Aluminum 7075-T6; 7075-T651

Categories: Metal; Nonferrous Metal; Aluminum Alloy; 7000 Series Aluminum Alloy

Material Notes: General 7075 characteristics and uses (from Alcoa): Very high strength material used for highly stressed structural parts. The T7351 temper offers improved stress-corrosion cracking resistance.

Applications: Aircraft fittings, gears and shafts, fuse parts, meter shafts and gears, missile parts, regulating valve parts, worm gears, keys, aircraft, aerospace and defense applications; bike frames, all terrain vehicle (ATV) sprockets.

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 0.25 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr + Ti limit.
Composition information provided by the Aluminum Association and is not for design.

Key Words: Aluminium 7075-T6; Aluminium 7075-T651, UNS A97075; ISO AlZn5.5MgCu; Aluminium 7075-T6; Aluminium 7075-T651; AA7075-T6

Physical Properties	Metric	English	Comments
Density	2.81 g/cc	0.102 lb/in³	AA; Typical

Mechanical Properties	Metric	English	Comments
Hardness, Brinell	150	150	AA; Typical; 500 g load; 10 mm ball
Hardness, Knoop	191	191	Converted from Brinell Hardness Value
Hardness, Rockwell A	53.5	53.5	Converted from Brinell Hardness Value
Hardness, Rockwell B	87	87	Converted from Brinell Hardness Value
Hardness, Vickers	175	175	Converted from Brinell Hardness Value
Tensile Strength, Ultimate	572 MPa	83000 psi	AA; Typical
	41.0 MPa @Temperature 371 °C	5950 psi @Temperature 700 °F	
	55.0 MPa @Temperature 316 °C	7980 psi @Temperature 601 °F	
	76.0 MPa @Temperature 260 °C	11000 psi @Temperature 500 °F	
	110 MPa @Temperature 204 °C	16000 psi @Temperature 399 °F	
	214 MPa @Temperature 149 °C	31000 psi @Temperature 300 °F	
	483 MPa @Temperature 100 °C	70100 psi @Temperature 212 °F	
	572 MPa @Temperature 24.0 °C	83000 psi @Temperature 75.2 °F	
	593 MPa @Temperature -28.0 °C	86000 psi @Temperature -18.4 °F	
	621 MPa @Temperature -80.0 °C	90100 psi @Temperature -112 °F	
	703 MPa @Temperature -196 °C	102000 psi @Temperature -321 °F	
	>= 462 MPa @Thickness 88.93 - 102 mm	>= 67000 psi @Thickness 3.501 - 4.00 in	Plate; T62, T651
	>= 490 MPa @Thickness 76.23 - 88.9 mm	>= 71100 psi @Thickness 3.001 - 3.50 in	Plate; T62, T651
	>= 496 MPa @Thickness 63.53 - 76.2 mm	>= 71900 psi @Thickness 2.501 - 3.00 in	Plate; T62, T651
	>= 510 MPa @Thickness 0.203 - 0.279 mm	>= 74000 psi @Thickness 0.00800 - 0.0110 in	Sheet
	>= 524 MPa @Thickness 0.305 - 0.991 mm	>= 76000 psi @Thickness 0.0120 - 0.0390 in	Sheet

