Aluminum 2024-T3

Categories: Metal; Nonferrous Metal; Aluminum Alloy; 2000 Series Aluminum Alloy

Material Notes: General 2024 characteristics and uses (from Alcoa): Good machinability and surface finish capabilities. A high strength material of adequate workability. Has largely superseded 2017 for structural applications.

Uses: Aircraft fittings, gears and shafts, bolts, clock parts, computer parts, couplings, fuse parts, hydraulic valve bodies, missile parts, munitions, nuts, pistons, rectifier parts, worm gears, fastening devices, veterinary and orthopedic equipment, structures.

Data points with the AA note have been provided by the Aluminum Association, Inc. and are NOT FOR DESIGN.

Composition Notes:
A Zr + Ti limit of 0.20 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier and the purchaser have mutually agreed.
Composition information provided by the Aluminum Association and is not for design.

Key Words: Aluminium 2024-T3; UNS A92024; ISO AlCu4Mg1; NF A-U4G1 (France); DIN AlCuMg2; AA2024-T3, ASME SB211; CSA CG42 (Canada); Al2024-T3

Vendors: Click here to view all available suppliers for this material.

Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	2.78 g/cc	0.100 lb/in³	AA; Typical

Mechanical Properties	Metric	English	Comments
Hardness, Brinell	120	120	AA; Typical; 500 g load; 10 mm ball
Hardness, Knoop	150	150	Converted from Brinell Hardness Value
Hardness, Rockwell A	46.8	46.8	Converted from Brinell Hardness Value
Hardness, Rockwell B	75	75	Converted from Brinell Hardness Value
Hardness, Vickers	137	137	Converted from Brinell Hardness Value
Tensile Strength, Ultimate	>= 440 MPa	>= 63800 psi	Drawn tube
	>= 475 MPa	>= 68900 psi	Wire, rod, and bar (rolled or cold finished); T36
	483 MPa	70000 psi	AA; Typical
☒	34.0 MPa @Temperature 371 °C	4930 psi @Temperature 700 °F	
	52.0 MPa @Temperature 316 °C	7540 psi @Temperature 601 °F	
	76.0 MPa @Temperature 260 °C	11000 psi @Temperature 500 °F	
	186 MPa @Temperature 204 °C	27000 psi @Temperature 399 °F	
	379 MPa @Temperature 149 °C	55000 psi @Temperature 300 °F	
	455 MPa @Temperature 100 °C	66000 psi @Temperature 212 °F	
	483 MPa @Temperature 24.0 °C	70100 psi @Temperature 75.2 °F	
	496 MPa @Temperature -28.0 °C	71900 psi @Temperature -18.4 °F	
	503 MPa @Temperature -80.0 °C	73000 psi @Temperature -112 °F	
	586 MPa @Temperature -196 °C	85000 psi @Temperature -321 °F	
☒	>= 435 MPa @Thickness 0.203 - 3.25 mm	>= 63100 psi @Thickness 0.00800 - 0.128 in	Flat sheet
	>= 440 MPa @Thickness 3.28 - 6.32 mm	>= 63800 psi @Thickness 0.129 - 0.249 in	Flat sheet

