



**Environmental
Product
Declaration**

According to EN15804+A2 (+indicators A1)



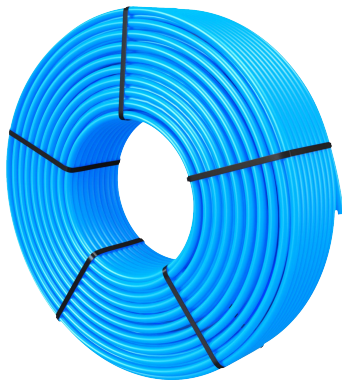
This declaration is for:

**Armaturjonsson Gulvvarmerør PE-RT,
diameter range 10-20 mm**

Provided by:

MAGNUM Heating B.V.

Armaturjonsson 



program operator

Stichting MRPI®

publisher

Stichting MRPI®

www.mrpi.nl

MRPI® registration

1.1.00554.2024

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13-6-2029



COMPANY INFORMATION

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PRODUCT

Armaturjonsson Gulvvarmerør, PE-RT,
diameter range 10-20 mm.

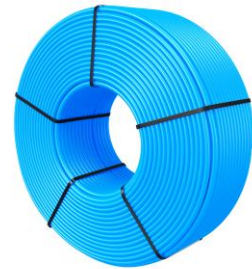
DECLARED UNIT/FUNCTIONAL UNIT

1 kg of pipe.

DESCRIPTION OF PRODUCT

Armaturjonsson Gulvvarmerør is developed for use in hot and cold water systems, floor and wall heating/cooling and ceiling cooling. The MAGNUM Tube is produced in a diameter range of 10-20 mm.

VISUAL PRODUCT



MRPI® REGISTRATION

1.1.00554.2024

DATE OF ISSUE

13-6-2024

EXPIRY DATE

13-6-2029

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Gert-Jan Vroege, Eco Intelligence. The LCA study has been done by Benthe Vermaas and R.A. Kraaijenbrink. LBP|SIGHT. The certificate is based on an LCA-dossier according to EN15804+A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPD's 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.

MORE INFORMATION

<https://www.armaturjonsson.no/produkter/vannb%C3%A5ren-gulvvarme/armaturjonsson-gulvvarmer%C3%B8r/armaturjonsson-gulvvarmer%C3%B8r>

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043 GR
Amsterdam

DEMONSTRATION OF VERIFICATION

CEN standard EN15804 serves as the core PCR(a)

Independent verification of the declaration an data according to EN15804+A2 (+indicators A1)

internal: external: x

Third party verifier: Gert-Jan Vroege, Eco Intelligence

[a] PCR = Product Category Rules

Ing. L. L. Oosterveen MSc. MBA
Managing Director MRPI

DETAILED PRODUCT DESCRIPTION

Armaturjonsson Gulvvarmerør is an underfloor heating tube made of PE-RT, developed for use in hot and cold water systems, floor and wall heating/cooling and ceiling cooling. It has a calculated life span of at least 50 years under normal conditions of use. Armaturjonsson Gulvvarmerør can be used in a temperature range from 5°C to 80°C. Short-term peak loads of up to 95°C at a maximum internal hydrostatic overpressure of 6 bar can be withstood without any problems.

Production processes

The five layered PE-RT tubes are made from PE granulate, EVOH and adhesive. The production processes of the tubes require electricity, heat and water usage. The tubes are packed in PE foil and placed on pallets for transport.

Technical data and certification

The technical data of the MAGNUM Tube are given in the table below. Armaturjonsson Gulvvarmerør has KOMO, MPA and SKZ certification.

| Technical property | Value | Unit | Standard |
|---|----------|-------------------|------------|
| Density | 0,933 | g/cm ³ | ASTMD-792 |
| Linear expansion coefficient 20°C – 70°C | 0,19 | mm/mK | DIN53752 A |
| Coefficient of thermal conductivity at 60°C | 0,4 | Watt/mK | DIN52612-1 |
| Deflection point (Vicat) | 122 | °C | ASTMD-1525 |
| Maximum elongation to failure | >800 | % | ISO527-2 |
| Bending radius | 5 | x Diameter | |
| Oxygen density | EVOH low | | DIN4726 |

