Description

Inconel 718/2.4668 (UNS N07718) is a nickel-chromium alloy known for its high strength, corrosion resistance, and excellent mechanical properties at elevated temperatures. It is a precipitation-hardenable superalloy that can maintain its properties in extreme environments, making it ideal for high-temperature applications. This alloy is particularly notable for its ability to withstand creep, fatigue, and oxidation, which makes it a preferred choice in industries such as aerospace, power generation, and oil and gas. The DIN designation for Inconel 718 is 2.4668.

Chemical Composition

- Nickel (Ni): 50.0 - 55.0%
- Chromium (Cr): 17.0 - 21.0%
- Iron (Fe): Balance
- Molybdenum (Mo): 2.8 - 3.3%
- Niobium + Tantalum (Nb+Ta): 4.75 - 5.5%
- Titanium (Ti): 0.65 - 1.15%
- Aluminum (Al): 0.2 - 0.8%
- Cobalt (Co): ≤ 1.0%
- Manganese (Mn): ≤ 0.35%
- Silicon (Si): ≤ 0.35%
- Carbon (C): ≤ 0.08%
- Phosphorus (P): ≤ 0.015%
- Sulfur (S): ≤ 0.015%
- Copper (Cu): ≤ 0.3%
- Boron (B): ≤ 0.006%

Mechanical Properties

- Tensile Strength: 1,275 MPa (min)
- Yield Strength (0.2% offset): 1,035 MPa (min)
- Elongation: 12% (min)

- Hardness: 331 HB (max)
- Creep Rupture Strength: 725 MPa at 650°C

Thermal & Physical Properties

- Density: 8.19 g/cm³
- Melting Range: 1,260 - 1,325°C
- Thermal Conductivity: 11.4 W/m·K at 20°C
- Specific Heat Capacity: 435 J/kg·K at 20°C
- Coefficient of Thermal Expansion: 13.0 x 10^{-6} /°C (20 - 1000°C)
- Electrical Resistivity: 1.29 µΩ·m at 20°C

Other Designations

- DIN: 2.4668
- UNS: N07718
- ASTM: B637, B670
- AMS: 5662, 5663

Fabrication and Heat Treatment

Fabrication:

- Formability: Inconel 718 can be readily formed using conventional techniques.
- Weldability: Exhibits good weldability, suitable for welding by all common methods including TIG, MIG, and resistance welding.
- Machinability: The alloy is difficult to machine, and it requires the use of carbide-tipped tools and low cutting speeds.

Heat Treatment:

- Solution Annealing: Heat to 980°C - 1,050°C and air cool.
- Aging Treatment: Typically aged at 720°C for 8 hours, followed by furnace cooling at 50°C/hour to 620°C, held for 8 hours, and air-cooled.

Applications

- Aerospace: Jet engines, turbine blades, and other components exposed to high temperatures and pressures.
- Power Generation: Gas turbines, steam turbines, and nuclear reactors.
- Oil & Gas: Downhole tools, valves, and other components used in harsh environments.
- Automotive: High-performance engine parts.
- Chemical Processing: Equipment exposed to corrosive environments at elevated temperatures.

Supplied Forms

- Round Bars
- Flat Bars
- Square Bars
- Hexagonal Bars
- Forged Bars

Features

- High Strength: Maintains strength at elevated temperatures up to 700°C.
- Corrosion Resistance: Excellent resistance to oxidation and corrosion, particularly in environments containing acids and corrosive gases.
- Fatigue and Creep Resistance: Exceptional resistance to creep and fatigue, making it ideal for cyclic loading applications.
- Good Weldability: Can be welded using standard welding techniques without the need for post-weld heat treatment.