	>= 395 MPa @Diameter <=6.32 mm	>= 57300 psi @Diameter <=0.249 in	Wire, rod, bar and shapes (extruded)
	>= 395 MPa @Diameter <=6.32 mm	>= 57300 psi @Diameter <=0.249 in	Extruded tube
	>= 415 MPa @Diameter 6.35 - 19.0 mm	>= 60200 psi @Diameter 0.250 - 0.749 in	Wire, rod, bar and shapes (extruded)
	>= 415 MPa @Diameter 6.35 - 19.0 mm	>= 60200 psi @Diameter 0.250 - 0.749 in	Extruded tube
	>= 450 MPa @Diameter 19.0 - 38.07 mm	>= 65300 psi @Diameter 0.750 - 1.499 in	Wire, rod, bar and shapes (extruded)
	>= 450 MPa @Diameter 19.0 - 38.07 mm	>= 65300 psi @Diameter 0.750 - 1.499 in	Extruded tube
	>= 470 MPa @Diameter >=38.1 mm	>= 68200 psi @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area 25-32 in^2
	>= 470 MPa @Diameter >=38.1 mm	>= 68200 psi @Diameter >=1.50 in	Extruded tube; Area 25-32 in^2
	>= 485 MPa @Diameter >=38.1 mm	>= 70300 psi @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area <25 in^2
	>= 485 MPa @Diameter >=38.1 mm	>= 70300 psi @Diameter >=1.50 in	Extruded tube; Area <25 in^2
Tensile Strength, Yield	>= 290 MPa	>= 42100 psi	Drawn tube
	345 MPa	50000 psi	AA; Typical
	>= 360 MPa	>= 52200 psi	Wire, rod, and bar (rolled or cold finished); T36
	>= 290 MPa @Thickness 0.203 - 3.25 mm	>= 42100 psi @Thickness 0.00800 - 0.128 in	Flat sheet
	>= 290 MPa @Thickness 3.28 - 6.32 mm	>= 42100 psi @Thickness 0.129 - 0.249 in	Flat sheet
	>= 290 MPa @Diameter <=6.32 mm	>= 42100 psi @Diameter <=0.249 in	Wire, rod, bar and shapes (extruded)
	>= 290 MPa @Diameter <=6.32 mm	>= 42100 psi @Diameter <=0.249 in	Extruded tube
	>= 305 MPa @Diameter 6.35 - 19.0 mm	>= 44200 psi @Diameter 0.250 - 0.749 in	Wire, rod, bar and shapes (extruded)
	>= 305 MPa @Diameter 6.35 - 19.0 mm	>= 44200 psi @Diameter 0.250 - 0.749 in	Extruded tube
	>= 315 MPa @Diameter 19.0 - 38.07 mm	>= 45700 psi @Diameter 0.750 - 1.499 in	Wire, rod, bar and shapes (extruded)
	>= 315 MPa @Diameter 19.0 - 38.07 mm	>= 45700 psi @Diameter 0.750 - 1.499 in	Extruded tube
	>= 315 MPa @Diameter >=38.1 mm	>= 45700 psi @Diameter >=1.50 in	Extruded tube; Area 25-32 in^2
	>= 330 MPa @Diameter >=38.1 mm	>= 47900 psi @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area 25-32 in^2
	>= 330 MPa @Diameter >=38.1 mm	>= 47900 psi @Diameter >=1.50 in	Extruded tube; Area <25 in^2
	>= 360 MPa @Diameter >=38.1 mm	>= 52200 psi @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area <25 in^2
	28.0 MPa @Strain 0.2 %, Temperature 371 °C	4060 psi @Strain 0.2 %, Temperature 700 °F	
	41.0 MPa @Strain 0.2 %, Temperature 316 °C	5950 psi @Strain 0.2 %, Temperature 601 °F	
	62.0 MPa	8990 psi	

	@Strain 0.2 %, Temperature 260 °C	@Strain 0.2 %, Temperature 500 °F	
	138 MPa @Strain 0.2 %, Temperature 204 °C	20000 psi @Strain 0.2 %, Temperature 399 °F	
	310 MPa @Strain 0.2 %, Temperature 149 °C	45000 psi @Strain 0.2 %, Temperature 300 °F	
	331 MPa @Strain 0.2 %, Temperature 100 °C	48000 psi @Strain 0.2 %, Temperature 212 °F	
	345 MPa @Strain 0.2 %, Temperature 24.0 °C	50000 psi @Strain 0.2 %, Temperature 75.2 °F	
	352 MPa @Strain 0.2 %, Temperature -28.0 °C	51100 psi @Strain 0.2 %, Temperature -18.4 °F	
	359 MPa @Strain 0.2 %, Temperature -80.0 °C	52100 psi @Strain 0.2 %, Temperature -112 °F	
	427 MPa @Strain 0.2 %, Temperature -196 °C	61900 psi @Strain 0.2 %, Temperature -321 °F	
Elongation at Break	>= 10 %	>= 10 %	Wire, rod, and bar (rolled or cold finished); T36
	10 - 16 %	10 - 16 %	Drawn tube
☒	11 % @Temperature 149 °C	11 % @Temperature 300 °F	
	16 % @Temperature 100 °C	16 % @Temperature 212 °F	
	17 % @Temperature -80.0 °C	17 % @Temperature -112 °F	
	17 % @Temperature -28.0 °C	17 % @Temperature -18.4 °F	
	17 % @Temperature 24.0 °C	17 % @Temperature 75.2 °F	
	18 % @Temperature -196 °C	18 % @Temperature -321 °F	
	23 % @Temperature 204 °C	23 % @Temperature 399 °F	
	55 % @Temperature 260 °C	55 % @Temperature 500 °F	
	75 % @Temperature 316 °C	75 % @Temperature 601 °F	
	100 % @Temperature 371 °C	100 % @Temperature 700 °F	
☒	10 - 15 % @Thickness 0.203 - 3.25 mm	10 - 15 % @Thickness 0.00800 - 0.128 in	Flat sheet
	>= 15 % @Thickness 3.28 - 6.32 mm	>= 15 % @Thickness 0.129 - 0.249 in	Flat sheet
	18 % @Thickness 1.59 mm	18 % @Thickness 0.0625 in	AA; Typical
☒	>= 8.0 % @Diameter >=38.1 mm	>= 8.0 % @Diameter >=1.50 in	Extruded tube; Area 25-32 in^2
	>= 8.0 % @Diameter >=38.1 mm	>= 8.0 % @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area 25-32 in^2
	>= 10 % @Diameter 19.0 - 38.07 mm	>= 10 % @Diameter 0.750 - 1.499 in	Wire, rod, bar and shapes (extruded)
	>= 10 % @Diameter >=38.1 mm	>= 10 % @Diameter >=1.50 in	Wire, rod, bar and shapes (extruded); Area <25 in^2
	>= 10 %	>= 10 %	Extruded tube

