The range of PVC-U products includes a complete series of solvent weld, threaded and adaptor fittings for pipes conveying fluids under pressure at maximum working temperatures not exceeding 60 °C.
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PVC-U

GENERAL CHARACTERISTICS

Developed in 1930 in Germany, PVC-U (rigid polyvinyl chloride – unplasticized) is obtained through the polymerization of a vinyl chloride monomer.

The presence of chlorine in the PVC-U molecule results in a high performance resin, in terms of thermal stability and chemical and mechanical resistance, up to temperatures of 60°C.

The different formulations obtained by adding suitable additives and stabilizers render the PVC-U the most versatile of all plastic materials, allowing it to be adapted to many applications involving fluids under pressure.

PVC-U represents one of the more economic solutions in the field of thermoplastic and metal materials for resolving problems in the transport of corrosive chemical fluids, and in the distribution and treatment of water in general.

The main reasons for this preference are the unique characteristics of the resin, which include:

• **Good chemical resistance:** PVC-U resins have excellent chemical resistance to most acids and alkalis, paraffin/aliphatic hydrocarbons and saline solutions. It is not recommended for the transport of polar organic compounds, including some types of chlorinated and aromatic solvents. PVC-U resins are also fully compatible with the transport of foodstuffs, demineralised water, potable water and unconditioned water, as provided for by current national and international standards.

• **Good thermal stability:** PVC-U resins have good thermal stability in the temperature range between 20°C and 50°C and are typically used in industrial and water supply applications, guaranteeing excellent mechanical strength, sufficient rigidity for the purpose, reduced thermal expansion coefficients and high factors of safety in service. PVC-U compounds are also resistant to combustion with a flash point of 399°C. The flame, in fact, only persists if the oxygen concentration is twice that of atmospheric or in the presence of a flame from an external source. Flash point: 399°C. Oxygen index: 45%. UL 94 class: V0. Thanks to the reduced coefficient of thermal conductivity (λ = 0.15 W/m °C according to ASTM C177) the use of PVC-U resin for transporting hot fluids reduces heat loss and virtually eliminates condensation problems.

• **Good mechanical strength:** PVC-U resins are characterised by their low permeability to oxygen and reduced water absorption (0.1% at 23°C according to ASTM D 570). The thermal stability of the material leads to good impact resistance and the capacity to support service pressures of 4 – 6 – 10 – 16 bar at 20°C.

• **Resistance to ageing:** PVC-U resins have a high circumferential breaking strength (Minimum Required Strength MRS ≥ 25.0 MPa at 20°C) and allow long installation lifetimes without showing any signs of significant physical-mechanical deterioration.
<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit of measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>ISO 1183 - ASTM D792</td>
<td>g/cm²</td>
<td>1.38</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>ISO 527</td>
<td>MPa = N/mm²</td>
<td>3200</td>
</tr>
<tr>
<td>IZOD notched impact strength at 23°C</td>
<td>ASTM D256</td>
<td>J/m</td>
<td>50</td>
</tr>
<tr>
<td>Ultimate elongation</td>
<td>ISO 527</td>
<td>%</td>
<td>50</td>
</tr>
<tr>
<td>Shore hardness</td>
<td>ISO 868</td>
<td>Shore D</td>
<td>80</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>ISO 527</td>
<td>MPa = N/mm²</td>
<td>50</td>
</tr>
<tr>
<td>VICAT softening point (B/50)</td>
<td>ISO 306</td>
<td>°C</td>
<td>76</td>
</tr>
<tr>
<td>Heat distortion temperature HDT (0.46 N/mm2)</td>
<td>ASTM D648</td>
<td>°C</td>
<td>86</td>
</tr>
<tr>
<td>Thermal conductivity at 23°C</td>
<td>DIN 52612-1 - ASTM C177</td>
<td>W/(m °C)</td>
<td>0.16</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>DIN 53752 - ASTM D696</td>
<td>m/(m °C)</td>
<td>8 x 10-5</td>
</tr>
<tr>
<td>Limiting Oxygen Index</td>
<td>ISO 4859-1 - ASTM D2863</td>
<td>%</td>
<td>45</td>
</tr>
</tbody>
</table>
The PVC-U production line operates to the highest quality standards, in full compliance with current legislation governing environmental issues and in accordance with standard ISO 14001. All products are manufactured in accordance with a quality assurance system complying with standard ISO 9001.

- ASTM D 1785
  Standard specification for pipes in PVC, Sch. 40-80-120
- ASTM D 2464
  Standard specification for threaded polyvinyl chloride (PVC) plastic pipe fittings
- ASTM D 2467
  Standard specification for polyvinyl chloride (PVC) plastic pipe fittings, sch. 80
- BS 10
  Specification for flanges and bolting for pipes, valves and fittings
- BS 21
  Specification for pipe threads for tubes and fittings
- BS 3505
  Specification for PVC-U pressure pipes for cold water supplies
- BS 3506
  Specification for PVC-U pipes for industrial use
- BS 4346-1
  Joints and fittings for use with solvent weld PVC pressure pipes
- DIN 2501
  Flange dimensions and drilling
- DIN 2999
  Whitworth pipe threads for threaded pipes and fittings
- DIN 8062
  PVC-U pipes - dimensions
- DIN 8063
  PVC-U pipe fittings - dimensions
- DVS 2204 - DVS 2221
  Adhesive bonding of thermoplastic PVC-U pipes and fittings
- EN 1092-1
  Flanges and their joints - Circular flanges for pipes, fittings, valves and accessories - Part 1: PN designated steel flanges
- EN ISO 1452
  PVC-U pipes and fittings for water supply systems
- EN ISO 15493
  Plastic piping systems (Pipes, Fittings and Valves) in ABS, PVC-U, PVC-C for industrial applications
- ISO 7
  PVC-U fittings with pressure-tight threaded joints
- ISO 161-1
  Dimensions of PVC-U pipes and fittings, metric series
- ISO 228-1
  PVC-U pipe fittings with threaded joints
• **ISO 727**
PVC-U pipes and fittings Dimensions and tolerances, metric series

