

DuPont™ Vespel® SP-1

POLYIMIDE ISOSTATIC SHAPES

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Typical ISO 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) | 86.2 (12.5) 41.4 (6.0) |
| Strain at Break | 23 °C (73 °F) 260 °C (500 °F) | D-1708 or E8 [†] | % | 7.5 6.0 |
| Flexural Strength | 23 °C (73 °F) 260 °C (500 °F) | D-790 | MPa (kpsi) | 110.3 (16.0) 62.1 (9.0) |
| Flexural Modulus | 23 °C (73 °F) 260 °C (500 °F) | D-790 | MPa (kpsi) | 3102 (450) 1724 (250) |
| 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) | 24.8 (3.6) 133.1 (19.3) 51.0 (7.4) |
| 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) | 55.8 (8.10) 26.2 (3.8) 42.1 (6.1) 16.5 (2.4) |
| Flexural Fatigue, Endurance Limit at 10 ³ cycles at 10 ⁷ cycles | 23 °C (73 °F) 23 °C (73 °F) | — | MPa (kpsi) | 65.5 (9.5) 44.8 (6.5) |
| Shear Strength | 23 °C (73 °F) | D-732 | MPa (kpsi) | 89.6 (13.0) |
| Izod Notched Impact Strength | 23 °C (73 °F) | D-256 | J/m | 42.7 |
| Izod Unnotched Impact Strength | 23 °C (73 °F) | D-256 | J/m | 747 |
| Poisson's Ratio | 23 °C (73 °F) | — | — | 0.41 |
| 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 | — | — | — | 0.35 |



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

| Thermal Property | Temperature | ASTM | Units | Typical Values |
|--|--|-------|-----------------------|------------------------------------|
| Coefficient of Linear Expansion | 23 °C (73 °F) to 260 °C (500 °F) –62 to +23 (–80 to 73° F) | D-696 | µm/m/°C (in/in/°F) | 54 (30) 45 (25) |
| Thermal Conductivity | 40 °C (104 °F) | — | W/m·°C | 0.35 |
| Specific Heat | — | — | J/kg/°C | 1130 |
| Deformation Under 14 MPa Load | 50 °C (122 °F) | D-621 | % | 0.14 |
| Deflection Temperature at 2 MPa | — | D-648 | °C | ~360 |
| Electrical Property | | | | |
| Dielectric Constant at 10 ² Hz at 10 ⁴ Hz at 10 ⁶ Hz | 23 °C (73 °F) | D150 | — | 3.62 3.64 3.55 |
| Dissipation Factor at 10 ² Hz at 10 ⁴ Hz at 10 ⁶ Hz | 23 °C (73 °F) | D150 | — | 0.0018 0.0036 0.0034 |
| Dielectric Strength, Short Time 2 mm Thick | 23 °C (73 °F) | D149 | MV/m | 22 (3.20) |
| Volume Resistivity | 23 °C (73 °F) | D257 | Ω·m | 10 ¹⁴ –10 ¹⁵ |
| Surface Resistivity | 23 °C (73 °F) | D257 | Ω | 10 ¹⁵ –10 ¹⁶ |
| Other Properties | | | | |
| Water Absorption 24 h 48 h Equilibrium, 50% RH | 23 °C (73 °F) 50 °C (122 °F) | D570 | % | 0.24 0.72 1.0–1.3 |
| Specific Gravity | — | D792 | — | 1.43 |
| Oxygen Index | — | D2863 | % | 53 |

† Machined isostatic tensile specimens made per D1708

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

** Steady state, unlubricated in air.

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