

### Machine Grade

MAKROLON<sup>®</sup> MG polycarbonate engineering plate is an amorphous thermo-plastic sheet. It offers extremely high impact strength, high modulus of elasticity, outstanding dimensional stability and good mechanical and electrical properties.

### Applications

Manifolds, insulators, diaphragms, electrical, semiconductor and military

Typical Properties			
Property	Test Method	Units	Values
<b>PHYSICAL</b>			
Specific Gravity	ASTM D792	-	1.2
Water Absorption, 24 hrs	ASTM D570	%	0.15
Poisson's Ratio	ASTM E132	-	0.38
<b>MECHANICAL</b>			
Tensile Strength, Ultimate	ASTM D638	psi	9,500
Tensile Strength, Yield	ASTM D638	psi	9,000
Tensile Modulus	ASTM D638	psi	340,000
Elongation	ASTM D638	%	110
Flexural Strength	ASTM D790	psi	13,500
Flexural Modulus	ASTM D790	psi	345,000
Compressive Strength	ASTM D695	psi	12,500
Compressive Modulus	ASTM D695	psi	345,000
Shear Strength @ Yield	ASTM D732	psi	6,000
Shear Strength, Ultimate	ASTM D732	psi	10,000
Shear Modulus	ASTM D732	psi	114,000
Rockwell Hardness	ASTM D785	-	M70/R118
<b>THERMAL</b>			
Coefficient of Thermal Expansion	ASTM D696	in/in/°F	3.75 x 10 <sup>-5</sup>
Coefficient of Thermal Conductivity	ASTM C177	BTU·in/hr·ft <sup>2</sup> ·°F	1.35
Heat Deflection Temperature @ 264 psi	ASTM D648	°F	270
Heat Deflection Temperature @ 66 psi	ASTM D648	°F	280
Brittleness Temperature	ASTM D746	°F	-200
<b>ELECTRICAL</b>			
Dielectric Constant, @10Hz	ASTM D150	-	2.96
Dielectric Constant @ 60Hz	ASTM D150	-	3.17
Volume Resistivity	ASTM D257	Ohm·cm	8.2 x 10 <sup>16</sup>
Dissipation Factor @ 60 Hz	ASTM D150	-	0.0009
Arc Resistance			
Stainless Steel Strip Electrodes	ASTM D495	Seconds	10-11
Tungsten Electrodes	ASTM D495	Seconds	120
Dielectric Strength, in air @ 0.125"	ASTM D149	V/mil	380
<b>FLAMMABILITY</b>			
Flame Class, @ 0.375"	UL 94	-	V0

### Fabrication Guidelines

**Cutting:** A circular saw blade with carbide teeth utilizing the “triple chip” tooth design is the preferred method of cutting MAKROLON MG polycarbonate sheet. Table or overhead panel saws are normally used. Circular saws should be run in the speed range of 6000-8000 ft/min. Blades for cutting 3/32” and thicker material should have 3-5 teeth per inch. The hook or rake angle should be 10°-15°.

**Drilling:** Standard high-speed twist drills should be used when drilling MAKROLON MG polycarbonate sheet. To achieve the best possible hole, surface speeds of 200 to 300 in./min for drills less than 1/4” to 1/2” in diameter should be used when material is machine dry. A cooling medium\* should be used with speeds of 500 to 700 in./min for drills under 1/4” diameter, and 1500 to 1600 in./min for drills 1/4” to 1/2” in diameter. A feed rate of 0.001 to 0.0015 per revolution is also recommended.

**Milling:** Milling can be used for either roughing or achieving extremely high-quality surface finishes. Best results can be obtained when using a high-speed steel end drill of the four-flute type with a 15°- rake angle.

**Turning:** Using conventional metal turning lathes with variable speed control, MAKROLON MG polycarbonate sheet can be cut without coolant at turning speeds of 1500 to 2500 in./min. If cutter at higher speeds, water is preferred as a coolant. Good results can be obtained when using a round-tip cutter, a high turning speed, a shallow cut and a low cross-feed rate. Radii of 15 to 30 mils are suggested for round tip cutters.

**Polishing:** MAKROLON MG polycarbonate sheet is machine grade, not optically clear. It can be polished using one of the following methods, mechanically or vapor polished. This will help improve optical clarity. Please follow all EPA, local, state and governmental guidelines when using any chemical-type polishing method.

### Cautions

The following are suggested guidelines or concerns regarding machining working with MAKROLON MG polycarbonate sheet or any other engineering plastics.

1. Thermal expansion is up to 10 times greater with plastics than metals.
2. Plastics will lose heat more slowly than metals
3. Avoid localized overheating.
4. Softening/melting temperatures of plastics are much lower than metals.

### Disclaimer

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether our products, technical assistance and information are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent.



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