

# HASTELLOY X

## Material & Process Capability

HASTELLOY® X alloy (UNS N06002) is a nickelchromium-iron-molybdenum alloy widely used in hightemperature and corrosive atmosphere applications. The alloy is commonly used in gas turbine engines. Its corrosion resistance also make it an excellent candidate for applications in petrochemical and energy generation applications, such as transition duct, combustor cans, afterburners, and spray bars.

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

HASTELLOY X possesses excellent forming and welding characteristics and is easy to fabricate. It offers outstanding localized corrosion resistance and oxidation resistance up to 2200 Deg. F (1200 Deg. C) along with excellent stress corrosion crack resistance.

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 using VELO3D standard 50 µm layer thickness parameters, using Praxair TruForm HXLC, aVELO3D -approved HASTELLOY X powder. HASTELLOY is a registered trademark of Haynes International, Inc.

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 <sup>1</sup>	60	cc per hr
Density	8.22 (0.297)	g/cc (lbs/in <sup>3</sup> )
Relative Density	99.9+	percent
Surface Finish, Sa <sup>2</sup>	6 (240)	µm (µin)

### Mechanical Properties at Room Temperature

Property <sup>3</sup>	As Printed		After Heat Treatment <sup>4</sup>		After Hot Isostatic Pressing <sup>5</sup>		
	Mean -3σ/Min	Average	Mean -3σ/Min	Average	Mean -3σ/Min	Average	
Modulus of Elasticity	131 (19)	179 (25.9)	132 (19.1)	227 (32.9)	148 (21.5)	204 (29.5)	GPa (MSI)
Ultimate Tensile Strength	665 (96.4)	674 (97.7)	625 (90.7)	644 (93.5)	643 (93.2)	658 (95.4)	MPa (KSI)
Yield (0.2% Offset)	461 (66.8)	487 (70.6)	320 (46.5)	336 (48.8)	303 (44.0)	323 (46.9)	MPa (KSI)
Elongation At Break	40.0	45.6	52.6	57.8	51	57.7	percent

1. Geometry-dependent. 2. Depends on orientation and process selected. 3. Mechanical & test samples printed in vertical orientation. 4. Solution annealed at 1177°C for 2 hours followed by rapid air cool. 5. HIP at 1177°C & 14.5 KSI for 3-5 hrs, followed by cooling at 150-200°C/min, processed at Quintus Technologies. Note: Specifications may change without notice.