

Environmental Product Declaration

 **EPD**®
THE INTERNATIONAL EPD® SYSTEM



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Resilient seated gate valves with PE ends for gas

Multiple product EPD based on average results of the product group
AVK International A/S

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|--------------------------|---|
| Programme: | The International EPD® System, www.environdec.com |
| Programme operator: | EPD International AB |
| EPD registration number: | S-P-12651 |
| Publication date: | 2024-04-30 |
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

| | |
|-------------------|---|
| Programme: | The International EPD® System |
| Address: | EPD International AB Box 210 60 SE-100 31 Stockholm Sweden |
| Website: | www.environdec.com |
| E-mail: | info@environdec.com |

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|---|
| Accountabilities for PCR, LCA and independent, third-party verification |
| Product Category Rules (PCR) |
| CEN standard EN 15804:2012+A2:2019 serves as the Core Product Category Rules (PCR) |
| Product Category Rules (PCR): <i>PCR 2019:14 Construction Products, UN CPC code: 412</i> |
| PCR review was conducted by: <i>The Technical Committee of the International EPD® System</i> |
| Life Cycle Assessment (LCA) |
| LCA accountability: <i>Jesper Kokborg Lassen, EnergySolution A/S, www.EnergySolution.dk</i> |
| Third-party verification |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by individual verifier Third-party verifier: Vito D'Incognito; Take Care International Approved by: The International EPD® System |
| Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: AVK International A/S

Contact: Niels Jørgen Hedegaard, +45 87 54 21 00.

Description of the organisation: AVK International A/S is part of the AVK Group, a privately owned Danish company employing +4,800 people worldwide. At AVK International A/S, we manufacture valves and accessories, and thanks to additional product types from other AVK factories, we are able to offer a wide selection of high-quality products to the markets in our geographical region covering Continental Europe, Central Asian and Caucasian countries and North Africa.

Product-related or management system-related certifications: AVK International is certified for: ISO 9001, ISO 14001, ISO 45001, ISO 50001, ISO 29001.

Name and location of production site(s): AVK International A/S, Smedeskovvej 40, 8464, Galten, Denmark

Product information

Product name: Resilient seated gate valves with PE ends for gas.

Product identification: Resilient seated gate valves with PE ends for gas

Product description: AVK International’s resilient seated gate valves with PE ends for gas are designed for installation both above- and below ground, with their primary function being the facilitation of the distribution of gas and other hydrocarbons. The valves are part of the intermediate distribution system utilized in combination with the piping system. The valves within this study do not embody any motorized or electric components. AVK International’s valves require no maintenance or inspection once installed and are only assumed to need repair/replacement if exterior damage is inflicted upon them.

Geographical scope: Global.

LCA information

Declared unit: 1 “average” kg of Resilient seated gate valve with PE ends for gas
 Number of declared results: 1 that declares the results for the average of the declared product group.
 Reference service life: Not applicable
 Time representativeness: Data input was collected in November 2023 - January 2024, based on data related to the fiscal year 2022 - 2023. All generic data refer to the Ecoinvent v3.9.1 database.
 Database(s) and LCA software used: Ecoinvent v3.9.1, SimaPro v9.5.
 Description of system boundaries: Cradle to gate, with options (A1-A3, A4, A5, C1-C4, D)
 Product series and size variants included: The EPD is a group EPD where the declared unit is calculated to an average based on valve types, and size range that valves type embody. The average represents a mean average valve calculated from the entire size range of a type collection. I.e., the average material composition applied for the declared unit is based on a mean average for all the types and sizes included. A screening was conducted on the sizes DN65, DN250, and DN400 for select product groups to ensure linearity in materiality.

| Product grouping | Included product types | Size Range | Picture |
|------------------|------------------------|---|---------|
| Series 36 – Gas | 36/78 36/90 | DN65 DN80 DN100 DN125 DN150 DN200 DN250 DN300 DN400 | |

The following information describes the scenarios in the different modules of the EPD.

Module A1-A3 = Sourcing of raw materials from the world, primarily CN by mass, and production in DK. Primary shipping and transport contributors are tied to China.

Module A4 = An average of 80 km for the transport to the assembly place. Numbers are based on the average for the fiscal year of 2022.

