

## VSH Shurjoint

grooved  
fittings

ductile iron, painted



# Environmental Product Declaration

in accordance with  
ISO 14044, ISO 14040 and EN 15804

## 1 general information

### 1.1 note on this document

The original document was written in English, all other versions are a translation of the original document.

### 1.2 declaration holder

#### **Aalberts integrated piping systems B.V.**

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Aalberts integrated piping systems develops the most advanced integrated piping systems for distribution and control of liquids and gases. These systems are used in various markets such as industry, utility and residential construction. We offer fully integrated piping systems in valve, connection, fastening and piping technology. In close cooperation with our customers, we build the perfect integrated piping system that meets all their requirements. Our piping systems are easy to specify, install, check and maintain, saving you considerable time on preparation and installation. We meet the highest quality and industry standards required in our markets.

### 1.3 declared product

This document applies to the VSH Shurjoint ductile iron fittings listed in the appendix -chapter 6- of this document. Galvanized fittings or Stainless steel fittings are not covered in this declaration. A VSH Shurjoint elbow 90° model 7110 (2 x groove), 114.3 mm (DN100), painted orange, with article number 171100045001 has been used as a reference article. All LCA results are based on 1 kg of the reference article.

### 1.4 LCA standards

This EPD is generated according to the following standards and requirements of: NEN-EN ISO 14040 [1], NEN-EN ISO 14044 [2], NEN-EN ISO 14025 [3] and EN15804+A2:2019 [4]

### 1.5 calculation method

LCA standard: EN15804+A2 (2019)  
Database: Worldwide - Ecoinvent v 3.9.1  
Cut-Off  
PCR: CEN standard 15804 serves as the Core PCR

### 1.6 statement comparability EPD

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with the requirements in EN15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN15804 and if the background systems are not based on the same database.

### 1.7 verification statement

This EPD is a preliminary self-declared version and is in the process of getting externally verified.

### 1.8 EPD details

Version: 1.1  
Date of issue: 01/5/2025  
Author of LCA: Fabian Bruns  
Production data: 2023/2024  
EPD created with: LCA software  
Ecochain Helix | version 4.3.1

Hilversum, January 2025  
Aalberts integrated piping systems B.V.

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Roland Voermans  
CEO

## 2 product

### 2.1 description and application purpose

VSH Shurjoint is a high-quality grooved piping system product range that saves considerable installation time compared to welding, flanged, and threaded connections. It is less labour-intensive, safer, and cleaner. It delivers a consistent quality in all grooved joint connections. VSH Shurjoint is suitable for a wide range of applications, including heating, cooling, compressed air, sprinkler, and dry extinguishing lines. The range includes more than 6000 individual products, including couplings, fittings, grooved to flange adapters, valves, and mechanical outlets. Sizes range from ½" (DN15) to 104" (DN2600).

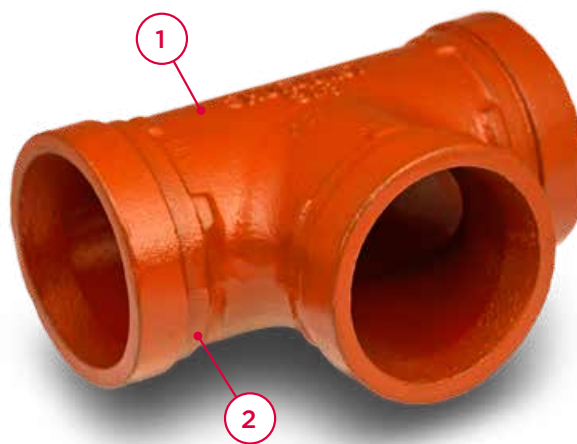
Grooved fittings and pipes are connected to each other by grooved, gasketed couplings. The coupling's 'key' engages with the pipe's or fitting's 'groove', compressing the coupling's gasket to create a seal within the grooved joint. The couplings are assembled with bolts and nuts. VSH Shurjoint couplings and fittings are available in ductile iron and stainless steel material. The couplings and fittings are finished with an orange, red, or black coating or are also offered with a galvanised coating.

#### materials

Ductile Iron Shurjoint components are made to ASTM A536 grade 65-45-12. This material provides the same or greater strength than forged or cast steel pipe materials, such as forged steel flanges – ASTM A105, steel valves – ASTM A216 WCB, forged steel pipe – ASTM A53 grade B, etc. For optimum performance, it is important that the correct gasket be used. Grooved couplings use various styles (shapes) of gaskets: standard, GapSeal, EP (End Protection) and FF (Fast-Fit) are examples. GapSeal gaskets are compatible with standard couplings and are interchangeable with standard gaskets. Other special types are not interchangeable with standard or GapSeal gaskets.

### 2.2 VSH Shurjoint fittings (orange & red)

VSH Shurjoint couplings are produced in our modern, automated factory in Taiwan. The VSH Shurjoint product range includes couplings, fittings, grooved to flange adapters, valves and mechanical outlets. Couplings are available in different styles and with different gaskets, to create an optimal connection, suited for the required application.



1. fitting body

2. groove

### 2.3 product composition

The reference article, VSH Shurjoint elbow 90°, model 7110 (2 x groove), 114.3 mm (DN100), painted orange, has the following composition:

|               |           |
|---------------|-----------|
| ductile iron: | 3080 gram |
| paint:        | 40 gram   |
| total circa:  | 3120 gram |

### 2.4 range and conversion factors

The life cycle assessment results in chapter 4 can be converted to other articles listed in the appendix of this document. This can be done by multiplying the results with the conversion factor for a specific product. For products and their corresponding conversion factors, see the appendix -chapter 6-.

## 3 life cycle assessment scope

### 3.1 system boundaries

This EPD can be regarded as a Cradle-to-Gate with options, A4-A5, C1-C4 and D. The following phases are considered not relevant for this product range: B

### 3.2 process flowchart

A simplified overview of the VSH Shurjoint ductile iron fitting production process flow



### 3.3 data quality

For module A1, specific data for product compositions as provided by the manufacturer are used. For module A2, transportation data of the raw materials used to the production site was collected. For module A3, energy consumption and waste production data was collected for production year 2023/2024. The used background processes are derived from Worldwide - Ecoinvent v 3.9.1 Cut-Off.

