

## Product Data

### AS-4145 HS

Amodel AS-4145 HS polyphthalamide (PPA), a 45% glass reinforced resin, is one of a new series of PPA resins designed to give *high crystallinity* when molded in *water-cooled molds*. Key properties of the resin are high heat resistance, high strength and stiffness over a broad temperature range, low moisture absorption, excellent chemical resistance, and excellent electrical properties.

Amodel AS-4145 HS resin can be profitably used for many automotive electrical and electronic applications, especially those re-

quiring enhanced dimensional stability. These applications may include connectors, sockets, switches, sensors, enclosures, and housings for systems, such as anti-lock brake, traction control, steering, electronic engine control, transmission control, and chassis controls.

This material processes readily on conventional injection molding equipment using water-cooled molds. Rapid crystallization rate and high flow allow short cycles and therefore high molding productivity and low part cost.

**Table 1 Typical Properties of Amodel AS-4145 HS Resin - ASTM Test Methods** (See Table 2 for Properties by ISO Methods)

Property	ASTM Test Method	Typical Values <sup>(1)</sup>					
		U.S. Customary Units			SI Units		
		DAM <sup>(2)</sup>	50% RH <sup>(3)</sup>	Units	DAM <sup>(2)</sup>	50% RH <sup>(3)</sup>	Units
<b>Mechanical</b>							
Tensile Strength	D 638	33.0	27.0	kpsi	228	186	MPa
Tensile Elongation	D 638	2.4	2.1	%	2.4	2.1	%
Tensile Modulus	D 638	2,200	2,200	kpsi	15.2	15.2	GPa
Flexural Strength	D 790	47.5	39.0	kpsi	327	269	MPa
Flexural Modulus	D 790	1,900	1,900	kpsi	13.1	13.1	GPa
Shear Strength	D 732	13.0	11.0	kpsi	90	76	MPa
Compressive Strength <sup>(4)</sup>	D 695	25.0	23.0	kpsi	172	158	MPa
Poisson's Ratio		0.40			0.40		
Izod Impact, Notched	D 256	1.9	1.8	ft-lb/in	100	95	J/m
<b>Thermal</b>							
Heat Deflection Temperature <sup>(5)</sup> at 264 psi (1.8 MPa)	D 648			°F	300		°C
at 66 psi (0.45 MPa)		572		°F	320		°C
Continuous Use Temperature at 1,200 hr.	D 3045	410		°F	210		°C
Melting Point	D 570	608		°F	320		°C
Flammability <sup>(6)</sup> , 1/8" (3.2 mm) bar	UL 94	HB			HB		
Coefficient of Thermal Expansion 32° to 194°F (0° to 90°C) FD <sup>(7)</sup>	E 831	9		ppm/°F	16		ppm/°C
32° to 194°F (0° to 90°C) TD <sup>(7)</sup>		33		ppm/°F	59		ppm/°C
300° to 480°F (150° to 250°C) FD <sup>(7)</sup>		7		ppm/°F	13		ppm/°C
300° to 480°F (150° to 250°C) TD <sup>(7)</sup>		61		ppm/°F	110		ppm/°C
<b>Electrical</b>							
Dielectric Strength, 1/16" (1.6 mm)	D 149	600	625	V/mil	24	25	kV/mm
Volume Resistivity	D 257	8 x 10 <sup>15</sup>	6 x 10 <sup>14</sup>	ohm-cm	8 x 10 <sup>15</sup>	6 x 10 <sup>14</sup>	ohm-cm
High Voltage Arc Track Rate- UL746A	§22	13	14	mm/min	13	14	mm/min
Comparative Tracking Index	D 3638	>600	>600	volts	>600	>600	volts
Dielectric Constant at 60 Hz	D 150	4.0	4.9		4.0	4.9	
Dielectric Constant at 10 <sup>6</sup> Hz		3.7	4.0		3.7	4.0	
Dissipation Factor at 60 Hz	D 150	0.004	0.024		0.004	0.024	
Dissipation Factor at 10 <sup>6</sup> Hz		0.011	0.037		0.011	0.037	
<b>General</b>							
Specific Gravity	D 792	1.54			1.54		
Moisture Absorption, 24 hours	D 570	0.21		%	0.21		%
Mold Shrinkage Flow Direction	D 955	0.4		%	0.4		%
Mold Shrinkage Transverse Direction		0.8		%	0.8		%

<sup>(1)</sup> These values are typical of limited production, final specifications may vary and actual properties of individual batches will vary within these limits.

<sup>(2)</sup> Dry as molded.

<sup>(3)</sup> Conditioned to 50% RH in accordance with ISO-1110, Accelerated Method.

<sup>(4)</sup> Test specimen 0.5 x 0.5 x 1" (12.7 x 12.7 x 25.4 mm).

<sup>(5)</sup> 0.125 inch (3.2 mm) thick specimens annealed in air for 3 hours at 320°F (160°C).

