

ALLOY 6061

Understanding Cold Finished Aluminum Alloys

Alloy 6061, a cold finished aluminum wrought product, is suggested for applications requiring high corrosion resistance. This general purpose alloy has excellent corrosion resistance to atmospheric conditions and good corrosion resistance to sea water. Susceptibility to stress-corrosion cracking and exfoliation is practically non-existent.

Cold finished alloy 6061 offers relatively high strength and excellent joining characteristics. (Caution: direct contact by dissimilar metals can cause galvanic corrosion; proper protection must be taken with regard to the dissimilar metal.)

Typical applications include electrical fittings and connectors, decorative and miscellaneous hardware, hydraulic couplings, brake parts and valve bodies and components for commercial, industrial, automotive and aerospace use. The -T4 temper offers good formability for cold upset and bending applications.

Anodizing

Alloy 6061 offers good finishing characteristics and responds well to anodizing. In particular, this alloy offers excellent response to hard-coat anodizing.

Machining

Alloy 6061 offers adequate machinability when machined using single-point or multi-spindle carbide tools on screw machines. Chips from machining may be difficult to break so chip breakers and special machining techniques (i.e. peck drilling) are recommended to improve chip formation. The alloy is rated C^{C} on the Aluminum Association machinability rating system, giving continuous chips and good surface finish. Extremely fine finishes in the 5 to 10 microinch range can be achieved using diamond tooling.

Joining

Alloy 6061 is easily welded and joined by various commercial methods. Since 6061 is a heat-treatable alloy, its strength in the -T6 condition can be reduced in the weld region.

The properties listed in this Alloy Data Sheet represent the best current information for this alloy. In each specific application, the user is expected to evaluate and test the alloy, temper and finishing method. Consult the Material Safety Data Sheet (MSDS) for proper safety and handling precautions when using alloy 6061.

Standard Tempers	Standard Temper Definitions*
T4, T451	Solution heat-treated and naturally aged to a substantially stable condition. Applies to products that are not cold worked after solution heat-treatment, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical property limits. Temper -T451 applies to products stress-relieved by stretching.
T6, T651	Solution heat-treated and then artificially aged. Applies to products that are not cold worked after solution heat-treatment, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical property limits. Temper -T651 applies to products stress-relieved by stretching.

*For further details of definitions, see Aluminum Association's Aluminum Standards and Data manual and Tempers for Aluminum and Aluminum Alloy Products.

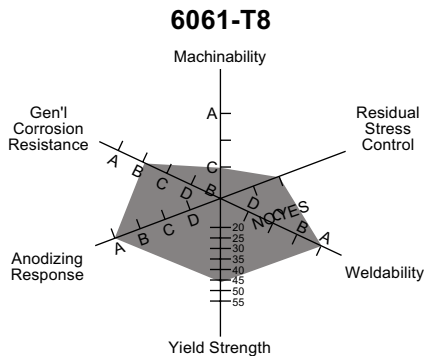
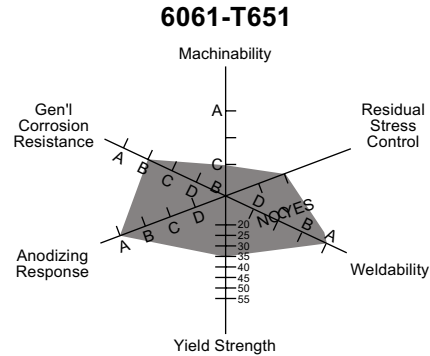
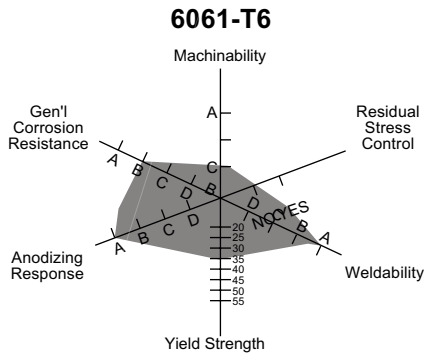
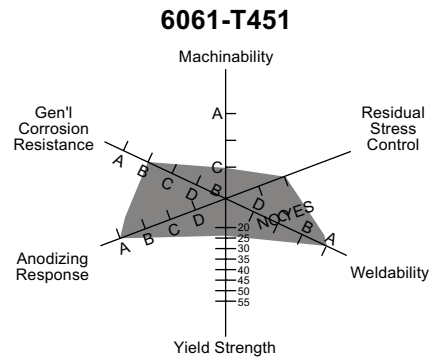
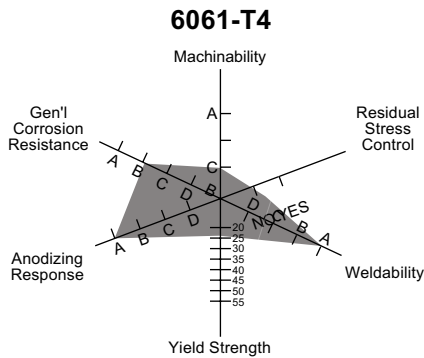
Alloy 6061 Chemical Analysis		Liquidus Temperature: 1206°F							Solidus Temperature: 1080°F		Density: 0.098 lb./in. ³	
Percent Weight	Elements									Others Each	Others Total	Aluminum
	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Aluminum			
Minimum	.40	̄	.15	̄	.8	.04	̄	̄	̄	̄	̄	Aluminum
Maximum	.8	.7	.40	.15	1.2	.35	.25	.15	.05	.15	Remainder	

Average Coefficient of Thermal Expansion (68; to 212;F) = 13.2 x 10⁻⁶ (inch per inch per ;F)

Alloy 6061 Global Cold Finished Products Capabilities and Mechanical Property Limits

Temper	Specified Section or Wall Thickness ² (inches)	Tensile Strength (ksi)		Elongation ³	Typical Brinell Hardness (500 kg load/ 10 mm ball)	Typical Ultimate Shearing Strength (ksi)	Typical Electrical Conductivity (%IACS)
		Ultimate	Yield (0.2% offset)	Percent Min. in 2 inch or 4D ⁴			
		Min.	Min.				
Standard Tempers ¹							
T4, T451 ^{5,7}	Up thru 8.000 ⁶	30.0	16.0	18	65	24	40
T6, T651 ^{5,7}	Up thru 8.000 ⁶	42.0	35.0	10	95	30	43

¹ The mechanical property limits for standard tempers are listed in the Standards section of the Aluminum Association's Aluminum Standards and Data manual. ² The thickness of the cross section from which the tension test specimen is taken determines the applicable mechanical properties. ³ For material of such dimensions that a standard test specimen cannot be taken, or for shapes thinner than 0.0625 the test for elongation is not required. ⁴ D = Specimen diameter. ⁵ For stress-relieved tempers, the characteristics and properties other than those specified may differ somewhat from the corresponding characteristics and properties of material in the basic temper. ⁶ Mechanical property minimums for bar have a maximum cross-sectional area of 50 sq. in. ⁷ Minimum thickness of 0.500 for -T451 or -T651.



Global Cold Finished Products

Znoelli Limited
 2/46 Hobill Ave, Manuaka
 Auckland
 Free Phone: 0508 Znoelli (966 355)
 P: 09 263 0350
 F: 09 263 0351
 e-mail:sales@znoelli.co.nz
 www.znoelli.co.nz

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