Module A5 = Installation is performed underground by excavation. The average installation depth is 1.6 m below the earth's surface. Valve ends in PE are joined together by electro-fusion. Packaging waste is sent for waste treatment.

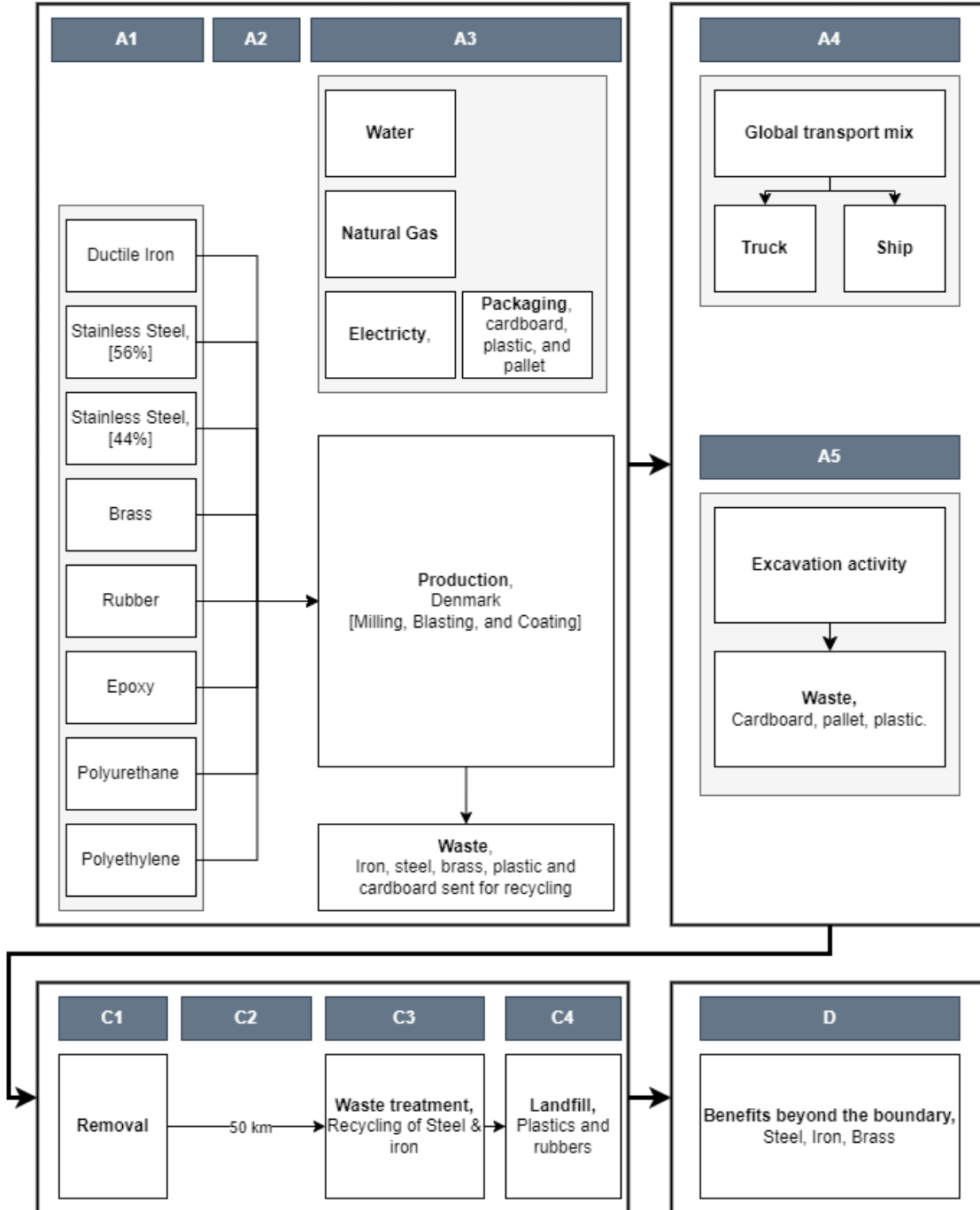
Module C1 = Removal of the valve by excavation handled by assumed professionals.

Module C2 = Transportation from dismantling site to waste treatment facility is 270 km.

Module C3, and C4 = Waste treatment of the product. The product containing 77%-83% metals is assumed to be waste treated as a collective unit. The remaining 17%-23% are assumed to be sent for landfill as a conservative approach in the applied global scenario.