<sup>(6)</sup> These flammability ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

<sup>(7)</sup> FD = Flow direction; TD = Transverse direction.

**Table 2 Typical Properties of Amodel AS-4145 HS Resin - ISO Test Methods**

Property	ISO Test Method	Typical Values <sup>(1)</sup>					
		U.S. Customary Units			SI Units		
		DAM <sup>(2)</sup>	50% RH <sup>(3)</sup>	Units	DAM <sup>(2)</sup>	50% RH <sup>(3)</sup>	Units
<b>Mechanical</b>							
Tensile Strength	527	32.5		kpsi	224		MPa
Tensile Elongation	527	2.2		%	2.2		%
Tensile Modulus	527	2,340		kpsi	16.1		GPa
Flexural Strength	178	47.4		kpsi	327		MPa
Flexural Modulus	178	1,940		kpsi	13.4		GPa
Izod Impact, Notched	180/1A	4.8		ft-lb/in <sup>2</sup>	10.0		kJ/m <sup>2</sup>
Charpy Impact, Notched	179/1eA	4.9		ft-lb/in <sup>2</sup>	10.4		kJ/m <sup>2</sup>
Charpy Impact, Unnotched	179/1eU	30		ft-lb/in <sup>2</sup>	64		kJ/m <sup>2</sup>
<b>Thermal</b>							
Melting Point	11357-3	608		°F	320		°C
Heat Deflection Temperature at 1.8 MPa	75Af	568		°F	298		°C
<b>General</b>							
Specific Gravity	1183A	1.55			1.55		

<sup>(1)</sup> These values are typical of limited production, final specifications may vary and actual properties of individual batches will vary within these limits.

<sup>(2)</sup> Dry as molded

<sup>(3)</sup> Conditioned to 50% RH in accordance with ISO-1110 Accelerated Method

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## Drying

Resin should be dried before molding because excessive moisture will result in nozzle drool, reduced mechanical properties, poor surface appearance, and sprue sticking. Extremely wet resin will result in a foamy extrudate. The target moisture level is 0.03 to 0.06% (300 to 600 ppm) and the maximum recommended drying temperature is 135°C (275°F).

Although Amodel resins are shipped with less than 0.15% moisture and packaged in moisture-proof foil-lined bags or boxes, the resin should be dried for optimum molding results. The preferred drying condition is 4 hours at 120°C (248°F). Alternatively, the resins can be dried for 8 hours at 90°C (194°F). In either case, a desiccant bed dryer with a dew point below -30°C (-22°F) should be used.

### Drying Tips:

- Do not open containers until ready to process.
- Drying at temperatures higher than 125°C (257°F) may result in the darkening of natural colored pellets.
- If a thermogravimetric moisture analyzer is used, it should be set to 170°C (338°F)
- Amodel resin in an open container needs to be dried as shown in the following table. The recommended drying time depends on how long the container has been open and the estimated relative humidity.

### Drying Time at 120°C (248°F), hours

Relative Humidity, %	Elapsed Time From Container Opening, hours				
	0.25	0.5	1	2	3
30	4.5	5.0	5.5	6.0	6.5
50	5.0	5.5	6.0	7.0	7.5
75	5.0	5.5	6.5	7.5	8.0
100	5.5	6.5	7.5	8.5	9.0

## Injection Molding

Amodel AS-4145 HS resin can be readily injection molded in most screw injection molding machines. A general purpose screw is recommended, with minimum back pressure.

The melt temperature should be between 625°F and 650°F (329°C and 343°C). Generally this can be achieved with barrel temperatures from 605° to 615°F (318° to 324°C) in the rear zone gradually increasing to 620° to 630°F (327° to 332°C) in the front zone.

Set injection pressure to give rapid injection, 3 to 4 in./sec (7.6 to 10 cm/sec). Adjust holding pressure to one-half injection pressure. Set hold time to maximize part weight.

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Transfer from injection to hold pressure at the screw position just before the part is completely filled. A mold temperature between 150°F and 200°F (65°C and 93°C) is high enough to achieve full crystallinity in the typical molded part with this resin.

## Standard Packaging and Labeling

Amodel AS-4145 HS resin is packaged in foil lined, multiwall paper bags containing 25 kg (55.115 pounds) of material. Special packaging can be supplied upon request. Individual packages will be plainly marked with the product number, the color, the lot number, and the net weight.

## Product Safety and Emergency Service

For product safety information or a Material Safety Data Sheet on a product of Solvay Advanced Polymers

**1 (800) 621-4557**

**1 (770) 772-8880 outside of U.S.**

For information or help in an emergency such as a spill, leak, fire or explosion, call day or night:

Emergency Health Information

**1 (800) 621-4590**

**1 (770) 772-5177 outside of U.S.**

Emergency Spill Information

**CHEMTREC 1 (800) 424-9300**

**1 (703) 527-3887 outside of U.S.  
collect calls accepted**

## For Additional Information

Technical Service

**1 (800) 621-4557**

Customer Service

**1 (800) 848-9744**

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