• **JIS K 6741**
PVC-U pipes

• **JIS B 0203**
  Tapered pipe threads

• **JIS K 6743**
PVC-U pipe fittings for water supply systems

• **UNI 11242**
  Solvent welding of PVC-U pipes, fittings and valves
APPROVALS AND QUALITY MARKS

• ABS
  The FIP PVC-U system is recognised as suitable for conveying and treating sanitary and conditioning water onboard ships and other units classified by the American Bureau of Shipping (ABS)

• ACS France (Attestation de conformité Sanitaire)
  Suitability of PVC-U for food and beverage applications

• BSI (British Standards Institution UK)
  PVC-U fittings to BS 4346-1

• BUREAU VERITAS (France)
  Suitability of PVC-U for conveying and treating sanitary and conditioning water in the maritime sector

• CSTB
  PVC-U fittings to standard EN ISO 1452

• IIP N. 122 Istituto Italiano dei Plastici (Italian Plastics Institute)
  PVC-U fittings to standard UNI EN ISO 1452
• **KIWA (Keurings Institut Voor Waterleiding Artikelen Holland)**
  PVC-U fittings to standard KIWA BRL K17301

• **UKR-SEPRO**
  FIP PVC-U fittings are certified in accordance with Ukrainian Health, Safety, Hygiene and Quality standards

• **WRAS (Water regulations advisory scheme - UK)**
  Suitability of PVC-U for transporting potable water

• **RMRS**
  FIP PVC-U fittings have been recognised as suitable for conveying, treating domestic and air conditioning waters on board ships and other units classified by the Russian Maritime Register of Shipping

• **DNV-GL**
  FIP PVC-U fittings have been recognised as suitable for conveying, treating domestic and air conditioning waters on board ships and other units classified by DNV-GL

• **NIZP**
  FIP PVC-U fittings have been recognised as suitable for conveying drinking water by the NIZP (National Institute of Public Health - Poland)
SOLVENT WELDING INSTRUCTIONS

Solvent welding, or cement jointing, is the longitudinal joining system for connecting rigid PVC-U pipes and fittings. The “cementing” is carried out using adhesives/cements obtained by dissolving PVC-U polymer in a solvent mixture. This solvent liquefies the walls of the pipe and/or fitting, allowing the constituent material to chemically combine and be subsequently welded. Chemical welding allows permanent joints be achieved possessing chemical and mechanical strength characteristics identical to those of the pipes and fittings joined. The adhesives/solvent cements must be selected according to the type of thermoplastic resin to weld, in that the nature of the solvents vary, as does the weld material contained in them. It must be remembered, therefore, that all the solvent cements designed for joining thermoplastic pipes and fittings must be used to join pipes, fittings and valves of the same material.

Before starting any solvent welding operations, the efficiency and condition of the equipment used and the pieces to be assembled must be verified, in particular the uniformity, fluidity and expiry date of the solvent cement.

1) Cut the pipe perpendicular to its axis to obtain a clean square section, preferably using a wheeled pipe cutter designed specifically for thermoplastic pipes (fig. 1).

2) Chamfer the outer edges of the pipe in order to ensure that it enters the socket of the fitting at an angle of 15°. The chamfering operation must be carried out at all costs, otherwise the lack of chamfer can lead to the solvent being scraped off the surface of the fitting, thus compromising the effectiveness of the joint. The chamfering must be carried out using the appropriate chamfering tool (fig. 2).

3) Measure the depth of the socket of the fitting to the internal shoulder and mark the corresponding distance on the end of the pipe (fig. 3 and 4). For more details, refer to the “Socket depth, cement and chamfer length” table.

4) Using an clean paper towel or applicator soaked in Cleaner-Primer, remove any traces of dirt or grease from the outer surface of the pipe for the entire cementing length. Repeat the same operation on the internal surface of the socket of the fitting: leaving the surfaces softened (fig. 5).

   Leave the surfaces to dry for a few minutes before applying the solvent cement. Remember that, in addition to cleaning the joint surfaces, the Cleaner-Primer also performs the important role of softening and preparing the surface to receive the solvent, an operation that enables a perfect joint to be obtained.

5) Apply the solvent cement in a uniform manner longitudinally over both parts to be assembled (outer surface of the pipe and internal coupling surface of the fitting) using an applicator or suitably sized coarse brush.

   For more detailed information, refer to the “Brush-applicator characteristics and dimensions” table.
It is advisable to use an applicator/brush of dimension not less than half the diameter of the pipe. The solvent cement must be applied along the entire length of the joining surface of both the pipe and the fitting:
- for the entire joint length of the pipe previously marked on the outer surface (fig. 6)
- for the entire depth of the socket as far as the internal shoulder (fig. 7)

6) Fully insert the pipe into the fitting immediately and without any rotation. Only after this operation will it be possible to slightly rotate both ends (max. 1/4 of a turn between pipe and fitting). This rotation movement will render the layer of applied solvent cement more uniform (fig. 8)

7) The pipe must be inserted in the fitting as soon and as quick as possible (after no more than 20-25 seconds is recommended). Depending on the external diameter of the pipe and, as a result, possible handling difficulties, the insertion of the pipe into the fitting must be carried out:
- manually by one person for external diameters < 90 mm.
- manually by two people for external diameters from d 90 to d < 160 mm.
- using mechanical pipe-pullers for external diameters > 160 mm.

8) Immediately after fully inserting the pipe in the fitting, apply pressure to the joined parts for a few seconds. Then use crepe paper or a clean cloth to remove any excess solvent cement from the outer surfaces, and from internal surfaces where possible (fig. 9).

9) Solvent cement drying: the joined parts must be left to stand in order to allow the solvent cement to set naturally without generating any unnecessary stress. The setting time depends on the amount of stress that the joint will be placed under.

