DIRECT METAL LASER SINTERING

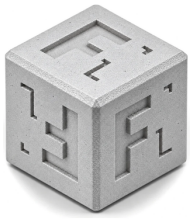
Aluminum 6061

High-Strength Structural Aluminum Alloy



Aluminum 6061 is a precipitation-hardened alloy renowned for its exceptional strength-to-weight ratio, excellent weldability, and superior corrosion resistance. With balanced mechanical properties and proven performance across aerospace, automotive, and structural applications, it delivers reliable, high-strength components for demanding engineering environments.

SURFACE FINISHES



Standard Finish Natural

Supports are carefully removed and parts are shot peened to a uniform matte surface, which also helps relieve residual stresses. Critical features may receive light machining for tighter tolerances.



Machining & Polishing Enhanced

Precision machining and polishing enhance surface quality for critical applications, achieving tighter tolerances and a smooth, high-gloss metallic finish.



Anodizing Protective

For aluminium parts, anodizing forms a protective oxide layer that significantly improves corrosion resistance and hardness while enhancing appearance.



Performance Paint Premium

An automotive-grade coating that enhances aesthetics and durability. Each part is hand-finished with professional-grade equipment for exceptional adhesion, in matte to semi-gloss with custom colour matching.

BUILD VOLUME	LEAD TIME	LAYER HEIGHT	TOLERANCE
250 × 250 × 325 mm	From 12 business days	0.04 mm	±0.3% (min ±0.3 mm)

MECHANICAL PROPERTIES

Aluminum 6061 delivers dependable strength and ductility for aircraft structural components, robot end-of-arm parts and automotive chassis brackets, helping teams move from prototype to production with confidence. Its balanced mechanical profile handles demanding load conditions without turning brittle in critical parts.

The values are for T6 heat-treated parts and sit at or above typical wrought 6061-T6 strength. Hardness is given on the Rockwell B scale and the modulus is measured ultrasonically. Elementum publishes fatigue results to 10 million cycles as a chart rather than a single value, so ask us for it when fatigue drives the design.

PROPERTY	VALUE	TEST STANDARD
Ultimate Tensile Strength	**331 MPa**	ASTM E8
Yield Strength, 0.2% Offset	**297 MPa**	ASTM E8
Elongation at Break	**12 %**	ASTM E8
Modulus of Elasticity	**76 GPa**	ASTM E494-15
Hardness, Rockwell B	**60 HRB**	ASTM E18

THERMAL PROPERTIES

Aluminum 6061 conducts heat well, which suits heat sinks and thermal management parts; conductivity was measured in the build (Z) direction. Its thermal expansion is typical of aluminum, so allow for it where parts meet steel or titanium.

The temperature rows come from one elevated-temperature test series, including its own 23 °C point, so compare the hot and cold rows with that point rather than with the room-temperature tensile value. Strength rises in the cold and holds well through 100 °C, then falls steeply above 150 °C, so the alloy is not suited to long-term service above 200 °C.

PROPERTY	VALUE	TEST STANDARD
Thermal Conductivity (Z)	**162 W/m·K**	ISO/DIS 22007-2.2 (transient plane source)
Coefficient of Thermal Expansion	**22.4 ×10^{-6}/K**	ASTM E228
Tensile Strength at −157 °C	**419 MPa**	ASTM E21 (Elementum Rev 2022-07-26)
Tensile Strength at 23 °C	**338 MPa**	ASTM E21 (Elementum Rev 2022-07-26)
Tensile Strength at 100 °C	**331 MPa**	ASTM E21 (Elementum Rev 2022-07-26)
Tensile Strength at 150 °C	**287 MPa**	ASTM E21 (Elementum Rev 2022-07-26)
Tensile Strength at 200 °C	**215 MPa**	ASTM E21 (Elementum Rev 2022-07-26)
Tensile Strength at 250 °C	**129 MPa**	ASTM E21 (Elementum Rev 2022-07-26)

PHYSICAL PROPERTIES

Aluminum's low density keeps parts lightweight yet durable, and printed parts reach near-full density, so critical features hold tolerance and downstream finishing stays predictable. The composition row lists the 6061 alloying elements and the ceramic addition.

As-built roughness depends on the face: top surfaces print smoothest, vertical walls are rougher and downward-facing 45° surfaces are roughest. Place cosmetic or sealing faces upward, or plan to machine or finish them.

PROPERTY	VALUE	TEST STANDARD
Nominal Composition	**Al-1.0Mg-0.6Si-0.28Cu-0.2Cr + 2% RAM additives**	Elementum 3D
Theoretical Maximum Density	**2.74 g/cm³**	Elementum 3D
Printed Relative Density	**> 99.5 %**	Elementum 3D
Surface Roughness Ra, As Built (Top, 0°)	**2.2 µm**	Stylus profilometry, 40 µm layers
Surface Roughness Ra, As Built (Vertical, 90°)	**5.9 µm**	Stylus profilometry, 40 µm layers
Surface Roughness Ra, As Built (45° Downskin)	**7.6 µm**	Stylus profilometry, 40 µm layers

ELECTRICAL PROPERTIES

Aluminum 6061 conducts electricity, supporting grounded housings, shielding features and electrically integrated metal components.

The conductivity value is an as-printed reference measured by 3D Systems on the same powder; T6 heat-treated parts may differ.

PROPERTY	VALUE	TEST STANDARD
Electrical Conductivity (As Printed)	**13 MS/m**	ASTM B193 at 20 °C (3D Systems data)

MANUFACTURING

Heat treatment	**T6 heat treatment**