57E-11 | -1,60E-09 | 1,06E-08 | 4,67E-12 | 5,29E-10 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 7,79E-12 | 1,81E-11 | 5,56E-14 | -4,78E-11 |
| HTP-nc | CTUh | 2,16E-07 | 1,20E-09 | -2,96E-09 | 2,15E-07 | 1,58E-10 | 1,44E-08 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,63E-10 | 8,59E-10 | 1,71E-12 | 7,23E-08 |
| SQP | - | 1,04E+01 | 1,07E+00 | 2,76E+00 | 1,43E+01 | 1,40E-01 | 7,21E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,33E-01 | 3,47E-01 | 7,78E-03 | -5,76E-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 | 2,36E-03 | 3,13E-06 | -2,45E-05 | 2,34E-03 | 4,09E-07 | 1,15E-04 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 6,82E-07 | 5,20E-07 | 5,54E-09 | -4,48E-05 |
| NHWD | kg | 5,10E-01 | 7,83E-02 | 5,43E-02 | 6,42E-01 | 1,02E-02 | 3,32E-02 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,71E-02 | 5,04E-03 | 2,52E-02 | -3,65E-02 |
| RWD | kg | 1,32E-04 | 8,10E-06 | 5,24E-05 | 1,92E-04 | 1,06E-06 | 9,92E-06 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 1,77E-06 | 1,02E-06 | 2,44E-08 | 2,21E-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 | 4,32E-04 | 4,32E-04 | 0,00E+00 | 2,16E-05 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 0,00E+00 | 4,79E-01 | 0,00E+00 | 0,00E+00 |
| MER | kg | 0,00E+00 | 0,00E+00 | 2,62E-05 | 2,62E-05 | 0,00E+00 | 1,31E-06 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| EEE | MJ | 0,00E+00 | 0,00E+00 | 1,51E-03 | 1,51E-03 | 0,00E+00 | 7,55E-05 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| ETE | MJ | 0,00E+00 | 0,00E+00 | 8,78E-04 | 8,78E-04 | 0,00E+00 | 4,39E-05 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

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 | 3,46E+00 | 1,54E-02 | 1,21E+00 | 4,69E+00 | 2,02E-03 | 2,40E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,37E-03 | 2,70E-02 | 3,00E-05 | 7,57E-02 |
| 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 | 3,46E+00 | 1,54E-02 | 1,21E+00 | 4,69E+00 | 2,02E-03 | 2,40E-01 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,37E-03 | 2,70E-02 | 3,00E-05 | 7,57E-02 |
| PENRE | MJ | 3,14E+01 | 1,31E+00 | 1,09E+01 | 4,35E+01 | 1,71E-01 | 2,07E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,86E-01 | 1,83E-01 | 3,94E-03 | -2,71E+00 |
| PENRM | 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 |
| PENRT | MJ | 3,14E+01 | 1,31E+00 | 1,09E+01 | 4,35E+01 | 1,71E-01 | 2,07E+00 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 2,86E-01 | 1,83E-01 | 3,94E-03 | -2,71E+00 |
| SM | kg | 2,17E-01 | 0,00E+00 | 1,26E-04 | 2,17E-01 | 0,00E+00 | 6,31E-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 | 3,64E-02 | 1,50E-04 | 2,10E-02 | 5,76E-02 | 1,97E-05 | 2,82E-03 | ND | ND | ND | ND | ND | ND | ND | 0,00E+00 | 3,28E-05 | 8,18E-05 | 3,96E-06 | -1,35E-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 for the Walraven Heavy Duty Clamp Stainless M12 98–106mm have been modelled as accurately as possible, prioritizing primary data from Walraven's production facility in the Czech Republic. Where supplier-specific data was unavailable, representative secondary datasets from recognized sources were used.

For Module A1, detailed product composition data was provided by the manufacturer. Module A2 incorporates transport distances and delivery modes for all raw materials. Module A3 includes measured energy consumption, material waste, and emissions from the 2023/2024 production year. Background data was selected from the Dutch Nationale Milieudatabase v3.8, based on Ecoinvent v3.6, to ensure consistency and comparability.

Data Collection Period
The dataset represents production processes from the year 2023/2024.

