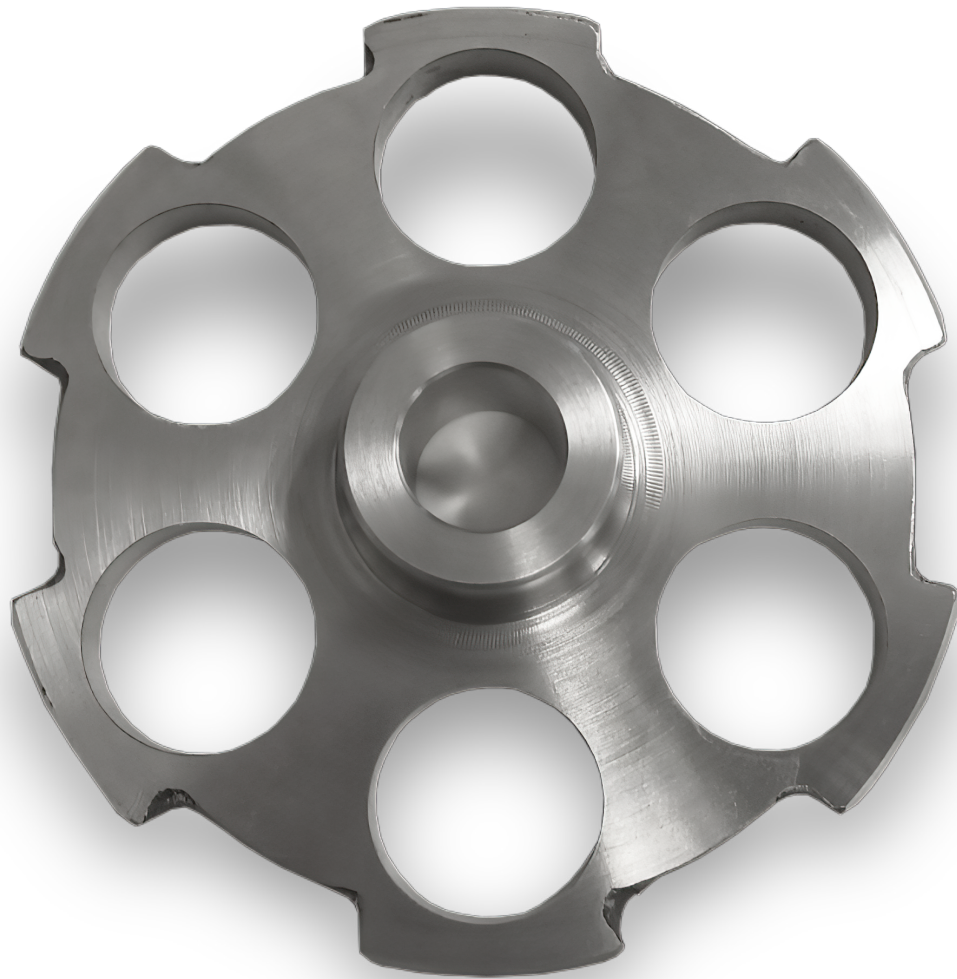


SPEE3D



SPEE3D  
316L Stainless  
Steel Select

# Stainless Steel 316L Select

## COMPOSITION %

<b>Si</b>	<0.3%	<b>C</b>	<0.03%	<b>Fe</b>	Bal
<b>Cr</b>	16-18%	<b>S</b>	<0.01%		
<b>Ni</b>	12-14%	<b>N</b>	<0.05%		
<b>Mo</b>	2-2.5%	<b>O-tot</b>	<0.5%		
<b>Mn</b>	<0.05%				

## DESCRIPTION

Stainless steel 316L is a very low carbon austenitic stainless steel with excellent corrosion resistance, good strength, and toughness. It is one of the many validated standard materials SPEE3D offers.

With SPEE3D's cold spray process, it is possible to rapidly manufacture high-quality stainless-steel parts. Mechanical performance is comparable to CF3M cast austenitic corrosion resistance alloy. SPEE3D strictly controls the quality of powders which have been optimized for our AM process.

Using SPEE3D's technology and process, users are able to manufacture complex stainless parts from idea to finished application in hours, rather than relying on disrupted supply chains or struggling to find the right sized billet.

