

General information:

Among the main properties and features of uPVC the following can be noted:

- **Good chemical resistance:** uPVC resins guarantee excellent chemical resistance with regard to most acids and alkalis, aliphatic hydrocarbons and saline solutions. uPVC resins are also totally compatible for handling food grade fluids, treated and untreated drinking water, as well as demineralised water according to current national and international standards. It is not resistant to aromatic or chlorinated carbons.
- **Good thermal stability:** Mostly in the intermediate temperature range between 20 °C and 50 °C, PVC-U finds its ideal application in industrial and water supplies, guaranteeing optimal performance in terms of mechanical resistance, good rigidity, low coefficients of thermal expansion and optimal safety factors in service.
- **Lifetime:** uPVC resins feature a high value in material strength (Minimum Required Strength MRS \geq 25.0 Mpa at 20°C) and an extremely long lifetime.

uPVC System Pressure/Temperature Relationship:

Pressure ratings for plastic pipework systems are always quoted at 20 °C, it is a fundamental principle of such systems that if the temperature is increased then the pressure rating must be reduced. uPVC systems should never be used for temperatures in excess of 60 °C. The following chart gives a rough guide as to the temperature/pressure relationship of uPVC pipework systems.

Metric Ratings	20 ° C	30 ° C	40 ° C	50 ° C	60 ° C
PN6	6.0 BAR	4.8 BAR	3.4 BAR	2.3 BAR	1.3 BAR
PN10	10.0 BAR	8.0 BAR	5.8 BAR	3.9 BAR	2.2 BAR
PN16	16.0 BAR	12.8 BAR	9.2 BAR	6.2 BAR	3.5 BAR

Developed in 1930 in Germany, uPVC (unplasticised polyvinyl chloride) is obtained by the process of polymerization vinyl chloride (a gaseous monomer). An highly reliable resin with high performance of thermal stability, chemical and mechanical resistance up to 60° C, is obtained by the presence of chlorine in the molecule of uPVC. The different formulations obtained by the addition of suitable additives and stabilizers, make uPVC the more versatile of the plastic materials, having several possibilities to be used in many applications with fluids under pressure.

uPVC represents one of the most economic solutions within the range of thermoplastic and metal materials. The uPVC system overcomes problems which can be encountered in applications for the conveyance of corrosive chemical fluids and also in the distribution and treatment of general water.

The main reasons for the preference of this system are attributed to the following characteristics of the resin:

- uPVC is basically inert to most inorganic bases, acids, saline solutions and paraffin/ aliphatic hydrocarbons. It is not recommended for use with polar organic solvent, including chlorinated and aromatic types.
- The unique molecular structure grants a low coefficient of thermal conductivity ($\lambda = 0,15$ W/m °C according to ASTM C177). It virtually eliminates condensation and offers superior heat retention reducing heat loss through piping walls.
- Low permeability to oxygen and reduced water absorption (0,1% at 23°C according to ASTM D 570).
- Good resistance to ageing, due to the chemical and physical properties of the uPVC resin.
- All components are suitable for conveying potable water, beverages and food.
- The material has excellent mechanical characteristics and good impact strength. These properties make the uPVC suitable for high service pressure (up to 16 bar at 20°C).
- The uPVC compounds present important characteristics associated with performance during fires, in fact the flash ignition temperature is 399°C and it persists only in extreme conditions, e.g. if the Oxygen concentration is two times higher than the atmospheric pressure, or only in presence of an external flame source. Flash ignition temperature: 399° C Limiting Oxygen Index: 45% Class UL 94 rating: V0
- The different jointing system options offer low installation costs.

Applicable Standards:

- ANSI B16.5 Pipe flanges and flanged fittings- NPS 1/2 through NPS 24 metric/inch.
- ASTM D 2464 Standard specification for polyvinyl chloride (PVC) threaded plastic pipe fittings.
- ASTM D 2467 Standard specification for polyvinyl chloride (PVC) plastic pipe fittings, schedule 80.
- BS 10 Specification for flanges and bolting for pipes, valves and fittings.
- BS 1560 Circular flanges for pipes, valves and fittings (Class designated).
- BS 4504 Circular flanges for pipes, valves and fittings (PN designated).
- DIN 2501 Flanges, Dimensions.
- DIN 2999 Whitworth pipe threads for threaded pipes and fittings.
- DIN 3202 Face-to-face and centre-to-face dimensions of valves.
- DIN 3441-2 Ball valves; dimensions.
- DIN 8062 PVC-U pipes dimensions.
- DIN 8063 PVC-U fittings, dimensions.
- DIN 16962 PVC-C Plastic Pipe, sch. 40 and 80.
- DIN 16963 Pipe connections and pipe components for fluids under pressure in HDPE.
- DVS 2204 - 2221 Solvent welding of thermoplastic materials PVC-U.
- EN 558-1 Industrial valves-Face-to-face and center-to-face dimensions of metal valves for use in flanged pipe systems - Part 1
- EN ISO 1452 Characteristics of PVC-U fittings and pipes of piping systems for water supply.
- EN ISO 15493 Plastics piping systems in ABS, PVC-U, PVC-C for industrial applications.
- EN ISO 16135 Industrial valves-Ball valves of thermoplastic materials.
- EN ISO 16136 Industrial valves-Butterfly valves of thermoplastic materials.
- EN ISO 16137 Industrial valves-Check valves of thermoplastic materials.
- EN ISO 16138 Industrial valves-Diaphragm valves of thermoplastic materials.
- ISO 7 PVC-U fittings with threaded connections sealing tight.ISO 161-1 PVC-U pipes and fittings dimensions, metric series.
- ISO 228-1 PVC-U fittings with threaded connections.
- ISO 727 Pipes and fittings in PVC-U. Dimensions and tolerances metric series.
- ISO 5211 Part-turn actuator attachments
- ISO 5752 Metal valves for use in flanged pipe systems; Face-to-face and centre-to-face dimensions.
- ISO 7005-1 Metallic flanges; part 1: steel flanges.
- ISO 9393 Thermoplastics valves-pressure test methods and requirements.