### 3.4 allocation

Allocation was carried out in accordance with the provisions of the EN15804. All manufacturing inputs (energy and auxiliary materials) were measured and assessed.

### 3.5 cut-off criteria

All relevant inputs and outputs - like emissions, energy and materials - have been taken into account in this LCA. In accordance with EN15804, the total neglected input flows per module does not exceed 5% of energy usage and mass.

### 3.6 assumptions and background information

**A1-A3:** For the raw material supply 100% of the materials on the bill of materials were modelled using data from suppliers when available or otherwise from the Ecoinvent database. Also included were waste and auxiliary materials like water, lubrication oil, bags and pallets. VSH Shurjoint products are manufactured in the Aipss factory, located in Pingtung, Taiwan. Specific transport distances of materials to Aalberts integrated piping systems from materials suppliers were used. This factory uses the national electricity mix for manufacturing the VSH Shurjoint products. Therefore the national electricity mix Taiwan was used for calculating the electricity consumption.

**A4-A5:** Transport from the factory in Pingtung, Taiwan, to the warehouse in Zeewolde, Netherlands, is done by Aalberts integrated piping systems and logistical partners. The main means of transport is by average {GLO} trucks or better performing engine and per container ship {GLO}. Transportation to customers within Europe from the warehouse in Zeewolde is done by logistical partners. The main means of transport in Europe is by Class Euro 5 trucks or better performing engine. The average transportation distance is calculated at 561 km. Installation uses an impact wrench or socket ratchet; the associated energy consumption is considered negligible.

**B1-B7:** A VSH Shurjoint fitting is designed for a lifetime of 50+ years of service. It does not need any maintenance, repair, replacement or refurbishment and has no operational water or energy use during its lifetime. This module was therefore not assessed (ND)

**C1-C4:** The piping system is assumed to be stripped as a whole from a building in the demolition process by means of diesel powered machines. The diesel modelled for the demolition process is 0.001L/Kg of VSH Shurjoint fitting.

The following transport distances were used; 50 km for waste separation, 50 km for recycling and 50 km for incineration or landfill by means of Class Euro 5 trucks or better performing engine. For building materials the values from the Nationale Milieu Database were used [5].

| material                      | recycling rate | incineration | landfill |
|-------------------------------|----------------|--------------|----------|
| ductile iron                  | 90%            |              | 10%      |
| ductile iron production waste | 100%           |              |          |
| paint (+ waste)               |                | 100%         |          |
| packaging foil                |                | 80%          | 20%      |
| wooden box                    |                | 100%         |          |
| remainder of product/waste    |                |              | 100%     |

**D:** Recycling rates described in Module C were used to calculate the benefits and loads beyond the system in module D

## 4 life cycle assessment results

The table below shows the results of a VSH Shurjoint elbow 90°, model 7110 (2 x groove), 114.3 mm (DN100), painted orange, with article number 171100045001 according to EN15804+A2 (2019). All LCA results are based on 1 kg of the reference article.