Module D = Benefits beyond the system are tied to the recycling of metals, and the subsequent substitution of iron cf. Annex D in 15804+A2.

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

| | Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Resource recovery stage |
|----------------------|---------------------|-----------|---------------|----------------------------|---------------------------|-----------|-------------|---------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|------------------------------------|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| Module | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules declared | X | X | X | X | X | MN D | MN D | MN D | MN D | MN D | MN D | MN D | X | X | X | X | X |
| Geography | GLO | GLO | DK | GLO | GLO | | | | | | | | GLO | GLO | GLO | GLO | GLO |
| Specific data used | >90% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | -2/ +6% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | 0% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

Content information

The resilient seated gate valves consist of the following main components:

- Body and bonnet of ductile iron with fusion-bonded epoxy coating
- Wedge of ductile iron fully vulcanized with EPDM rubber
- Stem of stainless steel
- Wedge nut and thrust collar of brass
- Bearing of polyamide and seals of EPDM rubber
- Pipe ends of polyethylene

The composition of a valve, per declared unit is as follows:

| Product Components | Gate valve for Gas |
|---------------------|--------------------|
| Stainless steel | 5.04E-02 |
| Carbon Steel | 1.21E-01 |
| Ductile Iron | 6.32E-01 |
| Polyamide | 4.14E-04 |
| Brass | 1.84E-02 |
| EPDM | 1.84E-02 |
| PE Coating | 3.48E-02 |
| PUR Coating | 0.00E+00 |
| PE Plastic | 1.33E-01 |
| TOTAL | 1.00E+00 |
| Packaging materials | Weight, kg |
| Pallet | 1.11E-05 |
| Cardboard | 1.42E-05 |
| Plastic (PE) | 1.10E-05 |
| TOTAL | 3.63E-05 |

| Dangerous substances from the candidate list of SVHC for Authorisation | EC No. | CAS No. | Weight-% per functional or declared unit |
|--|-----------|-----------|--|
| Lead | 231-100-4 | 7439-92-1 | <0.1 % |

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|---|-----------|----------|----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-fossil | kg CO2 eq. | 2.31E+00 | 2.30E-02 | 1.99E-02 | 1.73E-02 | 4.64E-02 | 4.44E-03 | 1.44E-01 | -6.50E-01 |
| GWP-biogenic | kg CO2 eq. | -2.41E-02 | 1.24E-05 | 2.44E-02 | 5.83E-06 | 1.56E-05 | 7.59E-06 | 1.80E-06 | 8.99E-04 |
| GWP-luluc | kg CO2 eq. | 1.87E-03 | 1.21E-05 | 8.31E-06 | 2.41E-06 | 2.39E-05 | 1.03E-05 | 6.06E-07 | -4.61E-04 |
| GWP-total | kg CO2 eq. | 2.28E+00 | 2.30E-02 | 2.00E-02 | 1.73E-02 | 4.64E-02 | 4.46E-03 | 1.44E-01 | -6.50E-01 |
| ODP | kg CFC 11 eq. | 6.10E-08 | 4.47E-10 | 3.25E-10 | 2.94E-10 | 6.93E-10 | 7.56E-11 | 3.21E-11 | -1.24E-08 |
| AP | mol H+ eq. | 2.05E-02 | 1.36E-04 | 1.70E-04 | 1.56E-04 | 1.64E-04 | 2.66E-05 | 5.20E-05 | -2.67E-03 |
| EP-freshwater | kg P eq. | 1.28E-03 | 1.64E-06 | 2.52E-06 | 7.99E-07 | 3.76E-06 | 8.05E-07 | 1.53E-07 | -2.42E-04 |
| EP-marine | kg N eq. | 3.35E-03 | 3.67E-05 | 7.43E-05 | 7.18E-05 | 5.39E-05 | 9.14E-06 | 8.34E-05 | -6.20E-04 |
| EP-terrestrial | mol N eq. | 3.67E-02 | 3.95E-04 | 8.04E-04 | 7.80E-04 | 5.71E-04 | 9.70E-05 | 2.80E-04 | -6.51E-03 |
| POCP | kg NMVOC eq. | 1.35E-02 | 1.46E-04 | 2.40E-04 | 2.32E-04 | 2.21E-04 | 3.20E-05 | 1.44E-04 | -3.12E-03 |
| ADP-minerals&metals* | kg Sb eq. | 1.14E-04 | 6.23E-08 | 2.88E-08 | 7.83E-09 | 1.48E-07 | 1.41E-08 | 3.35E-09 | -2.36E-07 |
| ADP-fossil* | MJ | 3.57E+01 | 3.33E-01 | 2.69E-01 | 2.25E-01 | 6.52E-01 | 7.19E-02 | 2.05E-02 | -7.21E+00 |
| WDP* | m3 | 7.30E-01 | 1.48E-03 | 1.10E-03 | 5.59E-04 | 2.89E-03 | 1.57E-03 | 1.46E-04 | -8.03E-02 |
| Acronyms | 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 Exceedance; 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 Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption | | | | | | | | |

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Additional mandatory and voluntary impact category indicators

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-GHG ¹ | kg CO ₂ eq. | 2.32E+00 | 2.56E-02 | 3.59E-01 | 1.73E-02 | 4.65E-02 | 4.46E-03 | 1.44E-01 | -6.50E-01 |

The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|--|----------|----------|----------|----------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| PM | [Disease incidence] | 1.87E-07 | 1.18E+00 | 7.19E-01 | 4.33E-09 | 3.68E-09 | 4.77E-10 | 7.50E-08 | -6.40E-08 |
| IRP ² | [kBq U235 eq.] | 1.45E-01 | 1.13E+00 | 6.89E-01 | 1.54E-04 | 5.55E-04 | 1.62E-04 | 1.96E-05 | -1.86E-02 |
| ETP-fw ¹ | [CTUe] | 5.36E+01 | 9.70E-01 | 5.81E-01 | 2.08E-01 | 7.27E-01 | 7.72E-02 | 1.20E+00 | -5.81E+00 |
| HTP-c ¹ | [CTUh] | 4.43E-08 | 2.05E-11 | 1.88E-11 | 1.68E-11 | 4.19E-11 | 4.76E-12 | 4.93E-10 | -1.84E-08 |
| HTP-nc ¹ | [CTUh] | 6.07E-07 | 4.50E-10 | 1.65E-10 | 8.69E-11 | 9.36E-10 | 8.81E-11 | 2.19E-09 | -2.24E-07 |
| SQP ¹ | - | 9.90E+00 | 9.63E-01 | 5.77E-01 | 1.62E-02 | 3.89E-01 | 8.96E-02 | 5.25E-02 | -1.48E+00 |
| Caption | PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality | | | | | | | | |
| Disclaimers | ¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator. ² 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. | | | | | | | | |

Resource use indicators

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|------|----------|----------|-----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| PERE | MJ | 2.41E+00 | 4.44E-03 | 1.36E-02 | 1.87E-03 | 8.29E-03 | 2.54E-03 | 3.22E-04 | -3.05E-01 |
| PERM | MJ | 0.00E+00 | 0.00E+00 | -3.83E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PERT | MJ | 2.41E+00 | 4.44E-03 | 9.74E-03 | 1.87E-03 | 8.29E-03 | 2.54E-03 | 3.22E-04 | -3.05E-01 |
| PENRE | MJ | 2.68E+00 | 5.67E-03 | 1.72E-02 | 2.38E-03 | 8.62E-03 | 5.25E+00 | 3.06E-04 | -2.88E-01 |

¹ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

| | | | | | | | | | |
|----------|--|----------|----------|----------|----------|----------|----------|----------|---------------|
| PENRM | MJ | 3.30E+01 | 3.28E-01 | 2.52E-01 | 2.23E-01 | 6.43E-01 | 5.32E+00 | 2.02E-02 | - 6.92E+00 |
| PENRT | MJ | 3.57E+01 | 3.33E-01 | 2.69E-01 | 2.25E-01 | 6.52E-01 | 7.19E-02 | 2.05E-02 | - 7.21E+00 |
| SM | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 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 | 0.00E+00 | 0.00E+00 |
| NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW | m3 | 7.41E-01 | 1.47E-03 | 1.11E-03 | 5.68E-04 | 2.89E-03 | 1.57E-03 | 1.45E-04 | -8.14E-02 |
| Acronyms | PERE = Use of renewable primary energy excluding renewable primary energy resources 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 excluding non-renewable primary 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water | | | | | | | | |

