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

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. Solution Treated 900-955°C, Aged 540°C. Alpha-Beta Alloy.

Applications: Blades, discs, rings, airframe, 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	4.43 g/cc	0.16 lb/in³	
Mechanical Properties			
Hardness, Brinell	379	379	Estimated from Rockwell C.
Hardness, Knoop	414	414	Estimated from Rockwell C.
Hardness, Rockwell C	41	41	
Hardness, Vickers	396	396	Estimated from Rockwell C.
Tensile Strength, Ultimate	1170 MPa	170000 psi	
Tensile Strength, Yield	1100 MPa	160000 psi	

Elongation at Break	10 %	10 %	
Modulus of Elasticity	114 GPa	16500 ksi	Average of tension and compression
Compressive Yield Strength	1070 MPa	155000 psi	
Notched Tensile Strength	1550 MPa	225000 psi	K_t (stress concentration factor) = 6.7
Ultimate Bearing Strength	2140 MPa	310000 psi	e/D = 2
Bearing Yield Strength	1790 MPa	260000 psi	e/D = 2
Poisson's Ratio	0.33	0.33	
Charpy Impact	23 J	17 ft-lb	V-notch
Fatigue Strength	160 MPa	23200 psi	at 1E+7 cycles. K_t (stress concentration factor) = 3.3
Fatigue Strength	700 MPa	102000 psi	Unnotched 10,000,000 Cycles
Fracture Toughness	43 MPa-m½	39.1 ksi-in½	
Shear Modulus	44 GPa	6380 ksi	
Shear Strength	760 MPa	110000 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	20-100°C
CTE, linear 250°C	9.2 µm/m-°C	5.11 µin/in-°F	Average over the range 20-315°C
CTE, linear 500°C	9.7 µm/m-°C	5.39 µin/in-°F	Average over the range 20-650°C
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	
Beta Transus	980 °C	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 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.