| impact category                                                                                            | unit                   | A1        | A2       | A3        | A1-A3     | A4       | C1       | C2       | C3        | C4       | D         | total            |
|------------------------------------------------------------------------------------------------------------|------------------------|-----------|----------|-----------|-----------|----------|----------|----------|-----------|----------|-----------|------------------|
| climate change (EN15804+A2)                                                                                | kg CO <sub>2</sub> eq  | 2,014     | 0,049    | 1,606     | 3,670     | 0,310    | 0,003    | 0,003    | 0,040     | 0,137    | -1,46E+00 | <b>2,697</b>     |
| climate change - fossil                                                                                    | kg CO <sub>2</sub> eq  | 2,108     | 0,049    | 1,608     | 3,765     | 0,309    | 0,003    | 0,003    | 0,040     | 0,045    | -1,48E+00 | <b>2,684</b>     |
| climate change - biogenic (EN15804+A2)                                                                     | kg CO <sub>2</sub> eq  | -1,20E-01 | 2,28E-05 | -2,46E-03 | -1,22E-01 | 7,45E-05 | 9,12E-07 | 1,18E-05 | -4,10E-04 | 0,092    | 0,016     | <b>-1,49E-02</b> |
| climate change - land use and LU change (EN15804+A2)                                                       | kg CO <sub>2</sub> eq  | 0,026     | 1,81E-05 | 0,001     | 0,027     | 1,83E-04 | 2,58E-07 | 1,71E-06 | 4,00E-05  | 5,13E-06 | 0,001     | <b>0,028</b>     |
| ozone depletion                                                                                            | kg CFC11 eq            | 5,01E-08  | 1,09E-08 | 2,20E-08  | 8,29E-08  | 4,01E-08 | 7,08E-10 | 5,56E-10 | 9,95E-10  | 3,23E-09 | -3,35E-08 | <b>9,50E-08</b>  |
| acidification                                                                                              | mol H <sup>+</sup> eq  | 0,010     | 2,86E-04 | 0,007     | 0,017     | 0,006    | 3,43E-05 | 1,25E-05 | 3,04E-04  | 9,93E-05 | -5,69E-03 | <b>0,018</b>     |
| eutrophication, freshwater                                                                                 | kg P eq                | 1,10E-04  | 4,98E-07 | 1,21E-04  | 2,31E-04  | 1,80E-06 | 1,19E-08 | 6,09E-08 | 1,24E-06  | 1,74E-07 | -5,26E-05 | <b>1,82E-04</b>  |
| eutrophication, marine                                                                                     | kg N eq                | 0,002     | 1,01E-04 | 0,001     | 0,003     | 0,002    | 1,51E-05 | 2,85E-06 | 6,93E-05  | 3,58E-05 | -1,04E-03 | <b>0,004</b>     |
| eutrophication, terrestrial                                                                                | mol N eq               | 0,021     | 0,001    | 0,011     | 0,034     | 0,017    | 1,66E-04 | 3,15E-05 | 7,90E-04  | 3,98E-04 | -1,22E-02 | <b>0,040</b>     |
| photochemical ozone formation                                                                              | kg NMVOC eq            | 0,010     | 3,17E-04 | 0,004     | 0,014     | 0,005    | 4,57E-05 | 1,35E-05 | 2,42E-04  | 1,16E-04 | -8,41E-03 | <b>0,011</b>     |
| resource use, minerals and metals                                                                          | kg Sb eq               | 3,83E-06  | 1,25E-06 | 8,25E-06  | 1,33E-05  | 1,99E-06 | 5,03E-09 | 1,01E-07 | 1,68E-06  | 3,02E-07 | -6,34E-07 | <b>1,68E-05</b>  |
| resource use, fossils                                                                                      | MJ                     | 24,084    | 0,744    | 21,614    | 46,441    | 4,110    | 0,045    | 0,081    | 0,450     | 0,265    | -1,02E+01 | <b>41,200</b>    |
| water use                                                                                                  | m <sup>3</sup> depriv. | 0,133     | 0,003    | 0,264     | 0,399     | 0,011    | 6,04E-05 | 0,002    | 0,006     | 0,005    | -2,83E-01 | <b>0,141</b>     |
| particulate matter                                                                                         | disease inc.           | 4,00E-07  | 4,43E-09 | 2,04E-08  | 4,24E-07  | 1,60E-08 | 9,07E-10 | 3,94E-10 | 4,38E-09  | 1,67E-09 | -8,51E-08 | <b>3,63E-07</b>  |
| ionising radiation                                                                                         | kBq U-235 eq           | 0,024     | 0,003    | 0,134     | 0,161     | 0,011    | 1,93E-04 | 1,28E-04 | 0,001     | 8,77E-04 | 0,026     | <b>0,200</b>     |
| ecotoxicity, freshwater                                                                                    | CTUe                   | 68,291    | 0,663    | 17,401    | 86,356    | 3,249    | 0,027    | 0,039    | 1,395     | 0,203    | -4,99E+01 | <b>41,343</b>    |
| human toxicity, cancer                                                                                     | CTUh                   | 8,52E-09  | 2,15E-11 | 4,12E-10  | 8,95E-09  | 1,59E-10 | 9,50E-13 | 1,46E-12 | 5,63E-11  | 6,35E-11 | -1,87E-10 | <b>9,04E-09</b>  |
| human toxicity, non-cancer                                                                                 | CTUh                   | 4,25E-08  | 7,26E-10 | 1,89E-08  | 6,21E-08  | 2,90E-09 | 2,33E-11 | 6,95E-11 | 1,99E-09  | 3,85E-10 | 2,90E-07  | <b>3,57E-07</b>  |
| land use                                                                                                   | Pt                     | 19,600    | 0,645    | 1,668     | 21,913    | 1,484    | 0,006    | 0,077    | 0,703     | 0,322    | -2,09E+00 | <b>22,415</b>    |
| use of renewable primary energy excluding renewable primary energy resources used as raw materials         | MJ                     | 2,967     | 0,011    | 0,648     | 3,626     | 0,045    | 2,65E-04 | 0,002    | 0,056     | 0,003    | 0,004     | <b>3,737</b>     |
| use of renewable primary energy resources used as raw materials                                            | MJ                     | 0         | 0        | 0         | 0         | 0        | 0        | 0        | 0         | 9,24E-04 | 0,303     | <b>0,304</b>     |
| total use of renewable primary energy resources                                                            | MJ                     | 2,967     | 0,011    | 0,648     | 3,626     | 0,045    | 2,65E-04 | 0,002    | 0,056     | 0,004    | 0,308     | <b>4,041</b>     |
| use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ                     | 25,127    | 0,778    | 23,213    | 49,119    | 4,301    | 0,047    | 0,082    | 0,473     | 0,188    | 0,253     | <b>54,462</b>    |
| use of non-renewable primary energy resources used as raw materials                                        | MJ                     | 0         | 0        | 0         | 0         | 0        | 0        | 0        | 0         | 0,087    | -1,08E+01 | <b>-1,07E+01</b> |
| total use of non-renewable primary energy resources                                                        | MJ                     | 25,127    | 0,778    | 23,213    | 49,119    | 4,301    | 0,047    | 0,082    | 0,473     | 0,276    | -1,06E+01 | <b>43,715</b>    |
| total energy                                                                                               | MJ                     | 28,094    | 0,789    | 23,861    | 52,745    | 4,347    | 0,047    | 0,083    | 0,529     | 0,280    | -1,03E+01 | <b>47,756</b>    |

| impact category                      | unit           | A1       | A2       | A3       | A1-A3    | A4       | C1       | C2       | C3       | C4       | D         | total    |
|--------------------------------------|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|
| use of secondary material            | kg             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| use of renewable secondary fuels     | MJ             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| use of non-renewable secondary fuels | MJ             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| use of net fresh water               | m <sup>3</sup> | 0,005    | 2,00E-04 | 0,006    | 0,011    | 4,92E-04 | 4,21E-06 | 4,46E-05 | 2,12E-04 | 1,85E-04 | -5,32E-03 | 0,006    |
| hazardous waste disposed             | kg.            | 1,59E-04 | 4,96E-06 | 4,46E-05 | 2,09E-04 | 2,35E-05 | 3,13E-07 | 1,27E-07 | 2,31E-06 | 9,75E-07 | -1,78E-04 | 5,77E-05 |
| non-hazardous waste disposed         | kg             | 0,191    | 0,051    | 0,089    | 0,332    | 0,102    | 6,66E-05 | 0,007    | 0,026    | 0,515    | -1,28E-01 | 0,854    |
| radioactive waste disposed           | kg             | 1,55E-05 | 1,78E-07 | 6,10E-05 | 7,67E-05 | 8,51E-07 | 5,10E-09 | 4,76E-08 | 7,53E-07 | 5,80E-07 | 8,93E-06  | 8,78E-05 |
| components for re-use                | kg             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| materials for recycling              | kg             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| materials for energy recovery        | kg             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| exported energy                      | MJ             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| exported energy thermic              | MJ             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |
| exported energy electric             | MJ             | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0        |

