Product Data

AMODEL®
polyphthalamide

A-4133 L

AMODEL A-4133 L polyphthalamide (PPA) is a 33% glass reinforced resin designed to give high crystallinity when molded in water-cooled molds. Key properties of the resin are high heat resistance, reduced outgassing, high strength and stiffness over a broad temperature range, low moisture absorption, excellent chemical resistance, and excellent electrical properties.

AMODEL A-4133 L resin can be advantageously used for many automotive electrical and electronic applications. 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. Its rapid crystallization rate and high flow can result in short cycles and therefore high molding productivity and lower part cost.

Table 1 Typical Properties of AMODEL A-4133 L Resin - ASTM Test Methods (See Table 2 for Properties by ISO Methods)

	ASTM	Typical Values[1]					
	Test	U.S. Customary Units			SI Units		
Property	Method	DAM[2]	50% RH[3]	Units	DAM[2]	50% RH[3]	Units
Mechanical							
Tensile Strength	D 638	29.0	25.0	kpsi	200	172	MPa
Tensile Elongation	D 638	2.5	2.2	%	2.5	2.2	%
Tensile Modulus	D 638	1.70	1.70	Mpsi	11.7	11.7	GPa
Flexural Strength	D 790	42.0	35.0	kpsi	290	241	MPa
Flexural Modulus	D 790	1.78	1.78	Mpsi	12.2	12.2	GPa
Shear Strength	D 732	13.0	11.0	kpsi	90	76	MPa
Compressive Strength[4]	D 695	23.5	22.5	kpsi	162	155	MPa
Poisson's Ratio		0.41			0.41		
Izod Impact, Notched	D 256	1.3	1.2	ft-lb/in	72	63	J/m
Izod Impact, Unnotched		9		ft-lb/in	480		J/m
Thermal							
Heat Deflection Temperature[5]	D 648						
at 264 psi (1.8 MPa)		572		°F	300		°C
at 66 psi (0.45 MPa)		608		°F	320		°C
Melting Point	D 570	620		°F	327		°C
Flammability[6] ,1/8" (3.2 mm) bar	UL 94	HB			HB		
Coefficient of Thermal Expansion	E 831						
32° to 194°F (0° to 90°C) FD,TD[7]		12, 33		µin./in.°F	22, 59		µm/m°C
300° to 480°F (150° to 250°C)FD,TD[7]		8, 67		µin./in.°F	15, 121		µm/m°C
General							
Specific Gravity	D 792	1.46			1.46		
Moisture Absorption, 24 hours	D 570	0.29		%	0.29		%
Mold Shrinkage Flow Direction	D 955	0.5		%	0.5		%
Mold Shrinkage Transverse Direction		1.0		%	1.0		%

(1) Actual properties of individual batches will vary within specification limits. Properties are typical of uncolored resin. Colorants or other additives may alter values.
(2) Dry as molded.
(3) Conditioned to 50% RH in accordance with ISO-1110, Accelerated Method.
(4) Test specimen 0.5 x 0.5 x 1" (12.7 x 12.7 x 25.4 mm).
(5) 0.125 inch (3.2 mm) thick specimens annealed in air for 3 hours at 320°F (160°C).
(6) These flammability ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.
(7) FD = Flow direction; TD = Transverse direction.

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Table 2 Typical Properties of AMODEL A-4133 L Resin - ISO Test Methods

Property	Temp., °C	ISO Test Method	Typical Values (1) U.S. Customary Units Value	Units	SI Units Value	Units
Mechanical						
Tensile Strength	23	527	28.0	kpsi	193	MPa
	100	527	19.4	kpsi	134	MPa
	150	527	13.0	kpsi	90	MPa
	175	527	11.7	kpsi	80	MPa
Tensile Elongation	23	527	1.9	%	1.9	%
	100	527	3.3	%	3.3	%
	150	527	3.3	%	3.3	%
	175	527	4.0	%	4.0	%
Tensile Modulus	23	527	1.78	Mpsi	12.3	GPa
	100	527	1.30	Mpsi	9.0	GPa
	150	527	0.93	Mpsi	6.4	GPa
	175	527	0.84	Mpsi	5.8	GPa
Flexural Strength	23	178	39.0	kpsi	269	MPa
	100	178	27.1	kpsi	187	MPa
	150	178	18.5	kpsi	127	MPa
	175	178	16.6	kpsi	115	MPa
Flexural Modulus	23	178	1.51	Mpsi	10.4	GPa
	100	178	1.12	Mpsi	7.7	GPa
	150	178	0.75	Mpsi	5.2	GPa
	175	178	0.71	Mpsi	4.9	GPa
Izod Impact, Notched	23	180/1A	3.9	ft-lb/in^2	8.3	kJ/m^2
Izod Impact, Unnotched	23	180/1U	26	ft-lb/in^2	54	kJ/m^2
Charpy Impact, Notched	23	179/1eA	3.8	ft-lb/in^2	8.1	kJ/m^2
Charpy Impact, Unnotched	23	179/1eU	41	ft-lb/in^2	86	kJ/m^2
Thermal						
Melting Point		11357-3	620	°F	327	°C
Heat Deflection Temperature at 1.8 MPa		75Af	590	°F	310	°C
General						
Specific Gravity		1183A	1.46		1.46	

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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 A-4133 L 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. 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 A-4133 L 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.

Precautionary Labeling

On the basis of the toxicological, physical, and chemical properties of AMODEL A-4133 L resin, 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

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