Aluminum 6061-T6; 6061-T651

Categories: Metal; Nonferrous Metal; Aluminum Alloy; 6000 Series Aluminum Alloy

Material Notes: 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-T651, UNS A96061; ISO AlMg1SiCu; Aluminium 6061-T6, AD-33 (Russia); AA6061-T6; 6061T6, ISO AlMg1SiCu; Aluminium 6061-T651, AD-33 (Russia); AA6061-T651

Vendors: Click here to view all available suppliers for this material.

Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	2.70 g/cc	0.0975 lb/in³	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	310 MPa	45000 psi	AA; Typical
☒	24.0 MPa @Temperature 371 °C	3480 psi @Temperature 700 °F	
	32.0 MPa @Temperature 316 °C	4640 psi @Temperature 601 °F	
	51.0 MPa @Temperature 260 °C	7400 psi @Temperature 500 °F	
	131 MPa @Temperature 204 °C	19000 psi @Temperature 399 °F	
	234 MPa @Temperature 149 °C	33900 psi @Temperature 300 °F	
	290 MPa @Temperature 100 °C	42100 psi @Temperature 212 °F	
	310 MPa @Temperature 24.0 °C	45000 psi @Temperature 75.2 °F	
	324 MPa @Temperature -28.0 °C	47000 psi @Temperature -18.4 °F	
	338 MPa @Temperature -80.0 °C	49000 psi @Temperature -112 °F	
	414 MPa @Temperature -196 °C	60000 psi @Temperature -321 °F	
Tensile Strength, Yield	276 MPa	40000 psi	AA; Typical
☒	12.0 MPa @Strain 0.2 %, Temperature 371 °C	1740 psi @Strain 0.2 %, Temperature 700 °F	
	19.0 MPa @Strain 0.2 %, Temperature 316 °C	2760 psi @Strain 0.2 %, Temperature 601 °F	

	34.0 MPa @Strain 0.2 %, Temperature 260 °C	4930 psi @Strain 0.2 %, Temperature 500 °F	
	103 MPa @Strain 0.2 %, Temperature 204 °C	14900 psi @Strain 0.2 %, Temperature 399 °F	
	214 MPa @Strain 0.2 %, Temperature 149 °C	31000 psi @Strain 0.2 %, Temperature 300 °F	
	262 MPa @Strain 0.2 %, Temperature 100 °C	38000 psi @Strain 0.2 %, Temperature 212 °F	
	276 MPa @Strain 0.2 %, Temperature 24.0 °C	40000 psi @Strain 0.2 %, Temperature 75.2 °F	
	283 MPa @Strain 0.2 %, Temperature -28.0 °C	41000 psi @Strain 0.2 %, Temperature -18.4 °F	
	290 MPa @Strain 0.2 %, Temperature -80.0 °C	42100 psi @Strain 0.2 %, Temperature -112 °F	
	324 MPa @Strain 0.2 %, Temperature -196 °C	47000 psi @Strain 0.2 %, Temperature -321 °F	
Elongation at Break	17 % @Temperature -28.0 °C	17 % @Temperature -18.4 °F	
	17 % @Temperature 24.0 °C	17 % @Temperature 75.2 °F	
	18 % @Temperature -80.0 °C	18 % @Temperature -112 °F	
	18 % @Temperature 100 °C	18 % @Temperature 212 °F	
	20 % @Temperature 149 °C	20 % @Temperature 300 °F	
	22 % @Temperature -196 °C	22 % @Temperature -321 °F	
	28 % @Temperature 204 °C	28 % @Temperature 399 °F	
	60 % @Temperature 260 °C	60 % @Temperature 500 °F	
	85 % @Temperature 316 °C	85 % @Temperature 601 °F	
	95 % @Temperature 371 °C	95 % @Temperature 700 °F	
	12 % @Thickness 1.59 mm	12 % @Thickness 0.0625 in	AA; Typical
	17 % @Diameter 12.7 mm	17 % @Diameter 0.500 in	AA; Typical
Modulus of Elasticity	68.9 GPa	10000 ksi	AA; Typical; Average of tension and compression. Compression modulus is about 2% greater than tensile modulus.
Notched Tensile Strength	324 MPa	47000 psi	2.5 cm width x 0.16 cm thick side-notched specimen, K_t = 17.
Ultimate Bearing Strength	607 MPa	88000 psi	Edge distance/pin diameter = 2.0
Bearing Yield Strength	386 MPa	56000 psi	Edge distance/pin diameter = 2.0
Poissons Ratio	0.33	0.33	Estimated from trends in similar Al alloys.
Fatigue Strength	96.5 MPa @# of Cycles 5.00e+8	14000 psi @# of Cycles 5.00e+8	completely reversed stress; RR Moore machine/specimen
Fracture Toughness	29.0 MPa-m½	26.4 ksi-in½	K_{IC}; TL orientation.
Machinability	50 %	50 %	0-100 Scale of Aluminum Alloys
Shear Modulus	26.0 GPa	3770 ksi	Estimated from similar Al alloys.

Shear Strength	207 MPa	30000 psi	AA; Typical

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00000399 ohm-cm @Temperature 20.0 °C	0.00000399 ohm-cm @Temperature 68.0 °F	AA; Typical

Thermal Properties	Metric	English	Comments
CTE, linear	23.6 µm/m-°C @Temperature 20.0 - 100 °C	13.1 µin/in-°F @Temperature 68.0 - 212 °F	AA; Typical; average over range
	25.2 µm/m-°C @Temperature 20.0 - 300 °C	14.0 µin/in-°F @Temperature 68.0 - 572 °F	
Specific Heat Capacity	0.896 J/g-°C	0.214 BTU/lb-°F	
Thermal Conductivity	167 W/m-K	1160 BTU-in/hr-ft²-°F	AA; Typical at 77°F
Melting Point	582 - 651.7 °C	1080 - 1205 °F	AA; Typical range based on typical composition for wrought products >= 1/4 in. thickness. Eutectic melting can be eliminated by homogenization.
Solidus	582 °C	1080 °F	AA; Typical
Liquidus	651.7 °C	1205 °F	AA; Typical

Processing Properties	Metric	English	Comments
Solution Temperature	529 °C	985 °F	
Aging Temperature	160 °C	320 °F	Rolled or drawn products; hold at temperature for 18 hr
	177 °C	350 °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	0.04 - 0.35 %	0.04 - 0.35 %	
Copper, Cu	0.15 - 0.40 %	0.15 - 0.40 %	
Iron, Fe	<= 0.70 %	<= 0.70 %	
Magnesium, Mg	0.80 - 1.2 %	0.80 - 1.2 %	
Manganese, Mn	<= 0.15 %	<= 0.15 %	
Other, each	<= 0.05 %	<= 0.05 %	
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.