

MATERIAL DATA SHEET

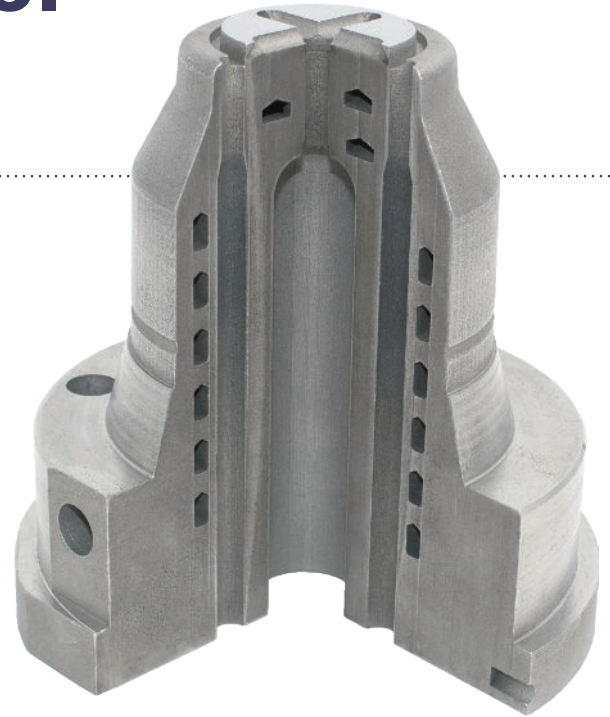
316L Stainless Steel

The alloy chemical composition complies with ASTM F3184-16

General Material and Process Specification

316L is a low carbon austenitic stainless steel alloy with chromium, nickel, and molybdenum as major alloying elements. This steel offers excellent mechanical and corrosion properties at room temperature and exhibits a high creep strength at elevated temperatures. This steel is widely used to produce tools and molds. The low carbon content of 316L reduces the possibility of in vivo corrosion which makes it a good material for biomedical applications.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a FormUp 350 system. All data is based on parts built with AddUp standard 40 µm layer thickness parameters, using fine spherical powder.



Physical Properties

	Results
Density (%) ¹	Typical 99.9
Theoretical density (g/cm ³) ²	8.0

¹ Relative density measured using optical microscopy

² Values based on literature

Surface Roughness Ra^{3,4,5}

	As-built	Bead blasted ⁵
Vertical surface	3.3±0.6	1.6±0.2

³ Depends on orientation and testing method

⁴ Tested using optical profilometer, cutoff wavelength λc=2.5 mm -Average of front, side and back surface

⁵ Surface treatment performed with glass blasting medium at 4 bar

Mechanical Properties⁶

	Test Method	Thermal State	
		As-built	Stress relieved ⁷
Tensile strength (MPa)	ASTM E8		
Horizontal direction (XY)		820±47	832±70
Vertical direction (Z)		770±32	787±64
Yield strength (MPa)	ASTM E8		
Horizontal direction (XY)		699±48	663±73
Vertical direction (Z)		632±29	605±54
Elongation at failure (%)	ASTM E8		
Horizontal direction (XY)		33±6	34±6
Vertical direction (Z)		34±3	34±4
Reduction of area (%)	ASTM E8		
Horizontal direction (XY)		55±12	59±14
Vertical direction (Z)		61±8	58±9

Mechanical Properties ⁶ (cont.)	Test Method	Thermal State	
		As-built	Stress relieved ⁷
Modulus of Elasticity (GPa)	ASTM E8		
Horizontal direction (XY)		193±9	202±14
Vertical direction (Z)		160±6	172±10
Rockwell hardness (HRB)	ASTM E18		
Horizontal direction (XY)		95.0±0.5	94.6±0.3
Vertical direction (Z)		93.4±0.2	93.4±0.5
Impact strength (J)⁸	ASTM E23		
Horizontal direction (XY)		28±2	33±3
Vertical direction (Z)		22±4	32±4

⁶ Tested at ambient temperature to ASTM E8. Machined before testing. Values based on a sample size of a minimum 39 across the build plate

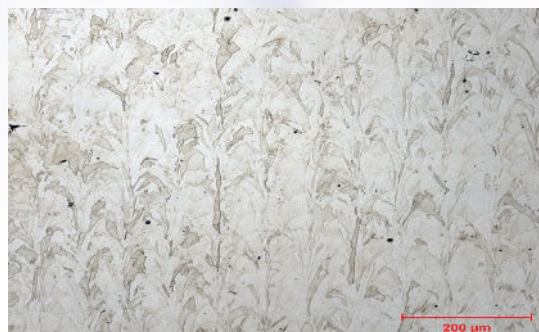
⁷ Specimens were stress-relieved at 650°C for 4 hours in inert atmosphere

⁸ Tested at sub-ambient temperature to ASTM E23

Microstructures



As-built



Stress relieved

Generic Data⁹

Thermal and Electrical Properties

	Results
Thermal conductivity (W/mk) at 20°C	15
Electrical Resistivity (Ωm) [x10 ⁻⁶]	0.74
Melting Range (°C)	1370-1400
Coefficient of thermal expansion (1/°C) [x10 ⁻⁶] at RT to 200°C	17.2

⁹ Based on the literature data

Chemical Composition¹⁰

Element	Fe	Cr	Ni	Mo	Mn	Si	P	S	C	O
Weight (%)	Balance	17.0-18.0	11.0-12.0	2.0-2.5	1.0-2.0	0.2-1.0	≤0.02	≤0.01	≤0.03	≤0.10

¹⁰ Based on the manufacturer material datasheet

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