

TUFFAK MG

PRODUCT DESCRIPTION

TUFFAK MG (MACHINE GRADE) POLYCARBONATE ENGINEERING PLATE IS AN AMORPHOUS THERMOPLASTIC MATERIAL MADE FROM BAYER'S TUFFAK POLYCARBONATE SHEET. THIS "NONE TOUGHER" POLYCARBONATE OFFERS EXTREMELY HIGH IMPACT STRENGTH, HIGH MODULUS OF ELASTICITY, OUTSTANDING DIMENSIONAL STABILITY AND GOOD MECHANICAL AND ELECTRICAL PROPERTIES. TUFFAK MG POLYCARBONATE SHEET HAS A 270°F HEAT DEFLECTION TEMPERATURE AT 264 PSI.

APPLICATIONS

TUFFAK MG POLYCARBONATE SHEET IS IDEAL FOR USE IN A WIDE RANGE OF APPLICATIONS WHERE CLARITY AND IMPACT STRENGTH IS ESSENTIAL.

TYPICAL APPLICATIONS FOR TUFFAK 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	Tuffak
PHYSICAL			
Specific Gravity	ASTM D792	-	1.2
Rockwell Hardness	ASTM D785	-	M70/R118
Water Absorption, Equilibrium, 24 hrs	ASTM D570	%	0.15
MECHANICAL			
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
THERMAL			
Coefficient of Thermal Expansion	ASTM D696	In/in/F	3.75×10^{-5}
Coefficient of Thermal Conductivity	ASTM C177	Btu-in/hr-ft-F	1.35
Heat Deflection Temperature, @ 264 psi	ASTM D648	F	270
Heat Deflection Temperature, @ 66 psi	ASTM D648	F	280
ELECTRICAL			
Dielectric Constant, @ 10 Hz	ASTM D150	-	2.96
Dielectric Constant, @ 60 Hz	ASTM D150	-	3.17
Volume Resistivity	ASTM D257	Ohm-cm	8.2×10^{16}
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
FLAMMABILITY			
UL 94 @ > or = .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 TUFFAK MG polycarbonate sheet. Table or overhead panel saws are normally used. Circular saws should utilize the speed range of 6,000 - 8,000 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 TUFFAK MG polycarbonate sheet. To achieve the best possible hole, surface speeds of 200 - 300 in/min for drills less than 1/4" to 1/2" in diameter should be used when material is machined dry. A cooling medium should be used with speeds 500 - 700 in/min for drills under 1/4" diameter and 1500 - 1600 in/min for drills 1/4" to 1/2" in diameter. A feed rate of .001 to .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 flour flute type with a 15° rake angle. You may consider using lubricants.

TURNING

Using conventional metal turning lathes with variable speed control, TUFFAK MG polycarbonate sheet can be cut without coolant at turning speeds of 1500 - 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. Radii of 15 - 30 mils are suggested for round tip cutters.

POLISHING

TUFFAK 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 methods.

A&C Plastics recommends checking with your supplier of cutting oils, coolants, and other products used during machining for information about the best product to use.

Cautions:

The following suggested guidelines or concerns regarding machining/working with TUFFAK 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 tolerance may be achieved using non-aromatic, 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 TUFFAK MG.