Description

Stainless Steel Grade 409Nb/1.4512 (also known as UNS S40920) is a ferritic stainless steel that contains niobium, which enhances its corrosion resistance, mechanical properties, and weldability. This grade is particularly well-suited for automotive applications, such as exhaust systems, where high temperature oxidation resistance and moderate corrosion resistance are required.

Chemical Composition

- Chromium (Cr): 10.5 - 11.7%
- Nickel (Ni): ≤ 0.5%
- Manganese (Mn): ≤ 1.0%
- Silicon (Si): ≤ 1.0%
- Carbon (C): ≤ 0.03%
- Phosphorus (P): ≤ 0.040%
- Sulfur (S): ≤ 0.020%
- Nitrogen (N): ≤ 0.030%
- Niobium (Nb): 0.17 - 0.45%
- Iron (Fe): Balance

Mechanical Properties

- Tensile Strength: 380 - 450 MPa
- Yield Strength: 200 - 280 MPa
- Elongation: 20 - 30%
- Hardness: ≤ 200 HB

Thermal & Physical Properties

- Density: 7.75 g/cm³
- Thermal Conductivity: 24.2 W/m·K (at 100°C)

- Specific Heat: 460 J/kg·K (at 20°C)
- Coefficient of Thermal Expansion: 10.5 µm/m·K (at 20-100°C)
- Electrical Resistivity: 0.60 µΩ·m (at 20°C)

Other Designations

- UNS: S40920
- EN: 1.4512
- ASTM: 409

Fabrication and Heat Treatment

- Welding: 409Nb/1.4512 stainless steel is weldable using most standard welding techniques. Post-weld annealing is recommended to maintain corrosion resistance and mechanical properties.
- Forming: This grade can be formed using conventional techniques. However, care should be taken to avoid cracking.
- Heat Treatment: Annealing should be performed at 790-900°C followed by air cooling.

Applications

- Automotive: Exhaust systems, catalytic converters, mufflers, tailpipes.
- Industrial: Heat exchangers, agricultural equipment, construction materials.
- Home Appliances: Kitchen equipment, water heaters, furnace components.
- Miscellaneous: Structural applications requiring moderate corrosion resistance and high temperature strength.

Supplied Forms

- Bars
- Coils
- Pipes

Features

- Enhanced Corrosion Resistance: The addition of niobium improves the corrosion resistance compared to standard 409 stainless steel.
- Good Oxidation Resistance: Suitable for high-temperature applications up to 675°C.
- Improved Weldability: Niobium addition helps in reducing grain growth and improving weld quality.
- High Strength: Good mechanical properties for structural applications.
- Cost-Effective: Lower cost compared to higher alloyed stainless steels while still providing good performance.