TECHNICAL DATA SHEET
Vespel (PI)
(Polyimide)

Vespel® is a high performance polyimide material which is formed from resin manufactured only by DuPont. Vespel® is one of the highest performing engineering plastics currently available. Vespel® will not melt and can operate continuously from cryogenic temperatures to 550°F (288°C), with intermittent to 900°F (482°C). Vespel® parts consistently exhibit excellent performance in a variety of applications requiring low wear and long life in severe environments.

Vespel Grades and Colors

Vespel® SP-21

For Vespel® SP-21, 15% graphite by weight is added to the base resin for increased wear resistance and reduced friction in applications such as bearings, thrust washes, bushings, seal rings, slide blocks and other wear surfaces. Vespel® SP-21 has the highest mechanical properties of the graphite-filled grades.

Vespel® SP-22

For Vespel® SP-22, 40% graphite by weight is added to the base resin for enhanced resistance to wear and friction and good dimensional and oxidative stability. Vespel® SP-22 has the lowest coefficient of thermal expansion of the graphite-filled grades. Typical applications are the same as those for Vespel® SP-21.

Vespel® SP-211

For Vespel® SP-211, 10% Teflon® (PTFE) and 15% graphite by weight are added to the base resin for the lowest coefficient of friction over a wide range of operating conditions. Vespel® SP-211 also has excellent wear resistance up to 300° F. Typical applications include sliding or linear bearings as well as many of the wear and friction applications for which the other Vespel® grades are suitable.

Vespel® SP-3

For Vespel® SP-3, 15% molybdenum disulfide by weight is added to the base resin for wear and friction resistance in vacuum and other moisture-free environments where graphite actually becomes abrasive. Typical applications include seals, bushings, bearings, gears and other wear surfaces in outer space and in ultra-high vacuum or dry-gas environments.

Benefits
Excellent temperature resistance
High wear resistance
Dimensionally stable
Resistant to radiation
Extremely low outgassing
Easily fabricated

Applications
Rotary seal rings
Thrust washers and discs
Bushings
Flanged bearings
Printer wire guides
Spline couplings
Wear strips
Valve seats
Thermal and electrical insulators
Wafer clamping, polishing and grinding rings
Wafer guides & carriers
Vacuum pads

SHAPES AVAILABLE

SEE NEXT PAGE FOR ADDITIONAL INFORMATION

NOTE: The information contained herein are typical values intended for reference and comparison purposes only. They should NOT be used as a basis for design specifications or quality control. Contact us for manufacturers' complete material property datasheets.
All values at 73°F (23°C) unless otherwise noted.

TYPICAL PROPERTIES of VESPEL®

ASTM or UL test	Property	SP-1	SP-21	SP-22	SP-211	SP-3
-	Filler Material	Unfilled	15% Graphite	40% Graphite	10% PTFE, 15% Graphite	15% Moly
	PHYSICAL					
D792	Density (lb/in³) (g/cm³)	0.051 1.43	0.055 1.51	0.060 1.65	0.056 1.55	0.058 1.60
D570	Water Absorption, 24 hrs @ 73°F (%) 48 hrs @ 122°F (%)	0.24 0.72	0.19 0.57	0.14 0.42	0.21 0.49	0.23 0.65
	MECHANICAL					
D638	Tensile Strength, Ultimate @ 73°F (psi) @ 500°F (psi)	12,500 6,000	9,500 5,500	7,500 3,400	6,500 3,500	8,200 -
D638	Tensile Modulus (psi)	-	-	-	-	-
D638	Tensile Elongation, Ultimate @ 73°F (%) @ 500°F (%)	7.5 6.0	4.5 6.0	3.0 2.0	3.5 3.0	4.0 -
D790	Flexural Strength, Ultimate @ 73°F (psi) @ 500°F (psi)	16,000 9,000	16,000 9,000	13,000 6,500	10,000 5,000	11,000 5,500
D790	Flexural Modulus @ 73°F (psi) @ 500°F (psi)	450,000 250,000	550,000 370,000	700,000 400,000	450,000 200,000	475,000 270,000
D695	Compressive Strength, 10% strain @ 73°F (psi)	19,300	19,300	16,300	14,800	18,500
D695	Compressive Modulus (psi)	350,000	420,000	475,000	300,000	350,000
D785	Hardness, Rockwell	E45-60	E25-45	E5-25	E1-20	E40-55
D256	IZOD Notched Impact (ft-lb/in)	0.8	0.8	-	-	0.4
	Poisson's Ratio	0.4	0.4	-	-	-
	THERMAL					
D696	Coefficient of Linear Thermal Expansion (x 10^{-5} in./in./°F)	3.0	2.7	2.1	3.0	2.9
D648	Heat Deflection Temp (°F / °C) at 264 psi	680 / 360	680 / 360	-	-	-
-	Max Continuous Operating Temp (°F / °C)	500 / 260	500 / 260	500 / 260	500 / 260	500 / 260
C177	Thermal Conductivity (BTU-in/ft²-hr-°F) (x 10^{-4} cal/cm-sec-°C)	2.0 6.9	6.0 20.7	12.0 41.3	5.3 18.3	3.2 11.0
UL94	Flammability Rating	V-0	V-0	V-0	V-0	V-0
	ELECTRICAL					
D149	Dielectric Strength (V/mil) short time, 1/8" thick	560	250	-	-	-
D150	Dielectric Constant at 1 MHz	3.55	13.2	-	-	-
D150	Dissipation Factor at 1 MHz	0.0034	0.0106	-	-	-
D257	Volume Resistivity (ohm-cm)at 50% RH	10^{14} - 10^{15}	10^{12} - 10^{13}	-	-	-

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