In particular, the following minimum setting times must be respected according to the ambient temperature:
• before handling the joint:
  - from 5 to 10 minutes for ambient T. > 10°C
  - from 15 to 20 minutes for ambient T. < 10°C
• for repair joints on pipes of any size or pressure not subject to hydraulic testing:
  - 1 hour for each atm of applied pressure
• for joints in pipes and fittings of any diameter subject to pressure testing up to PN 16:
  - minimum 24 hours

The solvent cement setting times indicated are valid at ambient temperature (approx. 25°C). For particular climatic conditions (humidity, temperature, etc...), we recommend you contact our technical services department and/or the solvent cement manufacturer for more information (fig. 10 and 11).
SOCKET DEPTH, CEMENT AND CHAMFER LENGTH

<table>
<thead>
<tr>
<th>Metric series de (mm)</th>
<th>BS series (inches)</th>
<th>Cementing length L (mm)</th>
<th>Chamfer Sm (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>3/8&quot;</td>
<td>14</td>
<td>14.5</td>
</tr>
<tr>
<td>20</td>
<td>1/2&quot;</td>
<td>16</td>
<td>16.5</td>
</tr>
<tr>
<td>25</td>
<td>3/4&quot;</td>
<td>18.5</td>
<td>19.5</td>
</tr>
<tr>
<td>32</td>
<td>1&quot;</td>
<td>22</td>
<td>22.5</td>
</tr>
<tr>
<td>40</td>
<td>1 1/4</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>50</td>
<td>1 1/2</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>63</td>
<td>2&quot;</td>
<td>37.5</td>
<td>36</td>
</tr>
<tr>
<td>75</td>
<td>2 1/2</td>
<td>43.5</td>
<td>43.5</td>
</tr>
<tr>
<td>90</td>
<td>3&quot;</td>
<td>51</td>
<td>50.5</td>
</tr>
<tr>
<td>110</td>
<td>4&quot;</td>
<td>61</td>
<td>63</td>
</tr>
<tr>
<td>125</td>
<td>-</td>
<td>68.5</td>
<td>-</td>
</tr>
<tr>
<td>140</td>
<td>5&quot;</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>160</td>
<td>6&quot;</td>
<td>86</td>
<td>90</td>
</tr>
<tr>
<td>180</td>
<td>-</td>
<td>96</td>
<td>-</td>
</tr>
<tr>
<td>200</td>
<td>-</td>
<td>106</td>
<td>-</td>
</tr>
<tr>
<td>225</td>
<td>8&quot;</td>
<td>118.5</td>
<td>115.5</td>
</tr>
<tr>
<td>250</td>
<td>-</td>
<td>131</td>
<td>-</td>
</tr>
<tr>
<td>280</td>
<td>10&quot;</td>
<td>146</td>
<td>142.5</td>
</tr>
<tr>
<td>315</td>
<td>12&quot;</td>
<td>163.5</td>
<td>168</td>
</tr>
</tbody>
</table>

CHARACTERISTICS AND DIMENSIONS OF BRUSHES- APPLICATORS

<table>
<thead>
<tr>
<th>de (mm)</th>
<th>External diameter (inches)</th>
<th>Type and dimensions of Brush or Applicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 - 25</td>
<td>3/8&quot; - 3/4&quot;</td>
<td>Round (8 - 10 mm)</td>
</tr>
<tr>
<td>32 - 63</td>
<td>1&quot; - 2&quot;</td>
<td>Round (20 - 25 mm)</td>
</tr>
<tr>
<td>75 - 160</td>
<td>2&quot; 1/2 - 6&quot;</td>
<td>Rectangular / round (45 - 50 mm)</td>
</tr>
<tr>
<td>&gt;160</td>
<td>&gt;6&quot;</td>
<td>Rectangular / cylindrical (45 - 50 mm)</td>
</tr>
<tr>
<td>&gt;160 - 315</td>
<td>&gt;6&quot; - 12&quot;</td>
<td>Rectangular / cylindrical (60 - 65 mm)</td>
</tr>
</tbody>
</table>
In the case where the external diameter of the pipe and the internal diameter of the fitting are at opposite extremes of their tolerance values, the dry pipe cannot be inserted in the dry socket of the fitting. Insertion will only be possible after having applied the Cleaner and Solvent Cement to both parts to be joined.

The solvent cement is manufactured from the same PVC resin used for the production of the pipes, fittings and valves. Unless otherwise specified, the solvent cement used on the surfaces to join must also be usable with the following tolerances:
- maximum interference 0.2 mm.
- maximum clearance 0.6 mm.

When using the Cleaner and Solvent Cement, the following precautions should be adopted:
- Use gloves and safety glasses to protect hands and eyes.
- Use the Cleaner and Solvent Cement in a working environment with sufficient ventilation to avoid the formation of pockets of air containing concentrations of evaporated solvent, which can irritate the respiratory tract and eyes.
- Due to the volatile nature of the solvents in the cleaner and cement, the containers must be closed immediately after use.
- Solvents in the gaseous phase tend to form flammable mixtures. Therefore, remove any ignition sources such as welding operations, accumulation of electrostatic charges, etc. from the work area, and do not smoke. In all cases, it is advisable to adhere strictly to the solvent cement manufacturer’s instructions written on the packaging.
- In order to prevent a deterioration in the performance of the cleaner and solvent cement, the joining operations should be carried out within an ambient temperature range of between +5 and +40°C.
- The amount of solvent cement used on the joints depends on a number of factors (environmental conditions, pipe size, cement viscosity, operator experience, etc.) which are often difficult to quantify. In this respect, Table “Rigid PVC-U pipes and fittings. Theoretical solvent cement consumption” reports the approximate quantities of cement normally used for joining various diameter pipes and fittings.
- After having completed all the joints and prior to putting the lines into service, make sure that the insides of the pipes and fittings are completely free of any solvent traces/vapours. This will prevent contamination of the fluids conveyed.
- Table “Most common defects” reports the most common types of defect found if the correct solvent welding procedure is not followed.
**RIGID PVC-U PIPES AND FITTINGS THEORETICAL SOLVENT CEMENT CONSUMPTION**

