

Description

Stainless Steel Grade **431/1.4057** is a martensitic stainless steel known for its high chromium content and low carbon levels. It is characterized by excellent corrosion resistance, high tensile strength, and good toughness, making it suitable for various applications, particularly in marine and industrial environments.

Chemical Composition

The typical chemical composition of Grade 431 is as follows:

Element	Composition (%)
Carbon (C)	0.12 - 0.17
Manganese (Mn)	0.3 max
Phosphorus (P)	0.040 max
Sulfur (S)	0.030 max
Silicon (Si)	0.20 - 0.60
Chromium (Cr)	15.50 - 16.50
Nickel (Ni)	2.0 - 3.0

Iron (Fe)	Balance
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Mechanical Properties

The mechanical properties of Grade **431/1.4057** are typically as follows:

Property	Value (Condition T)
Yield Strength (0.2% Proof)	655 MPa
Tensile Strength	862 MPa
Elongation (in 50mm)	20%
Brinell Hardness	260 HB

Thermal & Physical Properties

- Density: 7,750 kg/m³
- Elastic Modulus: 205 GPa
- Thermal Conductivity: 25 W/m·K
- Coefficient of Thermal Expansion: 10.5 µm/m/°C
- Electrical Resistivity: 0.74 nΩ·m at 25°C

Other Designations

- UNS: S43100
- DIN: 1.4057
- AISI: 431

- AFNOR: Z20CN17.2M
- BS: 431S29
- SUS: 431
- EN: X20CrNi 16 2

Fabrication and Heat Treatment

- Heat Treatment:
 - Hardened by heating to 980-1065°C followed by quenching in oil or air.
 - Tempering is typically done at temperatures between 425-600°C to enhance toughness.
 - Full annealing is not recommended as it can lead to loss of mechanical properties.
- Welding:
 - Pre-heating to 200-300°C is recommended before welding.
 - Post-weld heat treatment at 650°C is advised to relieve stresses.
- Machining:
 - Easily machined in the annealed state; however, machining is difficult when hardened.

Applications

Stainless Steel Grade **431/1.4057** is widely used in:

- Marine components
- Pump and propeller shafts
- Aircraft fasteners and fittings
- General industrial parts
- Fasteners such as bolts and nuts

Supplied Form

Grade **431/1.4057** is available in various forms, including:

- Round, square, and flat bars
- Seamless and welded pipes
- Forged bars and flanges
- Hot and cold rolled plates and sheets

Features

- High corrosion resistance compared to other martensitic grades.
- Excellent hardenability, allowing for through-hardening.
- Good toughness and strength, particularly in the hardened and tempered condition.

This datasheet provides a comprehensive overview of Stainless Steel Grade 431, suitable for engineers and designers considering this material for various applications.

