

## 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 <sup>(1)</sup>

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 <sup>-1</sup> ]	1.03x10 <sup>-5</sup>

<sup>(1)</sup> From AZO Materials

## Chemical Composition <sup>(2)</sup>

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

<sup>(2)</sup> 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
<b>Component Density [g/cc]</b>	7.74	--
<b>Percentage of Theoretical density</b>	99.9%	--
<b>Ultimate Tensile Strength (UTS) - ASTM E8</b>		
Horizontal (XY) [ksi (MPa)]	118.8 (820)	1.8 (12.4)
Vertical (Z) [ksi (MPa)]	96.7 (667)	3.3 (22.4)
<b>Yield Strength - ASTM E8</b>		
Horizontal (XY) [ksi (MPa)]	69.1 (447)	1.1 (7.58)
Vertical (Z) [ksi (MPa)]	63.8 (440)	2.0 (13.8)
<b>Elongation at Break - ASTM E8</b>		
Horizontal (XY)	14.1	1.95
Vertical (Z)	6.33	0.58
<b>Hardness (Rockwell) - ASTM E18</b>	97.5	0.76



### **Powder Particle Size Distribution** <sup>(3)</sup>

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

<sup>(3)</sup> From Praxair Surface Technologies

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