



21SPF SERIES DATA SHEET

21SPF NATURAL, 21SPF BLACK

GENERAL PURPOSE HIGH PRODUCTIVITY NYLON

Product Description

Vydyne 21SPF is a general purpose Nylon 6,6 resin available in natural color and black. It is designed principally for injection molding fabrication. This resin offers a well balanced combination of engineering properties characterized by high strength, rigidity, good toughness, high melt point, good surface lubricity, abrasion resistance, and resistance to many chemicals, solvents, gasoline, and machine and motor oils.

Vydyne 21SPF Series permit production of molded parts with good initial color plus good property and color retention when using regrinds. This resin is recognized by Underwriters Laboratories and conforms to the requirements of many industrial, federal, and military specifications for premium quality general purpose Nylon 6,6 resins.

Vydyne 21SPF Series are internally and externally lubricated for improved machine feed and exceptional mold release. It is intended for use in high productivity applications. In many applications, the molding cycle can be reduced because parts may be removed from the cavity at higher temperatures. In difficult molds where parts have a tendency to stick in the cavity, Vydyne 21SPF can reduce or eliminate the need for mold release sprays. Critical molded part dimensions should be checked against specifications before implementing shorter molding cycles on a routine production basis.

Typical Applications/End Uses

Vydyne 21SPF Series have been used in many molding applications such as terminal blocks, bearings, bushings, cams, electrical connectors and housings, electrical cable ties/tie straps and many other hardware and general industrial parts.

Vydyne® 21SPF Series Specifications and Regulations

ASTM Conforms to ASTM D-4066 PA 0111

Federal* Conforms to Federal Specification LP 410a

Military* Conforms to Military Specification MIL-M-20693B

FDA Complies with 21CFR 177-1500

** Superseded by ASTM D-4066.*



Typical Properties for Vydyne® 21SPF Series

PROPERTIES ¹	TEST METHOD ²	TEST TEMP	UNITS	DRY AS MOLDED ³	CONDITIONED ⁴ (2.5% MOISTURE)	
PHYSICAL						
Specific Gravity	ISO 1183	23°C	–	1.14		
Mold Shrinkage, Flow Direction	ASTM D-955	23°C	%	1.5-2.0		
Water Absorption @ 24 hours Saturation	ASTM D-570	23°C	% %	1.3 8		
MECHANICAL						
Tensile Modulus, Secant	ASTM D-638	23°C	MPa	3,370	1,970	
Tensile Strength @ Yield	ISO 527	23°C	MPa	83		
Tensile Elongation @ Yield	ASTM D-638	-40°C	%	4	7	
		23°C	%	4	20	
		77°C	%	30	30	
Tensile Elongation @ Break	ASTM D-638	-40°C	%	4	15	
		23°C	%	60	160	
		77°C	%	130	300	
Flexural Modulus, Secant	ISO 178	23°C	MPa	2,950		
Flexural Strength	ASTM D-790	23°C	MPa	117	47	
Notched Izod Impact, 4.0 mm	ISO 180	23°C	kJ/m ²	5.4		
THERMAL						
Deflection Temperature Under Load Unannealed @ 1.8 MPa	ISO 75		°C	72		
Melting Point	ISO 3146		°C	260		
ELECTRICAL						
Volume Resistivity	ASTM D-257	23°C	ohm-cm	6.0 x 10 ¹⁵	2.0 x 10 ¹³	
Dielectric Strength	ASTM D-149	23°C	kV/mm	22	22	
Dielectric Constant	ASTM D-150	23°C				
			10 ² Hz		3.7	6
			10 ³ Hz		3.6	6
			10 ⁶ Hz		3.1	3.5
Dissipation Factor	ASTM D-150	23°C				
					0.02	0.04
					0.02	0.04
				0.03	0.04	

(1) Typical properties; not to be construed as specifications. Fabrication conditions, part design, additives, processing aids, finishing materials, and use conditions can all affect the integrity, performance, and regulatory status of finished goods.

(2) All data taken on unannealed injection molded test specimens per ISO 294/ASTM D-1897.

(3) Samples sealed in moisture barrier packages immediately after molding.

(4) Equilibrium moisture at 50% relative humidity and 23°C (73°F). Conditioned per ISO 291 and/or ASTM D-618.