## 5 References

1. ISO 14040: Environmental management - Life cycle assessment - Principles and Framework', International Organization for Standardization, ISO14040:2006
2. ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO14044:2006
3. ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO14025:2006
4. NEN-EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products', NEN-EN 15804:2012+A2:2019
5. Forfaitaire waarden (mei 2024): forfaitaire waarden voor verwerking-scenario's einde leven behorende bij: Bepalingsmethode milieuprestatie bouwwerken, <https://milieudatabase.nl/nl/milieuprestatie/bepalingsmethode>
6. the paper value chain reached a 70.5% recycling rate in 2022: CEPI press release 31 july 2023, [https://www.cepi.org/wp-content/uploads/2023/07/EPRC-press-release\\_moniroting-report-2022\\_FINAL\\_31072023.pdf](https://www.cepi.org/wp-content/uploads/2023/07/EPRC-press-release_moniroting-report-2022_FINAL_31072023.pdf)

## 6 appendix

The life cycle assessment results listed in chapter 4 can be converted to the other sales articles listed using the conversion factor in accordance with the following tables.

| 7110 bend 90° (2 x groove), painted orange |                    |                   |
|--------------------------------------------|--------------------|-------------------|
| article no.                                | dimensions         | conversion factor |
| 171100010001                               | 33.7               | 0,25              |
| 171100012001                               | 42.4               | 0,5               |
| 171100012002                               | 42.4 (painted red) | 0,5               |
| 171100015001                               | 48.3               | 0,57              |
| 171100015002                               | 48.3 (painted red) | 0,57              |
| 171100020001                               | 60.3               | 0,91              |
| 171100029001                               | 76.1               | 1,4               |
| 171100030001                               | 88.9               | 1,97              |
| 171100045001*                              | 114.3              | 3,12              |
| 171100052001                               | 139.7              | 4,3               |
| 171100062001                               | 165.1              | 5,7               |
| 171100065001                               | 168.3              | 5,8               |
| 171100085001                               | 219.1              | 13                |
| 1711000A1001                               | 273                | 22,85             |
| 1711000A3001                               | 323.9              | 31,5              |
| 1711000A4001                               | 355.6              | 35,17             |
| 1711000A6001                               | 406.4              | 43                |
| *reference article                         |                    |                   |

| 7111 bend 45° (2 x groove), painted orange |                     |                   |
|--------------------------------------------|---------------------|-------------------|
| article no.                                | dimensions          | conversion factor |
| 171110010001                               | 33.7                | 0,22              |
| 171110012001                               | 42.4                | 0,3               |
| 171110012002                               | 42.4 (painted red)  | 0,3               |
| 171110015001                               | 48.3                | 0,4               |
| 171110015002                               | 48.3 (painted red)  | 0,4               |
| 171110020001                               | 60.3                | 0,57              |
| 171110020002                               | 60.3 (painted red)  | 0,57              |
| 171110029001                               | 76.1                | 0,94              |
| 171110029002                               | 76.1 (painted red)  | 0,94              |
| 171110030001                               | 88.9                | 1,3               |
| 171110030002                               | 88.9 (painted red)  | 1,3               |
| 171110045001                               | 114.3               | 2                 |
| 171110045002                               | 114.3 (painted red) | 2                 |
| 171110052001                               | 139.7               | 2,89              |
| 171110052002                               | 139.7 (painted red) | 2,89              |
| 171110062001                               | 165.1               | 4,02              |
| 171110062002                               | 165.1 (painted red) | 4,02              |
| 171110065001                               | 168.3               | 4,02              |
| 171110065002                               | 168.3 (painted red) | 4,02              |
| 171110085001                               | 219.1               | 7,98              |
| 171110085002                               | 219.1 (painted red) | 7,98              |
| 1711100A1001                               | 273                 | 13,6              |
| 1711100A3001                               | 323.9               | 20,5              |
| 1711100A4001                               | 355.6               | 22                |
| 1711100A6001                               | 406.4               | 34,33             |

| 7112 bend 22.5° (2 x groove), painted orange |                     |                   |
|----------------------------------------------|---------------------|-------------------|
| article no.                                  | dimensions          | conversion factor |
| 171120012001                                 | 42.4                | 0,31              |
| 171120015004                                 | 48.3                | 0,41              |
| 171120020004                                 | 60.3                | 0,74              |
| 171120029004                                 | 76.1                | 1,14              |
| 171120030004                                 | 88.9                | 1,35              |
| 171120045004                                 | 114.3               | 2,04              |
| 171120052001                                 | 139.7               | 3,07              |
| 171120062004                                 | 165.1               | 4,4               |
| 171120065004                                 | 168.3               | 4,24              |
| 171120085004                                 | 219.1               | 8,06              |
| 171120085005                                 | 219.1 (painted red) | 8,06              |
| 1711200A1001                                 | 273                 | 17,7              |
| 1711200A3001                                 | 323.9               | 19,5              |

| 7113 bend 11.25° (2 x groove), painted orange |            |                   |
|-----------------------------------------------|------------|-------------------|
| article no.                                   | dimensions | conversion factor |
| 171130012001                                  | 42.4       | 0,25              |
| 171130015001                                  | 48.3       | 0,32              |
| 171130020001                                  | 60.3       | 0,44              |
| 171130029001                                  | 76.1       | 0,72              |
| 171130030001                                  | 88.9       | 0,82              |
| 171130045001                                  | 114.3      | 1                 |
| 171130052001                                  | 139.7      | 2,05              |
| 171130062001                                  | 165.1      | 2,5               |
| 171130065001                                  | 168.3      | 2,5               |
| 171130085001                                  | 219.1      | 4,64              |
| 1711300A1001                                  | 273.0      | 10                |
| 1711300A3001                                  | 323.9      | 12,4              |