## KEY PROPERTIES

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- High corrosion resistance
- Good strength and toughness
- Good service life at high temperature

## MARKETS

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- Industrial
- Automotive
- Marine
- General engineering
- Oil, gas, mining

## APPLICATIONS

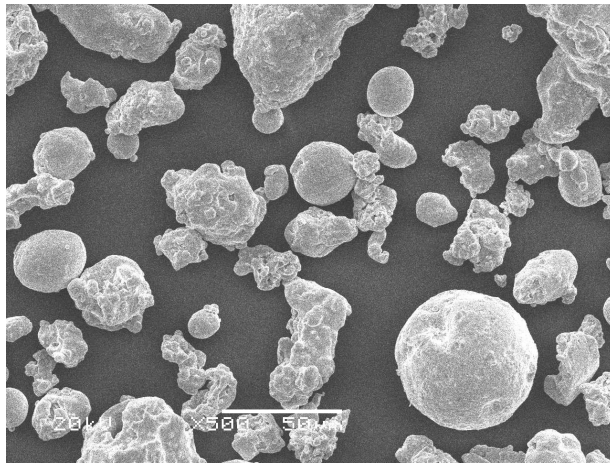
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- Valve bodies
- Manifolds
- Chemical processing parts
- Coastal and marine applications
- Tools
- Fittings

# SPEE3D POWDER PROPERTIES

<b>Part Number</b>	Stainless steel 316L Select
<b>Application</b>	Cold spray
<b>Maximum Particle Size</b>	Maximum 1% > 80 $\mu\text{m}^1$
<b>Minimum Particle Size</b>	Maximum 4% < 20 $\mu\text{m}^1$
<b>Atomization (If Applicable)</b>	Water Atomised
<b>Apparent Density (G/Cm3)</b>	2.6 - 3.6
<b>Hall Flow 2.5mm (Sec)</b>	No information available

<sup>1</sup>ISO 4497 Determination of particle size by dry sieving

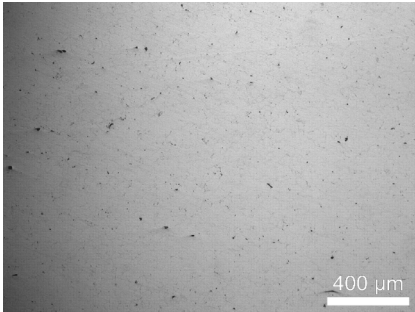
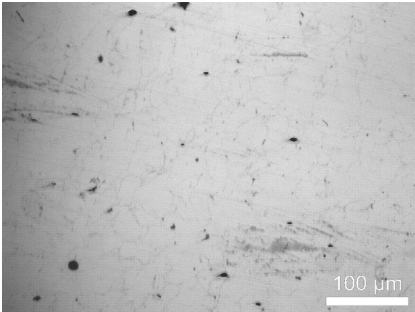
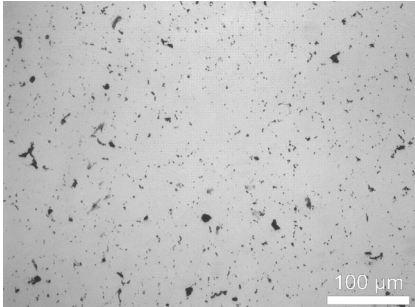
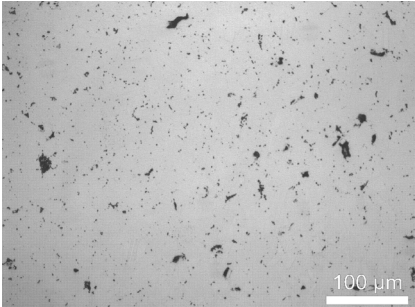


SEM image of Stainless Steel 316L

## ADDITIVE MANUFACTURING PROCESS

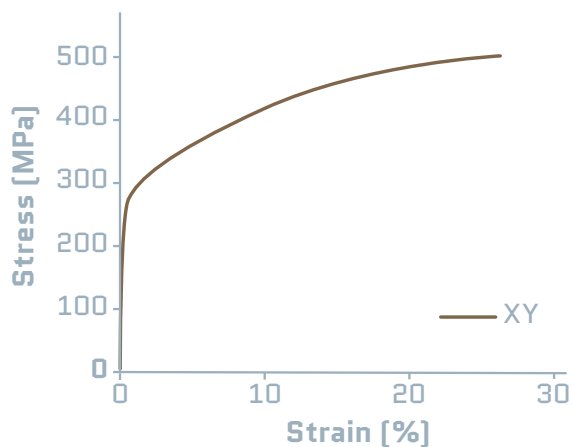
<b>SP3D Cold Spray process as built</b>	The powder is sprayed at 570°C and 30 bar using PHASER. Refer to SPEE3D Sprayed Parameters document for more details.
<b>Stress Relief, Solution Anneal and Age (SR/Sol/Age) (if applicable)</b>	We recommend that this material is cold loaded at ambient temperature, ramped up to 1200°C and sintered for 4 hours then followed by fast cooling. Inert gas environment such as nitrogen or argon is recommended. Refer to SPEE3D SOP for more details.
<b>Machinability</b>	Material has exceptional machinability.

