

## Description

Stainless Steel Grade 82 (DIN 1.4005) is a free-machining martensitic stainless steel known for its excellent machinability and moderate corrosion resistance. It is primarily used where extensive machining is required, making it an ideal choice for manufacturing precision components in high volumes. The addition of sulfur enhances its machinability but reduces its corrosion resistance compared to other martensitic stainless steels. Grade 82 is often chosen for parts that require both strength and machinability, such as fasteners, shafts, and valves.

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## Chemical Composition

- Carbon (C): 0.12 - 0.17%
  - Chromium (Cr): 12.00 - 14.00%
  - Manganese (Mn):  $\leq 1.50\%$
  - Silicon (Si):  $\leq 1.00\%$
  - Sulfur (S): 0.15 - 0.35%
  - Phosphorus (P):  $\leq 0.040\%$
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## Mechanical Properties

- Tensile Strength: 650 - 850 MPa
  - Yield Strength: 400 - 600 MPa
  - Elongation at Break: 15% (min)
  - Hardness: 200 - 260 HB (Brinell)
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## Thermal & Physical Properties

- Density: 7.75 g/cm<sup>3</sup>
- Melting Point: 1,400 - 1,460°C
- Thermal Conductivity: 25.0 W/m·K at 20°C
- Coefficient of Thermal Expansion: 10.2  $\mu\text{m}/\text{m}\cdot\text{K}$  at 20°C
- Specific Heat: 460 J/kg·K at 20°C

- Electrical Resistivity: 0.60  $\mu\Omega\cdot\text{m}$  at 20°C
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## Other Designations

- UNS: S41600
  - ASTM: A582
  - JIS: SUS416
  - BS: 416S21
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## Fabrication and Heat Treatment

- Machinability: Grade 82 is highly machinable due to the presence of sulfur, which acts as a chip breaker, allowing for faster machining speeds and longer tool life.
  - Welding: Not recommended due to the high sulfur content, which can lead to hot cracking.
  - Heat Treatment:
    - Annealing: Heat to 815 - 900°C, followed by slow furnace cooling to relieve internal stresses.
    - Hardening: Heat to 950 - 1,030°C and quench in oil or air. Temper at 150 - 370°C for enhanced mechanical properties.
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## Applications

- Automotive Industry: Used in parts like valve components, fasteners, and shafts where high machinability is critical.
  - Aerospace: Suitable for manufacturing small precision parts requiring high strength and good corrosion resistance.
  - General Engineering: Ideal for creating bushings, fittings, and screws where a combination of machinability and moderate corrosion resistance is needed.
  - Industrial Equipment: Used in the production of pumps, valves, and other components subjected to moderate corrosion and mechanical stress.
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## Supplied Forms

- Bars
  - Rods
  - Wires
  - Coils
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## Features

- Superior Machinability: Grade 82 is one of the most machinable stainless steels, making it ideal for high-speed machining operations.
- Moderate Corrosion Resistance: Provides adequate corrosion resistance for use in non-severe environments.
- Good Mechanical Properties: Offers a balanced combination of tensile strength and hardness, making it suitable for various engineering applications.
- Cost-Effective: Its machinability reduces manufacturing costs, especially in mass production.

