

DuPont™ Vespel® SP-1

POLYIMIDE DIRECT-FORMED PARTS

Typical Direct-Formed Properties

DuPont™ Vespel® SP-1 parts and shapes are specified for their excellent physical properties, including electrical and thermal insulation at high temperatures. SP-1 is an unfilled polymer.

Some data presented below are based on limited production runs and are subject to revision as new knowledge and experience become available.

Mechanical Property	Temperature	ASTM	Units	Typical Values
Tensile Strength	23 °C (73 °F) 260 °C (500 °F)	D-1708 or E8 [†]	MPa (kpsi)	72.4 (10.5) 36.5 (5.3)
Strain at Break	23 °C (73 °F) 260 °C (500 °F)	D-1708 or E8 [†]	%	7.5 7.0
Flexural Strength	23 °C (73 °F) 260 °C (500 °F)	D-790	MPa (kpsi)	82.7 (12.0) 44.8 (6.5)
Flexural Modulus	23 °C (73 °F) 260 °C (500 °F)	D-790	MPa (kpsi)	2482 (360) 1448 (210)
Compressive Stress at 1% strain at 10% strain at 0.1% offset	23 °C (73 °F) 23 °C (73 °F) 23 °C (73 °F)	D-695	MPa (kpsi)	24.1* (3.5) 112.4* (16.3) 33.1* (4.8)
Compressive Modulus	23 °C (73 °F)	D-695	MPa (kpsi)	2413* (350)
Axial Fatigue, Endurance Limit at 10 ³ cycles at 10 ⁷ cycles	23 °C (73 °F) 260 °C (500 °F) 23 °C (73 °F) 260 °C (500 °F)	—	MPa (kpsi)	—
Flexural Fatigue, Endurance Limit at 10 ³ cycles at 10 ⁷ cycles	23 °C (73 °F) 23 °C (73 °F)	—	MPa (kpsi)	—
Shear Strength	23 °C (73 °F)	D-732	MPa (kpsi)	—
Izod Notched Impact Strength	23 °C (73 °F)	D-256	J/m	—
Izod Unnotched Impact Strength	23 °C (73 °F)	D-256	J/m	—
Poisson's Ratio	23 °C (73 °F)	—	—	—
Wear and Friction				
Wear Rate ^{††}	—	—	m/s x 10 ⁻¹⁰	17– 85
Friction Coefficient ^{**} PV = 0.875 MPa·m/s PV = 3.5 MPa·m/s	—	—	—	0.29
In Vacuum	—	—	—	—
Static in Air	—	—	—	—



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DuPont™ Vespel® SP-1 Typical Direct-Formed Properties (continued)

Thermal Property	Temperature	ASTM	Units	Typical Values
Coefficient of Linear Expansion	23 °C (73 °F) to 260 °C (500 °F)	D-696	μm/m/°C (in/in/°F)	50 (28)
Thermal Conductivity	40 °C (104 °F)	—	W/m·°C	0.29*
Specific Heat	—	—	J/kg/°C	—
Deformation Under 14 MPa Load	50 °C (122 °F)	D-621	%	0.20
Deflection Temperature at 2 MPa	—	D-648	°C	—
Electrical Property				
Dielectric Constant at 10 ² Hz at 10 ⁴ Hz at 10 ⁶ Hz	23 °C (73 °F)	D150	—	—
Dissipation Factor at 10 ² Hz at 10 ⁴ Hz at 10 ⁶ Hz	23 °C (73 °F)	D150	—	—
Dielectric Strength, Short Time 2 mm Thick	23 °C (73 °F)	D149	MV/m	—
Volume Resistivity	23 °C (73 °F)	D257	Ω·m	—
Surface Resistivity	23 °C (73 °F)	D257	Ω	—
Other Properties				
Water Absorption 24 h 48 h Equilibrium, 50% RH	23 °C (73 °F) 50 °C (122 °F)	D570	%	1.0–1.3
Specific Gravity	—	D792	—	1.34
Oxygen Index	—	D2863	%	—

† Direct-formed specimens made per figure 19 of E-8 (standard bar for powdered metallurgy products); specimens tested by D638.

* Direct-formed (DF) properties marked with asterisk were measured parallel to the forming direction. All other direct-formed properties were measured perpendicular to the forming direction.

†† Unlubricated in air (PV 0.875 MPa·m/s).

** Steady state, unlubricated in air.

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