| 901 short radius 90° bend (2 x groove), painted red |            |                   |
|-----------------------------------------------------|------------|-------------------|
| article no.                                         | dimensions | conversion factor |
| 109010020002                                        | 60.3       | 0,7               |
| 109010029002                                        | 76.1       | 1,12              |
| 109010030002                                        | 88.9       | 1,4               |
| 109010045002                                        | 114.3      | 2,16              |
| 109010052002                                        | 139.7      | 3,62              |
| 109010062002                                        | 165.1      | 5,86              |
| 109010065002                                        | 168.3      | 5,87              |
| 109010085002                                        | 219.1      | 10,6              |

| 7120 tee (3 x groove), painted orange |                    |                   |
|---------------------------------------|--------------------|-------------------|
| article no.                           | dimensions         | conversion factor |
| 171200010001                          | 33.7               | 0,35              |
| 171200012001                          | 42.4               | 0,7               |
| 171200012002                          | 42.4 (painted red) | 0,7               |
| 171200015001                          | 48.3               | 0,9               |
| 171200015002                          | 48.3 (painted red) | 0,9               |
| 171200020001                          | 60.3               | 1,3               |
| 171200029001                          | 76.1               | 2,19              |
| 171200030001                          | 88.9               | 3,1               |
| 171200045001                          | 114.3              | 3,81              |
| 171200052001                          | 139.7              | 6,5               |
| 171200062001                          | 165.1              | 9,85              |
| 171200065001                          | 168.3              | 10                |
| 171200085001                          | 219.1              | 16,63             |
| 1712000A1001                          | 273                | 31                |
| 1712000A3001                          | 323.9              | 43,85             |

| 7121 tee reduced (3 x groove), painted orange |                       |                   |
|-----------------------------------------------|-----------------------|-------------------|
| article no.                                   | dimensions            | conversion factor |
| 17121010001                                   | 60.3 x 33.7 x 60.3    | 1,2               |
| 17121015001                                   | 60.3 x 48.3 x 60.3    | 1,2               |
| 171212920001                                  | 76.1 x 60.3 x 76.1    | 1,733             |
| 171213010001                                  | 88.9 x 33.7 x 88.9    | 2,47              |
| 171213015001                                  | 88.9 x 48.3 x 88.9    | 2,37              |
| 171213020001                                  | 88.9 x 60.3 x 88.9    | 2,8               |
| 171213029001                                  | 88.9 x 76.1 x 88.9    | 2,522             |
| 171214515001                                  | 114.3 x 48.3 x 114.3  | 4,21              |
| 171214520001                                  | 114.3 x 60.3 x 114.3  | 3,97              |
| 171214529001                                  | 114.3 x 76.1 x 114.3  | 4,3               |
| 171214530001                                  | 114.3 x 88.9 x 114.3  | 3,94              |
| 171215220001                                  | 139.7 x 60.3 x 139.7  | 5,202             |
| 171215229001                                  | 139.7 x 76.1 x 139.7  | 5,7               |
| 171215230001                                  | 139.7 x 88.9 x 139.7  | 5,7               |
| 171215245001                                  | 139.7 x 114.3 x 139.7 | 6,2               |
| 171216220001                                  | 165.1 x 60.3 x 165.1  | 8                 |
| 171216229001                                  | 165.1 x 76.1 x 165.1  | 8,5               |
| 171216230001                                  | 165.1 x 88.9 x 165.1  | 9,2               |
| 171216245001                                  | 165.1 x 114.3 x 165.1 | 8,8               |
| 171216252001                                  | 165.1 x 139.7 x 165.1 | 9,4               |
| 171216520001                                  | 168.3 x 60.3 x 168.3  | 8                 |
| 171216529001                                  | 168.3 x 76.1 x 168.3  | 7,76              |
| 171216530001                                  | 168.3 x 88.9 x 168.3  | 9,2               |
| 171216545001                                  | 168.3 x 114.3 x 168.3 | 8,8               |
| 171216552001                                  | 168.3 x 139.7 x 168.3 | 8,34              |
| 171218520001                                  | 219.1 x 60.3 x 219.1  | 14,76             |
| 171218529001                                  | 219.1 x 76.1 x 219.1  | 15                |
| 171218530001                                  | 219.1 x 88.9 x 219.1  | 15,49             |
| 171218545001                                  | 219.1 x 114.3 x 219.1 | 17,76             |
| 171218552001                                  | 219.1 x 219.1 x 139.7 | 17,8              |
| 171218562001                                  | 219.1 x 219.1 x 165.1 | 18,68             |
| 171218565001                                  | 219.1 x 219.1 x 168.3 | 18,68             |
| 17121A120001                                  | 273 x 273 x 60.3      | 27,4              |
| 17121A130001                                  | 273 x 273 x 88.9      | 26,74             |
| 17121A145001                                  | 273 x 273 x 114.3     | 28,5              |
| 17121A162001                                  | 273 x 273 x 165.1     | 30                |
| 17121A165001                                  | 273 x 273 x 168.3     | 30                |
| 17121A185001                                  | 273 x 273 x 219.1     | 31,5              |
| 17121A330001                                  | 324 x 324 x 88.9      | 37,12             |
| 17121A345001                                  | 324 x 324 x 114.3     | 41                |
| 17121A362001                                  | 324 x 324 x 165.1     | 37,6              |
| 17121A365001                                  | 324 x 324 x 168.3     | 38                |
| 17121A385001                                  | 324 x 324 x 219.1     | 38                |
| 17121A3A1001                                  | 324 x 324 x 273       | 40                |