<table>
<thead>
<tr>
<th>Pipe/Fitting diameter</th>
<th>Number of joints per kg of solvent cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>d (mm)</td>
<td>d (inches)</td>
</tr>
<tr>
<td>16</td>
<td>3/8”</td>
</tr>
<tr>
<td>20</td>
<td>1/2”</td>
</tr>
<tr>
<td>25</td>
<td>3/4”</td>
</tr>
<tr>
<td>32</td>
<td>1”</td>
</tr>
<tr>
<td>40</td>
<td>1” 1/4</td>
</tr>
<tr>
<td>50</td>
<td>1” 1/2</td>
</tr>
<tr>
<td>63</td>
<td>2”</td>
</tr>
<tr>
<td>75</td>
<td>2” 1/2</td>
</tr>
<tr>
<td>90</td>
<td>3”</td>
</tr>
<tr>
<td>110</td>
<td>4”</td>
</tr>
<tr>
<td>125</td>
<td>-</td>
</tr>
<tr>
<td>140</td>
<td>5”</td>
</tr>
<tr>
<td>160</td>
<td>6”</td>
</tr>
<tr>
<td>180</td>
<td>-</td>
</tr>
<tr>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>225</td>
<td>8”</td>
</tr>
<tr>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td>280</td>
<td>10”</td>
</tr>
<tr>
<td>315</td>
<td>12”</td>
</tr>
</tbody>
</table>

**MOST COMMON DEFECTS**

**Solvent cement too fluid (incorrect diluent addition)**

- **Immediate effect:** Cementing failure.
- **Consequence:** Joint separation or leaks from between the pipe and fitting.

**Excess solvent cement**

- **Immediate effect:** Internal and external runs beyond the joint zone.
- **Consequence:** Weakening of the outer surface of the joint area and formation of bubbles with micro-cracks/sources of fracture in the base material.

**Excessively dense solvent cement due to evaporated solvent**

- **Immediate effect:** Cementing failure.
- **Consequence:** Joint separation or leaks from between the pipe and fitting. Possible surface cracks triggering cracks in the base material.

**Insufficient and/or incorrect distribution of solvent cement**

- **Immediate effect:** Cementing failure or local weakness.
- **Consequence:** Joint separation or leaks from between the pipe and fitting.

**Incorrect pipe insertion (incomplete, excessive, misaligned)**

- **Immediate effect:** Imperfect joint.
- **Consequence:** Transmission of mechanical stresses from the pipe to the fitting and/or leaks from the joint.

**Impurities and/or humidity on the surfaces of the parts to join**

- **Immediate effect:** Imperfect joint.
- **Consequence:** Joint separation or leaks (fluid seepage) from between the pipe and fitting.
INSTALLATION INSTRUCTIONS FOR THREADED JOINTS

To guarantee the hydraulic seal of the joint on fittings and valves with a threaded female end, we recommend you perform the following operations:

1. Start winding some PTFE sealing tape on the outside of the threaded male end, taking care not to obstruct the through-hole on the pipe, fitting or valve (fig. 1);
2. Complete the first winding layer by winding the tape clockwise until you reach the root of the thread. Remember to keep the tape taut throughout the entire process (fig. 2);
3. Press on the tips of the thread to make sure the tape adheres fully to the support clip;
4. Increase the thickness of the PTFE layer by continuing to apply the taut tape and winding it clockwise until you achieve the optimal level (fig. 3);
5. Connect the previously sealed male end to the female end and proceed manually by screwing the two elements;
6. Make sure the layer of PTFE is not removed during screwing, as this would compromise the hydraulic seal of the joint;
7. Complete screwing the two ends exploiting the entire length of the thread with the aid of a strap wrench or similar tool;
8. Avoid tightening the elements too much, as this could damage the threads or cause stress to the elements themselves.

RECOMMENDATIONS

For correct installation, we recommend you only use sealing tape in non-sintered PTFE. Under all circumstances avoid using materials such as hemp, lint or paints usually implemented for the hydraulic seal on metal threads.

WARNINGS

Avoid using threaded joints in the following cases:

- highly critical applications, such as for conveying chemically aggressive or toxic fluids;
- in the presence of medium or high pressures. In this case, we recommend the use of solvent welding joints, hot welding joints or flanged joints;
- systems subject to mechanical and/or thermal stresses such as water hammers, strong variations in temperature, bends, misalignments and cross tensions which could cause the threaded joint to break prematurely;
- coupling of elements with excessive distance from one another.
ISO-UNI FITTINGS

Series of fittings designed for conveying fluids under pressure with a cold chemical weld jointing system (solvent welding) using a suitable solvent cement and cleanerprimer.

SOLVENT WELD FITTINGS, METRIC SERIES

<table>
<thead>
<tr>
<th>Technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size range</strong></td>
</tr>
<tr>
<td><strong>Nominal pressure</strong></td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td><strong>Reference standards</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Fitting material</strong></td>
</tr>
<tr>
<td><strong>Seal material</strong></td>
</tr>
</tbody>
</table>
PRESSURE VARIATION ACCORDING TO TEMPERATURE

For water and non-hazardous fluids for which the material is classified as CHEMICALLY RESISTANT (life expectancy 25 years). In other cases, a reduction of the nominal pressure PN is required.

REGRESSION CURVE FOR PVC-U FITTINGS

Regression coefficients according to EN ISO 1452 and EN ISO 15493 for MRS (minimum required strength) values = 25 N/mm² (MPa) (classification PVC-U 250).
SAFETY FACTORS

The table reports the safety factors for each pressure class as a function of time. Nominal pressure PN must be understood as being the standard pressure used for calculating and selecting the required fittings. In order to be able to comply with the safety factors, the maximum continuous working pressure at 20° C when conveying water must be the same as the nominal pressure values. Unless otherwise specified, the nominal pressures are as follows:

- solvent weld fittings from d 12 to d 225 PN 16 from d 250 to d 315 PN 10
- adaptor fittings from d 16 to d 110 PN 16
- threaded fittings from R 3/8” to R 4” up to PN 16.

