

# Ti-6Al-4V

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## 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 Velo3D 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 using Ti-6Al-4V on a Velo3D Sapphire<sup>®</sup> System can be heat treated in a manner similar to other methods.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a Velo3D Sapphire System. All data is based on parts built with Velo3D standard 50 µm layer thickness parameters, using standard 15-53 µm Ti-6Al-4V grade 5 powder.



Typical Volume Rate <sup>1</sup> , cc/hour	45
Density, g/cc (lbs/cubic in)	4.43 (0.16)
Relative Density, percent	99.9+
Surface Finish <sup>2</sup> , S <sub>a</sub> , µm (µin)	<15 (590)

## Mechanical Properties at Room Temperature

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

**1.** Geometry-dependent. **2.** Depends on orientation and process selected; for angles >25° from horizontal. **3.** Mechanical & test samples printed in vertical orientation, machined to ASTM E8 (round specimen #3). **4.** Heat treatment: anneal 2 hours at 800°C in argon atmosphere. **5.** Hot Isostatic Pressing: 2 hours at 800°C and 200 MPa, processed at Quintus Technologies.