

## Aluminum 6061-T6; 6061-T651

**Categories:** [Metal](#); [Nonferrous Metal](#); [Aluminum Alloy](#); [6000 Series Aluminum Alloy](#)

**Material Notes:** Information provided by Alcoa, Starmet and the references. General 6061 characteristics and uses: Excellent joining characteristics, good acceptance of applied coatings. Combines relatively high strength, good workability, and high resistance to corrosion; widely available. The T8 and T9 tempers offer better chipping characteristics over the T6 temper.



**Applications:** Aircraft fittings, camera lens mounts, couplings, marines fittings and hardware, electrical fittings and connectors, decorative or misc. hardware, hinge pins, magneto parts, brake pistons, hydraulic pistons, appliance fittings, valves and valve parts; bike frames.

Data points with the AA note have been provided by the Aluminum Association, Inc. and are NOT FOR DESIGN.

**Composition Notes:**

Composition information provided by the Aluminum Association and is not for design.

**Key Words:** al6061, UNS A96061; ISO AIMg1SiCu; Aluminium 6061-T6, AD-33 (Russia); AA6061-T6; 6061T6, UNS A96061; ISO AIMg1SiCu; Aluminium 6061-T651, AD-33 (Russia); AA6061-T651


Physical Properties	Metric	English	Comments
Density	<a href="#">2.70</a> g/cc	<a href="#">0.0975</a> lb/in <sup>3</sup>	AA; Typical
Mechanical Properties	Metric	English	Comments
Hardness, Brinell	95	95	AA; Typical; 500 g load; 10 mm ball
Hardness, Knoop	120	120	Converted from Brinell Hardness Value
Hardness, Rockwell A	40	40	Converted from Brinell Hardness Value
Hardness, Rockwell B	60	60	Converted from Brinell Hardness Value
Hardness, Vickers	107	107	Converted from Brinell Hardness Value
Tensile Strength, Ultimate	<a href="#">310</a> MPa	<a href="#">45000</a> psi	AA; Typical
	<a href="#">24.0</a> MPa	<a href="#">3480</a> psi	
	@Temperature 371 °C	@Temperature 700 °F	
	<a href="#">32.0</a> MPa	<a href="#">4640</a> psi	
	@Temperature 316 °C	@Temperature 601 °F	
	<a href="#">51.0</a> MPa	<a href="#">7400</a> psi	
	@Temperature 260 °C	@Temperature 500 °F	
	<a href="#">131</a> MPa	<a href="#">19000</a> psi	
	@Temperature 204 °C	@Temperature 399 °F	
	<a href="#">234</a> MPa	<a href="#">33900</a> psi	
	@Temperature 149 °C	@Temperature 300 °F	
	<a href="#">290</a> MPa	<a href="#">42100</a> psi	
	@Temperature 100 °C	@Temperature 212 °F	
	<a href="#">310</a> MPa	<a href="#">45000</a> psi	
	@Temperature 24.0 °C	@Temperature 75.2 °F	
	<a href="#">324</a> MPa	<a href="#">47000</a> psi	
	@Temperature -28.0 °C	@Temperature -18.4 °F	
	<a href="#">338</a> MPa	<a href="#">49000</a> psi	
	@Temperature -80.0 °C	@Temperature -112 °F	
	<a href="#">414</a> MPa	<a href="#">60000</a> psi	
	@Temperature -196 °C	@Temperature -321 °F	
Tensile Strength, Yield	<a href="#">276</a> MPa	<a href="#">40000</a> psi	AA; Typical
	<a href="#">12.0</a> MPa	<a href="#">1740</a> psi	0.2% Offset
	@Temperature 371 °C	@Temperature 700 °F	
	<a href="#">19.0</a> MPa	<a href="#">2760</a> psi	0.2% Offset