| 903 short radius tee (3 x groove), painted red |            |                   |
|------------------------------------------------|------------|-------------------|
| article no.                                    | dimensions | conversion factor |
| 109030020002                                   | 60.3       | 1                 |
| 109030029002                                   | 76.1       | 1,3               |
| 109030030002                                   | 88.9       | 2                 |
| 109030045002                                   | 114.3      | 3,6               |
| 109030052002                                   | 139.7      | 5,05              |
| 109030062002                                   | 165.1      | 7,48              |
| 109030065002                                   | 168.3      | 7,79              |
| 109030085002                                   | 219.1      | 15                |

| 7121M tee male branch (3 x groove), painted orange |                    |                   |
|----------------------------------------------------|--------------------|-------------------|
| article no.                                        | dimensions         | conversion factor |
| 1121M2010008                                       | 60.3 x R1 x 60.3   | 1,17              |
| 1121M2012008                                       | 60.3 x R1¼ x 60.3  | 1,19              |
| 1121M2015008                                       | 60.3 x R1½ x 60.3  | 1,1               |
| 1121M2910008                                       | 76.1 x R1 x 76.1   | 1,67              |
| 1121M2920008                                       | 76.1 x R2 x 76.1   | 2,1               |
| 1121M3010008                                       | 88.9 x R1 x 88.9   | 2,4               |
| 1121M3020008                                       | 88.9 x R2 x 88.9   | 2,8               |
| 1121M4510008                                       | 114.3 x R1 x 114.3 | 3,93              |
| 1121M4520008                                       | 114.3 x R2 x 114.3 | 4,2               |
| 1121M5220008                                       | 139.7 x R2 x 139.7 | 5,16              |
| 1121M6220008                                       | 165.1 x R2 x 165.1 | 8,43              |
| 1121M6520008                                       | 168.3 x R2 x 168.3 | 8                 |
| 1121M8520008                                       | 219.1 x R2 x 219.1 | 15,02             |

| 7150F tee female branch (3 x groove), painted orange |            |                   |
|------------------------------------------------------|------------|-------------------|
| article no.                                          | dimensions | conversion factor |
| 1150F2920013                                         | 76.1 x Rp2 | 0,69              |

| 7135 cross (4 x groove), painted orange |            |                   |
|-----------------------------------------|------------|-------------------|
| article no.                             | dimensions | conversion factor |
| 171350012001                            | 42.4       | 0,75              |
| 171350015001                            | 48.3       | 0,87              |
| 171350020001                            | 60.3       | 1,2               |
| 171350029001                            | 76.1       | 3                 |
| 171350030001                            | 88.9       | 3,1               |
| 171350045001                            | 114.3      | 5,2               |
| 171350052001                            | 139.7      | 5,9               |
| 171350062001                            | 165.1      | 14,5              |
| 171350065001                            | 168.3      | 14,5              |
| 171350085001                            | 219.1      | 20                |

| 7150 concentric reducer (2 x groove), painted orange |              |                   |
|------------------------------------------------------|--------------|-------------------|
| article no.                                          | dimensions   | conversion factor |
| 171501210001                                         | 42.4 x 33.7  | 0,19              |
| 171501510001                                         | 48.3 x 33.7  | 0,23              |
| 171501512001                                         | 48.3 x 42.4  | 0,28              |
| 171502010001                                         | 60.3 x 33.7  | 0,37              |
| 171502012001                                         | 60.3 x 42.4  | 0,31              |
| 171502015001                                         | 60.3 x 48.3  | 0,35              |
| 171502912001                                         | 76.1 x 42.4  | 0,5               |
| 171502915001                                         | 76.1 x 48.3  | 0,5               |
| 171502920001                                         | 76.1 x 60.3  | 0,5               |
| 171503012001                                         | 88.9 x 42.4  | 0,6               |
| 171503015001                                         | 88.9 x 48.3  | 0,6               |
| 171503020001                                         | 88.9 x 60.3  | 0,6               |
| 171503029001                                         | 88.9 x 76.1  | 0,6               |
| 171504515001                                         | 114.3 x 48.3 | 1                 |
| 171504520001                                         | 114.3 x 60.3 | 0,91              |

|              |                             |       |
|--------------|-----------------------------|-------|
| 171504529001 | 114.3 x 76.1                | 1,03  |
| 171504530001 | 114.3 x 88.9                | 1,3   |
| 171505230001 | 139.7 x 88.9                | 1,6   |
| 171505245001 | 139.7 x 114.3               | 1,42  |
| 171505545001 | 141.3 x 114.3               | 1,61  |
| 171506220001 | 165.1 x 60.3                | 1,9   |
| 171506229001 | 165.1 x 76.1                | 2     |
| 171506230001 | 165.1 x 88.9                | 2,21  |
| 171506245001 | 165.1 x 114.3               | 2,1   |
| 171506252001 | 165.1 x 139.7               | 2,5   |
| 171506520001 | 168.3 x 60.3                | 1,9   |
| 171506529001 | 168.3 x 76.1                | 2,32  |
| 171506530001 | 168.3 x 88.9                | 2,31  |
| 171506530002 | 168.3 x 88.9 (painted red)  | 2,31  |
| 171506545001 | 168.3 x 114.3               | 2,1   |
| 171506552001 | 168.3 x 139.7               | 2,717 |
| 171508530001 | 219.1 x 88.9                | 3,83  |
| 171508545001 | 219.1 x 114.3               | 4,27  |
| 171508552001 | 219.1 x 139.7               | 4,28  |
| 171508562001 | 219.1 x 165.1               | 5,059 |
| 171508565001 | 219.1 x 168.3               | 5,2   |
| 171508565002 | 219.1 x 168.3 (painted red) | 5,2   |
| 17150A145001 | 273 x 114.3                 | 8,46  |
| 17150A162001 | 273 x 165.1                 | 9     |
| 17150A165001 | 273 x 168.3                 | 9     |
| 17150A185001 | 273 x 219.1                 | 8,94  |
| 17150A365001 | 324 x 168.3                 | 14    |
| 17150A385001 | 324 x 219.1                 | 14    |
| 17150A3A1001 | 324 x 273                   | 13,66 |