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The information in this leaflet is provided in good faith. FIP will not be held liable for technical data not originating directly from recognised international standards. The company reserves the right to carry out any modifications. Products must be installed and maintained by qualified personnel.
## DIMENSIONS

### SIV

90° long radius bend (R=2d) with solvent weld sockets

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I: IP 122 H: KIWA KS034 ND 10

### GIV

90° elbow with solvent weld sockets (fig. A)

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I: IP 122 F: AFNOR NF04 H: KIWA KS034 ND 10
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90° elbow with solvent weld sockets (fig. B)

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I: IIP 122  F: AFNOR NF04  H: KIWA KS034 ND 10
**resale product
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I: IIP 122  F: AFNOR NF04  H: KIWA KS034 ND 10
*resale product
### TIV

90° Tee with solvent weld sockets

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**IIP 122 F: AFNOR NF04 H: KIWA KS034 ND 10**

### YIV

45° Tee with solvent weld sockets

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**resale product**
**TRIV**

90° reducing Tee with reduced branch and solvent weld sockets

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**resale product**
## XIV

90° cross with solvent weld sockets

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H: KIWA KS034 ND 10
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[IIP 122 F: AFNOR NF04]
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### O-RING

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**RIV**

Reducer: solvent weld spigot (d), solvent weld socket (d1 reduced)(Fig.A)

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I: IIP 122, F: AFNOR NF04

RIV: the quality marks refer to dimensions d and d1
RIV
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I: IIP 122 F: AFNOR NF04
RIV: the quality marks refer to dimensions d and d1.
**RIV**

Reducer: solvent weld spigot (d) or solvent weld socket (d2), solvent weld socket (d1 reduced) or solvent weld spigot (d3 reduced) (Fig.C)

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I: IIP 122  F: AFNOR NF04

RIV: the quality marks refer to dimensions d and d1.
**MRIV**

Reducer: solvent weld double socket (fig. A)

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*resale product*
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Reducer: solvent weld double socket (fig. B)

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### DIV
Reducing bush with solvent weld spigot (d) and solvent weld socket (d₁ reduced) (fig. A)

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* IF: IIP 122 F; AFNOR NF04
* resale product
Reducing bush with solvent weld spigot (d) and solvent weld socket (d1 reduced) (fig. B)

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*resale product

I: IIP 122
### QPV

Flat face stub according to DIN 8063 PN 10/16 with solvent weld socket

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*1: IIP 122  
*resale product

### QPV special flat for butterfly valves

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*to be used with ODV140 flange  
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QRV
Serrated face stub according to DIN 8063 PN 10/16 with solvent weld socket, for use with stubs QPV/QRV and flat gasket (for gasket sizes, see QHV)

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I IIP 122
**QHV/X**

Flat gasket in EPDM and FKM for DIN 2501 and EN 1092 stubs and flanges

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1. IIP 122

*PMA maximum admissible working pressure
** nominal tightening torque
*** resale product
**ODB**

Steel core backing ring, PP/FRP coated, according to EN/ISO/DIN for stubs QRV, QPV. Drilling: PN 10/16 up to DN 150; PN 10 from DN 200

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*maximum pressure values to EN/ISO/DIN. Pay attention to maximum admissible pressure values when selecting gaskets

**nominal tightening torque

*** for use with stubs QPV110, QRV110

**** for use with stubs QPV160, QRV160

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**ODB-SW**

Steel core backing ring, PP/FRP coated, according to EN/ISO/DIN for stubs QRV and QPV. Drilling: PN 10/16 up to DN 150; PN 10 from DN 200

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*PMA maximum admissible working pressure

**nominal tightening torque
ODBC
Steel core blind ring, PP/FRP coated, according to EN/ISO/DIN for stubs QRV, QPV. Drilling: PN 10/16 up to DN 150; PN 10 from DN 200

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*maximum pressure values according to EN/ISO/DIN. Pay attention to maximum admissible pressure values when selecting gaskets

**nominal tightening torque

FDV
Fixed flange with solvent weld socket according to EN/ISO/DIN with serrated raised face for flat gaskets (for gasket sizes, see QHV). Drilling: PN 10/16 up to DN 150; PN 10 from DN 200

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*MPA: maximum allowable pressure

**nominal tightening torque
**FCV**

Blind flange drilled according to EN/ISO/DIN with serrated raised face for flat gaskets (for gasket sizes, see QHV). Drilling: PN 10/16 up to DN 175; PN 10 from DN 200

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*MPA: maximum allowable pressure  
**nominal tightening torque  
***resale product
**OAB**

Steel core backing ring, PP/FRP coated, according to ANSI B16.5 cl.150 for stubs QRV, QPV

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* MPA: maximum admissible working pressure  
**nominal tightening torque

---

**OABC**

Steel core blind flange, PP/FRP coated, according to ANSI B16.5 cl.150

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* MPA: maximum admissible working pressure  
**nominal tightening torque
**AIV**

Hose adaptor with solvent weld spigot

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**ZIKM**
Pipe clip for ISO-DIN pipes in PP*

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*for pipe support systems, refer to guidelines DVS 2210-1 (Planning and execution - above-ground pipe systems)

**ZAKM**
Pipe clip for ASTM pipes in PP*

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*for pipe support systems, refer to guidelines DVS 2210-1 (Planning and execution - above-ground pipe systems)

**Resale product**
**DSM**

Distance plates in PP for ZIKM pipe clips*

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<td>8</td>
<td>4</td>
<td>10</td>
<td>40</td>
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</tr>
</tbody>
</table>

*for pipe support systems, refer to guidelines DVS 2210-1 (Planning and execution - above-ground pipe systems)

**resale product
The installation of thermoplastic pipe systems requires the use of support clips to prevent flexing and the resulting mechanical stresses. The distance between the clips depends on the pipe material, SDR, surface temperature and the density of the conveyed fluid. Before installing the clips, check the distances reported in the table below, as provided for by guidelines DVS 2210-01 for water pipes.

