

Product Information

Polycarbonate PC20 IR

PC20 IR is a polycarbonate with a lower viscosity, which is therefore suitable for both general purpose injection molding, and applications where higher flow and easier mold fill are required. It is lubricated for ease of mold release. This grade exhibits excellent natural color and color consistency, combined with outstanding light transmission characteristics, maintained over the full visible light spectrum.

Polycarbonate is an engineering thermoplastic widely recognized for its outstanding toughness, excellent strength, rigidity and creep resistance, electrical insulation characteristics and dimensional stability.

Mold shrinkage is low and almost isotropic; this offers benefits in dimensional stability and reduced warpage, and permits the production of complex shape parts to very close dimensional tolerances. Polycarbonate must be dried prior to processing, to fully maintain the mechanical properties of the material. To better realize the excellent transparency of this grade, melt temperatures in the range of 600°F to as high as 630°F are suggested – please refer to the Processing Guidelines overleaf.

TYPICAL PROPERTIES

<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>
Vicat Softening Point	D1525	°F	310	°C	150
Specific Gravity	D792	-	1.20	-	1.20
Water Absorption (24 hours immersion)	D570	%	0.15	%	0.15
Heat Deflection Temperature at 264 lbs/in ² (1.82 MPa)	D648	°F	266	°C	130
Mold Shrinkage Guideline* (Flow Direction)	1/8" section	%	0.5-0.7	%	0.5-0.7
Light Transmittance	D1003				
660 – 680 nm		0.125 in.	91%	3mm	91%
470 – 600 nm		0.125 in.	89%	3mm	89%
Tensile Strength at Yield	D638	lbs/in ²	9,200	MPa	63
Elongation at Break	D638	%	90-110	%	90-110
Flexural Strength	D790	lbs/in ²	14,500	MPa	100
Flexural Modulus	D790	lbs/in ²	350,000	MPa	2,414
Izod Impact Strength (Notched, 1/8" specimen)	D256	ft. lbs/in of notch	15-17	J/m	747-847
Tensile Impact Strength (Type S specimen)	D1822	ft. lbs/in	200-300	KJ/m	400-660
Rockwell Hardness	D785	R scale	118	-	-

*** 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.

PC20 IR Processing Guidelines

Drying

Although polycarbonate products from MDE are shipped in moisture resistant packaging, in order to realize best mechanical performance and surface appearance they must be further dried before processing.

The use of dehumidifying dryers is strongly recommended. 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 at least 250°F. If using a hopper dryer, depending on air hose length, and insulation of hoses and hopper, the drying air temperature may need to reach 260-270°F to achieve the required material temperature. Insulation of hoses and especially the hopper is strongly recommended. If the material temperature reaches 250°F, a residence time of 4 hours is generally adequate to ensure that the material is ready to be processed. If residence times are shorter, material temperatures should be increased to 280°F, which will normally ensure adequate drying within two hours.

Very high moisture levels will result in visual evidence in molded parts such as splay or silver streaking.. However, note that it is possible to satisfactorily process material and make parts of acceptable appearance, even though its moisture content is high enough to seriously diminish mechanical performance.

If moisture analysis equipment is available, the maximum acceptable moisture content of polycarbonate resins and compounds immediately prior to processing is 0.02%.

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.**

Typical Cylinder Tool Surface Temperature (°F)	Melt Temperatures (°F)			Temperatures (°F)		
	<u>Max.</u>	<u>Preferred</u>	<u>Min.</u>	<u>Front</u>	<u>Center</u>	<u>Rear</u>
160-200	600	550-580	525	560	550	540

- Melt temperatures over 600°F have been used successfully to further help flow in thin section or long flow-path tools, provided cylinder residence times are short.
- The light transmission characteristics of PC20 IR improve with mold temperatures at the lower end of the suggested range, and with increasing melt temperature, up to 630°F. For very best light transmission performance, therefore, the machine size must be selected to limit residence times to between three and five shots, so that these higher melt temperatures can be used without risk of discoloration.
- 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, and minimizes molded-in stress. 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 100-150 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.**