| 7150M        | reducer (2 x groove), painted orange |                   |
|--------------|--------------------------------------|-------------------|
| article no.  | dimensions                           | conversion factor |
| 1150M2010007 | 60.3 x R1                            | 0,41              |
| 1150M2015007 | 60.3 x R1½                           | 0,37              |
| 1150M2910007 | 76.1 x R1                            | 0,4               |
| 1150M2920007 | 76.1 x R2                            | 0,42              |
| 1150M3010007 | 88.9 x R1                            | 0,57              |
| 1150M3020007 | 88.9 x R2                            | 0,6               |
| 1150M4520007 | 114.3 x R2                           | 1,05              |
| 1150M6220007 | 165.1 x R2                           | 2,23              |
| 1150M6520007 | 168.3 x R2                           | 2,23              |

| 7151         | eccentric reducer (2 x groove), painted orange |                   |
|--------------|------------------------------------------------|-------------------|
| article no.  | dimensions                                     | conversion factor |
| 171512520001 | 73 x 60.3                                      | 0,65              |
| 171512920001 | 76.1 x 60.3                                    | 0,72              |
| 171513020001 | 88.9 x 60.3                                    | 1                 |
| 171513025001 | 88.9 x 73                                      | 1                 |
| 171513029001 | 88.9 x 76.1                                    | 1                 |
| 171514520001 | 114.3 x 60.3                                   | 1,29              |
| 171514529001 | 114.3 x 76.1                                   | 1,5               |
| 171514530001 | 114.3 x 88.9                                   | 1,3               |
| 171515230001 | 139.7 x 88.9                                   | 2,36              |
| 171515245001 | 139.7 x 114.3                                  | 2,8               |
| 171516220001 | 165.1 x 60.3                                   | 2                 |
| 171516230001 | 165.1 x 88.9                                   | 2,64              |
| 171516245001 | 165.1 x 114.3                                  | 2,46              |
| 171516252001 | 165.1 x 139.7                                  | 3,07              |
| 171516520001 | 168.3 x 60.3                                   | 2                 |
| 171516530001 | 168.3 x 88.9                                   | 3,5               |
| 171516545001 | 168.3 x 114.3                                  | 2,65              |

|              |               |       |
|--------------|---------------|-------|
| 171516552001 | 168.3 x 139.7 | 3,07  |
| 171518545001 | 219.1 x 114.3 | 6,6   |
| 171518562001 | 219.1 x 165.1 | 5,1   |
| 171518565001 | 219.1 x 168.3 | 4,88  |
| 17151A162001 | 273 x 165.1   | 11,5  |
| 17151A165001 | 273 x 168.3   | 11,5  |
| 17151A185001 | 273 x 219.1   | 12,17 |
| 17151A385001 | 324 x 219.1   | 18,5  |
| 17151A3A1001 | 324 x 273.0   | 20    |

| 54           | adapter (groove x female thread), painted orange |                   |
|--------------|--------------------------------------------------|-------------------|
| article no.  | dimensions                                       | conversion factor |
| 100541515006 | 48.3 x Rp1½                                      | 0,31              |
| 100542020006 | 60.3 x Rp2                                       | 0,42              |

| 55           | adapter (groove x male thread), painted orange |                   |
|--------------|------------------------------------------------|-------------------|
| article no.  | dimensions                                     | conversion factor |
| 100551515007 | 48.3 x R1½ orange                              | 0,35              |
| 100552020007 | 60.3 x R2 orange                               | 0,4               |

| 7160         | end cap (groove), painted red |                   |
|--------------|-------------------------------|-------------------|
| article no.  | dimensions                    | conversion factor |
| 171600010002 | 33.7                          | 0,1               |
| 171600012002 | 42.4                          | 0,15              |
| 171600015002 | 48.3                          | 0,2               |
| 171600020002 | 60.3                          | 0,3               |
| 171600029002 | 76.1                          | 0,4               |
| 171600030002 | 88.9                          | 0,7               |
| 171600045002 | 114.3                         | 1                 |
| 171600052002 | 139.7                         | 1,7               |
| 171600055001 | 141.3 (painted orange)        | 1,7               |
| 171600062002 | 165.1                         | 2,7               |
| 171600065002 | 168.3                         | 2,7               |
| 171600085002 | 219.1                         | 4,6               |
| 1716000A1002 | 273                           | 7                 |
| 1716000A3002 | 323.9                         | 10                |
| 1160H00A4001 | 355.6 (painted orange)        | 15,9              |
| 1160H00A6001 | 406.4 (painted orange)        | 20                |

| 7170         | flange adapter (flange x groove), painted orange |                   |
|--------------|--------------------------------------------------|-------------------|
| article no.  | dimensions                                       | conversion factor |
| 1170A00A3001 | 323.9                                            | 28                |
| 1170A00A4001 | 355.6                                            | 49,5              |
| 1170A00A6001 | 406.4                                            | 50                |
| 1170B00A1001 | 273.0                                            | 22                |
| 1170B00A3001 | 323.9                                            | 28                |
| 1170B00A4001 | 355.6                                            | 49,5              |
| 1170B00A6001 | 406.4                                            | 50                |
| 1170E00A1001 | 273.0                                            | 22                |
| 1170E00A3001 | 323.9                                            | 28                |
| 1170E00A4001 | 355.6                                            | 49,5              |
| 1170E00A6001 | 406.4                                            | 50                |

| 7180 universal flange adapter (flange x groove), painted orange |            |                   |
|-----------------------------------------------------------------|------------|-------------------|
| article no.                                                     | dimensions | conversion factor |
| 171800020001                                                    | 60.3       | 2,3               |
| 171800029001                                                    | 76.1       | 3,085             |
| 171800030001                                                    | 88.9       | 3,39              |
| 171800045001                                                    | 114.3      | 3,85              |
| 171800052001                                                    | 139.7      | 6,675             |
| 171800062001                                                    | 165.1      | 6,221             |
| 171800065001                                                    | 168.3      | 5,72              |
| 171800085001                                                    | 219.1      | 13,65             |