### Supporting PVC-U pipes conveying liquids of density 1 g/cm³ (water and other fluids of equal intensity).

For pipes of SDR 13.6 / S 6.3 / PN 16:

<table>
<thead>
<tr>
<th>d mm</th>
<th>&lt; 20° C</th>
<th>30° C</th>
<th>40° C</th>
<th>50° C</th>
<th>60° C</th>
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<tbody>
<tr>
<td>16</td>
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<td>750</td>
<td>600</td>
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<tr>
<td>20</td>
<td>1100</td>
<td>1050</td>
<td>1000</td>
<td>900</td>
<td>700</td>
</tr>
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</table>

For pipes of SDR 21 / S 10 / PN 10:

<table>
<thead>
<tr>
<th>d mm</th>
<th>&lt; 20° C</th>
<th>30° C</th>
<th>40° C</th>
<th>50° C</th>
<th>60° C</th>
</tr>
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<tbody>
<tr>
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<td>1100</td>
<td>900</td>
</tr>
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<td>40</td>
<td>1450</td>
<td>1400</td>
<td>1350</td>
<td>1250</td>
<td>1150</td>
</tr>
<tr>
<td>50</td>
<td>1600</td>
<td>1550</td>
<td>1500</td>
<td>1400</td>
<td>1000</td>
</tr>
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<td>125</td>
<td>2550</td>
<td>2450</td>
<td>2400</td>
<td>2200</td>
<td>1850</td>
</tr>
<tr>
<td>140</td>
<td>2700</td>
<td>2600</td>
<td>2500</td>
<td>2300</td>
<td>1950</td>
</tr>
<tr>
<td>160</td>
<td>2900</td>
<td>2800</td>
<td>2700</td>
<td>2500</td>
<td>2100</td>
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<tr>
<td>180</td>
<td>3100</td>
<td>2950</td>
<td>2850</td>
<td>2650</td>
<td>2200</td>
</tr>
</tbody>
</table>

For different SDR values, multiply the data in the table by the following factors:
- 1.08 for SDR 13.6 / S6.3 / PN16 size range d25 - d400
- 1.15 for SDR 11 / S5 / PN20 entire size range

**Supporting PVC-U pipes conveying liquids of density other than 1 g/cm³**

If the liquid being conveyed has a density other than 1 g/cm³, the distance L in the table must be multiplied by the factors in the table below.

<table>
<thead>
<tr>
<th>Fluid density in g/cm³</th>
<th>Support factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25</td>
<td>0.96</td>
</tr>
<tr>
<td>1.50</td>
<td>0.92</td>
</tr>
<tr>
<td>&lt; 0.01</td>
<td>1.42</td>
</tr>
</tbody>
</table>

For SDR 21 / S10 / PN10:
- 1.42 for SDR 21 / S10 / PN10

For SDR 13.6 / S6.3 / PN16:
- 1.30 for SDR 13.6 / S6.3 / PN16

For SDR 11 / S5 / PN20:
- 1.20 for SDR 11 / S5 / PN20
ISO-BSP FITTINGS

Series of fittings designed for conveying fluids under pressure with threaded and solvent weld cold chemical jointing systems (solvent welding) using suitable solvent cement and cleaner primer.

ADAPTOR FITTINGS

<table>
<thead>
<tr>
<th>Technical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size range</td>
<td>d 16 ÷ d 125 (mm): R 3/8” ÷ 4”</td>
</tr>
<tr>
<td>Nominal pressure</td>
<td>PN 16 with water at 20 °C</td>
</tr>
<tr>
<td>Temperature range</td>
<td>0 °C ÷ 60 °C</td>
</tr>
<tr>
<td></td>
<td>Thread: UNI ISO 228-1, DIN 2999, BS 21, ISO 7, ASTM D 2464, JIS B 0203</td>
</tr>
<tr>
<td>Reference standards</td>
<td>Construction criteria: EN ISO 1452, EN ISO 15493</td>
</tr>
<tr>
<td></td>
<td>Test methods and requirements: EN ISO 1452, EN ISO 15493</td>
</tr>
<tr>
<td></td>
<td>Installation criteria: DVS 2204, DVS 2221, UNI 11242</td>
</tr>
<tr>
<td>Fitting material</td>
<td>PVC-U</td>
</tr>
<tr>
<td>Seal material</td>
<td>EPDM, FKM</td>
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</tbody>
</table>
TECHNICAL DATA

PRESSURE VARIATION ACCORDING TO TEMPERATURE

For water and non-hazardous fluids for which the material is classified as CHEMICALLY RESISTANT (life expectancy 25 years). In other cases, a reduction of the nominal pressure PN is required.

REGRESSION CURVE FOR PVC-U FITTINGS

Regression coefficients according to EN ISO 1452 and EN ISO 15493 for MRS (minimum required strength) values = 25 N/mm² (MPa) (classification PVC-U 250)
SAFETY FACTORS

Nominal pressure PN must be understood as being the standard pressure used for calculating and selecting the required fittings. In order to be able to comply with the safety factors, the maximum continuous working pressure at 20°C when conveying water must be the same as the nominal pressure values. Unless otherwise specified, the nominal pressures are as follows:

- solvent weld fittings from d 12 to d 225 PN 16 from d 250 to d 315 PN 10
- adaptor fittings from d 16 to d 110 PN 16
- threaded fittings from R 3/8” to R 4” up to PN 16.

<table>
<thead>
<tr>
<th>Pe (bar)</th>
<th>1h</th>
<th>1000h</th>
<th>50 years</th>
<th>T</th>
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<tbody>
<tr>
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<td>6.72</td>
<td>5.12</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>4.2</td>
<td>3.2</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

The information in this leaflet is provided in good faith. FIP will not be held liable for technical data not originating directly from recognised international standards. The company reserves the right to carry out any modifications. Products must be installed and maintained by qualified personnel.
DIMENSIONS

**GIFV**
90° elbow with solvent weld socket and BSP threaded female end R

<table>
<thead>
<tr>
<th>d x R</th>
<th>PN</th>
<th>E</th>
<th>L</th>
<th>L₁</th>
<th>Z</th>
<th>Z₁</th>
<th>g</th>
<th>Code</th>
</tr>
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<tbody>
<tr>
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<td>23,5</td>
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<td>10</td>
<td>13</td>
<td>16</td>
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<tr>
<td>20 x 1/2&quot;</td>
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<td>16</td>
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<td>12</td>
<td>13</td>
<td>24</td>
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<td>16,3</td>
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<td>27</td>
<td>125</td>
<td>GIFV040114</td>
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<td>31</td>
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<td>37</td>
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<td>1130</td>
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**GIMV**
90° elbow with reinforced solvent weld socket d and BSP threaded female end R with stainless steel reinforcing ring