Waste indicators

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| Hazardous waste disposed | kg | 2.27E-03 | 6.46E-06 | 2.64E-06 | 5.78E-07 | 1.21E-05 | 1.37E-06 | 4.48E-04 | -1.04E-04 |
| Non-hazardous waste disposed | kg | 7.22E-01 | 2.25E-02 | 6.89E-04 | 4.82E-04 | 3.16E-02 | 1.82E-01 | 1.09E-03 | -1.23E-01 |
| Radioactive waste disposed | kg | 3.67E-05 | 8.50E-08 | 2.56E-07 | 3.64E-08 | 1.32E-07 | 3.91E-08 | 4.73E-09 | -4.51E-06 |

Output flow indicators

| Results per 1 kg of resilient seated gate valve (Series 36 – Gas) | | | | | | | | | |
|---|------|----------|----------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| Components for re-use | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Material for recycling | kg | 4.79E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.12E-01 | 0.00E+00 | 0.00E+00 |
| Materials for energy recovery | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy, electricity | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

| | | | | | | | | | |
|--------------------------|----|----------|----------|----------|----------|----------|----------|----------|----------|
| Exported energy, thermal | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
|--------------------------|----|----------|----------|----------|----------|----------|----------|----------|----------|

Information on biogenic carbon content

| Biogenic carbon content | Unit | Value |
|---|------|----------|
| Biogenic carbon content in product | Kg C | 0.00E+00 |
| Biogenic carbon content in accompanying packaging | Kg C | 6.79E-03 |

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, medium voltage (production of transmission lines, in addition to direct emissions and losses in the grid) of applied electricity for the manufacturing process (A3). 27.7% of the electricity utilized in 2023 has been sourced AVK International's solar installations. Residual mix is sourced from <https://www.aib-net.org/facts/european-residual-mix> with statistics from 2022.

| Applied electricity grid | Unit | Value | CO2 eq/kWh | CO2- eq/kWh |
|--|---------|-------|------------|-------------|
| Danish residual mix, medium voltage | kWh/kWh | 0.733 | 0.628 | 0.475 |
| Solar installation covering production, 2023 | kWh/kWh | 0.277 | 0.0803 | |

Additional environmental information

Cut-off criteria:

The general rules apply for the exclusion of inputs and outputs in the LCA which complies with 15804:2012+A2:2019. 6.3.6. In cases of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that. The total neglected input flows, e.g., per module A1-A3, A4-A5, and B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5 % of energy usage and mass.

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Range/variability of LCIA results:

An analysis of possible variability between the sizes has been performed on the sizes DN60, DN200, and DN400 to assess linearity. There is generally no significant variability in the LCIA results. However, there are differences depending on size, to which the environmental impacts generally have the distribution of a bell curve, with the mean difference varying by 4% for the core environmental impact categories when comparing the normalized kg/valve of a DN65, DN250, and DN400 valve. The impact categories sensitive to size are the midsize valves, which show higher contributions per kg/valve due to the internal parts weighing more relative to the ductile iron utilized for housing.

References

General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14. Construction Products. 1.3.4

| | |
|----------------------------|---|
| ISO 14025:2010 | Environmental labels and declarations - Type III environmental declarations - Principles and procedures |
| ISO 14044:2006 | Environmental management - Life cycle assessment - Requirements and guidelines |
| EN 15804:2012+A2:2019 | Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products |
| ISO 21930:2007 | Sustainability in building construction - Environmental declaration of building products |
| SimaPro | 9.5, ecoinvent 3.9.1 - allocation. cut-off by classification database |
| Electricity Mix | https://www.aib-net.org/facts/european-residual-mix |
| Transport, Waste treatment | https://www.eebguide.eu/eeblog/?p=1636 |
| Eurostat, waste ferrous | https://ec.europa.eu/eurostat/databrowser/bookmark/353668d9-dbe1-40fb-9140-7279168e8707?lang=en |

Calorific value, natural gas, Energistyrelsen (tl. Danish Energy Agency) – 2019.

<https://hbemo.dk/haandbog-for-energikonsulenter-hb2019-gaeldende/bilag-4-energimaerkning-af-eksisterende-bygninger/vejledende-tekniske-bilag-og-tabeller/braendsel/braendvaerdier-og-co2-emissionsfaktorer>