	>= 524 MPa	>= 76000 psi	Plate; T62, T651
	@Thickness 50.83 - 63.5 mm	@Thickness 2.001 - 2.50 in	
	>= 531 MPa	>= 77000 psi	Plate; T62, T651
	@Thickness 25.43 - 50.8 mm	@Thickness 1.001 - 2.00 in	
	>= 538 MPa	>= 78000 psi	Sheet
	@Thickness 1.02 - 3.17 mm	@Thickness 0.0400 - 0.125 in	
	>= 538 MPa	>= 78000 psi	Sheet
	@Thickness 3.20 - 6.32 mm	@Thickness 0.126 - 0.249 in	
	>= 538 MPa	>= 78000 psi	Plate; T62, T651
	@Thickness 6.35 - 12.7 mm	@Thickness 0.250 - 0.499 in	
	>= 538 MPa	>= 78000 psi	Plate; T62, T651
	@Thickness 12.7 - 25.4 mm	@Thickness 0.500 - 1.00 in	
Tensile Strength, Yield	503 MPa	73000 psi	AA; Typical
	32.0 MPa	4640 psi	0.2% Offset
	@Temperature 271 °C	@Temperature 520 °F	
	45.0 MPa	6530 psi	0.2% Offset
	@Temperature 316 °C	@Temperature 601 °F	
	62.0 MPa	8990 psi	0.2% Offset
	@Temperature 260 °C	@Temperature 500 °F	
	87.0 MPa	12600 psi	0.2% Offset
	@Temperature 204 °C	@Temperature 399 °F	
	186 MPa	27000 psi	0.2% Offset
	@Temperature 149 °C	@Temperature 300 °F	
	448 MPa	65000 psi	0.2% Offset
	@Temperature 100 °C	@Temperature 212 °F	
	503 MPa	73000 psi	0.2% Offset
	@Temperature 24.0 °C	@Temperature 75.2 °F	
	517 MPa	75000 psi	0.2% Offset
	@Temperature -28.0 °C	@Temperature -18.4 °F	
	545 MPa	79000 psi	0.2% Offset
	@Temperature -80.0 °C	@Temperature -112 °F	
	634 MPa	92000 psi	0.2% Offset
	@Temperature -196 °C	@Temperature -321 °F	
	>= 372 MPa	>= 54000 psi	Plate; T62, T651
	@Thickness 88.93 - 102 mm	@Thickness 3.501 - 4.00 in	
	>= 400 MPa	>= 58000 psi	Plate; T62, T651
	@Thickness 76.23 - 88.9 mm	@Thickness 3.001 - 3.50 in	
	>= 421 MPa	>= 61100 psi	Plate; T62, T651
	@Thickness 63.53 - 76.2 mm	@Thickness 2.501 - 3.00 in	
	>= 434 MPa	>= 62900 psi	Sheet
	@Thickness 0.203 - 0.279 mm	@Thickness 0.00800 - 0.0110 in	
	>= 441 MPa	>= 64000 psi	Plate; T62, T651
	@Thickness 50.83 - 63.5 mm	@Thickness 2.001 - 2.50 in	
	>= 462 MPa	>= 67000 psi	Sheet
	@Thickness 0.305 - 0.991 mm	@Thickness 0.0120 - 0.0390 in	
	>= 462 MPa	>= 67000 psi	Plate; T62, T651
	@Thickness 6.35 - 12.7 mm	@Thickness 0.250 - 0.499 in	
	>= 462 MPa	>= 67000 psi	Plate; T62, T651
	@Thickness 25.43 - 50.8 mm	@Thickness 1.001 - 2.00 in	
	>= 469 MPa	>= 68000 psi	Sheet
	@Thickness 1.02 - 3.17 mm	@Thickness 0.0400 - 0.125 in	
	>= 469 MPa	>= 68000 psi	Plate; T62, T651
	@Thickness 12.7 - 25.4 mm	@Thickness 0.500 - 1.00 in	
	>= 476 MPa	>= 69000 psi	Sheet
	@Thickness 3.20 - 6.32 mm	@Thickness 0.126 - 0.249 in	
Elongation at Break	9.00 %	9.00 %	
	@Temperature -196 °C	@Temperature -321 °F	
	11.0 %	11.0 %	
	@Temperature -80.0 °C	@Temperature -112 °F	
	11.0 %	11.0 %	
	@Temperature -28.0 °C	@Temperature -18.4 °F	
	11.0 %	11.0 %	
	@Temperature 24.0 °C	@Temperature 75.2 °F	
	14.0 %	14.0 %	
	@Temperature 100 °C	@Temperature 212 °F	
	30.0 %	30.0 %	
	@Temperature 149 °C	@Temperature 300 °F	
	55.0 %	55.0 %	
	@Temperature 204 °C	@Temperature 399 °F	
	65.0 %	65.0 %	
	@Temperature 260 °C	@Temperature 500 °F	
	70.0 %	70.0 %	

