



ASM Aerospace Specification Metals Inc.



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Titanium Ti-6Al-4V (Grade 5), Annealed

Subcategory: Alpha/Beta Titanium Alloy; Metal; Nonferrous Metal; Titanium Alloy

Key Words: Ti-6-4; UNS R56400; ASTM Grade 5 titanium; UNS R56401 (ELI); Ti6Al4V, biomaterials, biomedical implants, biocompatibility

Component	Wt. %
Al	6
Fe	Max 0.25
O	Max 0.2
Ti	90
V	4

Material Notes:

Information provided by Allvac and the references. Annealing Temperature 700-785°C. Alpha-Beta Alloy.

Applications: Blades, discs, rings, airframes, fasteners, components. Vessels, cases, hubs, forgings. Biomedical implants.

Biocompatibility: Excellent, especially when direct contact with tissue or bone is required. Ti-6Al-4V's poor shear strength makes it undesirable for bone screws or plates. It also has poor surface wear properties and tends to seize when in sliding contact with itself and other metals. Surface treatments such as nitriding and oxidizing can improve the surface wear properties.

Physical Properties	Metric	English	Comments
Density	<u>4.43 g/cc</u>	0.16 lb/in ³	
Mechanical Properties			
Hardness, Brinell	334	334	Estimated from Rockwell C.
Hardness, Knoop	363	363	Estimated from Rockwell C.
Hardness, Rockwell C	36	36	
Hardness, Vickers	349	349	Estimated from Rockwell C.
Tensile Strength, Ultimate	<u>950 MPa</u>	138000 psi	
Tensile Strength, Yield	<u>880 MPa</u>	128000 psi	

Elongation at Break	<u>14 %</u>	14 %	
Reduction of Area	<u>36 %</u>	36 %	
Modulus of Elasticity	<u>113.8 GPa</u>	16500 ksi	
Compressive Yield Strength	<u>970 MPa</u>	141000 psi	
Notched Tensile Strength	<u>1450 MPa</u>	210000 psi	K_t (stress concentration factor) = 6.7
Ultimate Bearing Strength	<u>1860 MPa</u>	270000 psi	e/D = 2
Bearing Yield Strength	<u>1480 MPa</u>	215000 psi	e/D = 2
Poisson's Ratio	0.342	0.342	
Charpy Impact	<u>17 J</u>	12.5 ft-lb	V-notch
Fatigue Strength	<u>240 MPa</u>	34800 psi	at 1E+7 cycles. K_t (stress concentration factor) = 3.3
Fatigue Strength	<u>510 MPa</u>	74000 psi	Unnotched 10,000,000 Cycles
Fracture Toughness	<u>75 MPa-m^{1/2}</u>	68.3 ksi-in ^{1/2}	
Shear Modulus	<u>44 GPa</u>	6380 ksi	
Shear Strength	<u>550 MPa</u>	79800 psi	Ultimate shear strength

Electrical Properties

Electrical Resistivity	<u>0.000178 ohm-cm</u>	0.000178 ohm-cm	
Magnetic Permeability	1.00005	1.00005	at 1.6kA/m
Magnetic Susceptibility	3.3e-006	3.3e-006	cgs/g

Thermal Properties

CTE, linear 20°C	<u>8.6 μm/m-°C</u>	4.78 μin/in-°F	20-100°C
CTE, linear 250°C	<u>9.2 μm/m-°C</u>	5.11 μin/in-°F	Average over the range 20-315°C
CTE, linear 500°C	<u>9.7 μm/m-°C</u>	5.39 μin/in-°F	Average over the range 20-650°C
Specific Heat Capacity	<u>0.5263 J/g-°C</u>	0.126 BTU/lb-°F	
Thermal Conductivity	<u>6.7 W/m-K</u>	46.5 BTU-in/hr-ft ² -°F	
Melting Point	1604 - 1660 °C	2920 - 3020 °F	
Solidus	<u>1604 °C</u>	2920 °F	
Liquidus	<u>1660 °C</u>	3020 °F	
Beta Transus	<u>980 °C</u>	1800 °F	

References for this datasheet.

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error.