# Product Data

**AMODEL®**
**polyphthalamide**

# A-1145 HS

AMODEL A-1145 HS is a 45% glass reinforced, heat stabilized polyphthalamide (PPA) which exhibits a high heat deflection temperature, high flexural modulus and high tensile strength. Excellent creep resistance and low moisture absorption are also characteristic of this resin.

This material is well suited for many devices requiring dimensional stability and low outgassing at high ambient temperature. It can be easily processed using conventional equipment and methods.

**Table 1 Typical Properties of AMODEL A-1145 HS Resin - ASTM Test Methods** (See Table 2 for Properties by ISO Methods)

| Property | ASTM Test Method | Typical Values [1] U.S. Customary Units DAM[2] | 50% RH[3] | Units | SI Units DAM[2] | 50% RH[3] | Units |
|---|---|---|---|---|---|---|---|
| **Mechanical** | | | | | | | |
| Tensile Strength | D 638 | 37.5 | 33.0 | kpsi | 259 | 228 | MPa |
| Tensile Elongation | D 638 | 2.6 | 2.1 | % | 2.6 | 2.1 | % |
| Tensile Modulus | D 638 | 2.50 | 2.50 | Mpsi | 17.2 | 17.2 | GPa |
| Flexural Strength | D 790 | 52.6 | 42.7 | kpsi | 363 | 294 | MPa |
| Flexural Modulus | D 790 | 2.00 | 2.00 | Mpsi | 13.8 | 13.8 | GPa |
| Shear Strength | D 732 | 15.6 | 13.3 | kpsi | 108 | 92 | MPa |
| Compressive Strength [4] | D 695 | 28.1 | | kpsi | 194 | | MPa |
| Poisson's Ratio | | 0.41 | | | 0.41 | | |
| Izod Impact, Notched | D 256 | 2.1 | 1.9 | ft-lb/in | 110 | 100 | J/m |
| Izod Impact, Unnotched | D 256 | 21 | | ft-lb/in | 1120 | | J/m |
| Rockwell Hardness | D 785 | 125 | | R | 125 | | R |
| **Thermal** | | | | | | | |
| Melting Point | D 3418 | 590 | | °F | 310 | | °C |
| Heat Deflection Temperature [5] | D 648 | | | | | | |
| at 264 psi (1.8 MPa) | | 549 | | °F | 287 | | °C |
| at 66 psi (0.45 MPa) | | 574 | | °F | 301 | | °C |
| Continuous Use Temperature, 5,000 hr. | D 3045 | 365 | | °F | 185 | | °C |
| Continuous Use Temperature, 20,000 hr. | | 329 | | °F | 165 | | °C |
| Flammability [6], 1/8" (3.2 mm) bar | UL 94 | HB | | | HB | | |
| Coefficient of Thermal Expansion | E 831 | | | | | | |
| 32° to 212°F (0° to 100°C), FD[7],TD[8] | | 8, 28 | | µin./in.°F | 15, 50 | | µm/m°C |
| 320° to 480°F (160° to 250°C), FD[7],TD[8] | | 6, 56 | | µin./in.°F | 10, 100 | | µm/m°C |
| **Electrical** | | | | | | | |
| Dielectric Strength, 1/8" (3.2 mm) | D 149 | 584 | 584 | V/mil | 23 | 23 | kV/mm |
| Volume Resistivity | D 257 | $1 \times 10^{16}$ | $2 \times 10^{15}$ | ohm-cm | $1 \times 10^{16}$ | $2 \times 10^{15}$ | ohm-cm |
| High Voltage Arc Resistance | D 495 | 145 | 125 | sec | 145 | 125 | sec |
| Comparative Tracking Index | D 3638 | 550 | 550 | volts | 550 | 550 | volts |
| Dielectric Constant at 60 Hz | D 150 | 4.6 | 4.9 | | 4.6 | 4.9 | |
| Dielectric Constant at $10^6$ Hz | | 4.4 | 4.5 | | 4.4 | 4.5 | |
| Dissipation Factor at 60 Hz | D 150 | 0.005 | 0.009 | | 0.005 | 0.009 | |
| Dissipation Factor at $10^6$ Hz | | 0.016 | 0.021 | | 0.016 | 0.021 | |
| **General** | | | | | | | |
| Specific Gravity | D 792 | 1.59 | | | 1.59 | | |
| Moisture Absorption, 24 hr. | D 570 | 0.12 | | % | 0.12 | | % |
| Mold Shrinkage, Flow Direction | D 955 | 0.2 | 0.1 | % | 0.2 | 0.1 | % |
| Mold Shrinkage, Transverse Direction | | 0.6 | 0.1 | % | 0.6 | 0.1 | % |

