Makrolon® MG sheet

Machine grade

Makrolon® MG polycarbonate engineering plate is an amorphous thermoplastic sheet. It offers extremely high impact strength, high modulus of elasticity, outstanding dimensional stability, and good mechanical and electrical properties.

Applications

Manifold, insulators, diaphragms, electrical, semiconductor, and military

Typical Properties

Property	Test Method	Units	Values
PHYSICAL			
Specific Gravity	ASTM D 792	–	1.2
Water Absorption, 24 hours @ 73°F	ASTM D 570	%	0.15
Poisson's Ratio	ASTM E 132	–	0.38
MECHANICAL			
Tensile Strength, Break	ASTM D 638	psi	9,500
Tensile Strength, Yield	ASTM D 638	psi	9,000
Tensile Modulus	ASTM D 638	psi	340,000
Elongation	ASTM D 638	%	110
Flexural Strength	ASTM D 790	psi	13,500
Flexural Modulus	ASTM D 790	psi	345,000
Compressive Strength	ASTM D 695	psi	12,500
Compressive Modulus	ASTM D 695	psi	345,000
Shear Strength, Break	ASTM D 732	psi	10,000
Shear Strength, Yield	ASTM D 732	psi	6,000
Shear Modulus	ASTM D 732	psi	114,000
Rockwell Hardness	ASTM D 785	–	M70 / R118
THERMAL			
Coefficient of Thermal Expansion	ASTM D 696	in/in/°F	3.75×10^{-5}
Coefficient of Thermal Conductivity	ASTM C 177	BTU·in/hr·ft²·°F	1.35
Heat Deflection Temperature @ 264 psi	ASTM D 648	°F	270
Heat Deflection Temperature @ 66 psi	ASTM D 648	°F	280
Brittleness Temperature	ASTM D 746	°F	-200
ELECTRICAL			
Dielectric Constant @ 10 Hz	ASTM D 150	–	2.96
Dielectric Constant @ 60 Hz	ASTM D 150	–	3.17
Volume Resistivity	ASTM D 257	Ohm·cm	8.2×10^{16}
Dissipation Factor @ 60 Hz	ASTM D 150	–	0.0009
Arc Resistance	–	–	–
Stainless Steel Strip electrode	ASTM D 495	Seconds	10
Tungsten Electrodes	ASTM D 495	Seconds	120
Dielectric Strength, in air @ 0.125˝	ASTM D 149	V/mil	380
FLAMMABILITY			
Flame Class @ 0.395˝	UL 94	–	V-0

Agency and specification compliance

Flammability - Plastic component	UL 94	UL File #E351891
Polycarbonate sheet classification	A-A-59502	Type 1 Class 1
Polycarbonate resin classification	ASTM D 3935	PC0116

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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 machine dry. A cooling medium* should be used with speeds of 500-700 in./min for drills under ¼” 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

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