

Sapa Industrial Extrusions

Alloy 6063, one of the most popular alloys in the 6000 series, provides good extrudability and a high quality surface finish. Sapa produces 6063 for use in standard architectural shapes, custom solid shapes and heatsinks, as well as seamless and structural tube and pipe. This alloy is often used for electrical applications in the -T5, -T52 and -T6 conditions due to its good electrical conductivity.

In the heat-treated condition, alloy 6063 provides good resistance to general corrosion, including resistance to stress corrosion cracking. It is easily welded or brazed by various commercial methods (caution: direct contact by dissimilar metals can cause galvanic corrosion). Since 6063 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 6063.

Alloy 6063 offers excellent response for anodizing in its -T5, -T52, -T53 ("matte finish"), -T54, -T6 ("lustrous" finish) tempers. The most common methods are clear, clear and color dying, and bright dipping and hard coat. Bright dipping provides an economical alternative to mechanical polished finishes while offering improved surface durability.

Since 6063 is the alloy of choice for aesthetic applications, special packaging may be required to protect critical exposed surfaces. Alloy 6063 is not typically ink-stenciled in order to preserve its surface finish quality. If stenciling and/or special packaging is required, it should be specified at the time of quotation.

Sapa offers alloy 6063 in a variety of standard tempers, as well as special tempers developed for unique applications.

Typical applications for alloy 6063 include:	▪ Architectural and building products	▪ Door and window frames
	▪ Electrical components and conduit	▪ Railings and furniture
	▪ Pipe and tube for irrigation systems	▪ Heatsinks

6063 TEMPER DESIGNATIONS AND DEFINITIONS

Standard Tempers	Standard Temper Definitions*
F	As fabricated. There is no special control over thermal conditions and there are no mechanical property limits.
O	Annealed. Applies to products that are annealed to obtain the lowest strength temper.
T1	Cooled from an elevated temperature shaping process and naturally aged. (See Note A.)
T4	Solution heat-treated and naturally aged. (See Note B.)
T5, T52, T53, T54, T55	Cooled from an elevated temperature shaping process and artificially aged. (See Note A.)
T6	Solution heat-treated and artificially aged. (See Note B.)
Special Tempers	Special Temper Definitions**
T4S6	For 6063 extrusions requiring maximum formability in the naturally aged condition. This temper is intended for use when extrusions will be formed by the customer in the naturally aged condition and subsequently aged to -T6. May not meet -T4 minimum mechanical properties, but will meet -T6 minimum when properly aged. Test reports will state -T6 properties to demonstrate heat treat capabilities, but product will be supplied in the naturally aged condition. (See Note C.)
T6S5	For 6063 extrusions requiring good formability; meets standard 6063 -T6 minimum properties. (See Note B.)

* For further details of definitions, see Aluminum Association's Aluminum Standards and Data manual and Tempers for Aluminum and Aluminum Alloy Products.
 ** Sapa Special Temper Designations are unregistered tempers for reference only, not recognized by the Aluminum Association, and are provided for customer use to identify unique processing, material or end use application characteristics.

Note 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.

Note B: 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 properties.

Note C: The specified temper will not conform to military, Federal, ASTM, ASME and AMS specifications.

CHEMICAL COMPOSITION Melting Temperature Range: 1140-1210 °F Density: 0.097 lb./in.³

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Others	
									Each	Total
6063	0.20-0.6	0.35	0.10	0.10	0.45-0.9	0.10	0.10	0.10	0.05	0.15

Chemical composition in weight percent maximum unless shown as a range or minimum.

Average Coefficient of Thermal Expansion (68° to 212°F) = 13.0×10^{-6} (in./in.°F)

Aluminum = Remainder

6063 EXTRUDED MECHANICAL AND PHYSICAL PROPERTY LIMITS¹

Standard Tempers	Wall Thickness ² Inches (min.)	Tensile Strength Ksi (min.)	Yield Strength Ksi (min.)	Elongation ³ % (min.)	Typical Thermal Conductivity, @77°F, BTU-in./ft. ² hr.°F	Typical Electrical Conductivity, @68°F, % IACS
O	All	19.0 max.	—	18	1510	58
T1	Up thru .500	17.0	9.0	12	1340	50
	.501 - 1.000	16.0	8.0	12	1340	50
T4	Up thru .500	19.0	10.0	14	1340	50
	.501 - 1.000	18.0	9.0	14	1340	50
T5	Up thru .500	22.0	16.0	8	1450	55
	.501 - 1.000	21.0	15.0	8	1450	55
T52	Up thru 1.000	22.0 - 30.0	16.0 - 25.0	8	1450	55
T53	Up thru .249	13.0 - 21.0	5.0 - 13.0	14	—	—
T54	Up thru .124	33.0	30.0	8	1390	53
	.125 - .499	33.0	30.0	10	1390	53
T55	Up thru .124	28.0	23.0	8	1450	55
	.125 - .249	27.0	22.0	10	1450	55
	.250 - .499	26.0	21.0	12	1450	55
T6	Up thru .124	30.0	25.0	8	1390	53
	.125 - 1.000	30.0	25.0	10	1390	53
Sapa Special Tempers*						
T6S5	Up thru .124	30.0	25.0	8	1390	53
	.125 - 1.000	30.0	25.0	10	1390	53

- Minimum property levels unless shown as a range or indicated as a maximum (max.)
 - The thickness of the cross section from which the tension test specimen is taken determines the applicable mechanical properties.
 - 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.
- * Sapa Special Temper Designations are unregistered tempers for reference only, not recognized by the Aluminum Association, and are provided for customer use to identify unique processing, material or end use application characteristics. The specified special temper will not conform to Military, Federal, ASTM, ASME and AMS specifications.

COMPARATIVE CHARACTERISTICS OF RELATED ALLOYS/TEMPERS¹

Alloy	Temper	Formability				Machinability				General Corrosion Resistance				Weldability				Brazeability				Anodizing Response			
		D	C	B	A	D	C	B	A	D	C	B	A	D	C	B	A	D	C	B	A				
6063	-O																								
	-T1, -T4																								
	-T5, T52																								
	-T53																								
	-T54, -T6																								
	-T6S5																								
6061	-T4																								
	-T6, -T6511																								
6101	-T6, -T63																								N/A
	-T61, -T64																								N/A
6463	-T5																								

1. Rating: A=Excellent B=Good C=Fair D=Poor

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