CNC MACHINING

Aluminum 6061-T6

Lightweight Structural Alloy for CNC Machining

Aluminum 6061-T6 is a versatile aerospace-grade alloy that balances strength, corrosion resistance, and machinability. It delivers accurate, lightweight CNC components with excellent surface finish and consistent mechanical performance.



MACHINING ENVELOPE	LEAD TIME	TOLERANCE	PROCESS
1000 × 600 × 500 mm	5-7 business days	±0.025 mm typical	CNC Machining

MECHANICAL PROPERTIES

Aluminum 6061-T6 delivers dependable strength and toughness for lightweight structural brackets and frames, precision enclosures and tooling plates, helping teams move from prototype to production with confidence. Its balanced mechanical profile handles demanding load conditions while staying ductile rather than brittle, and because machining adds no layer lines, parts carry the full properties of the wrought stock.

Typical values describe average production stock, while the minimum rows are the limits each product form must meet, with plate and cold-finished rod held to a higher tensile minimum than extruded bar, so design margins start from the minimum for the stock a part is cut from. Elongation is given for two specimen sizes, fatigue strength is given for fully reversed bending at a stated cycle count, and the bearing rows apply to pinned and bolted joints.

PROPERTY	VALUE	TEST STANDARD
Ultimate Tensile Strength (typical)	**310 MPa**	Aluminum Association typical
Tensile Yield Strength (typical)	**276 MPa**	Aluminum Association typical
Ultimate Tensile Strength, Minimum (plate and cold-finished rod)	**290 MPa**	ASTM B209 / B211 (Alro Metals Guide)
Tensile Yield Strength, Minimum (plate and cold-finished rod)	**241 MPa**	ASTM B209 / B211 (Alro Metals Guide)
Ultimate Tensile Strength, Minimum (extruded bar)	**262 MPa**	ASTM B221 / Aluminum Association limits
Tensile Yield Strength, Minimum (extruded bar)	**241 MPa**	ASTM B221 / Aluminum Association limits
Elongation at Break (1.6 mm thick specimen)	**12 %**	Aluminum Association typical
Elongation at Break (12.7 mm diameter specimen)	**17 %**	Aluminum Association typical
Modulus of Elasticity	**68.9 GPa**	Aluminum Association typical
Shear Strength	**207 MPa**	Aluminum Association typical
Fatigue Strength (5×10^8 cycles, fully reversed)	**96.5 MPa**	R.R. Moore, Aluminum Association typical
Brinell Hardness (500 kg, 10 mm ball)	**95 HB**	Aluminum Association typical
Fracture Toughness K_1c (T-L)	**29 MPa·√m**	Aerospace Specification Metals / MatWeb data sheet

Bearing Yield Strength (e/D = 2.0)	**386 MPa**	Aerospace Specification Metals / MatWeb data sheet
Ultimate Bearing Strength (e/D = 2.0)	**607 MPa**	Aerospace Specification Metals / MatWeb data sheet

THERMAL PROPERTIES

Aluminum 6061-T6 conducts heat well, which suits heat sinks and thermal management parts, and its thermal expansion is typical of aluminum, so allow for it in tight assemblies and where parts meet steel or titanium.

The T6 temper gets its strength from artificial ageing, and long exposure at elevated temperature over-ages it and lowers its strength. The rows at temperature show how quickly tensile and yield strength fall as parts run hotter, so size hot parts from those rows rather than the room-temperature values.

PROPERTY	VALUE	TEST STANDARD
Thermal Conductivity (25 °C)	**167 W/m·K**	Aluminum Association typical
Coefficient of Thermal Expansion (20–100 °C)	**23.6 ×10⁻⁶/K**	Aluminum Association typical
Specific Heat	**0.896 J/g·K**	Aerospace Specification Metals / MatWeb data sheet
Melting Range (solidus–liquidus)	**582–652 °C**	Aluminum Association typical
Ultimate Tensile Strength at 100 °C	**290 MPa**	MatWeb data sheet, typical at temperature
Ultimate Tensile Strength at 149 °C	**234 MPa**	MatWeb data sheet, typical at temperature
Ultimate Tensile Strength at 204 °C	**131 MPa**	MatWeb data sheet, typical at temperature
Tensile Yield Strength at 100 °C	**262 MPa**	MatWeb data sheet, typical at temperature
Tensile Yield Strength at 149 °C	**214 MPa**	MatWeb data sheet, typical at temperature
Tensile Yield Strength at 204 °C	**103 MPa**	MatWeb data sheet, typical at temperature

PHYSICAL PROPERTIES

Low density makes parts lightweight yet durable, at about a third of the weight of steel, and wrought stock is fully dense, so critical features hold tolerances and downstream finishing stays predictable.

The composition rows show the magnesium and silicon that make 6061 heat-treatable, with small additions of copper and chromium. Surface roughness is our as-machined finish; specify a finer finish on sealing or cosmetic faces.

PROPERTY	VALUE	TEST STANDARD
Density	**2.70 g/cm³**	Aluminum Association typical
Surface Roughness, As Machined	**Ra 1.6–3.2 µm**	Forge Labs as-machined finish
Magnesium (Mg)	**0.8–1.2 wt%**	Aluminum Association composition limits
Silicon (Si)	**0.40–0.8 wt%**	Aluminum Association composition limits
Copper (Cu)	**0.15–0.40 wt%**	Aluminum Association composition limits
Chromium (Cr)	**0.04–0.35 wt%**	Aluminum Association composition limits

Iron (Fe)	**≤ 0.7 wt%**	Aluminum Association composition limits
Zinc (Zn)	**≤ 0.25 wt%**	Aluminum Association composition limits
Manganese (Mn)	**≤ 0.15 wt%**	Aluminum Association composition limits
Titanium (Ti)	**≤ 0.15 wt%**	Aluminum Association composition limits

ELECTRICAL PROPERTIES

Aluminum 6061-T6 electrical properties support conductive housings, grounded fixtures, shielding features and functional prototypes that interact with electrical systems, and the published conductivity and resistivity give engineers reliable inputs for current flow and grounding models.

Anodizing forms an insulating oxide, so mask grounding points or specify a conversion coating where electrical continuity matters.

PROPERTY	VALUE	TEST STANDARD
Electrical Resistivity (20 °C)	**3.99×10^{-8} Ω·m**	Aluminum Association typical
Electrical Conductivity (20 °C)	**43 % IACS**	Aluminum Association typical (Alro Metals Guide)

COMPLIANCE

6061-T6 machining stock is produced to ASTM and AMS specifications for each product form: plate, cold-finished rod and bar, and extruded bar, so drawings can call up the material by specification.

STANDARD	STATUS
ASTM B209 / AMS-QQ-A-250/11 Plate, 6061-T6 / T651: North American stock specification	Stock specification
ASTM B211 / AMS-QQ-A-225/8 Cold-finished rod and bar, 6061-T651: North American stock specification	Stock specification
ASTM B221 / AMS-QQ-A-200/8 Extruded rod and bar, 6061-T6511: North American stock specification	Stock specification

MANUFACTURING

Colours & finishes	**Bright as-machined finish; deburring, bead blasting, clear or coloured anodizing and conversion coating**
Tighter tolerances	**Down to ±0.010 mm on request**
Precision finish	**Ra 0.4 µm on critical faces**