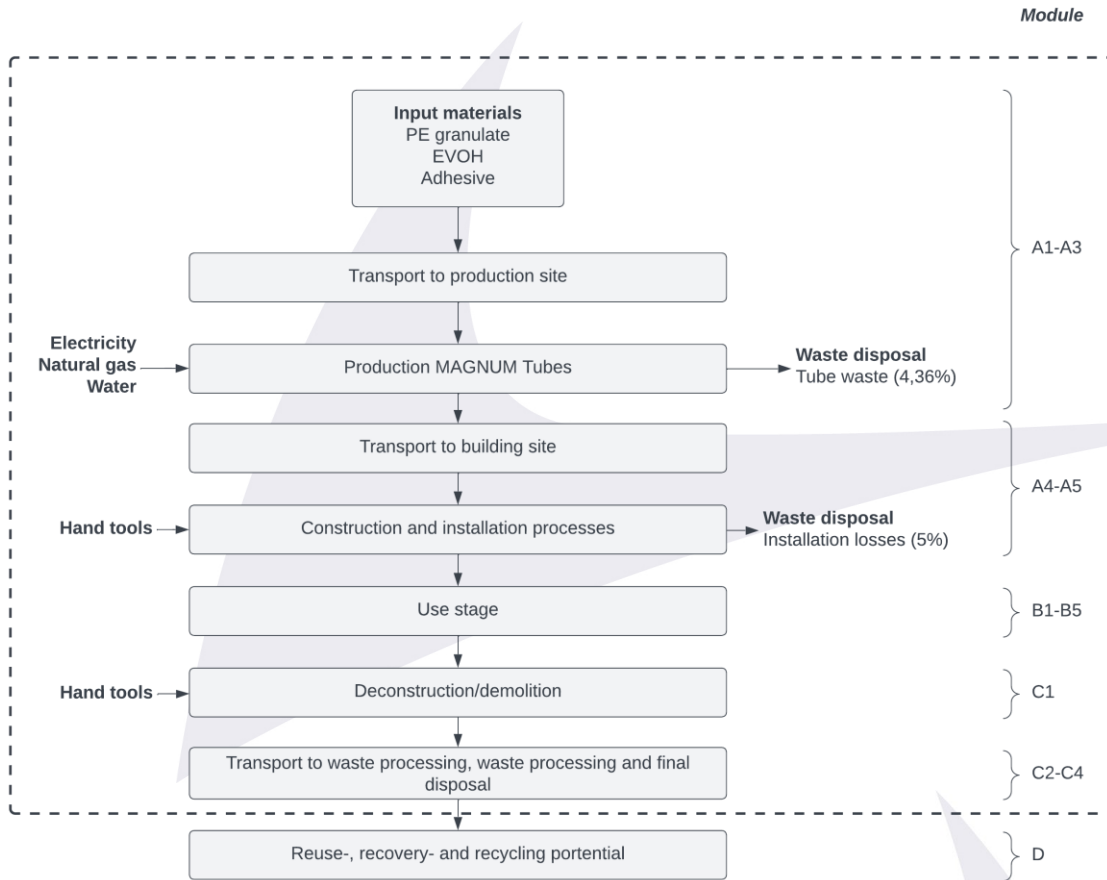
| Component (> 1%) | (%) |
|---|-----|
| Polyethylene Raised Temperature (PE-RT) | 88% |
| Adhesive | 6% |
| Ethylene Vinyl Alcohol (EVOH) | 6% |

SCOPE AND TYPE

This EPD is based on a Cradle-to-Grave LCA of Armaturjonsson Gulvvarmerør underfloor heating tubes, produced in a single MAGNUM production site in Tholen. Armaturjonsson Gulvvarmerør are installed in the Netherlands and at its end-of-life, it is treated according to the Dutch end-of-life scenarios. As a result, the EPD is representative for the Dutch market.

Company-specific data for the production stage has been collected by Magnum Projectservices B.V. The LCI data has been evaluated by the LCA-practitioner and checked by the EPD verifier. Generic data has been used for the background processes, originating from the Ecoinvent 3.6 Cut-off database. For the calculation of the LCA results, the software program SimaPro 9.5.0.0 has been used.

| PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USER 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 | X | X | X | X | X | ND | ND | X | X | X | X | X |
| X= Modules Assessed | | | | | | | | | | | | | | | | |
| ND= Not Declared | | | | | | | | | | | | | | | | |



REPRESENTATIVENESS

The data used for the LCA are representative for the production of Armaturjonsson Gulvarmerør, manufactured by MAGNUM Heating B.V. in Netherlands.