# TYPICAL MICROSTRUCTURES

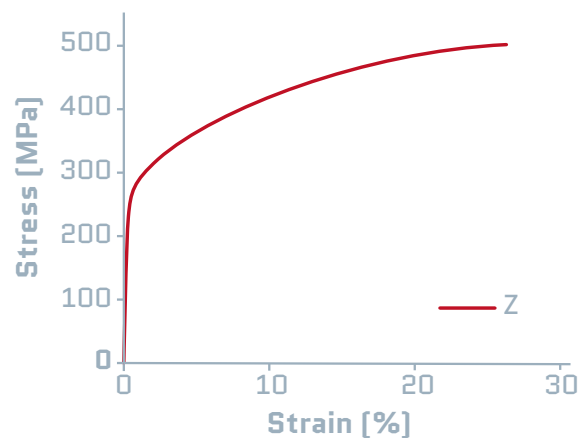
Condition	Transverse (X-Y Plane)	Longitudinal (Y-Z Plane)	Notes
As built			Mean densities above 98.4%
After heat treatment			Mean densities above 98%

## TYPICAL TENSILE TEST 316L STAINLESS STEEL SELECT – SP3D

TENSILE CURVE XY



TENSILE CURVE Z



# MECHANICAL PROPERTIES

	<b>CAST (reference)</b> ASTM A743 Annealed CF3M <sup>1</sup>	<b>SPEE3D PRINTED</b> Stainless Steel 316L Select <sup>2</sup>	<b>WROUGHT (reference)</b> ASTM A276 Annealed 316L170 <sup>3</sup>
Yield Strength (MPa) <sup>4</sup>	170	XY = 240 (min) Z = 250 (min)	170
Ultimate Tensile Strength (MPa) <sup>4</sup>	485	XY = 479 (min) Z = 490 (min)	485
Elongation at break (min %) <sup>4</sup>	30	XY = 22 (min) Z = 23 (min)	40
Modulus of Elasticity (Gpa) <sup>4</sup>	N/A	XY = 180 (min) Z = 152 (min)	193
Hardness Vickers (HV5) <sup>5</sup>	150	123 (typ)	150
Corrosion rate (mmpy) <sup>6</sup>	N/A	0.01	0.01

## ASTM Information:

1. From ASTM standard A743.
2. Samples were heat treated according to SPEE3D's standard operating procedure.
3. From ASTM standard A276
4. Specimens tested according to ASTM E8.
5. Specimens tested according to ASTM E92-17
6. Specimens tested according to ASTM G59-97 (Tested in 3.5% NaCl solution)

Listed designations are for reference purposes only. Composition and mechanical properties may vary. End-use material performance is impacted (+/-) by certain factors including but not limited to part geometry and design, application and evaluation conditions.

## Abbreviations:

XY = The XY direction is defined as the direction along a print layer.

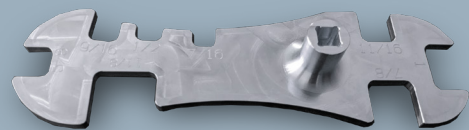
Z = The Z direction is defined as the direction perpendicular to the print layer, normal to the XY plane.



## VALVE HANDLE

**Part Print Weight:** 1.2kg/2.6lbs

**Print Time:** 60 minutes



## MULTI-TOOL

**Part Print Weight:** 1.8kg/4lbs

**Print Time:** 108 minutes

## Print More Metals, Faster

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Our full terms and conditions apply and can be found on our website at [www.spee3d.com/terms-and-conditions/](http://www.spee3d.com/terms-and-conditions/).

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**COVER:** The cover shows a possible part that can be printed using SPEE3D's 316L Stainless Steel Select material. To learn more about this part contact our materials team at [contact@spee3d.com](mailto:contact@spee3d.com).

This material datasheet is up to date as of April 2023

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