



Torlon[®] 4601

polyamide-imide

Torlon 4601 is a speciality wear-resistant grade of polyamide-imide (PAI). Most Torlon PAI grades cannot be molded successfully in molds with undercuts. Torlon 4601 has been formulated to be moldable in tools with minor undercuts and give very good performance in lubricated wear applications.

Torlon PAI has the highest strength and stiffness of any thermoplastic up to 275°C (525°F). It has outstanding resistance to wear, creep, and chemicals.

Potential applications for Torlon 4601 polyamide-imide include ball bearing cages, and other molded articles that require undercut tooling.

Typical Properties⁽¹⁾ by ASTM Test Methods

Property	Test Method	US Customary Units		SI Units	
MECHANICAL					
Tensile Strength	D 638	17.5	kpsi	121	MPa
Tensile Modulus	D 638	0.61	Mpsi	4.2	GPa
Tensile Elongation	D 638	4.1	%	4.1	%
Flexural Modulus	D 790	0.65	Mpsi	4.5	GPa
Flexural Strength	D 790	26.4	kpsi	182	MPa
Izod Impact Strength, Notched	D 256	4.3	ft-lb/in	230	J/m
Izod Impact Strength, Unnotched	D 4812	7	ft-lb/in	400	J/m
Shear Strength	D 732				
at 23°C (73°F)		15.6	kpsi	108	MPa
THERMAL					
Heat Deflection Temperature	D 648				
at 264 psi (1.8 MPA)		543	°F	284	°C
GENERAL					
Specific Gravity	D 792	1.39		1.39	

⁽¹⁾ Property values for individual batches will vary within specification limits. Values shown are typical for uncolored resin; colorants may alter values.

Drying

Drying Torlon resin to a moisture content of 500 ppm or lower is required to avoid molding problems, like brittle parts and foaming. The resin should be dried in a circulating air oven equipped with a desiccant system.

Place the resin on drying trays in layers no more than 5 to 8 cm (2 to 3") deep. Minimum drying times are 3 hours at 177°C (350°F), 4 hours at 150°C (300°F), or 16 hours at 121°C (250°F).

Injection Molding

The injection molding press should be equipped with a screw having a length to diameter (L/D) ratio between 18:1 and 24:1 and a compression ratio between 1:1 and 1.5:1. Check devices are not recommended.

Recommended barrel temperatures are 305°C (580°F) in the feed zone increasing to 370°C (700°F) at the nozzle. The mold temperature should be adjusted until the temperature of the surface measures between 200°C (390°F) and 215°C (420°F).

Set the injection pressure to achieve a rapid fill. On most machines, this will be near the maximum injection pressure available. Fill the entire mold with primary injection boost and then drop off to a hold pressure. Begin hold pressure at a high setting of 41 to 55 MPa (6,000 to 8,000 psi), for several seconds, then drop off to 21 to 35 MPa (3,000 to 5,000 psi), for the duration of the hold pressure sequence. This will help minimize or eliminate any internal porosity or sink. If part defects, such as blistering at the gate, color change and degradation, splay and surface delamination, or gas burning at the knit lines and vents, are encountered, the injection fill rate may be too high.

Use moderate back pressure, about 7 MPa (1,000 psi), and lower screw recovery speeds (50-100 rpm). Avoid intermittent feeding and screw slippage which can lead to overheating and possible polymer degradation.

Total cycle time should be as short as possible to reduce residence time in the barrel. Excessive residence time will cause an increase in melt viscosity, reducing flow.

Cycle time consistency is very important for successful molding for Torlon parts and automatic operation is highly recommended.

Molds should be designed for smooth part ejection and provide adequate draft.

Post-cure

Torlon polymers are unique in that they are supplied at a relatively low molecular weight to facilitate processing, and the molded parts must be post-cured to achieve a high molecular weight and optimum properties. The post-curing process involves placing the molded articles in a forced air oven and thermally treating them to a series of increasing temperatures for various times. Contact your Solvay Advanced Polymers' representative for a specific recommendation for post-curing your part.

Standard Packaging and Labeling

Torlon 4601 resin is packaged in lined cardboard boxes containing 25 kg (55.115 pounds) of material. Individual packages will be plainly marked with the product number, color, lot number, and net weight.

For assistance with an emergency involving products of Solvay Advanced Polymers, such as a spill, leak, fire, or explosion, call day or night:

Emergency Health Information

USA +1.800.621.4590

International +1.770.772.8577

Emergency Spill Information

USA +1.800.424.9300 / +1.703.527.3887 (CHEMTREC)

Europe +44 208.762.8322 (CARECHEM)

China +86.10.5100.3039

All other Asian countries +65.633.44.177

For additional product information, technical assistance, and Material Safety Data Sheets (MSDS), call:

USA +1.800.621.4557 / +1.770.772.8760

Europe +49.211.5135.9000

Japan +81.3.5425.4300

China & Southeast Asia +86.21.5080.5080

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Material Safety Data Sheets (MSDS) for products of Solvay Advanced Polymers are available upon request from your sales representative or by emailing us at advancedpolymers@solvay.com. Always consult the appropriate MSDS before using any of our products.

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