| 7160C end cap with concentric drain (groove x female thread), painted red |             |                   |
|---------------------------------------------------------------------------|-------------|-------------------|
| article no.                                                               | dimensions  | conversion factor |
| 1160C2010002                                                              | 60.3 x Rp1  | 0,26              |
| 1160C2910002                                                              | 76.1 x Rp1  | 0,429             |
| 1160C2915002                                                              | 76.1 x Rp1½ | 0,364             |
| 1160C3010002                                                              | 88.9 x Rp1  | 0,66              |
| 1160C3020002                                                              | 88.9 x Rp2  | 0,48              |
| 1160C4510002                                                              | 114.3 x Rp1 | 1,117             |
| 1160C4520002                                                              | 114.3 x Rp2 | 0,962             |
| 1160C5220002                                                              | 139.7 x Rp2 | 1,475             |
| 1160C6220002                                                              | 165.1 x Rp2 | 2,284             |
| 1160C6520002                                                              | 168.3 x Rp2 | 2,474             |
| 1160C8520002                                                              | 219.1 x Rp2 | 4,57              |

| 7160T end cap with eccentric drain (groove x female thread), painted |              |                   |
|----------------------------------------------------------------------|--------------|-------------------|
| article no.                                                          | dimensions   | conversion factor |
| 1160T2010002                                                         | 60.3 x Rc1   | 0,25              |
| 1160T2910002                                                         | 76.1 x Rc1   | 0,44              |
| 1160T2912002                                                         | 76.1 x Rc1¼  | 0,35              |
| 1160T2915002                                                         | 76.1 x Rc1½  | 0,4               |
| 1160T3010002                                                         | 88.9 x Rc1   | 0,65              |
| 1160T3012002                                                         | 88.9 x Rc1¼  | 0,65              |
| 1160T3015002                                                         | 88.9 x Rc1½  | 0,6               |
| 1160T3020002                                                         | 88.9 x Rc2   | 0,49              |
| 1160T4510002                                                         | 114.3 x Rc1  | 0,95              |
| 1160T4512002                                                         | 114.3 x Rc1¼ | 0,95              |
| 1160T4515002                                                         | 114.3 x Rc1½ | 0,9               |
| 1160T4520002                                                         | 114.3 x Rc2  | 0,9               |
| 1160T5220002                                                         | 139.7 x Rc2  | 1,51              |
| 1160T6220002                                                         | 165.1 x Rc2  | 2,5               |
| 1160T6520002                                                         | 168.3 x Rc2  | 2,6               |
| 1160T8520002                                                         | 219.1 x Rc2  | 4,5               |

| 58 welding nipple (groove x weld) |            |                   |
|-----------------------------------|------------|-------------------|
| article no.                       | dimensions | conversion factor |
| 100582040001                      | 60.3       | 0,5               |
| 100582940001                      | 76.1       | 0,9               |
| 100583040001                      | 88.9       | 1,1               |
| 100584560001                      | 114.3      | 2,35              |
| 100585260001                      | 139.7      | 3,3               |
| 100586560001                      | 168.3      | 4,5               |
| 100588560001                      | 219.1      | 6,5               |

| 59 welding nipple (groove x male thread) |            |                   |
|------------------------------------------|------------|-------------------|
| article no.                              | dimensions | conversion factor |
| 100591040002                             | 33.7 x R1  | 0,21              |
| 100591240002                             | 42.4 x R1¼ | 0,31              |
| 100591540002                             | 48.3 x R1½ | 0,35              |
| 100592040002                             | 60.3 x R2  | 0,48              |
| 100592940002                             | 76.1 x R2½ | 0,72              |
| 100593040002                             | 88.9 x R3  | 1,06              |
| 100594560002                             | 114.3 x R4 | 2,3               |

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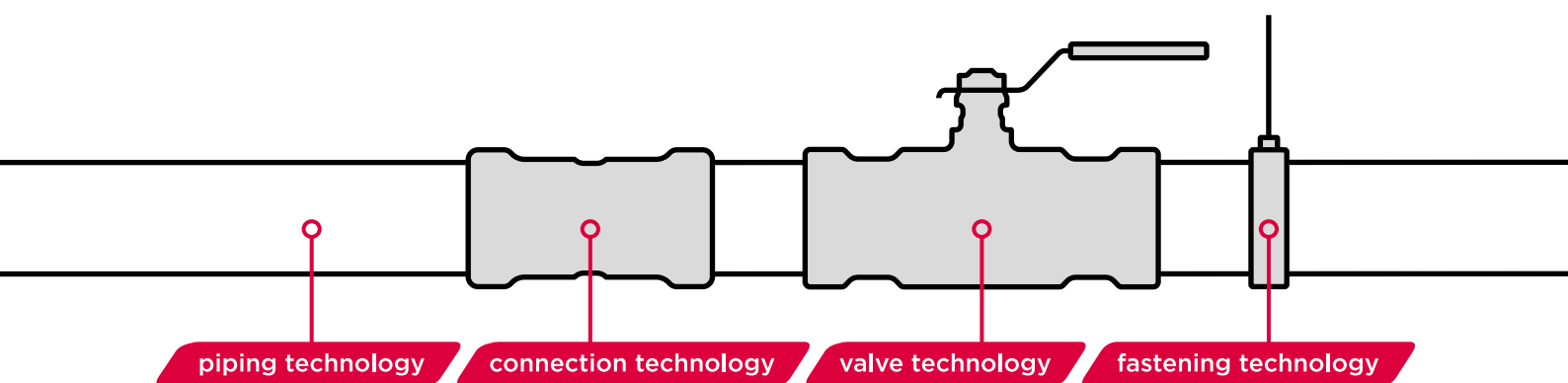
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