ENVIRONMENTAL IMPACT per 1 kg of pipe (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. | | | | 8,86 E-05 | 5,39 E-07 | 4,54 E-06 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 4,79 E-07 | 5,10 E-07 | 2,37 E-08 | -4,41 E-07 |
| GWP | kg CO2 eq. | | | | 5,14 E+00 | 2,11 E-02 | 3,94 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,87 E-02 | 2,47 E+00 | 2,62 E-02 | -1,50 E+00 |
| ODP | Kg CFC11 eq. | | | | 5,53 E-07 | 3,74 E-09 | 2,86 E-08 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 3,32 E-09 | 5,86 E-09 | 5,47 E-10 | -1,75 E-07 |
| POCP | Kg ethene eq. | | | | 3,62 E-03 | 1,27 E-05 | 1,85 E-04 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,13 E-05 | 1,15 E-05 | 5,95 E-06 | -2,20 E-04 |
| AP | kg SO2 eq. | | | | 1,88 E-02 | 9,27 E-05 | 9,79 E-04 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 8,24 E-05 | 2,59 E-04 | 1,47 E-05 | -1,02 E-03 |
| EP | kg (PO4) 3- eq. | | | | 3,05 E-03 | 1,82 E-05 | 1,63 E-04 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,62 E-05 | 9,46 E-05 | 5,97 E-06 | -1,57 E-04 |

Toxicity indicators for Dutch market

| | | | | | | | | | | | | | | | | | | | |
|-------|-----------|--|--|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----|----|--------------|--------------|--------------|--------------|---------------|
| HTP | kg DCB-Eq | | | | 1,54 E+00 | 8,88 E-03 | 8,32 E-02 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 7,89 E-03 | 7,20 E-02 | 2,13 E-03 | -8,21 E-02 |
| FAETP | kg DCB-Eq | | | | 4,32 E-02 | 2,59 E-04 | 3,77 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,30 E-04 | 2,70 E-02 | 2,16 E-03 | -8,77 E-04 |
| MAETP | kg DCB-Eq | | | | 1,46 E+02 | 9,32 E-01 | 9,73 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 8,28 E-01 | 4,00 E+01 | 2,16 E+00 | -3,64 E+00 |
| TETP | kg DCB-Eq | | | | 6,80 E-03 | 3,14 E-05 | 3,50 E-04 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,79 E-05 | 8,45 E-05 | 3,80 E-06 | -2,72 E-04 |
| ECI | euro | | | | 0,53 | 0,00 | 0,03 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | ND | ND | 0,00 | 0,00 | 0,14 | 0,00 | -0,09 |
| ADPF | kg Sb eq. | | | | 5,81 E-02 | 1,55 E-04 | 2,94 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,38 E-04 | 1,65 E-04 | 2,55 E-05 | -1,38 E-02 |

- 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 expressed in [kg Sb-eq.]

