

# Inconel IN718

## Material & Process Capability

Inconel IN718 is a precipitation-hardenable nickel-based superalloy known for its superb tensile strength when subjected to extreme pressure and heat. It has a rupture strength at temperatures up to 1290 °F (980 °C), making it ideal for high temperature applications such as gas turbine and power/process industry parts. The material is often used for critical applications in the aerospace, defense, and petrochemical industries.

The VELO3D intelligent additive printing solution uniquely enables companies to build the parts they need without compromising design or quality - resulting in complex parts higher in performance than traditional casting techniques or other additive methods.



### General Process

In addition to its strength, Inconel IN718 is characterized for its superb fatigue, creep and corrosion resistance in extreme environments subjected to high mechanical loads. However, it is a difficult metal to shape and machine using subtractive manufacturing techniques.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a VELO<sup>3D</sup> Sapphire® system. All data is based on parts built using VELO<sup>3D</sup> standard 50 µm layer thickness parameters, using Praxair Tru-Form 718-35, a VELO<sup>3D</sup>- approved powder. Parts built from IN718 on a Sapphire system can be heat treated like those manufactured by other methods.

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	8.19 (0.296)	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 & HIP <sup>6</sup>		
	Mean -3σ/ Min	Average	Mean -3σ/ Min	Average	
Modulus of Elasticity	103 (14.9)	110 (15.9)	166 (24.1)	199 (28.9)	GPa (MSI)
Ultimate Tensile Strength	912 (132)	953 (138)	1286 (187)	1320 (191)	MPa (KSI)
Yield (0.2% Offset)	512 (74.3)	603 (87.4)	1022 (148)	1063 (154)	MPa (KSI)
Elongation At Break	24.1	30.9	15.3	20.7	percent
Hardness, HRC			42.3	43.3	

1. Geometry-dependent. 2. Depends on orientation and process selected. 3. Mechanical & test samples printed in vertical orientation. 4. Heat treatment per ASTM F3055, Hot Isostatic Pressing per ASTM F3055, solution & age per AMS 5662.