

Material Information



Inconel 625

Introduction

Inconel 625 is a nickel-based superalloy used in Selective Laser Melting. It combines high strength with strong resistance to corrosion and oxidation, including in many elevated-temperature and demanding service environments. SLM can produce complex metal parts and geometries that may be difficult or costly to manufacture using conventional methods.

Advantages

High tensile, creep, and rupture strength; good corrosion and oxidation resistance; and reliable performance in many harsh environments. SLM also supports the production of complex geometries and consolidated part designs.

Disadvantages

Inconel 625 powder and SLM production can be costly compared with more common metals. The alloy is also difficult to machine, and printed parts may require support removal, machining, and heat treatment. Residual stress, distortion, and direction-dependent properties may need to be managed.

Tolerance

±300µm or 0.3%

Recommendation

Choose SLM Inconel 625 for functional parts that require a combination of corrosion resistance, strength, and elevated-temperature performance. It is especially worth considering for complex components used in marine, chemical processing, energy, and other demanding environments. For general-purpose prototypes without these requirements, a lower-cost material may be more practical.

Material Specifications		
Tensile Strength	ASTM D638M	≥830MPa
Yield Strength	ASTM D638M	≥410MPa
Elongation at Break	ASTM D638M	≥35%

Attention

The rapid heating and cooling cycle in SLM can generate residual stress and cause distortion. Part orientation, support design, stress relief or other heat treatment, and post-machining should be considered according to the geometry and end-use requirements. Actual mechanical and corrosion performance depends on the printer, process parameters, build orientation, post-processing, and service environment; validate critical parts for their intended application.

Applications

SLM Inconel 625 is used for functional metal parts that need strength and resistance to corrosive or elevated-temperature environments. Typical applications include the following:

Aerospace and energy:

Gas-turbine components, exhaust hardware, heat exchangers, and other high-performance parts, subject to the requirements of the specific service conditions.

Marine and offshore:

Pump and valve components, fluid-handling parts, and fittings exposed to seawater or chloride-rich environments where corrosion resistance is important.

Chemical processing and oil and gas:

Manifolds, connectors, and process-equipment components exposed to aggressive media or demanding operating conditions, after material compatibility is verified.

Industrial equipment:

Custom tooling, brackets, and complex functional components that require a combination of strength, corrosion resistance, and elevated-temperature capability.