Underwriters Laboratories Recognized Component Ratings Yellow card file number E70062

COLOR	MIN. THICKNESS (MM)	TEMPERATURE INDEX (°C)			HOT WIRE IGNITION	UL94 FLAM. CLASS	HIGH AMP ARC IGN.	HIGH VOLT TRACK RATE	D495 ARC RESISTANCE	IEC TRACK RATE (CTI)
		ELEC.	MECH.							
			W/IMPACT	W/O IMPACT						
ALL	0.71	130	75	85	4	V-2	0	—	—	—
	1.5	130	75	85	3	V-2	0	—	—	—
	3.0	130	75	85	2	V-2	0	0	5	0

Virgin and regrind up to 50% by weight have the same basic material characteristics.

* All numerical flame spread ratings appearing in this data sheet are not intended to reflect hazards presented by this or any other material under actual fire conditions. Each end user should determine whether potential fire hazards are associated with the finished product and whether Vydyne resin is suitable for the particular use. Products made from Vydyne resins should not be exposed to open flames. In the case of direct exposure to open fire, Vydyne resins and products made therefrom can ignite and burn. Always store and use finished products in locations well away from open flames and other sources of ignition.

Typical Molding Conditions for Vydyne® 21SPF Series

Optimum processing conditions will depend on such features as machine size, screw design, die design, and material residence time. The settings below are a guide to achieving stable processing and good part quality. It is best to use a hand-held pyrometer to measure stock melt temperature in an airshot.

PARAMETERS	MACHINE SETTINGS
PHYSICAL	
Stock Temperature, °C	271-293
SUGGESTED MACHINE CONDITIONS	
Cylinder Settings, °C	
Rear	249-271
Center	277-288
Front	282-293
Nozzle	277-288
Mold Surface Temperature, °C	38-93
Injection Pressure, MPa	55-138
Holding Pressure, MPa	55-138
Clamp Pressure	
U.S. Tons/in ² of Projected Area	2-4
Screw Back Pressure, MPa	Low: 0.17-1.03
Screw Speed, rpm	Low: 50-150
Injection Time, sec	Fast: 1-2.5
Cushion, mm	1.6-6.4



Suggested Guidelines for Molding

1. Storage

Vydyne nylon resins are hygroscopic and should be stored under cool, dry conditions in their original factory sealed packaging until ready for use.

2. Material Drying

A dehumidified air (desiccant bed)-type dryer is recommended with a maximum air temperature of 160°F (71°C) and a residence time of 1-3 hours.

3. Melt Temperature

Recommended melt temperatures are 520-560°F (271-293°C). The melt temperature must be measured from an air shot using a hand-held pyrometer, since in addition to the barrel heaters, screw back pressure and screw rotation add additional heat to the melt.

4. Barrel-to-shot Ratio

A barrel-to-shot ratio of 40 to 80% of the machine's rated capacity in polystyrene is recommended. A lower barrel-to-shot ratio results in excess residence time and polymer degradation causing permanent embrittlement of the molded part. A higher barrel-to-shot ratio makes it more difficult for the molding machine to deliver a uniform melt or achieve high fill speeds.

5. Injection Rates and Screw Speed

Injection rates should be as fast as possible without causing excessive shear to the material, resulting in material degradation. The use of back pressure should be minimized between 25 and 150 psi. (1.72-10.34 bar) to yield a consistent melt and/or adequate mixing

of color concentrates. Screw rotation speed should be controlled at the minimum required to maintain the molding cycle, with the optimum range between 50 and 150 rpm.

6. Mold Temperature

Mold surface temperatures should be controlled in a range between 100 and 200°F (38-93°C). Temperatures on the high end are recommended as the molding cycle allows assisting in mold filling and improving molded part performance.

7. Use of Regrind

Regrind must be dried before use. The suggested procedure is to grind and reuse the reground material immediately after molding. Regrind ratios of 25% or less have shown no significant property loss when properly molded. However, acceptable levels for each application should be determined by actual performance of the finished parts.

8. Molding Equipment & Tooling

Standard screw-type injection molding machines with a general purpose injection screw design are recommended.

9. Start-up and Shutdown Procedures

To facilitate machine start-up after extended shutdown, the cylinder and any hot runner blocks or manifold should be purged of nylon prior to shutdown with a material that flows at a lower process temperature. Do not shut down a machine with nylon resin remaining in the barrel. General purpose crystal polystyrene, natural polyethylene, or clear acrylic regrind is recommended.

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