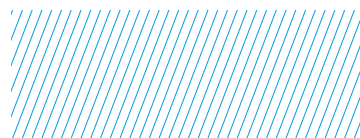


# MATERIAL

## TYPICAL PROPERTIES

### Properties of PVC

Property	Value	Conditions and Remarks
<b>Physical properties</b>		
Molecular weight (resin)	140,000	cf: K57 PVC 70,000
Relative density	1.42 - 1.48	cf: PE 0.95 - 0.96, GRP 1.4 - 2.1, CI 7.20, Clay 1.8 - 2.6
Water absorption	0.12%	23°C, 24 hours cf: AC 18 - 20% AS1711
Hardness	80	Shore D Durometer, Brinell 15, Rockwell R 114, cf: PE Shore D 60
Impact strength - 20°C	20 kJ/m <sup>2</sup>	Charpy 250 µm notch tip radius
Impact strength - 0°C	8 kJ/m <sup>2</sup>	Charpy 250 µm notch tip radius
Coefficient of friction	0.4	PVC to PVC cf: PE 0.25, PA 0.3
<b>Mechanical properties</b>		
Ultimate tensile strength	52 MPa	AS 1175 Tensometer at constant strain rate cf: PE 30
Elongation at break	50 - 80%	AS 1175 Tensometer at constant strain rate cf: PE 600-900
Short term creep rupture	44 MPa	Constant load 1 hour value cf: PE 14, ABS 25
Long term creep rupture	28 MPa	Constant load extrapolated 50 year value cf: PE 8-12
Elastic tensile modulus	3.0 - 3.3 GPa	1% strain at 100 seconds cf: PE 0.9-1.2
Elastic flexural modulus	2.7 - 3.0 GPa	1% strain at 100 seconds cf: PE 0.7-0.9
Long term creep modulus	0.9 - 1.2 GPa	Constant load extrapolated 50 year secant value cf: PE 0.2 - 0.3
Shear modulus	1.0 GPa	1% strain at 100 seconds $G=E/2/(1+\mu)$ cf: PE 0.2
Bulk modulus	4.7 GPa	1% strain at 100 seconds $K=E/3/(1-2\mu)$ cf: PE 2.0
Poisson's ratio	0.4	Increases marginally with time under load. cf: PE 0.45
<b>Electrical properties</b>		
Dielectric strength (breakdown)	14 - 20 kV/mm	Short term, 3 mm specimen PE 70-85
Volume resistivity	$2 \times 10^{14} \Omega \cdot m$	AS 1255.1 PE > 1016
Surface resistivity	$10^{13} - 10^{14} \Omega$	AS 1255.1 PE > 1013
Dielectric constant (permittivity)	3.9 (3.3)	50 Hz (106 Hz) AS 1255.4
Dissipation factor (power factor)	0.01 (0.02)	50 Hz (106 Hz) AS 1255.4



Thermal properties		
Softening point	80 - 84°C	Vicat method AS 1462.5 (min. 75°C for pipes)
Max. continuous service temp.	60°C	cf: PE 80*, PP 110*
Coefficient of thermal expansion	7 x 10 <sup>-5</sup> /K	7 mm per 10 m per 10°C cf: PE 18 - 20 x 10 <sup>-5</sup> , DI 1.2 x 10 <sup>-5</sup>
Thermal conductivity	0.16 W/[m.K]	0 - 50°C PE 0.4
Specific heat	1,000 J/[kg.K]	0 - 50°C
Thermal diffusivity	1.1 x 10 <sup>-7</sup> m <sup>2</sup> /s	0 - 50°C
Fire performance		
Flammability (oxygen index)	45%	ASTM D2863 Fennimore Martin test, cf: PE 17.5, PP 17.5
Ignitability index	10 - 12 (/20)	cf: 9 - 10 when tested as pipe AS 1530 Early Fire Hazard Test
Smoke produced index	6 - 8 (/10)	cf: 4 - 6 when tested as pipe AS 1530 Early Fire Hazard Test
Heat evolved index	0	
Spread of flame index	0	Will not support combustion. AS 1530 Early Fire Hazard Test

## Abbreviations

PE	Polyethylene
PP	Polypropylene
PA	Polyamide (nylon)
CI	Cast Iron
AC	Asbestos Cement
GRP	Glass Reinforced Pipe

## Conversion of Units

$$1 \text{ MPa} = 10 \text{ bar} \qquad \qquad \qquad = 9.81 \text{ kg/cm}^2 \qquad \qquad \qquad = 145 \text{ lbf/in}^2$$