

MATERIAL DATA SHEET

420 Stainless Steel

The alloy chemical composition complies with AISI 420, UNS S42000, and X20Cr13 standards.

General Material and Process Specification

Grade 420 stainless steel is martensitic steel. This stainless steel alloy is widely used in tooling, aerospace, marine, nuclear, and defense fields because of its combination of high strength and excellent corrosion resistance.

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 standard spherical 20-53 μm 420 stainless steel powder.



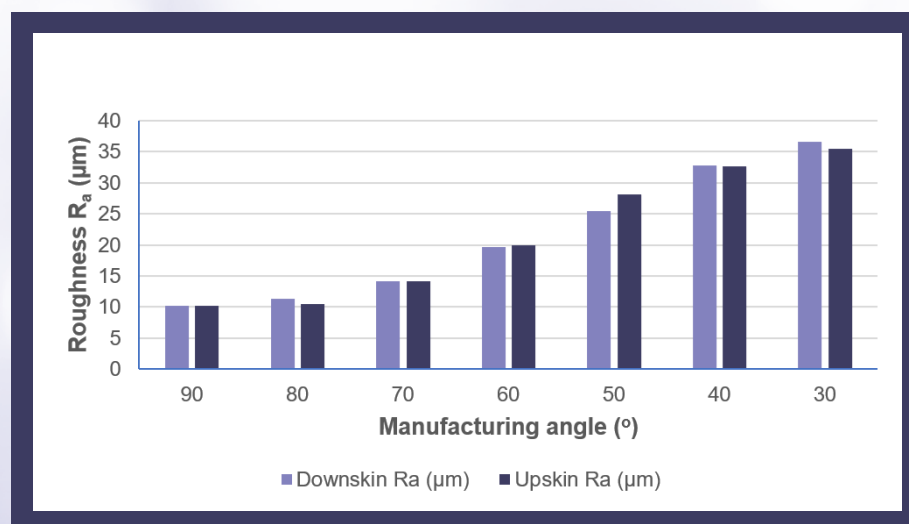
Physical Properties	Results
Density (%) ¹	Typical 99.99
Theoretical density (g/cm ³) ²	7.8

¹ Relative density analysis was carried out using optical microscopy
² Values based on literature

Surface Roughness R_a ^{3,4}	As-printed	Bead blasted
Vertical surface	7 to 10	-

³ Depends on orientation and testing method
⁴ Tested using optical profilometer, cutoff wavelength $\lambda_c=2.5\text{mm}$

Surface Roughness vs Manufacturing Angle



Mechanical Properties ⁵	Test Method	Thermal State		
		Stress relieved ⁶	Heat treated ⁷	Heat treated ⁸
Tensile strength (MPa)	ISO 6892-1			
Vertical direction (Z)		1063±6	1742±73	1038±68
Yield strength (MPa)	ISO 6892-1			
Vertical direction (Z)		843±5	1425±10	825±44
Elongation at failure (%)	ISO 6892-1			
Vertical direction (Z)		13±1	3±2	15±1
Rockwell hardness (HRC)	ISO 6508-1			
Vertical direction (Z)		34	44	32

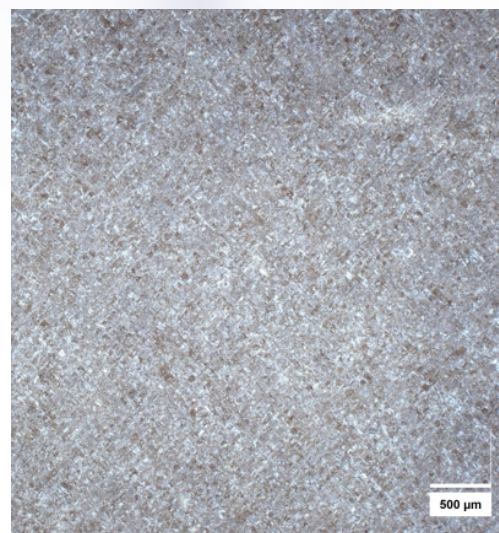
⁵ Tested at ambient temperature to ISO 6508-1, machined before testing

⁶ Specimens were stress-relieved at 650 °C for 4 h

⁷ Specimens were solutionized at 1020 °C for 1 h then tempered at 550 °C for 2 h in air

⁸ Specimens were solutionized at 1020 °C for 1 h then tempered at 600 °C for 2 h in air

Microstructure



Stress relieved

Generic Data⁹

Thermal and Electrical Properties	Results
Thermal conductivity (W/mk) at 100°C	25
Electrical conductivity (S/m) [x10⁵]	14.7
Melting range (°C)	1450-1510
Coefficient of thermal expansion (1/k)	1.03x10 ⁻⁵

⁹ Based on the literature data

Chemical Composition¹⁰

Element	Fe	Cr	C	Si	Mn	Ni	Mo	W	Co	V
Weight (%)	Balance	13.4	0.37	0.49	0.27	0.112	0.03	0.035	0.012	0.082

¹⁰ Based on the manufacturer material datasheet

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