

Product Information

Nylon N60N45L and N60N45HSL

N60N45L is a nucleating, high flow nylon 6. Cavities with thin wall sections, or tool designs with long flow paths, can be successfully filled due to the easy flow characteristics, and the nucleation helps to achieve fast cycle times.

Where resistance of molded parts to the effects of prolonged high temperature exposure is required, the use of **N60N45HSL**, which contains an effective heat stabilizer package, is recommended.

Both formulations are internally lubricated for ease of mold release; several alternate "super-lubricated" formulations are available for applications where constraints of tool design or short cycle time goals make part ejection more difficult.

The combination of low viscosity and nucleation results in a mechanical property profile slightly different from that of a general purpose nylon 6 such as **N6050L**; these grades exhibit higher strength and rigidity, but lower toughness; otherwise the overall characteristics of nylon resins are fully retained.

These products offer extremely cost-effective performance and production in applications where their special combination of characteristics is appropriate.

TYPICAL PROPERTIES DRY AS MOLDED

<u>PROPERTY</u>	<u>ASTM TEST METHOD</u>	<u>ENGLISH</u>		<u>S.I.</u>	
		<u>UNITS</u>	<u>VALUE</u>	<u>UNITS</u>	<u>VALUE</u>
Melting Range	D789	°F	410-437	°C	210-225
Specific Gravity	D792	-	1.13	-	1.13
Water Absorption (24 hours immersion)	D570	%	1.15	%	1.15
Heat Deflection Temperature at 264 lbs/in ² (1.82 MPa)	D648	°F	160	°C	71
Mold Shrinkage Guideline* (Flow Direction)	1/8" section	%	1.0-1.3	%	1.0-1.3
Tensile Strength at Yield	D638	lbs/in ²	12,500	MPa	86
Elongation at Break	D638	%	20-30	%	20-30
Flexural Strength	D790	lbs/in ²	17,000	MPa	117
Flexural Modulus	D790	lbs/in ²	420,000	MPa	2,897
Izod Impact Strength (Notched, 1/8" specimen)	D256	ft. lbs/in of notch	0.8 – 1.1	J/m	43 - 59
Rockwell Hardness	D785	R scale	R120	-	-

* Please review shrinkage projections for specific applications with an MDE Technical Representative.

All data generated using test specimens injection molded from natural color material. Inclusion of color pigments or other additives may change some or all of these test results. Test specimens are stored in a moisture proof container immediately after molding and contain less than 0.2% moisture; tests are conducted at 23°C and 50% relative humidity unless otherwise stated.

These mechanical property test data have been developed using injection molded specimens tested under standardized conditions; furthermore, many of the mechanical properties of thermoplastic materials can be influenced by changes in processing conditions, environmental factors such as temperature and humidity, and rate of application of stress. Therefore, these test results, which characterize typical production material, should not be used either to establish specification limits or alone as the basis for engineering design.

N60N45L and N60N45HSL

Processing Guidelines

Drying

Nylon compounds from MDE are shipped in moisture resistant packaging, dried to less than 0.25% moisture. Most processors will further dry nylon resins and compounds, especially after exposure of virgin resin to ambient air for more than an hour, or when a proportion of reground material is being used.

The use of dehumidifying dryers is strongly preferred. The dew point of the drying air stream should be no more than -20°F, and preferably lower. The drying air temperature must be high enough to achieve a pellet temperature of 175-180°F. If using a hopper drier, depending on air hose length and insulation of hoses and hopper, the drying air temperature may need to reach 200-220°F to achieve the required material temperature.

If the pellet temperature reaches 180°F, a residence time of 4 hours is generally adequate to ensure that the material is ready to be processed. Only if residence times are limited to 2 hours should a pellet temperature of 200°F be considered; at 200°F, there is a risk of material oxidation, with associated yellowing of natural color and loss of part performance.

Nylon compounds usually demonstrate visual evidence of unacceptably high moisture levels. This includes splay or silver streaking on the molded part surface, or an unstable melt or nozzle drool at the machine. Additional drying time is indicated if these characteristics are observed.

If moisture analysis equipment is available, an acceptable moisture content range for normal processing is 0.1% to 0.25% maximum. Mold-in-color parts with critical cosmetic requirements may require drying to < 0.1%.

Temperature Guidelines

The following temperature guidelines are suggested for general use **if a machine can be selected where shot size is 40-70% of nominal machine capacity.**

<u>Tool Surface Temperature (°F)</u>	<u>Melt Temperatures (°F)</u>			<u>Typical Cylinder Temperatures (°F)</u>		
	<u>Max.</u>	<u>Preferred</u>	<u>Min.</u>	<u>Front</u>	<u>Center</u>	<u>Rear</u>
140-180	540	480-520	460	470	480	490

- A "reverse" temperature profile helps ensure a homogeneous melt, and improves screw recovery, and helps to optimize cycle times. When achievement of very short cycle times is required, especially for a multi-cavity tool configuration which requires the use of over 50% of barrel capacity, much higher rear zone set temperatures (in the range 540-560 °F) can be necessary to ensure development of a good quality melt.
- A mold surface temperature in the suggested range improves surface appearance, helps consistency of mold fill and therefore consistency of dimensions, minimizes the effect of weld lines and also helps realize best molded part performance.
- A medium to fast injection speed maximizes weld line strength, minimizes molded in stress, and also contributes to achievement of best surface gloss. Good venting of cavities is essential to allow fast fill without burning.

Screw Forward Time

It is recommended that back pressure of about 50 p.s.i. gauge be applied to the screw to help development of a homogeneous melt, and to ensure consistent shot volume. Screw rotation should also be as slow as possible consistent with cycle time goals, usually 40-80 r.p.m., although speeds as high as 150-200 r.p.m. have been successfully used to minimize overall cycle time. Special screw designs are normally required if rotation speeds over 200 r.p.m. are to be considered.

Screw Recovery

It is recommended that back pressure of about 50 p.s.i. gauge be applied to the screw to help development of a homogeneous melt, and to ensure consistent shot volume. Screw rotation should also be as slow as possible consistent with cycle time goals, usually 40-80 r.p.m.

Mold Shrinkage

Standard ASTM test specimens are used to develop shrinkage guidelines. Test specimens are end-gated, 1/8 inch thickness, and molded at conditions recommended for this formulation. **Actual shrinkage in molded parts will depend on several variables, including processing conditions, part configuration and gate location, both of which influence material flow direction, and wall section thickness.**