

# Makrolon MG Product Data



**MAKROLON® MG** (Machine Grade) polycarbonate engineering plate is an amorphous thermoplastic material made from Bayer's MAKROLON polycarbonate sheet. This "None Tougher" polycarbonate offers extremely high impact strength, high modulus of elasticity, outstanding dimensional stability and good mechanical and electrical properties. MAKROLON MG polycarbonate sheet has a 270°F (132°C) heat deflection temperature at 264 psi.

## APPLICATIONS

MAKROLON MG polycarbonate sheet is ideal for use in a wide range of applications where clarity and impact strength is essential. Typical applications for MAKROLON MG polycarbonate sheet include sight glasses, manifolds, insulators, diaphragms, and other machined parts. The product can be used in the medical, electrical, semiconductor, military/government, and other industrial markets.

## Typical Physical Properties

Property	Test Method	Units	MAKROLON
<b>PHYSICAL</b>			
Specific Gravity	ASTM D792	-	1.2
Rockwell Hardness	ASTM D785	-	M70/R118
Water Absorption, Equilibrium, 24 hrs	ASTM D570	%	0.15
<b>MECHANICAL</b>			
Tensile Strength, Yield	ASTM D638	psi	9000
Tensile Strength, Ultimate	ASTM D638	psi	9500
Tensile Modulus	ASTM D638	psi	345000
Flexural Strength	ASTM D790	psi	13500
Flexural Modulus	ASTM D790	psi	345000
Compressive Strength	ASTM D695	psi	12500
Compressive Modulus	ASTM D695	psi	345000
Elongation	ASTM D638	%	110
Poisson's Ratio	-	-	0.38
Shear Strength, @ Yield	ASTM D732	psi	6000
Shear Strength, Ultimate	ASTM D732	psi	10000
Shear Modulus	ASTM D732	psi	114000
<b>THERMAL</b>			
Coefficient of Thermal Expansion	ASTM D696	In/in/F	3.75 x 10 <sup>-6</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
<b>ELECTRICAL</b>			
Dielectric Constant, @ 10 Hz	ASTM D150	-	2.96
Dielectric Constant, @ 60 Hz	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
Dissipation Factor, @ 1 MHz	ASTM D150	-	0.01
Arc Resistance	ASTM D495	Seconds	
Stainless Steel Strip Electrode			10-11
Tungsten Electrodes			120
Dielectric Strength, in air, 125 mils	ASTM D149	V/mil	380
<b>FLAMMABILITY</b>			
UL 94 @ > or = .375"	UL 94	-	V0

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## 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 machined dry. A cutting 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. You may consider using lubricants\* such as light machine oil\* when routing.
- 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 cutting 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.**
- A&C Plastics recommends checking with your supplier of cutting oils, coolants, and other products used during machining as to the best product to use when machining MAKROLON MG polycarbonate sheet or any other polycarbonate plate.**

## 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.
5. Coolants are generally not required for most machining operations (not including drilling).
6. Optimum surface finishes and close tolerances may be achieved using nonaromatic, water-soluble coolants. We suggest spray mists and pressurized air as effective means of cooling the material during cutting, drilling, and turning.
7. General purpose petroleum-based cutting fluids, although suitable for many metals and plastics, may contribute to stress cracking of amorphous plastics such as MAKROLON MG polycarbonate sheet.