ENVIRONMENTAL IMPACT per 1 kg of pipe (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. | | | | 5,17 E+00 | 2,13 E-02 | 4,58 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,89 E-02 | 2,47 E+00 | 3,06 E-02 | -1,52 E+00 |
| GWP-fossil | kg CO2 eq. | | | | 5,25 E+00 | 2,13 E-02 | 4,00 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,89 E-02 | 2,47 E+00 | 3,06 E-02 | -1,52 E+00 |
| GWP-biogenic | kg CO2 eq. | | | | -8,16 E-02 | 9,82 E-06 | 5,82 E-02 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 8,72 E-06 | 6,69 E-03 | 2,37 E-05 | 9,46 E-04 |
| GWP-luluc | kg CO2 eq. | | | | 1,76 E-03 | 7,79 E-06 | 9,00 E-05 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 6,92 E-06 | 1,43 E-05 | 1,09 E-06 | -7,22 E-05 |
| ODP | kg CFC11 eq. | | | | 6,73 E-07 | 4,69 E-09 | 3,48 E-08 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 4,17 E-09 | 6,11 E-09 | 6,84 E-10 | -1,98 E-07 |
| AP | mol H+ eq. | | | | 2,42 E-02 | 1,23 E-04 | 1,26 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,10 E-04 | 3,64 E-04 | 1,93 E-05 | -1,32 E-03 |
| EP-freshwater | kg PO4 eq. | | | | 7,32 E-05 | 2,15 E-07 | 3,74 E-06 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,91 E-07 | 6,09 E-07 | 3,97 E-08 | -1,90 E-06 |
| EP-marine | kg N eq. | | | | 7,00 E-03 | 4,35 E-05 | 3,72 E-04 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 3,86 E-05 | 1,61 E-04 | 1,19 E-05 | -3,97 E-04 |
| EP-terrestrial | mol N eq. | | | | 7,74 E-02 | 4,79 E-04 | 4,11 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 4,26 E-04 | 1,74 E-03 | 7,10 E-05 | -4,49 E-03 |
| POCP | kg NMVOC eq. | | | | 2,50 E-02 | 1,37 E-04 | 1,31 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,22 E-04 | 4,23 E-04 | 2,71 E-05 | -1,42 E-03 |
| ADP-minerals & metals | kg Sb eq. | | | | 8,86 E-05 | 5,39 E-07 | 4,54 E-06 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 4,79 E-07 | 5,10 E-07 | 2,37 E-08 | -4,41 E-07 |
| ADP-fossil | MJ, net calorific value | | | | 1,20 E+02 | 3,21 E-01 | 6,09 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,85 E-01 | 3,06 E-01 | 5,24 E-02 | -2,54 E+01 |
| WDP | m3 world eq. Deprived | | | | 1,99 E+00 | 1,15 E-03 | 1,01 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,02 E-03 | 1,08 E-02 | 2,24 E-03 | -1,11 E-01 |

- GWP-total = Global Warming Potential total
- GWP-fossil = Global Warming Potential fossil fuels
- GWP-biogenic = Global Warming Potential biogenic
- GWP-luluc = Global Warming Potential land use and land use change
- ODP = Depletion potential of the stratospheric ozone layer
- AP = Acidification Potential, Accumulated 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 [2]
- ADP-fossil = Abiotic Depletion for fossil resources potential [2]
- WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

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 experienced with the indicator.

ENVIRONMENTAL IMPACT per 1 kg of pipe (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 incidence | | | | 3,10 E-07 | 1,91 E-09 | 1,60 E-08 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,70 E-09 | 1,74 E-09 | 3,63 E-10 | -4,63 E-09 |
| IRP | kBq U235 eq. | | | | 2,26 E-01 | 1,34 E-03 | 1,16 E-02 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,19 E-03 | 7,10 E-04 | 2,05 E-04 | -8,31 E-03 |
| ETP-fw | CTUe | | | | 5,38 E+01 | 2,86 E-01 | 2,86 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,54 E-01 | 2,22 E+00 | 6,40 E-02 | -2,25 E+00 |
| HTP-c | CTUh | | | | 1,85 E-09 | 9,28 E-12 | 1,12 E-10 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 8,24 E-12 | 1,05 E-10 | 1,48 E-12 | -1,05 E-10 |
| HTP-nc | CTUh | | | | 5,55 E-08 | 3,13 E-10 | 3,06 E-09 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,78 E-10 | 3,77 E-09 | 3,78 E-11 | -1,68 E-09 |
| SQP | ---- | | | | 4,55 E+01 | 2,78 E-01 | 2,33 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 2,47 E-01 | 9,35 E-02 | 1,24 E-01 | -3,55 E+00 |

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 [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 experienced with the indicator.

