CNC MACHINING

Polycarbonate

Impact Resistant Transparent Plastic

CNC machined polycarbonate offers optical clarity, high impact resistance, and excellent dimensional stability. It is ideal for transparent guards, lenses, and structural covers that must remain tough and lightweight.

MACHINING ENVELOPE	LEAD TIME	TOLERANCE	PROCESS
1000 × 600 × 500 mm	5-7 business days	±0.050 mm typical	CNC Machining

MECHANICAL PROPERTIES

Polycarbonate (CNC) delivers dependable strength and impact resistance for transparent instrument covers, safety guards and machine windows. Its balanced mechanical profile handles demanding load conditions without turning brittle in critical parts.

Polycarbonate yields and then stretches a long way before it breaks, and unnotched samples do not break at all. Notched values are lower, so generous internal radii at corners, slots and holes keep the full toughness of the material in machined parts. Instrumented impact shows the energy a flat panel absorbs under a falling dart, the best guide for guards and windows.

PROPERTY	VALUE	TEST STANDARD
Tensile Strength, Ultimate	**65.5 MPa**	ASTM D638
Tensile Strength, Yield	**62 MPa**	ASTM D638
Tensile Modulus	**2340 MPa**	ASTM D638
Elongation at Break	**110 %**	ASTM D638
Flexural Strength	**93 MPa**	ASTM D790
Flexural Modulus	**2380 MPa**	ASTM D790
Compressive Strength	**86 MPa**	ASTM D695
Compressive Modulus	**2380 MPa**	ASTM D695
Izod Impact Strength, Notched (3.2 mm)	**960 J/m**	ASTM D256
Izod Impact Strength, Unnotched (3.2 mm)	**No break**	ASTM D256
Instrumented Impact, Total Energy (3.2 mm)	**64 J**	ASTM D3763
Shear Strength, Ultimate	**69 MPa**	ASTM D732
Shear Strength, Yield	**41 MPa**	ASTM D732
Shear Modulus	**786 MPa**	ASTM D732
Rockwell Hardness (M / R)	**M70 / R118**	ASTM D785
Poisson's Ratio	**0.38**	ASTM E132

THERMAL PROPERTIES

Polycarbonate (CNC) stays tough far below freezing and holds its shape up to its heat-deflection limit, so guards and windows in medical and industrial equipment can sit near heat sources. Heat deflection shows the short-term limit under load. For long-term use, Plaskolite gives a lower continuous service limit for clear sheet than the UL 746B rating Ensinger publishes for its rod, plate and tube, so use the sheet figure for sheet-based guards and windows.

Polycarbonate expands far more than metal, so allow clearance where clear panels are fastened into metal frames. Ignition temperatures and the horizontal burn result describe how it behaves in a fire; its UL 94 rating is listed with compliance.

PROPERTY	VALUE	TEST STANDARD
HDT @ 1.82 MPa (264 psi)	**132 °C**	ASTM D648
HDT @ 0.45 MPa (66 psi)	**138 °C**	ASTM D648
Glass Transition Temperature	**149 °C**	ISO 11357 (Ensinger, public-source value)
Continuous Service Temperature (sheet)	**100 °C**	Plaskolite TUFFAK fabrication guide
Long-Term Service Temperature	**121 °C**	UL 746B (Ensinger TECANAT natural)
Intermittent Service Temperature	**135 °C**	Ensinger TECANAT natural data
Brittleness Temperature	**-129 °C**	ASTM D746
Coefficient of Linear Thermal Expansion	**67.5 ×10^{-6}/K**	ASTM D696
Thermal Conductivity	**0.19 W/m·K**	ASTM C177
Specific Heat	**1.26 J/g·K**	ASTM C351 (Ensinger TECANAT natural)
Self-Ignition Temperature	**550 °C**	ASTM D1929
Flash-Ignition Temperature	**440 °C**	ASTM D1929
Horizontal Burn, Average Extent	**< 25 mm**	ASTM D635

PHYSICAL PROPERTIES

Polycarbonate (CNC) offers consistent density and surface quality, so critical features hold tolerances and downstream finishing remains predictable. Low density makes parts lightweight yet durable, and low moisture absorption keeps them dimensionally stable in varying environmental conditions.

Light transmission and haze are measured on the polished surface of clear sheet as supplied. A machined face is translucent until it is polished, so specify which faces need optical clarity; the refractive index helps when designing lenses and light pipes.

