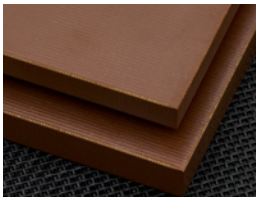
DuPont™ Vespel® Polyimide SP Family

Extremely high temperature creep resistant plastic with excellent friction and wear characteristics



DuPont™ Vespel® Polyimide is an extremely high temperature, creep resistant plastic material that is often used in high heat environments where thermoplastic materials lose their mechanical properties. Vespel®, a lightweight alternative to metal, is available in a variety of formulations including unfilled grades and several low friction and wear grades.

DuPont™ Vespel® Polyimide Material Options

The Vespel® SP Family of products are highly durable polyimides used in demanding applications where exceptional thermal resistance, low wear and/or low friction, strength and impact resistance are desired.

SP-1 – Unfilled offers superior wear and insulation properties with operating temperatures from cryogenic to 260°C (500°F). Low electrical conductivity. Highest elongation and purity of SP family. Available as stock shapes.

SP-3 – Used in vacuum and dry environments with low outgassing. Available as stock shapes.

SP-21 – Graphite-enhanced with low-friction properties for use with or without lubrication in various applications. Available as custom parts or stock shapes.

SP-211 – Lower coefficient of friction than SP-21 without lubrication in various applications. Available as custom parts or stock shapes.

SP-22 – Minimal thermal expansion and dimensional stability for design flexibility. Available as custom parts or stock shapes.

SP-202 – Conductive, eliminates static charge in high temperature substrate handling applications.

DuPont™ Vespel® is widely used for:

- Semiconductor and material handling machinery
- Chip test sockets
- Wafer clamping rings
- Valve seats and sealing applications
- Spline couplings
- High performance bearings and bushings
- Locking fasteners for aerospace
- Pivot bushings on unison ring

Performance characteristics:

- Long term performance at temperatures up to 260°C (500°F)
- Outstanding sealing characteristics when mated against metals
- Excellent unlubricated bearing and wear properties (bearing grades)
- Good electrical insulating properties (unfilled grades)

Available in:

Sheet Rod

DUPONT™
Authorized Distributor

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TYPICAL PROPERTIES OF DUPONT™ VESPEL® POLYIMIDE SP

	ASTM Method	Units	SP-1 Unfilled	SP-3 15% Vacuum Bearing Grade	SP-21 15% Graphite	SP-211 15% Graphite and 10% Teflon®	SP-22 40% Graphite
Mechanical							
Tensile strength, 23°C (73°F)	D1708 /D638	MPa (kpsi)	86.2 (12.5)	56.5 (8.2)	65.5 (9.5)	44.8 (6.5)	51.7 (7.5)
Tensile strength, 260°C (500°F)	D1708 /D638	MPa (kpsi)	41.4 (6.0)		37.9 (5.5)	24.1 (3.5)	23.4 (3.4)
Elongation at break, 23°C (73°F)	D1708 /D638	%	7.5	4.0	4.5	3.5	3.0
Elongation at break, 260°C (500°F)	D1708 /D638	%	6.0		3.0	3.0	2.0
Flexural modulus, 23°C (73°F)	D790	MPa (kpsi)	3,100 (450)	3,280 (475)	3,790 (550)	3,100 (450)	4,830 (700)
Flexural modulus, 260°C (500°F)	D790	MPa (kpsi)	1,720 (250)	1,860 (270)	2,550 (370)	1,380 (200)	2,760 (400)
Compressive stress at 10% strain, 23°C (73°F)	D695	MPa (kpsi)	133 (19.3)	128 (18.5)	133 (19.3)	102 (14.8)	112 (16.3)
Deformation under 13.8 MPa (2,000 psi) load	D621	%	0.14	0.12	0.10	0.13	0.08
Friction							
Coefficient of friction at PV = .875 MPa m/s (25,000 psi-ft/min)*			0.29	0.25	0.24	0.12	0.20
Coefficient of friction at PV = 3.5 MPa m/s (25,000 psi-ft/min)*				0.17	0.12	0.08	0.09
Static coefficient of friction in air*			0.35		0.30	0.20	0.27
PV limit (unlubricated)**		MPa-m/s (kpsi ft/min)			12.3 (350)	3.5 (100)	12.3 (350)
Other Properties							
Coefficient of thermal expansion 23-300°C (73-572°F)	E831	µm/m/K (10^{-6} in/in-°F)	54 (30)	52 (29)	49 (27)	54 (30)	38 (21)
Hardness	D785	Rockwell E	45–60	40–55	25–45	1–20	5–25
Water absorption, 24 hr at 23°C (73°F)	D570	%	0.24	0.23	0.19	0.21	0.14

*Versus carbon steel, steady state, unlubricated, in air, thrust bearing. **PV limits for any material vary with different combinations of pressure and velocity as well as other conditions.

View Typical Properties for Vespel® SP-202 Conductive Grade.