

Material Data Sheet

420 Stainless Steel

Printer Process Specifications

Material	420 Stainless Steel (AISI 420; S42000)
Layer Thickness (µm)	30
Laser Power (W)	100
Additive Manufacturing System	XM200C
Print Parameters	420-C-30-210810

Material Description

Grade 420 stainless steel has a high-carbon content and minimum chromium content (12%). Once annealed, it is ductile and once polished, ground, or hardened it has excellent corrosion resistance. Notably, it has the highest hardness of all other stainless steel grades that also have 12% chromium. For martensitic steels, it has a moderately high electrical conductivity.

Material Properties

- High hardness
- Good ductility (annealed)
- Excellent corrosion resistance (polished)
- Must be used below 800 °F (427 °C)

Applications

- Cutlery
- Dental/surgical instruments
- Needle valves
- Shear blades

General Wrought Material Data ⁽¹⁾

Density [g/cc]	7.75
Thermal Conductivity [W/m*K]	24.9
Melting Range [°C]	1450 - 1510
Coefficient of Thermal Expansion (0 to 100 °C) [K ⁻¹]	1.03x10 ⁻⁵

⁽¹⁾ From AZO Materials

Chemical Composition ⁽²⁾

Element	Mass %
Fe	Balance
Cr	12%
C	0.15%
Mn	1%
P	0.04%
S	0.03%
Si	1%
Cr	12 - 14%

⁽²⁾ From AK Steel

Heat Treatment

Testing samples were precipitation hardened at 800 °C for 2 hours and air cooled.

Mechanical Properties

	Mean Value	Standard Deviation
Component Density [g/cc]	7.74	--
Percentage of Theoretical density	99.9%	--
Ultimate Tensile Strength (UTS) - ASTM E8		
Horizontal (XY) [ksi (MPa)]	118.8 (820)	1.8 (12.4)
Vertical (Z) [ksi (MPa)]	96.7 (667)	3.3 (22.4)
Yield Strength - ASTM E8		
Horizontal (XY) [ksi (MPa)]	69.1 (447)	1.1 (7.58)
Vertical (Z) [ksi (MPa)]	63.8 (440)	2.0 (13.8)
Elongation at Break - ASTM E8		
Horizontal (XY)	14.1	1.95
Vertical (Z)	6.33	0.58
Hardness (Rockwell) - ASTM E18	97.5	0.76



Powder Particle Size Distribution ⁽³⁾

Per ASTM B822 (Using Microtrac)	Min	Max
-16	0	4
d10 (microns)	10	25
d50 (microns)	20	40
d90 (microns)	35	50

⁽³⁾ From Praxair Surface Technologies

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