OUTPUT FLOWS AND WASTE CATEGORIES per 1 kg of pipe (A1 and A2)

| | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|------|------|----|----|----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----|----|--------------|--------------|--------------|--------------|---------------|
| HWD | kg | | | | 1,17 E-04 | 8,13 E-07 | 6,09 E-06 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 7,22 E-07 | 2,52 E-06 | 7,96 E-08 | -3,23 E-05 |
| NHWD | kg | | | | 2,65 E+00 | 2,03 E-02 | 1,53 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,81 E-02 | 2,43 E-02 | 2,09 E-01 | -1,14 E-02 |
| RWD | kg | | | | 3,17 E-04 | 2,11 E-06 | 1,62 E-05 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 1,87 E-06 | 7,57 E-07 | 3,11 E-07 | -1,24 E-05 |
| CRU | kg | | | | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 |
| MFR | kg | | | | 3,90 E-04 | 0,00 E+00 | 2,49 E-03 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 |
| MER | kg | | | | 3,64 E-02 | 0,00 E+00 | 8,86 E-02 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 0,00 E+00 | 8,35 E-01 | 0,00 E+00 | 0,00 E+00 |
| EEE | MJ | | | | 2,73 E-01 | 0,00 E+00 | 4,53 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 0,00 E+00 | 6,23 E+00 | 0,00 E+00 | 0,00 E+00 |
| ETE | MJ | | | | 4,70 E-01 | 0,00 E+00 | 7,81 E-01 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | 0,00 E+00 | ND | ND | 0,00 E+00 | 0,00 E+00 | 1,07 E+01 | 0,00 E+00 | 0,00 E+00 |

HWD = Hazardous Waste Disposed

RWD = Radioactive Waste Disposed

MFR = Materials for recycling

EEE = Exported Electrical Energy

NHWD = Non Hazardous Waste Disposed

CRU = Components for reuse

MER = Materials for energy recovery

ETE = Exported Thermal Energy

RESOURCE USE per 1 kg of pipe (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 | | | | 1,74 E-02 | 0E+00 | 9E-04 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| PERM | MJ | | | | 0,00 E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| PERT | MJ | | | | 2,91 E+00 | 4E-03 | 1E-01 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 4E-03 | 1E-02 | 9E-04 | -7E-01 |
| PENRE | MJ | | | | 5,71 E+00 | 0E+00 | 3E-01 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| PENRM | MJ | | | | 4,32 E+01 | 0E+00 | 2E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| PENRT | MJ | | | | 1,29 E+02 | 3E-01 | 7E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 3E-01 | 3E-01 | 6E-02 | -3E+01 |
| SM | kg | | | | 1,19 E-04 | 0E+00 | 6E-06 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| RSF | MJ | | | | 0,00 E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| NRSF | MJ | | | | 0,00 E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| FW | m3 | | | | 3,67 E-02 | 4E-05 | 2E-03 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 3E-05 | 4E-04 | 5E-05 | -1E-03 |

PERE = Use of renewable energy excluding renewable primary energy resources

PERM = Use of renewable 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

NRSF = Use of non-renewable secondary fuels

FW = Use of net fresh water

BIOGENIC CARBON CONTENT per 1 kg of pipe (A2)

| | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|-------|------|----|----|----|---------------|-------|-------|-------|-------|-------|-------|-------|----|----|-------|-------|-------|-------|-------|
| BBCpr | kg C | | | | 0,00 E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 |
| BCCpa | kg C | | | | -8,16 E-02 | 1E-05 | 6E-02 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | 0E+00 | ND | ND | 0E+00 | 9E-06 | 7E-03 | 2E-05 | 9E-04 |

BBCpr = Biogenic carbon content in product

BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

The reference year of this study is 2022-2023. The LCA was carried out in accordance with the requirements and guidelines of the NMD "Bepalingsmethode Milieuprestatie Bouwwerken" (Environmental Performance Assessment Method for Construction Works) (version 1.1, March 2022) and the NMD-Verification protocol (version 1.1, May 2022). The NMD-Assessment method is based on ISO 14040 - ISO14044 and NEN-EN 15804:2012 + A2 (2019).

Allocation

Since it's impossible to gather individual energy consumption data for each product manufactured in the plant, allocation methods are employed. These allocations rely on the annual production rate and are executed with high accuracy and precision.

To determine the values per 1 kg of the considered product, the total product weight per annual production is taken into account. As the factory manufactures various types of pipes, of which the production processes are similar, the annual production percentages are utilized for allocation purposes. This involves allocating the annual total energy consumption (both heat and electricity), water usage, and waste generation per product based on the ratio of the declared product's annual production to the factory's total annual production. Due to the fixed formulation of the product, there's no need to allocate raw materials considering the total annual production.

Cut-off

In line with paragraph 6.3.6 of the EN15804:A2, all significant input and output streams must be included in the calculations.

