Alcoa Global Cold Finished Products

ALLOY 7075

Understanding Cold Finished Aluminum Alloys

Alloy 7075, a cold finished aluminum wrought product, has the highest strength of all aluminum screw machine alloys. The -T6 and -T651 tempers have a typical tensile strength of 83 ksi, which is higher than many mild steels.

Due to its very high strength, alloy 7075 is used for highly stressed structural parts. Applications include aircraft fittings, gears and shafts, fuse parts, meter shafts and gears, missile parts, regulating valve parts, worm gears, keys, and various other commercial aircraft, aerospace and defense equipment. Rod and bar product forms can be machined on multi-spindle and CNC machining equipment.

Machining

Alloy 7075 offers good machinability when machined using single-point or multi-spindle carbide tools on screw machines. The use of a chip breaker is recommended. The alloy is rated “B” on the Aluminum Association machinability rating system, giving curled or easily broken chips with good to excellent surface finish.

Corrosion

Alloy 7075 has moderate corrosion resistance. The overaged -T73 and -T7351 tempers offers good stress-corrosion cracking resistance as compared to the -T6 and -T651 tempers. (Caution: direct contact by dissimilar metals can cause galvanic corrosion.)

Anodizing

The anodizing response rating for 7075 alloy is good using commercially available methods. The alloy can be both hard and clear-coat anodized.

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 7075.

7075 Temper Designations and Definitions

Standard Tempers	Standard Temper Definitions*
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 properties. Temper -T651 applies to products that are stress-relieved by stretching.
T73, T7351	Solution heat-treated and overaged/stabilized. Applies to wrought products that are artificially aged after solution heat-treatment to carry them beyond a point of maximum strength to provide control of some significant characteristic other than mechanical properties. Applies to cast products that are artificially aged after solution heat-treatment to provide dimensional and strength stability.

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

Alloy 7075 Chemical Analysis

Liquidus Temperature: 1175°F **Solidus Temperature:** 890°F **Density:** 0.101 lb./in.^{3}

Percent Weight	Elements								Others Each	Others Total	
	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti			Aluminum
Minimum	—	—	1.2	—	2.1	.18	5.1	—	—	—	
Maximum	.40	.50	2.0	.30	2.9	.28	6.1	.20	.05	.15	Remainder

Average Coefficient of Thermal Expansion (68° to 212°F) = 13.1 x 10^{-6} (inch per inch per °F)

Alloy 7075 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	Typical Ultimate Shearing Strength	Typical Electrical Conductivity
		Ultimate		Yield (0.2% offset)					
		Min.	Max.	Min.	Max.	Percent Min. in 2 inch or 4D[4]	(500 kg load/ 10 mm ball)	(ksi)	(%IACS)
Standard Tempers[1]									
T6	Up thru 4.000[5]	77.0	—	66.0	—	7	150	48	33
T651	Up thru 4.000[5]	77.0	—	66.0	—	7	150	48	33
	4.001 - 6.000	75.0	—	64.0	—	7	150	48	33
	6.001 - 7.000	73.0	—	62.0	—	7	150	48	33
T73, T7351	Up thru 4.000	68.0	—	56.0	—	10	130	—	40[6]
	4.001 - 5.000	66.0	—	55.0	—	8	130	—	40[6]
	5.001 - 6.000	64.0	—	52.0	—	8	130	—	40[6]

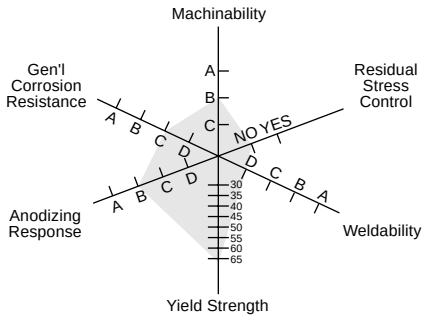
① The mechanical property limits for standard tempers are listed in the "standards section" of the Aluminum Association's Aluminum Standards and Data manual and Tempers for Aluminum and Aluminum Alloy Products. ② The thickness of the cross section from which the tension test specimen is taken determines the applicable mechanical properties. ③ For material of such dimensions that a standard test specimen cannot be obtained, or for shapes thinner than 0.062", the test for elongation is not required. ④ D = Specimen diameter. ⑤ Mechanical properties applicable to rod for thickness shown. For square, hexagonal and octagonal bar, the maximum thickness is 3.5" and for rectangular bar the maximum thickness is 3". ⑥ Minimum value when lot acceptance required for stress corrosion and exfoliation corrosion; 38.0-39.9 per standard requirements and yield strength does not exceed minimum by more than 11.9 ksi.

Comparative Characteristics of Related Alloys/Tempers[1]

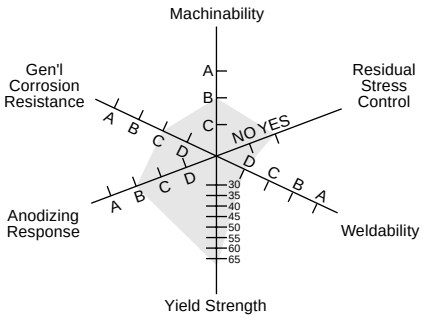
Alloy	Temper	Formability Low – High	Machinability D C B A	General Corrosion Resistance D C B A	Weldability (Arc with Inert Gas) D C B A	Brazeability D C B A	Anodizing Response D C B A	Stress Corrosion Cracking[2] D C B A
7075	-T6, -T651							
	-T73, -T7351							
2024	-T351, -T4							
	-T6							
	-T851							
6061	-T6, -T651							

① Rating: A=Excellent B=Good C=Fair D=Poor For further details of explanation of ratings, see Aluminum Association's Aluminum Standards and Data manual. ② Ratings A, B and C are relative ratings based on stress applied transversely with respect to the direction of fabrication after controlled exposure to sodium chloride solution by alternate immersion: A - No known instances of failure in service or laboratory tests. B - No known instances of failure in service, laboratory failures only. C - Service and laboratory failures under special conditions.

7075-T6



7075-T651



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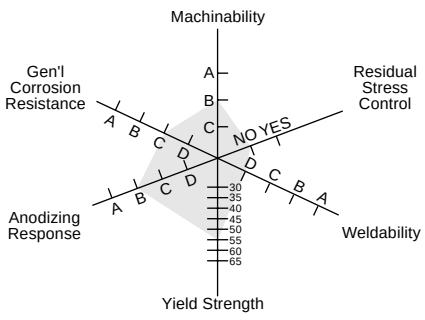

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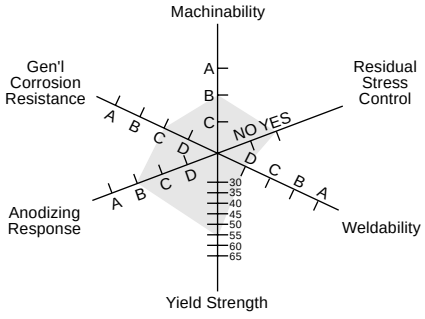

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