

# vydyne 21X Series data sheet

21X Natural, 21X Black general purpose nylon

## Product Description

### **Vydyne® 21X is a general purpose Nylon**

**66 resin.** Available in natural 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 21X Series** permits production of molded parts with good initial color plus good property and color retention when using regrind. 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 66 resins.

**Vydyne 21X Series** are externally lubricated for improved machine feed and mold release. This formulation is designed to provide easy release of parts from molds using standard molding conditions.

## Typical Applications/End Uses

Vydyne 21X 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 21X 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 21 CFR 177-1500

*\* Superseded by ASTM D-4066*

Find more information or contact us at [www.vydyne.com](http://www.vydyne.com)



# Typical Properties for Vydyne 21X Series

Test temperature 23°C unless otherwise noted

Physical Properties	Test Conditions	Dry as Molded	Conditioned 2.5% Moisture
Specific Gravity (g/cm <sup>3</sup> )	ISO 1183	1.14	—
Mold Shrinkage (%)	ASTM D-955	1.5-2.0	—
Water Absorption (%)	ASTM D-570		
24 hours		1.3	—
Saturation		8.0	—
Mechanical Properties	Test Conditions	Dry as Molded	Conditioned 2.5% Moisture
Tensile Strength @ Yield (MPa)	ISO 527	83	62
Tensile Strength @ Break (MPa)	ISO 527	62	—
Elongation @ Yield (%)	ISO 527	11	—
Elongation @ Break (%)	ISO 527	35	—
Tensile Modulus (MPa)	ISO 527	3,000	1,310
Poisson's Ratio	ISO 527	0.4	—
Flexural Modulus (MPa)	ISO 178	2,900	1,310
Flexural Strength (MPa)	ISO 178	33	41
Notched Izod Impact (KJ/M <sup>2</sup> )	ISO 180		
23°C		5.3	—
-40°C		2.0	—
Thermal Properties	Test Conditions	Dry as Molded	Conditioned 2.5% Moisture
Melting Point (°C)	ISO 3146	260	—
Heat Deflection Temperature (°C)	ISO 75		—
1.82 MPa		64	—
0.45 MPa		190	—
Vicat @ 50N (°C)	ISO 306	237	—
Coefficient of Linear Thermal Expansion	ISO 11359		
2 mm - Parallel, 23°C-55°C (10 <sup>-5</sup> mm/mm/°C)		1.1	
2 mm - Normal, 23°C-55°C (10 <sup>-5</sup> mm/mm/°C)		1.2	
Electrical Properties	Test Conditions	Dry as Molded	Conditioned 2.5% Moisture
Volume Resistivity (ohm-cm)	ASTM D-257	6.0x10 <sup>15</sup>	2.0x10 <sup>13</sup>
Dielectric Strength (kV/mm)	ASTM D-149		
Short Time		23	22
Step-By-Step		21	19
Dielectric Constant	ASTM D-150		
10 <sup>2</sup> Hz		3.7	6.0
10 <sup>3</sup> Hz		3.6	6.0
10 <sup>6</sup> Hz		3.1	3.5
Dissipation Factor	ASTM D-150		
10 <sup>2</sup> Hz		0.02	0.04
10 <sup>3</sup> Hz		0.02	0.04
10 <sup>6</sup> Hz		0.03	0.08

# Flammability Properties for Vydyne 21X

Ignition Characteristic	Test Conditions	Dry as Molded	Conditioned 2.5% Moisture
<b>Glow Wire Flammability Index (GWFI/°C)</b>	EC 60695-2-12		
0.71 mm		—	—
1.5 mm		—	—
3.0 mm		—	—
<b>Glow Wire Ignition Temperature (GWIT/°C)</b>	IEC 60695-2-12		
0.71 mm		—	—
1.5 mm		—	—
3.0 mm		—	—
<b>Limiting Oxygen Index (%O<sub>2</sub>)</b>	ASTM D-2863	<b>30</b>	<b>31</b>

## Typical Molding Conditions for Vydyne 21X Series

Optimal 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 air shot.

## Underwriters Laboratories Recognized Component Ratings

Yellow Card File Number E70062

Color: All

Parameters	Test Conditions	Thickness (mm)			
		0.4	0.71	1.5	3.0
<b>Temperature Index (°C)</b>	UL 746B				
Electrical		65	130	130	130
Mechanical w/Impact		65	75	75	75
Mechanical w/o Impact		65	85	85	85
<b>Hot Wire Ignition (Rating)</b>	UL 746A	—	4	3	2
<b>UL94 Flammability Class (Rating)</b>	UL Flame Test	V-2	V-2	V-2	V-2
<b>High Amperage Arc Ignition (Rating)</b>	UL 746A	—	0	0	0
<b>High Volt Track Rate (Rating)</b>	UL 746A	—	—	—	0
<b>D495 Arc Resistance (Rating)</b>	UL 746A	—	—	—	5
<b>UL 746A Track Rate (CTI) (Rating)</b>	UL 746A	—	—	—	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 sources of ignition.

## Suggested Machine Conditions

Melt Temperature, °C 275 to 305

Parameters	Machine Settings
Cylinder Settings °C	270 to 310
Mold Surface Temperature, °C	15 to 95
Injection Pressure, MPa	55 to 140
Holding Pressure, MPa	55 to 140
Injection Time, sec	< 1 to 2.5
Screw Back Pressure, MPa	0.2 to 1.0
Screw Speed, rpm	50 to 150
Cushion, mm	3.0 to 6.4
Clamp Pressure, tons/cm <sup>2</sup>	0.3 to 0.7

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## Suggested Guidelines for Molding

1. Your Vydyne nylon resins arrive packaged in moisture-protected containers. If you do not open the original package prior to use, then drying is not necessary. However, if drying is necessary, we recommend that you use a dehumidified air-type dryer (desiccant bed) with a maximum air temperature of 70°C or 1 to 3 hours.

2. The recommended melt temperatures for Vydyne general-purpose resins are 275 to 305°C. Measure the stock in an air shot with a hand-held pyrometer. In addition to the barrel heater bands, screw back pressure and rotation speed add heat to the melt.

3. Maintain mold surface temperatures in a range of 15 to 95°C. We recommend

temperatures on the high end, as the molding cycle allows, to aid in mold filling and to improve the appearance of the molded part.

4. Injection fill rates should be fast. Minimize the use of back pressure 0.2 to 1.0 MPa to yield a consistent melt and/or adequate mixing of color concentrates. Set the screw rotation speed at the minimum required to maintain the molding cycle (50 to 150 rpm).

5. Hold pressure should be set high enough to prevent screw bounce. Hold time should be set until the gate freezes.

6. Maintain your machine's shot-weight-to-barrel-size ratio at 40% to 80% of rated (polystyrene) capacity. A lower shot-to-barrel ratio results in excess residence

time and polymer degradation, which can permanently embrittle the molded part. At a shot-to-barrel ratio above the recommended ratio, molding machinery is often unable to deliver a uniform melt or the desirable fast mold fill.

7. Regrind must be dry when molded. The preferred procedure is to grind and reuse immediately after molding. Regrind-to-virgin ratios of 25% or less have shown no significant property loss when properly molded. However, to ensure adequate performance of your molded part, determine acceptable levels for each application through actual part testing.



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