Methodology and Reproducibility
The life cycle assessment was conducted in accordance with EN 15804+A2:2019, ISO 14040, ISO 14044, ISO 14025, and the NMD Bepalingsmethode v1.2 (2025). Modelling and calculations were carried out using Ecochain Helix software (version 4.3.1). System boundaries cover A1–A3 (raw material supply, transport, and manufacturing), A4–A5 (transport to site and installation), C1–C4 (end-of-life processing, transport, treatment, and disposal), and D (reuse, recovery, and recycling potential).

Inventory and Allocation
All relevant material, energy, emissions, and packaging flows are included. Allocation of shared manufacturing inputs, such as electricity and auxiliary materials, was performed using mass-based allocation. No secondary materials were used in production. Cut-off criteria were applied, ensuring that excluded flows do not exceed 5% of mass or energy per module.

Data Sources
Primary data includes material composition, transport distances, and site-specific energy consumption and emissions from Walraven's Czech Republic facility. Where primary data was lacking, verified datasets from Ecoinvent 3.6 and the Nationale Milieudatabase v3.8 were applied, covering stainless steel processing, zinc coating, electricity use, and freight transport.

## SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Modules A1 to A3 encompass the life cycle phases from raw material acquisition to production. Module A1 models the extraction and processing of the raw materials for the Walraven Heavy Duty Clamp Stainless M12 98-106mm. The product is composed mainly of stainless steel (HD Clamp SSt M12) and a zinc coating. Material data is derived from the 2023/2024 bill of materials and modeled using Nationale Milieudatabase (NMD) v3.8 and Ecoinvent v3.6 datasets. Stainless steel is modeled with an approximate average market content of 49.8% primary and 50.2% secondary steel per background dataset. Zinc is treated with its own specific LCA record due to coating application.

Module A2 covers inbound transportation of raw materials to the Walraven Czech Republic facility. Transport modeling follows EN 15804+A2 conventions using a standard 50% load factor. Main components like HD Clamp SSt are transported approximately 600 km by truck. Zinc plating services occur 100 km from the plant. Transport emissions are modeled using Ecoinvent v3.6 with the 0001-tra&Transport, vrachtwagen reference.

Module A3 represents the production stage, covering all on-site manufacturing processes at Walraven Czech Republic using 2023/2024 primary energy and process data. Electricity is drawn from the local Czech low-voltage grid and contributes significantly to zinc treatment processes. Lubricating oil, argon, and $CO_2$ are used in the manufacturing line. Steel scrap from production is internally recycled. Packaging, auxiliary inputs, and waste are all accounted for. Capital goods are excluded under the EN15804+A2 cutoff criteria.

Module A4 accounts for transport from the production site to installation. A standard 150 km one-way distance is assumed, with a 50% truck load factor. Emissions are calculated using Ecoinvent v3.6 truck transport records from NMD v3.8.

Module A5 considers the clamp's installation process. Manual installation assumes 5% material loss from handling inefficiencies. No energy is required during installation. Installation waste includes zinc-coated steel, which is modeled for waste processing: 5% is landfilled (100 km transport distance assumed). No plastic or rubber components are present in this product. All assumptions follow Bepalingsmethode v1.2 (2025) standards.

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% |

Module C1 assumes that the Walraven Heavy Duty Clamp Stainless M12 98–106mm is manually deconstructed at end-of-life without any energy input. Module C2 models the transportation of waste materials, with steel and zinc sent 50 km to recycling facilities.

Module C3 addresses waste treatment, assuming 100% recycling for both steel and zinc with appropriate sorting. Emissions are modeled using NMD v3.8 and Ecoinvent v3.6 datasets, with steel referenced via 0315-reC&Sorteren en persen oud ijzer and zinc modeled using applicable waste zinc and landfill data.

Module C4 covers final disposal, where 5% of steel and zinc are assumed to be sent to landfill, referencing 0253-sto&Stort staal for steel and 0248-sto&Stort koper, lood, verzinkt staal, zink for zinc.

Module D evaluates the environmental benefits from recycling and material substitution. Steel is credited with a 44.8% substitution efficiency, calculated as the difference between 95% recycling and 50.2% secondary content already present. Zinc is modeled with 95% recycling, and the corresponding environmental credit is applied. As there are no plastics or rubber components, incineration-based energy recovery does not apply.

This modeling adheres to EN 15804+A2:2019 + AC:2021 and the Dutch Bepalingsmethode v1.2 (2025), following the modular LCA methodology with site-specific operational data from 2023/2024. Results are reported using the Environmental Cost Indicator (MKI) and include a full breakdown of all life cycle stages.

## 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

## REFERENCES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