PLASTIC-CRAFT
Vespel®

PI — Polyimide (Direct-Formed)

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The ultimate high-temperature polymer. Vespel® SP polyimide parts maintain structural integrity from cryogenic temperatures to 900°F with no melting point. Unmatched combination of thermal stability, mechanical strength, low friction, and wear resistance for the most extreme environments.

STOCK AVAILABILITY

Rods, sheets, rings, and custom machined parts. Long lead times on some grades — contact for availability and pricing.

KEY HIGHLIGHTS

900°F peak service temp
No melting point
Extreme wear resistance
Low friction (self-lubricating)
Cryogenic to extreme heat
Low outgassing (NASA approved)

✓ **The only plastic that operates from −400°F to +900°F**

COMMON APPLICATIONS

Jet engine seal rings
Semiconductor wafer clamps
Thrust washers & bushings
Vacuum & space hardware
Compressor vane tips
Glass handling pads
Race car transmissions

GRADES AVAILABLE

SP-1 (unfilled, best strength)
SP-21 (15% graphite, bearing)
SP-22 (40% graphite, low CTE)
SP-211 (15% graphite + PTFE)
SP-3 (15% MoS_2, dry lube)

MATERIAL PROPERTIES — TYPICAL VALUES (SP-1 UNFILLED)

PROPERTY	ASTM	TYPICAL VALUE	UNITS
PHYSICAL			
Specific Gravity	D792	1.43	—
Water Absorption, 24h	D570	0.24	%
MECHANICAL			
Tensile Strength, Ultimate	D638	12,500	psi (86 MPa)
Tensile Modulus	D638	450,000	psi (3,100 MPa)
Elongation at Break	D638	7.5	%
Flexural Strength	D790	16,000	psi (110 MPa)
Flexural Modulus	D790	450,000	psi (3,100 MPa)
Compressive Strength (10%)	D695	17,000	psi (117 MPa)
Impact, Izod Notched	D256	0.8	ft·lb/in (43 J/m)
Hardness, Rockwell	D785	E52	—
Coefficient of Friction (dynamic)	D3702	0.29	vs. steel (unlubricated)
THERMAL			
Max Continuous Service	–	550	°F (288°C)
Peak / Short-Term	–	900	°F (482°C)
CTE (Linear)	D696	2.7 × 10⁻&sup5;	in/in/°F
Thermal Conductivity	C177	2.5	BTU·in/hr·ft²·°F
Decomposition Onset	TGA	> 900	°F (482°C) in air
ELECTRICAL			
Volume Resistivity	D257	10^{16}	ohm·cm
Dielectric Strength	D149	560	V/mil (22 kV/mm)
Dielectric Constant, 1kHz	D150	3.55	—
FLAMMABILITY			
UL Flammability Rating	UL 94	V-0	—
Limiting Oxygen Index	D2863	53	%

PROCESSING / FABRICATION NOTES: Direct-formed (sintered), not melt-processable | Machine with carbide or diamond tools | Low outgassing — meets NASA ASTM E595 | High-cost material — design for minimal material removal

CHEMICAL RESISTANCE: Good resistance to most organic solvents, hydraulic fluids, fuels, and dilute acids. **AVOID:** concentrated sulfuric acid, nitric acid, and strong oxidizing agents at elevated temperatures.