Elongation at Break



	@Temperature 316 °C	<a href="#">34.0</a> MPa	@Temperature 601 °F	<a href="#">4930</a> psi	0.2% Offset
	@Temperature 260 °C	<a href="#">103</a> MPa	@Temperature 500 °F	<a href="#">14900</a> psi	0.2% Offset
	@Temperature 204 °C	<a href="#">214</a> MPa	@Temperature 399 °F	<a href="#">31000</a> psi	0.2% Offset
	@Temperature 149 °C	<a href="#">262</a> MPa	@Temperature 300 °F	<a href="#">38000</a> psi	0.2% Offset
	@Temperature 100 °C	<a href="#">276</a> MPa	@Temperature 212 °F	<a href="#">40000</a> psi	0.2% Offset
	@Temperature 24.0 °C	<a href="#">283</a> MPa	@Temperature 75.2 °F	<a href="#">41000</a> psi	0.2% Offset
	@Temperature -28.0 °C	<a href="#">290</a> MPa	@Temperature -18.4 °F	<a href="#">42100</a> psi	0.2% Offset
	@Temperature -80.0 °C	<a href="#">324</a> MPa	@Temperature -112 °F	<a href="#">47000</a> psi	0.2% Offset
	@Temperature -196 °C	17.0 %	@Temperature -321 °F	17.0 %	
	@Temperature -28.0 °C	17.0 %	@Temperature -18.4 °F	17.0 %	
	@Temperature 24.0 °C	18.0 %	@Temperature 75.2 °F	18.0 %	
	@Temperature -80.0 °C	18.0 %	@Temperature -112 °F	18.0 %	
	@Temperature 100 °C	20.0 %	@Temperature 212 °F	20.0 %	
	@Temperature 149 °C	22.0 %	@Temperature 300 °F	22.0 %	
	@Temperature -196 °C	28.0 %	@Temperature -321 °F	28.0 %	
	@Temperature 204 °C	60.0 %	@Temperature 399 °F	60.0 %	
	@Temperature 260 °C	85.0 %	@Temperature 500 °F	85.0 %	
	@Temperature 316 °C	95.0 %	@Temperature 601 °F	95.0 %	
	@Temperature 371 °C	12.0 %	@Temperature 700 °F	12.0 %	AA; Typical
	@Thickness 1.59 mm	17.0 %	@Thickness 0.0625 in	17.0 %	AA; Typical
	@Diameter 12.7 mm		@Diameter 0.500 in		
Modulus of Elasticity		<a href="#">68.9</a> GPa		<a href="#">10000</a> ksi	AA; Typical; Average of tension and compression. Compression modulus is about 2% greater than tensile modulus.
Notched Tensile Strength		<a href="#">324</a> MPa		<a href="#">47000</a> psi	2.5 cm width x 0.16 cm thick side-notched specimen, $K_t = 17$ .
Ultimate Bearing Strength		<a href="#">607</a> MPa		<a href="#">88000</a> psi	Edge distance/pin diameter = 2.0
Bearing Yield Strength		<a href="#">386</a> MPa		<a href="#">56000</a> psi	Edge distance/pin diameter = 2.0
Poissons Ratio		0.330		0.330	
Fatigue Strength		<a href="#">96.5</a> MPa		<a href="#">14000</a> psi	Estimated from trends in similar Al alloys. completely reversed stress; RR Moore machine/specimen $K_{IC}$ ; TL orientation.
	@# of Cycles 5.00e+8		@# of Cycles 5.00e+8		
Fracture Toughness		<a href="#">29.0</a> MPa-m <sup>1/2</sup>		<a href="#">26.4</a> ksi-in <sup>1/2</sup>	0-100 Scale of Aluminum Alloys
Machinability		50 %		50 %	Estimated from similar Al alloys.
Shear Modulus		<a href="#">26.0</a> GPa		<a href="#">3770</a> ksi	
Shear Strength		<a href="#">207</a> MPa		<a href="#">30000</a> psi	AA; Typical

Electrical Properties	Metric	English	Comments
Electrical Resistivity	<a href="#">0.00000399</a> ohm-cm @Temperature 20.0 °C	<a href="#">0.00000399</a> ohm-cm @Temperature 68.0 °F	AA; Typical
Thermal Properties	Metric	English	Comments

CTE, linear 	<a href="#">23.6</a> $\mu\text{m/m-}^\circ\text{C}$	<a href="#">13.1</a> $\mu\text{in/in-}^\circ\text{F}$	AA; Typical; average over range
	@Temperature 20.0 - 100 $^\circ\text{C}$	@Temperature 68.0 - 212 $^\circ\text{F}$	
	<a href="#">25.2</a> $\mu\text{m/m-}^\circ\text{C}$	<a href="#">14.0</a> $\mu\text{in/in-}^\circ\text{F}$	
	@Temperature 20.0 - 300 $^\circ\text{C}$	@Temperature 68.0 - 572 $^\circ\text{F}$	
Specific Heat Capacity	<a href="#">0.896</a> $\text{J/g-}^\circ\text{C}$	<a href="#">0.214</a> $\text{BTU/lb-}^\circ\text{F}$	
Thermal Conductivity	<a href="#">167</a> $\text{W/m-K}$	<a href="#">1160</a> $\text{BTU-in/hr-ft}^2\text{-}^\circ\text{F}$	AA; Typical at 77 $^\circ\text{F}$
Melting Point	<a href="#">582</a> - <a href="#">651.7</a> $^\circ\text{C}$	<a href="#">1080</a> - <a href="#">1205</a> $^\circ\text{F}$	AA; Typical range based on typical composition for wrought products 1/4 inch thickness or greater; Eutectic melting can be completely eliminated by homogenization.
Solidus	<a href="#">582</a> $^\circ\text{C}$	<a href="#">1080</a> $^\circ\text{F}$	AA; Typical
Liquidus	<a href="#">651.7</a> $^\circ\text{C}$	<a href="#">1205</a> $^\circ\text{F}$	AA; Typical

Processing Properties	Metric	English	Comments
Solution Temperature	<a href="#">529</a> $^\circ\text{C}$	<a href="#">985</a> $^\circ\text{F}$	
Aging Temperature	<a href="#">160</a> $^\circ\text{C}$	<a href="#">320</a> $^\circ\text{F}$	Rolled or drawn products; hold at temperature for 18 hr
	<a href="#">177</a> $^\circ\text{C}$	<a href="#">350</a> $^\circ\text{F}$	Extrusions or forgings; hold at temperature for 8 hr

Component Elements Properties	Metric	English	Comments
Aluminum, Al	95.8 - 98.6 %	95.8 - 98.6 %	As remainder
Chromium, Cr	0.040 - 0.35 %	0.040 - 0.35 %	
Copper, Cu	0.15 - 0.40 %	0.15 - 0.40 %	
Iron, Fe	<= 0.70 %	<= 0.70 %	
Magnesium, Mg	0.80 - 1.20 %	0.80 - 1.20 %	
Manganese, Mn	<= 0.15 %	<= 0.15 %	
Other, each	<= 0.050 %	<= 0.050 %	
Other, total	<= 0.15 %	<= 0.15 %	
Silicon, Si	0.40 - 0.80 %	0.40 - 0.80 %	
Titanium, Ti	<= 0.15 %	<= 0.15 %	
Zinc, Zn	<= 0.25 %	<= 0.25 %	

[References](#) for this datasheet.

This data is for reference only, and is not intended for engineer or design. Please consult a Clinton aluminum authorized representative.



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