	@Diameter <=6.32 mm	@Diameter <=0.249 in	
	>= 10 %	>= 10 %	Extruded tube
	@Diameter 6.35 - 19.0 mm	@Diameter 0.250 - 0.749 in	
	>= 10 %	>= 10 %	Extruded tube
	@Diameter 19.0 - 38.07 mm	@Diameter 0.750 - 1.499 in	
	>= 10 %	>= 10 %	Extruded tube; Area <25 in^2
	@Diameter >=38.1 mm	@Diameter >=1.50 in	
	>= 12 %	>= 12 %	Wire, rod, bar and shapes (extruded)
	@Diameter <=6.32 mm	@Diameter <=0.249 in	
	>= 12 %	>= 12 %	Wire, rod, bar and shapes (extruded)
	@Diameter 6.35 - 19.0 mm	@Diameter 0.250 - 0.749 in	
Modulus of Elasticity	73.1 GPa	10600 ksi	AA; Typical; Average of tension and compression. Compression modulus is about 2% greater than tensile modulus.
Notched Tensile Strength	379 MPa	55000 psi	2.5 cm width x 0.16 cm thick side-notched specimen, K_t = 17.
Ultimate Bearing Strength	855 MPa	124000 psi	Edge distance/pin diameter = 2.0
Bearing Yield Strength	524 MPa	76000 psi	Edge distance/pin diameter = 2.0
Poissons Ratio	0.33	0.33	
Fatigue Strength	138 MPa @# of Cycles 5.00e+8	20000 psi @# of Cycles 5.00e+8	completely reversed stress; RR Moore machine/specimen
Machinability	70 %	70 %	0-100 Scale of Aluminum Alloys
Shear Modulus	28.0 GPa	4060 ksi	
Shear Strength	283 MPa	41000 psi	AA; Typical

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00000582 ohm-cm @Temperature 20.0 °C	0.00000582 ohm-cm @Temperature 68.0 °F	AA; Typical

Thermal Properties	Metric	English	Comments
CTE, linear	21.1 µm/m-°C @Temperature -50.0 - 20.0 °C	11.7 µin/in-°F @Temperature -58.0 - 68.0 °F	
	22.9 µm/m-°C @Temperature 20.0 - 100 °C	12.7 µin/in-°F @Temperature 68.0 - 212 °F	
	23.2 µm/m-°C @Temperature 20.0 - 100 °C	12.9 µin/in-°F @Temperature 68.0 - 212 °F	AA; Typical; average over range
	23.8 µm/m-°C @Temperature 20.0 - 200 °C	13.2 µin/in-°F @Temperature 68.0 - 392 °F	
	24.7 µm/m-°C @Temperature 20.0 - 300 °C	13.7 µin/in-°F @Temperature 68.0 - 572 °F	
Specific Heat Capacity	0.875 J/g-°C	0.209 BTU/lb-°F	
Thermal Conductivity	121 W/m-K	840 BTU-in/hr-ft^2-°F	AA; Typical at 77°F
Melting Point	502 - 638 °C	935 - 1180 °F	AA; Typical range based on typical composition for wrought products >= 1/4 in. thickness. Eutectic melting is not eliminated by homogenization.
Solidus	502 °C	935 °F	AA; Typical
Liquidus	638 °C	1180 °F	AA; Typical

Processing Properties	Metric	English	Comments
Annealing Temperature	413 °C	775 °F	
Solution Temperature	493 °C	919 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	90.7 - 94.7 %	90.7 - 94.7 %	As remainder
Chromium, Cr	<= 0.10 %	<= 0.10 %	

Copper, Cu	3.8 - 4.9 %	3.8 - 4.9 %
Iron, Fe	<= 0.50 %	<= 0.50 %
Magnesium, Mg	1.2 - 1.8 %	1.2 - 1.8 %
Manganese, Mn	0.30 - 0.90 %	0.30 - 0.90 %
Other, each	<= 0.05 %	<= 0.05 %
Other, total	<= 0.15 %	<= 0.15 %
Silicon, Si	<= 0.50 %	<= 0.50 %
Titanium, Ti	<= 0.15 %	<= 0.15 %
Zinc, Zn	<= 0.25 %	<= 0.25 %

References for this datasheet.