

Description

Stainless Steel Grade 420/1.4021 is a high-carbon martensitic stainless steel known for its high hardness and excellent corrosion resistance. It is often used in applications requiring a combination of high strength and moderate corrosion resistance. Grade 420 can be hardened through heat treatment to achieve a range of hardness levels and mechanical properties, making it versatile for various industrial uses.

Chemical Composition

- Chromium (Cr): 12.0 - 14.0%
 - Carbon (C): 0.15 - 0.40%
 - Manganese (Mn): $\leq 1.0\%$
 - Silicon (Si): $\leq 1.0\%$
 - Phosphorus (P): $\leq 0.04\%$
 - Sulfur (S): $\leq 0.03\%$
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Mechanical Properties

- Tensile Strength: 655 - 980 MPa
 - Yield Strength: 345 MPa (minimum)
 - Elongation: 20% (in 50 mm)
 - Hardness (Rockwell C): 50 (annealed) to 60 (hardened)
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Thermal & Physical Properties

- Density: 7.74 g/cm³
 - Melting Range: 1450 - 1510 °C
 - Thermal Conductivity: 24.9 W/m·K (at 100°C)
 - Specific Heat Capacity: 460 J/kg·K (at 25°C)
 - Electrical Resistivity: 0.55 $\mu\Omega\cdot\text{m}$ (at 20°C)
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Other Designations

- UNS: S42000
 - ASTM: A276, A580
 - DIN: 1.4021
 - EN: X20Cr13
 - JIS: SUS 420J1
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Fabrication and Heat Treatment

- Forming: Stainless steel 420/1.4021 can be formed using conventional methods, but requires more force than other stainless steels due to its higher strength and hardness.
 - Welding: This grade is not recommended for welding as it can be difficult to weld and may require preheating and post-weld heat treatment to prevent cracking.
 - Heat Treatment:
 - Annealing: Heat to 840-900°C, then cool slowly in the furnace to improve ductility and machinability.
 - Hardening: Heat to 980-1035°C, then quench in oil or air for maximum hardness.
 - Tempering: Heat to 150-370°C to reduce brittleness while maintaining hardness.
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Applications

- Cutlery: High hardness and sharpness retention make it ideal for knives and blades.
 - Surgical Instruments: Used in medical tools requiring high strength and corrosion resistance.
 - Industrial Blades: Suitable for various industrial cutting tools.
 - Valves and Pumps: Used in components exposed to water and other corrosive environments.
 - Gears and Bearings: Employed where high wear resistance and strength are essential.
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Supplied Forms

- Bars
 - Coils
 - Wires
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Features

- High Hardness: Achievable through heat treatment, making it suitable for cutting and wear-resistant applications.
- Good Corrosion Resistance: Offers resistance to mild corrosive environments, although not as high as austenitic grades.
- Excellent Wear Resistance: Suitable for applications with high friction and wear.
- Versatile Heat Treatment: Can be annealed or hardened to achieve desired mechanical properties.
- Magnetic Properties: 420 stainless steel is magnetic in all conditions.

