Thermoplastic Polyester PBT200L

PBT200L is an un-reinforced intermediate molecular weight polybutylene terephthalate (thermoplastic polyester) recommended for applications where improved toughness and ductility are required. The higher viscosity of this polymer may limit its use in multi-cavity, thin-wall or long-flow path tools.

PBT is a highly crystalline thermoplastic, and exhibits physical and mechanical properties typical of this structure. These include good strength, rigidity and toughness, excellent dimensional stability, resistance to the effects of a very wide range of chemicals, solvents and oils, natural lubricity and wear resistance and easy processability with outstanding part surface appearance.

PBT200L exhibits flow characteristics suitable for most tool configurations, although thin wall or long flow path designs may require higher melt and tool temperatures to satisfactorily fill with minimum molded-in stress.

Although PBT resins and compounds from MDE are shipped in moisture proof packaging, drying prior to processing is essential to enable best mechanical properties to be realized.

TYPICAL PROPERTIES

PROPERTY	ASTM TEST METHOD	ENGLISH UNITS	ENGLISH VALUE	S.I. UNITS	S.I. VALUE
Melting Range	D789	◦F	420-445	◦C	228
Specific Gravity	D792	-	1.31	-	1.31
Water Absorption (Immersion to Equil. At 23◦C/73◦F)	D570	%	0.09	%	0.09
Heat Deflection Temp. at 264 lbs/in^2(1.82MPa)	D648	◦F	130	◦C	54
Mold Shrinkage* (Flow Direction)	1/8" section	%	1.8-2.2	%	1.8-2.2
Tensile Strength at Yield	D638	lbs/in^2	8,100	MPa	
Elongation at Break	D638	%	150-200	%	150-200
Flexural Strength	D790	lbs/in^2	12,500	MPa	
Flexural Modulus	D790	lbs/in^2	360,000	MPa	
Izod Impact Strength (Notched, 1/8" specimen)	D256	ft. lbs/in of notch	1.0	J/m	53
Rockwell Hardness	D785	M Scale	76-78	-	-

*** 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. 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.

PBT200L
Processing Guidelines

Drying

Although Thermoplastic Polyester (PBT) compounds from MDE are shipped in moisture resistant packaging, drying before processing is essential to ensure full realization of part performance, especially toughness. PBT absorbs very little moisture from its surrounding environment, but hydrolysis of the polymer when melted in the molding machine is rapid, causing breakdown of the polymer structure and loss of mechanical properties. Further, unlike other moisture sensitive engineering thermoplastics, such as nylon, there may be no visible evidence (such as splay marking) of unacceptably high moisture levels.

The use of dehumidifying hopper dryers is therefore strongly recommended to ensure that both virgin material and regrind are properly dried. The dew point of the drying air stream should be no more than –20◦F, and preferably lower. The drying air temperature required varies with residence time of the material in the hopper at the drying temperature:

Residence Time	Temperature
2-3 hours	260-280◦F(Max)
5-6 hours	230-240◦F
8 hours-overnight	215◦F

If equipment is available to analyze moisture content, the recommended maximum level is 0.05%. PBT can be processed without difficulty at levels up to 0.1%, but some loss of mechanical properties and part performance will occur.

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**.

Tool Surface Temperature (◦F)	Melt Temperatures (◦F)			Typical Cylinder Temperatures (◦F)		
	Max.	Preferred	Min.	Front	Center	Rear
160-180	520	480-500	470	480	480	480

- A "flat" temperature profile helps ensure a homogeneous melt, and improves screw recovery.
- 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 fast injection speed maximizes weld line strength, minimizes molded in stress, and also assures achievement of best surface appearance. Good venting of cavities is essential to allow fast fill without burning.

Screw Forward Time

Adequate screw forward time under follow-up pressure is important to ensure proper packing before gate freeze, during which time it is essential to maintain a "cushion" of 1/8"-1/4". Optimum screw forward time can be judged by a part weight vs. forward time plot. Avoid overpacking, which can generate molded-in stresses.

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 the conditions recommended above for this formulation. **Actual shrinkage of molded parts will**

depend on several variables including part configuration and gate location, both of which influence material flow direction, wall section thickness, and processing conditions.