

# ROD & BAR ALLOY 2024

## ALLOY DESCRIPTION

2024 is heavily utilized in aircraft applications because it has good machining characteristics and higher strength than either 2014 and 2017. Though cold formability is considered fair, it is one of the most popular alloys for cold heading and thread rolling applications as a result of the superior grain structure that can be obtained. Corrosion resistance and anodizeability are only fair. It is also the basic alloy for cold finished square and rectangular bar. Again, this is because of its high strength and good machinability, which are essential for precision fittings and parts.

## TYPICAL MECHANICAL PROPERTIES

Temper	Tensile (.500" Dia. Specimen)					Hardness	Shear		Fatigue*		Modulus	
	Ultimate		Yield		Elongation/4D		Ultimate Shearing Strength		Endurance Limit - R.R. Moore Type		Modulus of Elasticity	
	KSI	MPa	KSI	MPa		%		KSI	MPa	KSI	MPa	KSI x 10 <sup>3</sup>
0	27	186	11	76	22	47	18	124	13	90	10.6	73.1
T4, T351	68	469	47	324	19	120	41	283	20	138	10.6	73.1
T6	69	476	57	393	10	125	41	283	18	124	10.6	73.1
T851	70	482	65	448	7	128	43	296	18	124	10.6	73.1

\*5 x 10E8 cycles of reversed stress

## COMPARATIVE CHARACTERISTICS

Temper	Corrosion Resistance		Cold Workability <sup>3</sup>	Machinability <sup>3</sup>	Anodize Response <sup>3</sup>	Brazeability <sup>4</sup>	Weldability <sup>4</sup>		
	General <sup>1</sup>	Stress <sup>2</sup>					Gas	Arc	Spot
T4, T351	D	C	C	B	C	D	C	B	B
T6	D	B	C	B	C	D	D	C	B
T851	D	B	D	B	C	D	D	C	B

- Ratings A through E are relative ratings in decreasing order of merit, based on exposures to sodium chloride solution by intermittent spraying or immersion. Alloys with A and B ratings can be used in industrial and seacoast atmospheres without protection. Alloys with C, D and E ratings generally should be protected at least on faying surfaces.
- Stress-corrosion cracking ratings are based on service experience and on laboratory tests of specimens exposed to the 3.5% sodium chloride alternate immersion test.  
 A= No known instance of failure in service or in laboratory tests.  
 B= No known instance of failure in service; limited failures in laboratory tests of short transverse specimens.  
 C= Service failures with sustained tension stress acting in short transverse direction relative to grain structure; limited failures in laboratory tests of long transverse specimens.  
 D= Limited service failures with sustained longitudinal or long transverse areas.
- Ratings A through D for Workability (cold), A through E for Machinability and A through C for Anodize Response, are relative ratings in decreasing order of merit.
- Ratings A through D for Weldability and Brazeability are relative ratings defined as follows:  
 A= Generally weldable by all commercial procedures and methods.  
 B= Weldable with special techniques or for specific applications that justify preliminary trials or testing to develop welding procedure and weld performance.  
 C= Limited weldability because of crack sensitivity or loss in resistance to corrosion and mechanical properties.  
 D= No commonly used welding methods have been developed.

**APPLICABLE SPECIFICATIONS**

Cold Finished	Extruded
ASTM B211	ASTM B221
AMS-QQ-A-225/6	AMS-QQ-A-200/3
	AMS 4152
AMS 4339	AMS 4164
AMS 4120	AMS 4165

**CHEMICAL COMPOSITION LIMITS**

									Others	
Weight %	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Each	Total
Minimum			3.80	0.30	1.20					
Maximum	0.50	0.50	4.90	0.90	1.80	0.10	0.25	0.15	0.05	0.15

**TYPICAL PHYSICAL PROPERTIES**

Characteristic			English	Metric
Nominal Density (68 °F / 20 °C)			0.100 lbs./in. <sup>3</sup>	2.77 Mg/m <sup>3</sup>
Melting Range			935 °F - 1180 °F	502 °C - 638 °C
Specific Heat (212 °F / 100 °C)			0.209 BTU/lb. - °F	875 J/kg - °K
Coefficient of Thermal Expansion	Linear 68 °F - 212 °F 20 °C - 100 °C		12.7 micro in./in. - °F	22.9 micro m/m - °K
	Volumetric 68 °F / 20 °C		3.67 x 10 <sup>-5</sup> in. <sup>3</sup> /in. <sup>3</sup> - °F	66 x 10 <sup>-6</sup> m <sup>3</sup> /m <sup>3</sup> - °K
Thermal Conductivity (68 °F / 20 °C)	O Temper		110 BTU/ft. - hr. - °F	190 W/m - °K
	T4, T351		69 BTU/ft. - hr. - °F	120 W/m - °K
	T6, T851		88 BTU/ft. - hr. - °F	151 W/m - °K
Electrical Conductivity (68 °F / 20 °C)	Equal Volume	O Temper	50% IACS	
		T4, T351	30% IACS	
		T6, T851	38% IACS	
	Equal Weight	O Temper	160% IACS	
		T4, T351	96% IACS	
		T6, T851	122% IACS	