

# Inconel 625

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## Material & Process Capability

Inconel<sup>®</sup> 625 is a precipitation-hardenable nickel-based superalloy. It is characterized by having excellent tensile, creep, and rupture properties, particularly at high temperatures. IN625 has good corrosion resistance in various corrosive environments.

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, IN625 is characterized by its superb fatigue, creep, and rupture resistance in extreme environments. IN625 is difficult 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 Velo3D Sapphire<sup>®</sup> System. All data is based on parts built using Velo3D standard 50 µm layer thickness parameters, using Praxair Tru-Form 625-2, a Velo3D-approved powder.

Parts built from IN625 on a Sapphire System can be heat treated like those manufactured by other methods.



Typical Volume Rate <sup>1</sup> , cc/hr	51
Density, g/cc (lbs/cubic inch)	8.19 (0.296)
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> , MPa (ksi)	As Printed		Solution Anneal <sup>4</sup>		After HIP <sup>5</sup>	
	Mean -3σ	Mean	Mean -3σ	Mean	Mean -3σ	Mean
Ultimate Tensile Strength, MPa (ksi)	868 (126)	875 (127)	826 (120)	833 (121)	885 (128)	892 (129)
Yield (0.2% Offset), MPa (ksi)	559 (81)	576 (83.6)	371 (53.8)	377 (54.7)	374 (54.2)	385 (55.8)
Elongation At Break, percent	39.1	41.7	56.3	60.3	43.9	48.9
Hardness, HRB	94	96	86	88	85	88

**1.** Geometry-dependent. **2.** Depends on orientation & process selected. **3.** Mechanical & test samples printed in vertical orientation. **4.** Solution Anneal per AMS7000: product solution annealed in accordance with AMS2774 under inert or vacuum atmosphere at 1190 °C± 4°C (2174°F±39°F) for 60±10 minutes; cooled at a rate equal to an air cooling or faster to 650°C (1200°F) and cooled from 650°C (1200°F) at any rate. **5.** Hot Isostatic Pressing per AMS7000: HIP under inert atmosphere at 14,500 psi (100 MPa) minimum within 1149°C to 1204°C (2100°F to 2200°F), held at selected temperature within ±14°C (±25°F) for 3 to 5 hours; under inert atmosphere in autoclave to below 649°C (1200°F). Cool from 649°C (1200°F) at any rate.