Description

Stainless Steel Grade 925/1.4418 is a martensitic stainless steel that is designed for applications requiring high strength, hardness, and wear resistance. This grade is particularly known for its good machinability and excellent response to heat treatment, making it a versatile choice for a wide range of industrial applications. The alloy is commonly used in the manufacturing of precision components and is favored in industries such as aerospace, automotive, and heavy machinery.

DIN Number: 1.4418 (approximate match for martensitic stainless steels with similar properties)

Chemical Composition

- Carbon (C): 0.08 - 0.15%
- Chromium (Cr): 15.0 - 17.0%
- Nickel (Ni): 3.0 - 5.0%
- Manganese (Mn): ≤ 1.00%
- Silicon (Si): ≤ 1.00%
- Molybdenum (Mo): 1.5 - 2.5%
- Sulfur (S): ≤ 0.030%
- Phosphorus (P): ≤ 0.040%
- Iron (Fe): Balance

Mechanical Properties

- Tensile Strength: 700 - 900 MPa
- Yield Strength: ≥ 450 MPa
- Elongation at Break: ≥ 15%
- Hardness (Brinell): 250 - 300 HB

Thermal & Physical Properties

- Density: 7.75 g/cm³
- Thermal Conductivity: 16.2 W/m·K (at 20°C)
- Specific Heat Capacity: 460 J/kg·K (at 20°C)
- Electrical Resistivity: 0.70 µΩ·m (at 20°C)
- Coefficient of Thermal Expansion: 10.0 µm/m·K (at 20°C)

Other Designations

- ASTM A276 (for similar martensitic stainless steel bars)
- UNS S92500 (approximate equivalent for specialized martensitic grades)
- AFNOR Z10CND17-05-01
- BS 970 431S29

Fabrication and Heat Treatment

Fabrication:

- Machinability: Stainless Steel Grade 925 offers good machinability, especially in the annealed or normalized condition.
- Weldability: This grade is not typically recommended for welding due to the potential for cracking, though welding can be performed with preheating and post-weld heat treatment.
- Cold Working: Not commonly performed on this grade, as it may lead to brittleness.

Heat Treatment:

- Annealing: Heat to 780-850°C, followed by slow cooling.
- Hardening: Heat to 950-1050°C and quench in oil or air, followed by tempering at 150-300°C for the desired hardness.
- Tempering: Tempering is required after hardening to relieve stresses and achieve the desired mechanical properties.

Applications

- Aerospace Components: Used for manufacturing parts that require high strength and corrosion resistance.
- Automotive Parts: Suitable for high-performance components such as shafts and gears.
- Heavy Machinery: Ideal for components that are subject to wear and stress, like bearings and valves.
- Oil & Gas Industry: Used in equipment exposed to harsh environments due to its high corrosion resistance and strength.
- Cutlery and Blades: Utilized in manufacturing industrial knives and cutting tools.

Supplied Forms

- Bars (Round, Square, Hexagonal)
- Rods
- Wire
- Billets
- Forged Blocks

Features

- High Strength: Provides excellent tensile strength and toughness, making it ideal for heavy-duty applications.
- Good Machinability: Can be easily machined, particularly in its annealed state.
- Wear Resistance: Exhibits high wear resistance, essential for components subject to friction and abrasion.
- Corrosion Resistance: Offers good resistance to atmospheric corrosion, making it suitable for use in harsh environments.
- Hardness: Capable of achieving high hardness levels through heat treatment, allowing for enhanced performance in critical applications.