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<th>d x R</th>
<th>PN</th>
<th>E</th>
<th>E₁</th>
<th>L</th>
<th>L₁</th>
<th>Z</th>
<th>Z₁</th>
<th>g</th>
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### TIFV
90° Tee with solvent weld socket d and BSP threaded female end R

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<th>L</th>
<th>L₁</th>
<th>Z</th>
<th>Z₁</th>
<th>g</th>
<th>Code</th>
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<tbody>
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<td>12</td>
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### TIMV
90° Tee with reinforced end: solvent weld socket d and BSP threaded female branch R with stainless steel reinforcing ring

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<tr>
<th>d x R</th>
<th>PN</th>
<th>E</th>
<th>E₁</th>
<th>L</th>
<th>L₁</th>
<th>Z</th>
<th>Z₁</th>
<th>g</th>
<th>Code</th>
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<td>23,5</td>
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<td>11</td>
<td>24</td>
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<td>15</td>
<td>12</td>
<td>13</td>
<td>38</td>
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<td>25 x 3/4&quot;</td>
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<td>15</td>
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<td>60</td>
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<td>21,5</td>
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<td>125</td>
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<td>33,5</td>
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**MIFV**
Double socket with solvent weld socket d and BSP threaded female end R

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<th>PN</th>
<th>E</th>
<th>K</th>
<th>L</th>
<th>L₁</th>
<th>Z</th>
<th>g</th>
<th>Code</th>
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<td>11,4</td>
<td>5,5</td>
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<td>28,5</td>
<td>29</td>
<td>16</td>
<td>15</td>
<td>4</td>
<td>20</td>
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<td>35</td>
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<td>5</td>
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<td>43</td>
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**MIMV**
Double socket with solvent weld socket d and BSP threaded female end R with stainless steel reinforcing ring

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**DIMV**

Double adaptor with solvent weld socket df, solvent weld spigot dm and BSP threaded female end R with stainless steel reinforcing ring (fig. A)

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**DIMV**

Double adaptor with solvent weld socket df, solvent weld spigot dm and BSP threaded female end R with stainless steel reinforcing ring (fig. B)

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NRIV
Barrel nipple with reduced solvent weld spigot d and BSP threaded male end R

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KIFV
Double adaptor with solvent weld socket df, solvent weld spigot dm and BSP threaded male end R

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Union with solvent weld socket d and BSP threaded female end R with O-Ring in EPDM

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### BIRV
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**BIFOV**
Adaptor union in PVC-U/brass with solvent weld socket \(d\) and BSP threaded brass female end \(R\) with O-Ring in EPDM

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**BIROV**
Adaptor union in PVC-U/brass with solvent weld socket \(d\) and BSP threaded brass male end \(R\) with O-Ring in EPDM

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### BIFXV
Adaptor union in PVC-U/stainless steel with solvent weld socket \( d \) and BSP threaded A316L stainless steel female end \( R \) with O-Ring in EPDM or FKM

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### BIRXV
Adaptor union in PVC-U/stainless steel with solvent weld socket \( d \) and BSP threaded A316L stainless steel male end \( R \) with O-Ring in EPDM or FKM

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**EFV**

Union nut with BSP thread for union types BIV, BIFV, BFV, BLV, BIRV, BIFOV, BIROV, BIFXV, BIRXV.

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**F/BFV**

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**O-RING**

O-Ring for union types BIV, BIFV, BFV, BLV, BIRV, BIFOV, BIROV, BIFXV, BIRXV

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**LIV**
Tank connector with solvent weld spigot d, threaded joint R with tightening nut and flat gasket in EPDM

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**LIFV**
Tank connector with solvent weld socket d, male threaded joint R and female threaded joint R₁ with tightening nut and flat gasket in EPDM or FKM

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<th>K</th>
<th>L</th>
<th>L₁</th>
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**JFV**
Back nut with BSP thread (used on LIV and LIFV)

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BSP FITTINGS

Series of fittings for pipes conveying fluids under pressure with threaded joints.

### TECHNICAL SPECIFICATIONS

<table>
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<th>Specification</th>
<th>Details</th>
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<td><strong>Size range</strong></td>
<td>R 3/8” ÷ 4”</td>
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<tr>
<td><strong>Nominal pressure</strong></td>
<td>PN 16 with water at 20 °C</td>
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<tr>
<td><strong>Temperature range</strong></td>
<td>0 °C ÷ 60 °C</td>
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</table>
| **Coupling standards** | Thread: ISO 228-1, DIN 2999, ISO 7, BS 21, ASTM D 2464, JIS B0203  
                         | Flanging system: DIN 2501, EN 1092-1 |
| **Reference standards**| Construction criteria: EN ISO 1452, EN 15493  
                         | Test methods and requirements: EN ISO 1452, EN ISO 15493 |
| **Fittings material**  | PVC-U |
| **Seal material**      | EPDM, FKM |
TECHNICAL DATA

PRESSURE VARIATION ACCORDING TO TEMPERATURE

For water and non-hazardous fluids for which the material is classified as CHEMICALLY RESISTANT (life expectancy 25 years). In other cases, a reduction of the nominal pressure PN is required.

REGRESSION CURVE FOR PVC-U FITTINGS

Regression coefficients according to EN ISO 1452 and EN ISO 15493 for MRS (minimum required strength) values = 25 N/mm² (MPa) (classification PVC-U 250)
SAFETY FACTORS

The table reports the safety factors for each pressure class as a function of time.
Nominal pressure PN must be understood as being the standard pressure used for calculating and selecting the required fittings. In order to be able to comply with the safety factors, the maximum continuous working pressure at 20°C when conveying water must be the same as the nominal pressure values. Unless otherwise specified, the nominal pressures are as follows:
- solvent weld fittings from d 12 to d 225 PN 16 from d 250 to d 315 PN 10
- adaptor fittings from d 16 to d 110 PN 16
- threaded fittings from R 3/8” to R 4” up to PN 16.

