

Description

Stainless Steel Grade 415M/1.4005 is a martensitic stainless steel known for its high strength and hardness. It is particularly suitable for applications where high mechanical properties and moderate corrosion resistance are required. This grade is often used in demanding environments where durability and strength are essential.

Chemical Composition

- Chromium (Cr): 12.0 - 14.0%
- Nickel (Ni): $\leq 0.60\%$
- Carbon (C): 0.35 - 0.45%
- Manganese (Mn): 0.60 - 1.00%
- Silicon (Si): $\leq 1.00\%$
- Phosphorus (P): $\leq 0.040\%$
- Sulfur (S): $\leq 0.030\%$

DIN Number: 1.4005

Mechanical Properties

- Tensile Strength: 800 - 950 MPa
 - Yield Strength: 600 - 850 MPa
 - Elongation: 10 - 15% in 50 mm
 - Hardness: 210 - 250 HB
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Thermal & Physical Properties

- Density: 7.70 g/cm³
- Thermal Conductivity: 25.4 W/m·K
- Specific Heat Capacity: 500 J/kg·K
- Melting Point: Approx. 1450°C

- Thermal Expansion: $11.5 \times 10^{-6} / ^\circ\text{C}$ (20-100°C)
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Other Designations

- ASTM: A314
 - AISI: 415
 - UNS: S41500
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Fabrication and Heat Treatment

- Machinability: Good machinability in the hardened and tempered condition.
 - Welding: Not recommended due to the risk of cracking; if necessary, preheat and post-weld heat treatment are required.
 - Heat Treatment:
 - Annealing: Heat to 850 - 1050°C, followed by cooling in air or water.
 - Hardening: Heat to 980 - 1040°C, quench in water or oil, then temper at 150 - 250°C as required.
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Application

- Automotive: Engine components, gear shafts, and valve components.
 - Oil & Gas: Pump shafts, valve bodies, and high-stress components.
 - Industrial Machinery: Components requiring high strength and hardness, such as bearings and shafts.
 - Marine: Components exposed to harsh marine environments with moderate corrosion resistance needs.
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Supplied Forms

- Bars
- Rounds
- Forgings

Features

- High Strength: Offers excellent tensile and yield strength, making it suitable for high-load applications.
- Good Hardness: Provides good hardness after heat treatment, enhancing wear resistance.
- Moderate Corrosion Resistance: Suitable for environments where moderate corrosion resistance is required.
- Fabrication Friendly: Can be machined and formed effectively in the hardened state.

