Sheet Coil & Plate Alloy 2024

Technical Data

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 anodizeablilty 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	Brinell 500kg 10 mm	Ultimate Shearing Strength		Endurance Limit - R.R. Moore Type		Modulus of Elasticity	
	KSI	MPa	KSI	MPa	%		KSI	MPa	KSI	MPa	KSI x 10^3	Gpa
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
T361	72	496	57	393	13	130	42	290	18	124	10.6	73.1
T851	65	448	60	414	6		40	276			10.6	73.1
T861	70	483	66	455	6		42	290			10.6	73.1

*5 x 10E8 cycles of reversed stress

COMPARATIVE CHARACTERISTICS

Temper	Corrosion Resistance		Cold Workability[3]	Machinability[3]	Anodize Response[3]	Brazeability[4]	Weldability[4]		
	General[1]	Stress[2]					Gas	Arc	Spot
T4,T351	D	C	C	B	C	D	C	B	B
T361	D	C	D	B	C	D	D	C	B
T861, T851	D	B	D	B	C	D	D	C	B

1 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.

2 Stress-corrosion cracking ratings are based on service experience and 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

3 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.

4 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.

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CHEMICAL COMPOSITION LIMITS

									Others	
Weight %	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Each	Total
Minimum	-	-	3.8	0.30	1.2	-	-	-	-	-
Maximum	0.50	0.50	4.9	0.9	1.8	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.^{3}	2.77 Mg/m^3
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^{-5}in.^{3}/in.^{3} -°F	66 x 10^{-6}m^3/m^3 -°K
Thermal Conductivity (68 °F/20 °C)	O Temper	110 BTU/ft. - hr. - °F	190 W/m - °K
	T4, T351, T451	69 BTU/ft. - hr. - °F	120 W/m - °K
	T651	88 BTU/ft. - hr. - °F	151 W/m - °K
Electrical Conductivity (68 °F/20 °C)	Equal Volume	O Temper	50% IACS
		T451	30% IACS
		T651	38% IACS
	Equal Weight	O Temper	160% IACS
		T451	96% IACS
		T651	122% IACS