PROPERTY	VALUE	TEST STANDARD
Specific Gravity	**1.2**	ASTM D792
Light Transmission, Clear (3 mm)	**86 %**	ASTM D1003
Haze, Clear (3 mm)	**< 1 %**	ASTM D1003
Refractive Index	**1.586**	ASTM D542
Water Absorption (24 h)	**0.15 %**	ASTM D570

ELECTRICAL PROPERTIES

Polycarbonate (CNC) is an electrical insulator with high resistivity and good dielectric strength, for insulating covers, windows and functional prototypes in integrated electrical systems where a UL 94 HB rating is acceptable. Flame-rated enclosures need a V-0 grade.

The dielectric constant and the low dissipation factor help evaluate dielectric losses in signal-sensitive or high-frequency use. Arc resistance is reported for two electrode types, as Plaskolite tests it.

PROPERTY	VALUE	TEST STANDARD
Volume Resistivity	**8.2×10^{16} Ω·cm**	ASTM D257
Surface Resistivity	**> 10^{14} Ω**	IEC 60093
Dielectric Strength (3.2 mm, in air)	**15 kV/mm**	ASTM D149
Dielectric Constant (60 Hz)	**3.17**	ASTM D150
Dielectric Constant (1 MHz)	**2.96**	ASTM D150
Dissipation Factor (60 Hz)	**0.0009**	ASTM D150
Arc Resistance (tungsten / stainless strip electrodes)	**120 / 10 s**	ASTM D495

CHEMICAL PROPERTIES

Plaskolite rates polycarbonate in a bent-strip test at 23 °C and up to 2% strain, so the ratings show which chemicals crack a stressed part. Dilute acids, isopropyl and ethyl alcohol, mineral oils, salt water and oxidizers such as hydrogen peroxide and dilute sodium hypochlorite are tolerated, while bases, ammonia and amines, ketones, and chlorinated and aromatic solvents attack it, and fuels only partially resist.

Highly stressed parts can crack within a minute in an aggressive solvent, and plasticized PVC in contact can stress-crack polycarbonate, so confirm cleaners and contact materials with application-specific testing before production release.

CHEMICAL	RATING
Acetic acid (up to 10%)	**Good**
Citric acid	**Good**
Hydrochloric acid 20%	**Good**
Hydrochloric acid (concentrated)	**Poor**
Sulfuric acid 50%	**Good**
Sulfuric acid 70%	**Moderate**
Sulfuric acid (concentrated)	**Poor**
Nitric acid up to 10%	**Good**
Nitric acid 10–20%	**Moderate**
Nitric acid above 20%	**Poor**
Phosphoric acid (concentrated)	**Good**
Sodium hydroxide (caustic soda)	**Poor**
Potassium hydroxide	**Poor**
Ammonia and amines	**Poor**
Isopropyl alcohol	**Good**
Ethyl alcohol 96%	**Good**

Methanol	**Poor**
Ethylene glycol	**Good**
Acetone	**Poor**
Methyl ethyl ketone (MEK)	**Poor**
Methylene chloride	**Poor**
Toluene and xylene	**Poor**
Hexane and heptane	**Good**
Gasoline	**Moderate**
Diesel oil	**Moderate**
Hydraulic and lubricating oils (mineral)	**Good**
Benzene	**Poor**
Sodium chloride (saturated) and sea water	**Good**
Calcium chloride (saturated)	**Good**
Sodium carbonate (saturated)	**Good**
Hydrogen peroxide 30%	**Good**
Sodium hypochlorite 5%	**Good**
Ozone	**Good**
Chlorine gas (wet)	**Poor**

COMPLIANCE

Plaskolite lists TUFFAK GP sheet under UL file E87887, and its UL 94 rating depends on wall thickness, so read the rating with the thickness it was tested at. Ensinger cites ASTM D6098 as the shapes specification for its TECANAT natural rod, plate and tube.

The FDA statement covers the resin in Ensinger stock shapes rather than a named food-contact regulation, so food-contact parts are confirmed with Forge Labs before ordering. Neither grade carries biocompatibility data, and Ensinger does not define TECANAT for medical or dental implants.

STANDARD	STATUS
UL 94 flammability Plaskolite UL file E87887 for TUFFAK GP sheet: HB at 1.5 mm (0.060 in); V-0 only at 10 mm (0.394 in). Not a flame-retardant grade at thin sections	HB
ASTM D6098 (S-PC0111) Extruded polycarbonate rod, plate and tube for machining, the shapes specification Ensinger cites for TECANAT natural (resin to ASTM D3935 PC0150B34840)	Stock specification
FDA (resin) Ensinger lists FDA compliance for the resin used in TECANAT natural stock shapes; no CFR section or food-contact scope is named. TUFFAK GP sheet carries no food-contact statement	Ensinger statement

MANUFACTURING

Colours & finishes	**Clear stock; deburring, flame polishing, vapor polishing and hard coating**