

Ti 6Al-4V

Material & Process Capability

Ti 6Al-4V is an alpha-beta titanium alloy characterized by its strength-to-mass ratio and corrosion resistance. It is a lightweight yet strong alloy suitable for highly loaded structures, including aerospace jet engines, gas turbines, pressure vessels and biomechanical components.

The VELO^{3D} intelligent additive printing solution uniquely enables companies to build the parts they need without compromising design or quality - resulting in complex, higher performance parts than traditional casting techniques or other additive methods.



General Process

Three common heat treatment processes for Ti 6Al-4V include mill annealing, duplex annealing, and solution treating and aging. Parts built with Ti 6Al-4V on a VELO^{3D} Sapphire printer can be heat treated similar to other manufacturing methods.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a VELO^{3D} Sapphire[®] System. All data is based on parts built with VELO^{3D} standard 50 µm layer thickness parameters, using standard 15-53 µm Ti 6Al- 4V grade 5 powder.

Accuracy, Small Parts	±0.050 (±0.002)	mm (in)
Accuracy, Large Parts	±0.2	percent
Minimum Wall Thickness; up to 500:1 aspect ratio	0.200 (0.008)	mm (in)
Typical Volume Rate ¹	45	cc per hr
Density	4.43 (0.16)	g/cc (lbs/in ³)
Relative Density	99.9+	percent
Surface Finish, Sa ²	6 (240)	µm (µin)

Mechanical Properties at Room Temperature

Property ³	After Heat Treatment ⁵		After Hot Isostatic Pressing ⁶		
	Mean -3σ/Min	Average	Mean -3σ/Min	Average	
Modulus of Elasticity ⁴	95 (13.8)	115 (16.7)	107 (15.5)	112 (16.2)	GPa (MSI)
Ultimate Tensile Strength	970 (141)	994 (144)	988 (143)	1009 (146)	MPa (KSI)
Yield (0.2% Offset)	798 (116)	819 (119)	822 (119)	838 (122)	MPa (KSI)
Elongation At Break	17	21	13	17	percent

1. Geometry-dependent. 2. Depends on orientation and process selected. 3. Mechanical & test samples printed in vertical orientation. 4. For reference; estimated from ASTM E8 tensile testing. 5. Heat treatment anneal 2 hours at 800°C in argon atmosphere. 6. Hot isostatic pressing: 2 hours at 800°C and 200 MPa, processed at Quintus Technologies.