Titanium Ti-6Al-4V (Grade 5), ELI, 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 0.14
O	Max 0.13
Ti	90
V	4

Material Notes:

Information provided by Allvac and the references. Annealing Temperature 700-785ºC. ELI (Extra Low Interstitial) grade has lower impurity limits, especially oxygen and iron. Alpha-Beta Alloy

Applications: Applications requiring excellent fracture toughness and fatigue strength; aircraft, structural components, biomedical.. 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	4.43 g/cc	0.16 lb/in³	
Mechanical Properties			
Hardness, Brinell	326	326	Estimated from Rockwell C.
Hardness, Knoop	354	354	Estimated from Rockwell C.
Hardness, Rockwell C	35	35	
Hardness, Vickers	341	341	Estimated from Rockwell C.
Tensile Strength, Ultimate	860 MPa	125000 psi	

Tensile Strength, Yield	790 MPa	115000 psi	
Elongation at Break	15 %	15 %	
Modulus of Elasticity	113.8 GPa	16500 ksi	
Compressive Yield Strength	860 MPa	125000 psi	
Notched Tensile Strength	1170 MPa	170000 psi	K_t (stress concentration factor) = 3.5
Ultimate Bearing Strength	1740 MPa	252000 psi	e/D = 2
Bearing Yield Strength	1430 MPa	207000 psi	e/D = 2
Poisson's Ratio	0.342	0.342	
Charpy Impact	24 J	17.7 ft-lb	V-notch
Fatigue Strength	140 MPa	20300 psi	at 1E+7 cycles. K_t (stress concentration factor) = 3.1
Fatigue Strength	300 MPa	43500 psi	1E+7 cycles, Unnotched
Fracture Toughness	100 MPa-m½	91 ksi-in½	K_{IC}
Shear Modulus	44 GPa	6380 ksi	
Shear Strength	550 MPa	79800 psi	Ultimate shear strength

Electrical Properties

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

Thermal Properties

CTE, linear 20°C	8.6 µm/m-°C	4.78 µin/in-°F	20-100ºC
CTE, linear 250°C	9.2 µm/m-°C	5.11 µin/in-°F	Average over the range 20-315ºC
CTE, linear 500°C	9.7 µm/m-°C	5.39 µin/in-°F	Average over the range 20-650ºC
Specific Heat Capacity	0.5263 J/g-°C	0.126 BTU/lb-°F	
Thermal Conductivity	6.7 W/m-K	46.5 BTU-in/hr-ft²-°F	
Melting Point	1604 - 1660 °C	2920 - 3020 °F	
Solidus	1604 °C	2920 °F	
Liquidus	1660 °C	3020 °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 consistant 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.