21SPC Data Sheet

General Purpose High Productivity

Product Description

Vydyne 21SPC is a general purpose Nylon 6,6 resin available in natural color. 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 21SPC permits 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.

Internally and externally lubricated for improved machine feed and exceptional mold release. Vydyne 21SPC 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 21SPC 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 21SPC has 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® 21SPC 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 21 CFR 177-1500.

** Superseded by ASTM D-4066.*

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Typical Properties for Vydyne® 21SPC

Properties[1]	Test Method[2]	Test Temp	Units	Dry as Molded[3]	Conditioned[4] (2.5% Moisture)
Physical					
Specific Gravity	ASTM D-792	73°C	–	1.14	
Mold Shrinkage, Flow Direction	ASTM D-955	73°F	%	1.5-2.0	
Water Absorption @ 24 hours	ASTM D-570	73°F	%	1.3	
Saturation			%	8.0	
Mechanical					
Tensile Modulus, Secant	ASTM D-638	73°F	psi	430,000	190,000
Tensile Strength @ Yield	ASTM D-638	-40°F	psi	15,500	15,000
		73°F	psi	12,000	9,000
		170°F	psi	9,000	6,000
Tensile Elongation @ Yield	ASTM D-638	-40°F	%	5	6
		73°F	%	10	20
		170°F	%	30	30
Tensile Elongation @ Break	ASTM D-638	-40°F	%	20	60
		73°F	%	40	200
		170°F	%	300	300
Flexural Modulus, Secant	ASTM D-790	73°F	psi	440,000	190,000
Flexural Strength	ASTM D-790	73°F	psi	13,000	6,000
Notched Izod Impact, 0.125 in	ASTM D-256	73°F	ft lb/in	1.0	3.0
		-40°F	ft lb/in	0.6	0.5
Thermal					
Deflection Temperature Under Load					
Unannealed @ 264 psi	ASTM D-648	°F		147	160
Unannealed @ 66 psi		°F		450	430
Melting Point	ASTM D-789	°F		500	
Electrical					
Volume Resistivity	ASTM D-257	73°F	ohm-cm	6.0×10^{15}	2.0×10^{13}
Dielectric Strength	ASTM D-149	73°F	volts/mil		
Short Time				570	550
Step-By-Step				540	480
Dielectric Constant	ASTM D-150	73°F			
10^2 Hz				3.7	6.0
10^3 Hz				3.6	6.0
10^6 Hz				3.1	3.5
Dissipation Factor	ASTM D-150	73°F			
10^2 Hz				0.02	0.04
10^3 Hz				0.02	0.04
10^6 Hz				0.03	0.08
Ignition Characteristic[5]					
Limiting Oxygen Index	ASTM D-2863		$\%0_2$	30	31

(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.
(5) All numerical flame spread ratings appearing in this data 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 the 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.

Underwriters Laboratories Recognized Component Ratings Yellow card file number E70062

Color	Min. Thickness (mm)	Temperature Index (°C) Elec.	Mech. w/Impact	Mech. w/o Impact	Hot Wire Ignition	UL94 Flam. Class	High Amp Arc Ign.	High Volt Track Rate	D495 Arc Resistance	IEC Track Rate (CTI)
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.

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Typical Molding Conditions for Vydyne® 21SPC

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, °F	520-560
Suggested Machine Conditions	
Cylinder Settings, °F	
Rear	480-520
Center	530-550
Front	540-560
Nozzle	530-550
Mold Surface Temperature, °F	100-200
Injection Pressure, psi	8,000-20,000
Holding Pressure, psi	8,000-20,000
Clamp Pressure	
U.S. Tons/in² of Projected Area	2-4
Screw Back Pressure, psi	Low: 25-150
Screw Speed, rpm	Low: 50-150
Injection Time, sec	Fast: 1-2.5
Cushion, in	1/16-1/4

VYDYNE nylon resins®

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 160ºF (71ºC) and a residence time of 1-3 hours.

3. Melt Temperature
Recommended melt temperatures are 520-560ºF (271-293ºC). 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 200ºF (38-93ºC). 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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