- A cut-off process may not contribute to more than 1% of the energy usage and may not exceed 1% of the mass. Processes excluded from the calculations may not contribute to more than 5% of the total energy usage or total mass.
- The sum of the processes excluded from the calculations, may not contribute to more than 5% of the total energy usage or total mass.

In line with EN 15804 the following processes are not considered within the system boundaries of this LCA:

- Overhead processes, like office departments, personal transportation, etc.
- Production, maintenance and the end-of-life stage of capital goods like buildings, machinery, etc.
- The optional material content of pigment, due to the negligible mass contribution <0,3%. The mass contribution of the pigment is distributed proportionally to the other input materials.

It is not to be expected for the above-mentioned processes to contribute significantly to the environmental profile of the MAGNUM tubes.

SENARIOS AND ADDITIONAL TECHNICAL INFORMATION

A1-A3 - Production

The five layered PE-RT tubes are made from PE granulate, EVOH and adhesive. The production processes of the tubes require electricity, heat and water usage. The tubes are packed in PE foil and placed on pallets for transport.

A4 - Transport to building site

In line with the Bepalingsmethode, the MAGNUM Tubes are transported by freight lorry and cover a distance of 150 km.

A5 - Installation

It is assumed that no impacts are related to the installation processes of the product, as the MAGNUM Tubes are installed manually. In accordance with the Bepalingsmethode, there is a material loss of 5% during this stage. The packaging materials are processed as waste in this stage in accordance with the prescribed set of scenario values for the end-of-life stage by the Bepalingsmethode.

B1-B5 - Use

There are no emissions or environmental impacts during the use stage. The use stage is declared as '0'.

C1 - Demolition

It is assumed that no impacts are related to the demolition of the product, as the MAGNUM Tubes are dismantled manually.

C2-C4 - Transport, processing and disposal EoL

The waste in this stage is also processed by the set of scenario values for the end-of-life-stage, as prescribed by the Bepalingsmethode. Thereby, 80% is incinerated and 20% is sent to landfill.

Module D - Loads and benefits beyond the system boundaries

Due to the incineration processes at the end-of-life, 80% of the MAGNUM Tubes are converted into energy.

The recycling/incineration loads and benefits, after reaching end-of-waste, of the losses during construction and that of the packaging materials (A5) are also included in module D.

Armatuurjonsson Gulvvarmerør dimensions

Armatuurjonsson Gulvvarmerør is manufactured in seven dimension variations. The mass distribution of the input materials differs slightly under these dimension variations. The maximal deviation per impact category due to these variations is below 4%. The environmental profile in this EPD is based on the worst-case assumption. This EPD is thereby representative of all seven dimensions manufactured by MAGNUM. To obtain the environmental profile of a meter of Armatuurjonsson Gulvvarmerør with a specific dimension, multiply the environmental profile in this EPD by the mass per meter tube in kg listed in the table below.

| MAGNUM Tube dimensions | Mass per meter tube (kg) |
|------------------------|--------------------------|
| 10 x 1,3 mm | 0,041 |
| 12 x 1,5 mm | 0,061 |
| 14 x 2 mm | 0,076 |
| 16 x 2 mm | 0,089 |
| 17 x 2 mm | 0,095 |
| 18 x 2 mm | 0,101 |
| 20 x 2 mm | 0,114 |

DECLARATION OF SVHC

The product does not contain materials listed in the "Candidate list of Substances of Very High Concern for authorization".

REFERENCES

- [1] The NMD "Bepalingsmethode Milieuprestatie Bouwwerken" (Environmental Performance Assessment Method for Construction Works) (version 1.1, March 2022) and the NMD-Verification protocol (version 1.1, May 2022).
- [2] NEN-EN 1584 Duurzaamheid van bouwwerken - Milieuverklaringen van producten - Basisregels voor de productgroep bouwproducten;
- [3] ISO, 2006. "Environmental management. Life cycle assessment - Principles and framework". ISO 14040:2006;
- [4] ISO, 2006. "Environmental management. Life cycle assessment – Requirements and Guidelines". ISO 14044:2006;
- [5] International Organization for Standardization, ISO/TR 14025, "Environmental labels and declarations – Type III environmental declarations", ISO/TR 14025:2000.

REMARKS

None.