Extruded Aluminum Alloy 6061

Alloy 6061 is a medium to high strength alloy which displays good toughness characteristics. Due to its versatility, it is one of the most widely used alloys in the 6000 series. Apex Aluminum Extrusions produces 6061 for use in standard and custom, solid & hollow shapes, and bar products, as well as seamless and structural pipes and tubes.

Alloy 6061 has excellent corrosion resistance to atmospheric conditions and good corrosion resistance to seawater. This alloy also offers good finishing characteristics and responds well to anodizing; however, where cosmetic appearance is critical, consider the use of alloy 6063.

Alloy 6061 is easily welded and joined by various commercial methods. (Caution: direct contact by dissimilar metals can cause galvanic corrosion.) Since 6061 is a heat-treatable alloy, strength in its-T6 condition can be reduced in the weld region. Selection of an appropriate filler alloy will depend on the desired weld characteristics. Consult the Material Safety Data Sheet (MSDS) for proper safety and handling precautions when using alloy 6061.

For minor bending applications, special forming tempers are available (dependent upon bend radius and degree of bend). When more severe bends are required, a softer temper condition such as -T1/-T4 or even -O (anneal) may be necessary to prevent cracking. After artificial aging (precipitation heat-treating), 6061-T1/-T4 is capable of developing -T6 properties. Apex Aluminum Extrusions offers 6061 alloy with a wide selection of standard and special tempers.

COMMON USES FOR ALLOY 6061

- Transportation components
- Marine fittings & hardware
- Consumer furniture
- Machinery & equipment
- Recreation products
- Bike frames

6061 TEMPER DESIGNATIONS & DEFINITIONS

Standard Tempers	Standard Temper Definitions*
F	As fabricated. There is no special control over thermal conditions and there are no mechanical property limits.
T1	Cooled from an elevated temperature shaping process and naturally aged.[A]
T4	Solution heat-treated and naturally aged.
T51	Cooled from an elevated temperature shaping process and artificially aged.[A]
T6	Solution heat-treated and artificially aged.

* For further details of definitions, see Aluminum Association's Aluminum Standards and Data manual and Tempers for Aluminum and Aluminum Alloy Products.
[A] Applies to products that are not cold worked after cooling from an elevated temperature shaping process, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical properties.

CHEMICAL COMPOSITION

Melting Temperature Range: 1080 -1206°F | Density 0.098 lb./in³

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Other	
									Each	Total
6061	0.40- 0.80	0.70	0.15- 0.40	0.15	0.80- 1.20	0.04- 0.35	0.25	0.15	0.05	0.15

Remainder is Aluminum
Chemical composition in weight percent maximum unless shown as a range or minimum.
Average Coefficient of Thermal Expansion (68° to 212°F) = 13.1 x 10 (in./in.°F)

6061 EXTRUDED MECHANICAL & PHYSICAL PROPERTY LIMITS[1]

Standard Tempers	Wall Thickness[2] Inches (min.)	Tensile Strenth (ksi)		Elongation[3] % (min.)	Typical Electrical Conductivity, @68ºF, % IACS	Typical Thermal Conductivity, @77°F, BTU-in./ft.2 hr.°F (W/m-K@25ºC)
		Ultimate (min.)	Yield - 0.2% offset (min.)			
-T1	Up thru 0.625	26.0	14.0	16	40	N/A
-T4	All	26.0	16.0	16	42	1070 (155)
-T51	Up thru 0.625	35.0	30.0	8	42	N/A
-T6	Up thru 0.249	38.0	35.0	8	43	1160 (167)
	0.250 & over	38.0	35.0	10	43	1160 (167)

1. Minimum property levels unless shown as a range or indicated as a maximum (max.)
2. The thickness of the cross section from which the tension test specimen is taken determines the applicable mechanical properties.
3. For materials of such dimensions that a standard test specimen cannot be taken, or for shapes thinner than .062", the test for elongation is not required. Elongation percent is minimum in 2" or 4 times specimen diameter.

COMPARATIVE CHARACTERISTICS OF RELATED ALLOYS/TEMPERS[1]