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<th>1000h</th>
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The information in this leaflet is provided in good faith. FIP will not be held liable for technical data not originating directly from recognised international standards. The company reserves the right to carry out any modifications. Products must be installed and maintained by qualified personnel.
### DIMENSIONS

#### GFV

90° elbow with BSP threaded female ends

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<th>L</th>
<th>Z</th>
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#### HFV

45° elbow with BSP threaded female ends

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**MFV**

Double socket with BSP threaded female ends

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**TFV**

90° Tee with BSP threaded female ends

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### NFV
Barrel nipple with BSP threaded male ends

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**EFV**

Union nut with BSP thread for union types BIV, BIFV, BFV, BLV, BIRV, BIFOV, BIROV, BIFXV, BIRXV

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**F/BFV**

Union bush with BSP threaded female end

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Q/BFV
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### Q/BFO

Union end in brass with female BSP thread

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### Q/BRX

Union end in A316L stainless steel with male BSP thread

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Q/BFX
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RFV
Reducer with BSP threaded male end (R) and BSP threaded female end (R1 reduced) (fig. A)

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**RFV**
Reducer with BSP threaded male end (R) and BSP threaded female end (R1 reduced)
(fig. B)

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**IFFV**
Reducer: BSP threaded female end (R1), BSP threaded male end (R reduced)

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DFV
Reducing bush with BSP threaded male end (R) and BSP threaded female end (R1 reduced)

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### AFV

**Hose adaptor with BSP threaded male end**

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### ADV

**Hose adaptor with BSP threaded female end (R) and EPDM flat gasket**

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BS FITTINGS
PVC-U
Fittings according to british standard
BS FITTINGS

Series of fittings for pipes conveying fluids under pressure with solvent weld and threaded joints according to British Standard.

FITTINGS ACCORDING TO BRITISH STANDARD

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<tr>
<th>Technical specifications</th>
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<td><strong>Size range</strong></td>
<td>d 1/2” ÷ 8”</td>
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<tr>
<td><strong>Nominal pressure</strong></td>
<td>up to 15 bar with water at 20 °C</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
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<td><strong>Flanging system</strong></td>
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<td>Construction criteria</td>
<td>ISO 7, ASTM D 2464, JIS B 0203, EN ISO 1452, EN ISO 15493</td>
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<tr>
<td>Test methods and requirements</td>
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<td>Installation criteria</td>
<td>DVS 2204, DVS 2221, UNI 11242</td>
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<th>Fittings material</th>
<th>PVC-U</th>
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<tbody>
<tr>
<td>Seal material</td>
<td>EPDM</td>
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PRESSURE VARIATION
ACCORDING TO
TEMPERATURE

For water and non-hazardous fluids with regard to which the material is classified as CHEMICALLY RESISTANT. In other cases, a reduction of the nominal pressure PN is required (25 years with safety factor).

- class E 15 bar
- class D 12 bar
- class C 9 bar

SAFETY FACTORS

The table reports the safety factors for each pressure class as a function of time.

BS fittings are split into pressure classes according to usage. In order to be able to comply with the safety factors, the maximum continuous working pressure at 20° C when conveying water must be the same as the pressure class. Unless otherwise specified, the nominal pressures are as follows:

- solvent weld fittings from d 1/2" to d 4" class E from d 6" to d 8" class D
- adaptor fittings from d 1/2" to d 2" class E from d 2 1/2" to d 4" class D

The information in this leaflet is provided in good faith. FIP will not be held liable for technical data not originating directly from recognised international standards. The company reserves the right to carry out any modifications. Products must be installed and maintained by qualified personnel.
# Dimensions

**SLV**

90° long radius bend (R=2D) with solvent weld sockets

<table>
<thead>
<tr>
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<th>PN</th>
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<th>Z</th>
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**GLV**

90° elbow with solvent weld sockets

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### HLV
45° elbow with solvent weld sockets

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### MLV
Solvent weld double socket

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### MILV

mm/inch double socket union, one socket for solvent welding to metric pipes and one for solvent welding to imperial (inches) pipes

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### TLV

90° Tee with solvent weld sockets

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Union bush for solvent welding, metric series

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Union end for solvent welding, BS series

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O-RING
O-ring for union types BIV, BIFV, BFV, BLV, BIRV, BIFOV, BIROV, BIFXV, BIRXV

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### DLV
Reducing bush with solvent weld spigot (d) and solvent weld socket (d1 reduced) (Fig. A)

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### DLV
Reducing bush with solvent weld spigot (d) and solvent weld socket (d1 reduced) (Fig. B)

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QLV
Serrated face stub with solvent weld socket, for use with stubs QLV and flat gaskets QHV/X and QHV/Y (QHV/Y only when coupling to ISO/DIN “ODV and ODB” flanges)

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**QHV/Y**

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**FLV**
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### GLFV
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### MLFV
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ILFV
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# Abbreviations

**ABS** acrylonitrile butadiene styrene  
**d** nominal external diameter of the pipe in mm  
**DN** nominal internal diameter of the pipe in mm  
**EPDM** Ethylene-Propylene-Diene-Monomer  
**FKM (FPM)** fluoroelastomer  
**g** weight in grams  
**HIPVC** PVC high impact  
**K** lid key  
**NBR** nitrile butadiene rubber  
**OP** operating pressure  
**P** pipe holder  
**PA-GR** fibreglass reinforced polyamide  
**PBT** polybutylene terephthalate  
**PE** polyethylene  
**PN** nominal pressure in bar (max. operating pressure at 20°C water)  
**POM** polyoxymethylene  
**PP-GR** fibreglass reinforced polypropylene  
**PP-H** polypropylene homopolymer  
**PVC-C** chlorinated polyvinyl chloride  
**PVC-U** unplasticized polyvinylchloride  
**PVDF** polyvinylidene difluoride  
**PTFE** polynethrafluorethylene  
**R** nominal thread size in inches  
**S** pipe thickness in mm  
**SDR** standard dimension ratio = d/s  
**U** number of holes