[1] Actual properties of individual batches will vary within specification limits. Properties are typical of uncolored resin. Colorants or other additives will 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 silicone oil for one-half hour at 500°F (260°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
[8] TD = Transverse direction

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## Table 2 Typical Properties of AMODEL A-1145 HS 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 | 38.1 | kpsi | 263 | MPa |
| | 100 | 527 | 25.1 | kpsi | 173 | MPa |
| | 150 | 527 | 12.3 | kpsi | 85 | MPa |
| | 175 | 527 | 11.0 | kpsi | 76 | MPa |
| Tensile Elongation | 23 | 527 | 2.7 | % | 2.7 | % |
| | 100 | 527 | 2.5 | % | 2.5 | % |
| | 150 | 527 | 7.2 | % | 7.2 | % |
| | 175 | 527 | 6.5 | % | 6.5 | % |
| Tensile Modulus | 23 | 527 | 2.44 | Mpsi | 16.8 | GPa |
| | 100 | 527 | 1.62 | Mpsi | 11.2 | GPa |
| | 150 | 527 | 1.16 | Mpsi | 8.0 | GPa |
| | 175 | 527 | 0.78 | Mpsi | 5.4 | GPa |
| Flexural Strength | 23 | 178 | 54.7 | kpsi | 377 | MPa |
| | 100 | 178 | 38.7 | kpsi | 267 | MPa |
| | 150 | 178 | 16.1 | kpsi | 111 | MPa |
| | 175 | 178 | 13.7 | kpsi | 95 | MPa |
| Flexural Modulus | 23 | 178 | 2.31 | Mpsi | 15.9 | GPa |
| | 100 | 178 | 1.89 | Mpsi | 13.0 | GPa |
| | 150 | 178 | 0.78 | Mpsi | 5.4 | GPa |
| | 175 | 178 | 0.71 | Mpsi | 4.9 | GPa |
| Izod Impact, Notched | 23 | 180/1A | 4.9 | ft-lb/in$^2$ | 10.3 | kJ/m$^2$ |
| Izod Impact, Unnotched | 23 | 180/1U | 29 | ft-lb/in$^2$ | 61 | kJ/m$^2$ |
| Charpy Impact, Notched | 23 | 179/1eA | 4.9 | ft-lb/in$^2$ | 10.3 | kJ/m$^2$ |
| Charpy Impact, Unnotched | 23 | 179/1eU | 44 | ft-lb/in$^2$ | 93 | kJ/m$^2$ |
| **Thermal** | | | | | | |
| Melting Point | | 11357-3 | 590 | °F | 310 | °C |
| Heat Deflection Temperature at 1.8 MPa | | 75Af | 538 | °F | 281 | °C |
| **General** | | | | | | |
| Specific Gravity | | 1183A | 1.59 | | 1.59 | |

(1) Actual properties of individual batches will vary within specification limits. Properties are typical of uncolored resin. Colorants or other additives will alter values.



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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-1145 HS resin 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° to 605°F (304° to 318°C) in the rear zone and gradually increase to 600° to 625°F (315° to 329°C) in the front zone. These conditions should give melt temperatures of 610° to 650°F (321° 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 A-1145 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.

## Precautionary Labeling

On the basis of the toxicological, physical, and chemical properties of AMODEL A-1145 HS 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**