

## Description

Stainless Steel Grade 416/1.4005 is a martensitic stainless steel known for its free-machining properties due to the addition of sulfur. It offers high machinability and can be hardened through heat treatment, making it suitable for various industrial applications. 416 stainless steel exhibits good corrosion resistance, especially in mild corrosive environments, and provides excellent wear resistance.

## Chemical Composition

- Carbon (C): 0.15% max
- Chromium (Cr): 12.0 - 14.0%
- Manganese (Mn): 1.25% max
- Silicon (Si): 1.00% max
- Phosphorus (P): 0.060% max
- Sulfur (S): 0.15% min
- Nickel (Ni): 0.75% max
- Iron (Fe): Balance

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## Mechanical Properties

- Tensile Strength: 540 - 790 MPa
- Yield Strength: 275 MPa min
- Elongation at Break: 20% min
- Hardness: 262 HB max (annealed)

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## Thermal & Physical Properties

- Density: 7.74 g/cm<sup>3</sup>
  - Melting Point: 1480°C (2696°F)
  - Thermal Conductivity: 24.9 W/m·K at 100°C
  - Specific Heat Capacity: 0.460 J/g·K at 20°C
  - Electrical Resistivity: 570 nΩ·m at 20°C
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## Other Designations

- DIN Number: 1.4005
  - UNS: S41600
  - AISI: 416
  - EN: X12CrS13
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## Fabrication and Heat Treatment

- Machinability: Excellent machinability due to sulfur addition; ideal for high-speed machining operations.
  - Welding: Not typically recommended for welding due to sulfur content. If welding is necessary, preheat and post-weld heat treatment are required to minimize cracking.
  - Heat Treatment:
    - Annealing: Heat to 815-900°C, followed by slow furnace cooling.
    - Hardening: Heat to 950-1020°C, then quench in oil or air.
    - Tempering: Heat to 205-370°C, then air cool.
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## Applications

- Automotive: Valve components, shafts, and fasteners.
  - Industrial: Gears, pump shafts, and bolts.
  - Aerospace: Various machined components.
  - Food Processing: Knife blades and other cutting tools.
  - Home Appliances: Screws, nuts, and other hardware components.
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## Supplied Forms

- Bars: Round, square, hexagonal, and flat bars.
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## Features

- Free-Machining: High sulfur content enhances machinability.
- Corrosion Resistance: Good resistance in mild corrosive environments.
- Wear Resistance: Suitable for applications requiring high wear resistance.
- Hardening: Can be hardened through heat treatment for increased strength and hardness.
- Magnetic: Magnetic in all conditions.

