

# Amperprint 0233 HAYNES 282

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## Material & Process Capability

Amperprint® 0233 HAYNES® 282® powder is produced by Höganäs under license from Haynes International, Inc. It is a vacuum induction melted, argon gas atomized, spherical powder for additive manufacturing. Velo3D has qualified this powder, produced by Höganäs AB, a world leader in metal powder production, under license from Haynes International, for use in the Sapphire® family of printers. The Velo3D end-to-end metal AM solution uniquely enables companies to build the parts they need without compromising design or quality - resulting in complex parts higher in performance than casting or other methods.

This alloy is a gamma-prime strengthened nickel-chromium-cobalt superalloy for high temperature applications and shows a good balance of creep strength at high temperatures, thermal stability, weldability, and fabricability.

## General Process

In addition to its strength, the alloy is characterized by its superb fatigue, creep, and corrosion resistance under extreme conditions; it is ideal for high temperature applications such as gas turbine and power/process industry parts.

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 Amperprint 0233 HAYNES 282. Parts built with this alloy on a Sapphire System can be heat treated like those manufactured by other methods. Haynes 282 is a registered trademark of Haynes International, Inc.



Typical Volume Rate <sup>1</sup> , cc/hr	60
Density, g/cc (lbs/cubic inch)	8.28 (0.299)
Relative Density, percent	99.9+
Surface Finish <sup>2</sup> , S <sub>a</sub> , µm (µin)	<15 (590) for angles >25° from horizontal

## Mechanical Properties at Room Temperature

Property <sup>3</sup>	As Printed		After Heat Treatment & HIP <sup>4</sup>	
	Mean -3σ	Mean	Mean -3σ	Mean
Modulus of Elasticity, GPa (msi)	126 (18.3)	152 (22.0)	186 (27.0)	201 (29.2)
Ultimate Tensile Strength, MPa (ksi)	850 (123)	862 (125)	1141 (165.5)	1158 (168.0)
Yield (0.2% Offset), MPa (ksi)	547 (79.3)	573 (83.1)	711 (103)	743 (108)
Elongation At Break, percent	44.9	47.3	29.3	34.5

**1.** Geometry-dependent. **2.** Depends on orientation and process selected. **3.** Mechanical & test samples printed in vertical orientation. **4.** Hot Isostatic Pressing at 1175°C (2150°F) for 4 hours, rapid cool. Vacuum Solution Heat Treat at 1135°C (2075°F) for 30 min. Two-step vacuum age, first at 1010°C (1850°F) for two hours followed by rapid air cool, then at 790°C (1450°F) for eight hours, followed by rapid air cool.