PVC-U GENERAL CHARACTERISTICS

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PVC-U (rigid, unplasticised polyvinyl chloride) was developed in Germany in 1930 and is obtained by polymerising vinyl chloride monomer. The chlorine in the PVC-U molecule gives a high-performance resin in terms of thermal stability and of chemical and mechanical resistance, up to temperatures of 60 °C.

Formulations obtained with suitable additives and stabilisers make PVC-U one of the most versatile plastic materials, adaptable to many applications involving fluids under pressure. It is one of the more economical solutions among thermoplastic and metal materials for conveying corrosive chemical fluids and for the distribution and treatment of water in general. The main reasons are the characteristics of the resin:

- **Good chemical resistance:** excellent resistance to most acids and alkalis, paraffin/aliphatic hydrocarbons and saline solutions. Not recommended for polar organic compounds, including some types of chlorinated and aromatic solvents. Fully compatible with foodstuffs, demineralised water, potable water and unconditioned water, as provided for by current national and international standards.
- **Good thermal stability:** in particular between 20 °C and 50 °C, the range typical of industrial and water supply applications, with excellent mechanical strength, adequate rigidity, low thermal expansion coefficients and high safety factors in service. PVC-U compounds are also resistant to combustion: flash point 399 °C; the flame persists only if the oxygen concentration is twice that of the atmosphere or in the presence of an external flame. Oxygen index 45 %; UL 94 class V0. The low coefficient of thermal conductivity (λ = 0.15 W/m °C according to ASTM C177) reduces heat loss when conveying hot fluids and virtually eliminates condensation problems.
- **Good mechanical strength:** low permeability to oxygen and low water absorption (0.1 % at 23 °C according to ASTM D 570). The thermal stability of the material gives good impact resistance and the capacity to support service pressures of 4 - 6 - 10 - 16 bar at 20 °C.
- **Resistance to ageing:** high circumferential breaking strength (Minimum Required Strength MRS ≥ 25.0 MPa at 20 °C) and long installation lifetimes without significant physical-mechanical deterioration.

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PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	UNIT OF MEASUREMENT	VALUE
Density	ISO 1183 - ASTM D792	g/cm^3	1.38
Modulus of elasticity	ISO 527	$MPa = N/mm^2$	3200
Charpy impact strength at 23 °C	ASTM D256	kJ/m^2	5-8
Ultimate elongation	ISO 527	%	50
Shore hardness	ISO 868	Shore D	80
Tensile strength	ISO 527	$MPa = N/mm^2$	50
VICAT softening point (B/50)	ISO 306	°C	76
Heat distortion temperature HDT (0.46 N/mm^2)	ASTM D648	°C	86
Thermal conductivity at 23 °C	DIN 52612-1 - ASTM C177	W/(m °C)	0.16
Coefficient of linear thermal expansion	DIN 53752 - ASTM D696	m/(m °C)	8×10^{-5}
Limiting Oxygen Index	ISO 4859-1 - ASTM D2863	%	43

MAIN PROPERTIES

PROPERTY OF PVC-U	BENEFITS
Thermal resistance	Service range 0-60 °C (see the pressure/temperature curves)
Low surface roughness	High flow coefficients (extremely smooth internal walls); pressure drop constant over time; low risk of stoppages due to scaling; reduced transfer of material to the conveyed fluid
Chemical resistance	Good chemical resistance for conveying acids and alkalis, paraffin/aliphatic hydrocarbons and saline solutions
Abrasion resistance	Extremely low operating costs due to the long service life
Insulating	Non-conductive (immune to galvanic corrosion); no condensation problems; minimum heat loss
Linear thermal expansion coefficients	Reduced need for supports and expansion joints, with considerable advantages in plant design
Easy to join (solvent weld sockets)	Reduced installation costs thanks to the solvent weld joint made with a suitable solvent cement
Fire behaviour	Good resistance to combustion, also due to the presence of self-extinguishing chlorine
Good mechanical resistance	Adequate mechanical strength; complies with the requirements of industrial plant design

Specifications are subject to change without notice.