	@Temperature 316 °C	@Temperature 601 °F	
	70.0 %	70.0 %	
	@Temperature 371 °C	@Temperature 700 °F	
	>= 3.00 %	>= 3.00 %	Plate; T62, T651
	@Thickness 88.93 - 102 mm	@Thickness 3.501 - 4.00 in	
	>= 5.00 %	>= 5.00 %	Sheet
	@Thickness 0.203 - 0.279 mm	@Thickness 0.00800 - 0.0110 in	
	>= 5.00 %	>= 5.00 %	Plate; T62, T651
	@Thickness 50.83 - 63.5 mm	@Thickness 2.001 - 2.50 in	
	>= 5.00 %	>= 5.00 %	Plate; T62, T651
	@Thickness 63.53 - 76.2 mm	@Thickness 2.501 - 3.00 in	
	>= 5.00 %	>= 5.00 %	Plate; T62, T651
	@Thickness 76.23 - 88.9 mm	@Thickness 3.001 - 3.50 in	
	>= 6.00 %	>= 6.00 %	Plate; T62, T651
	@Thickness 25.43 - 50.8 mm	@Thickness 1.001 - 2.00 in	
	>= 7.00 %	>= 7.00 %	Sheet
	@Thickness 0.305 - 0.991 mm	@Thickness 0.0120 - 0.0390 in	
	>= 7.00 %	>= 7.00 %	Plate; T62, T651
	@Thickness 12.7 - 25.4 mm	@Thickness 0.500 - 1.00 in	
	>= 8.00 %	>= 8.00 %	Sheet
	@Thickness 1.02 - 3.17 mm	@Thickness 0.0400 - 0.125 in	
	>= 8.00 %	>= 8.00 %	Sheet
	@Thickness 3.20 - 6.32 mm	@Thickness 0.126 - 0.249 in	
	>= 9.00 %	>= 9.00 %	Plate; T62, T651
	@Thickness 6.35 - 12.7 mm	@Thickness 0.250 - 0.499 in	
	11.0 %	11.0 %	AA; Typical
	@Thickness 1.59 mm	@Thickness 0.0625 in	
	11.0 %	11.0 %	AA; Typical
	@Diameter 12.7 mm	@Diameter 0.500 in	
Modulus of Elasticity	71.7 GPa	10400 ksi	AA; Typical; Average of tension and compression. Compression modulus is about 2% greater than tensile modulus.
Poissons Ratio	0.330	0.330	
Fatigue Strength	159 MPa	23000 psi	completely reversed stress; RR Moore machine/specimen
	@# of Cycles 5.00e+8	@# of Cycles 5.00e+8	
Fracture Toughness	17.6 MPa-m½	16.0 ksi-in½	T651; Plate; S-L; average
	16.5 - 19.8 MPa-m½	15.0 - 18.0 ksi-in½	T651; Plate; S-L
	18.7 MPa-m½	17.0 ksi-in½	T651; Forgings; S-L
	20.0 MPa-m½	18.2 ksi-in½	K(IC) in S-L Direction
	22.0 - 25.3 MPa-m½	20.0 - 23.0 ksi-in½	T651; Plate; T-L
	24.2 MPa-m½	22.0 ksi-in½	T651; Plate; T-L; average
	25.0 MPa-m½	22.8 ksi-in½	K(IC) in T-L Direction
	28.6 MPa-m½	26.0 ksi-in½	T651; Plate; L-T; average
	27.5 - 29.7 MPa-m½	25.0 - 27.0 ksi-in½	T651; Plate; L-T
	29.0 MPa-m½	26.4 ksi-in½	K(IC) in L-T Direction
Machinability	70 %	70 %	0-100 Scale of Aluminum Alloys
Shear Modulus	26.9 GPa	3900 ksi	
Shear Strength	331 MPa	48000 psi	AA; Typical

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00000515 ohm-cm	0.00000515 ohm-cm	AA; Typical
	@Temperature 20.0 °C	@Temperature 68.0 °F	

Thermal Properties	Metric	English	Comments
CTE, linear	21.6 µm/m-°C	12.0 µin/in-°F	
	@Temperature -50.0 - 20.0 °C	@Temperature -58.0 - 68.0 °F	
	23.4 µm/m-°C	13.0 µin/in-°F	
	@Temperature 20.0 - 100 °C	@Temperature 68.0 - 212 °F	
	23.6 µm/m-°C	13.1 µin/in-°F	AA; Typical; average over range
	@Temperature 20.0 - 100 °C	@Temperature 68.0 - 212 °F	
	24.3 µm/m-°C	13.5 µin/in-°F	
	@Temperature 20.0 - 200 °C	@Temperature 68.0 - 392 °F	
	25.2 µm/m-°C	14.0 µin/in-°F	
	@Temperature 20.0 - 300 °C	@Temperature 68.0 - 572 °F	
	25.2 µm/m-°C	14.0 µin/in-°F	average
	@Temperature 20.0 - 300 °C	@Temperature 68.0 - 572 °F	
Specific Heat Capacity	0.960 J/g-°C	0.229 BTU/lb-°F	

Thermal Conductivity	130 W/m-K	900 BTU-in/hr-ft²-°F	AA; Typical at 77°F
Melting Point	477 - 635.0 °C	890 - 1175 °F	AA; Typical range based on typical composition for wrought products 1/4 inch thickness or greater. Homogenization may raise eutectic melting temperature 20-40°F but usually does not eliminate eutectic melting.
Solidus	477 °C	890 °F	AA; Typical
Liquidus	635.0 °C	1175 °F	AA; Typical

Processing Properties	Metric	English	Comments
Annealing Temperature	413 °C	775 °F	
Solution Temperature	466 - 482 °C	870 - 900 °F	
Aging Temperature	121 °C	250 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	87.1 - 91.4 %	87.1 - 91.4 %	As remainder
Chromium, Cr	0.18 - 0.280 %	0.18 - 0.280 %	
Copper, Cu	1.20 - 2.0 %	1.20 - 2.0 %	
Iron, Fe	<= 0.50 %	<= 0.50 %	
Magnesium, Mg	2.10 - 2.90 %	2.10 - 2.90 %	
Manganese, Mn	<= 0.30 %	<= 0.30 %	
Other, each	<= 0.050 %	<= 0.050 %	
Other, total	<= 0.15 %	<= 0.15 %	
Silicon, Si	<= 0.40 %	<= 0.40 %	
Titanium, Ti	<= 0.20 %	<= 0.20 %	
Zinc, Zn	5.10 - 6.10 %	5.10 - 6.10 %	

References for this datasheet.

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