Product Data

AMODEL®
polyphthalamide

AS-1933 HS, AS-1945 HS

AMODEL AS-1933 HS and AS-1945 HS are 33% and 45% glass reinforced grades of polyphthalamide (PPA) resin. These grades were developed specifically for improved performance in a 50/50 ethylene glycol and water environment. These materials exceed the performance required by the automotive industry for polymeric materials exposed to antifreeze at 226°F (108°C), even when tested at 275°F (135°C).

Potential applications include a variety of automotive components such as thermostat housings, heater core endcaps, heater hose connectors, and water inlets, outlets, and valves.

These materials are readily processed using conventional injection molding equipment and methods.

Table 1 Typical Properties of AMODEL AS-1933 HS and AS-1945 HS Resins - ASTM Test Methods

(See Table 2 for Properties by ISO Methods)

	ASTM	Typical Values[1]					
	Test	U.S. Customary Units			SI Units		
Property	Method	AS-1933	AS-1945	Units	AS-1933	AS-1945	Units
Mechanical							
Tensile Strength	D 638	32.0	36.5	kpsi	220	252	MPa
Tensile Elongation	D 638	2.5	2.5	%	2.5	2.5	%
Tensile Modulus	D 638	1,700	2,200	kpsi	11.7	15.2	GPa
Flexural Strength	D 790	45.4	52.0	kpsi	313	358	MPa
Flexural Modulus	D 790	1,560	2,000	kpsi	10.7	13.8	GPa
Izod Impact Strength	D 256	1.7	2.3	ft-lb/in	91	123	J/m
After Immersion in 50/50 Glycol/Water Mixture for 1,000 hours at 275°F (135°C)							
Tensile Strength	D 638	11.0	15.5	kpsi	76	107	MPa
Tensile Modulus	D 638	1,100	1,500	kpsi	7.6	10.3	GPa
Izod Impact Strength	D 256	1.0	1.3	ft-lb/in	53	69	J/m
Thermal							
Deflection Temperature,	D 648						
at 264 psi (1.8 MPa)		530	540	°F	277	282	°C
General							
Specific Gravity	D 792	1.45	1.57		1.45	1.57	
Mold Shrinkage	D 955						
Flow Direction		0.2	0.2	%	0.2	0.2	%
Transverse Direction		0.6	0.3	%	0.6	0.3	%

[1] Typical values, actual values of individual batches will vary within specification limits.

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Table 2 Typical Properties of AMODEL AS-1933 HS and AS-1945 HS Resins - ISO Test Methods

Property	ISO Test Method	Typical Values (1) U.S. Customary Units AS-1933 HS	AS-1945 HS	Units	SI Units AS-1933 HS	AS-1945 HS	Units
Mechanical							
Tensile Strength	527	30.7	35.4	kpsi	212	244	MPa
Tensile Elongation	527	2.5	2.5	%	2.5	2.5	%
Tensile Modulus	527	1,830	2,190	kpsi	12.6	15.1	GPa
Flexural Strength	178	44.8	48.6	kpsi	309	335	MPa
Flexural Modulus	178	1,540	1,830	kpsi	10.6	12.6	GPa
Izod Impact, Notched	180/1A	4.5	5.0	ft-lb/in^2	9.5	10.6	kJ/m^2
Charpy Impact, Notched	179/1eA	4.8	6.1	ft-lb/in^2	10.0	12.9	kJ/m^2
Charpy Impact, Unnotched	179/1eU	36	41	ft-lb/in^2	76	86	kJ/m^2
Thermal							
Melting Point	11357-3	594	594	°F	312	312	°C
Heat Deflection Temperature at 1.8 MPa	75Af	532	540	°F	278	282	°C
General							
Specific Gravity	1183A	1.45	1.57		1.45	1.57	

(1) Actual properties of individual batches will vary within specification limits.

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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

	Elapsed Time From Container Opening, hours				
Relative Humidity, %	**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-1933 HS and AS-1945 HS resins can be readily injection molded in most screw injection molding machines. A general purpose screw is recommended, with minimum back pressure.

Barrel temperatures generally should range from 580°F to 605°F (304°C to 318°C) in the rear zone and gradually increase to 600°F to 625°F (315°C to 329°C) in the front zone. These conditions should give melt temperatures of 610°F to 650°F (321°C to 343°C).

A mold temperature of 275°F (135°C) is recommended to ensure full crystallinity in the typical molded part. High crystallinity results in optimum mechanical properties, excellent dimensional stability and good surface appearance. The use of lower mold temperatures may produce parts with lower crystallinity and, consequently, optimal performance may not be achieved.

Standard Packaging and Labeling

AMODEL AS-1933 HS and AS-1945 HS resins are packaged in foil lined multiwall paper bags containing 55.1 pounds (25 kg) 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.

Precautionary Labeling

On the basis of toxicological, physical, and chemical properties of AMODEL AS-1933 HS and AS-1945 HS resins, labeling used on containers is as follows:

Caution: Handling and/or processing this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose, and throat.

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