TECHNICAL DATA SHEET

Stainless Steel: 431 Round Bar

Description
Type 431 is a martensitic stainless steel alloy known for its hardenability, providing a blend of high tensile and torsional strength, making it particularly suitable for shaft manufacturing. This alloy is designed for applications demanding robust strength and toughness, along with reasonable corrosion resistance. Its notable resistance to saltwater corrosion renders it widely employed in marine equipment and systems. In its annealed state, Type 431 is easily machined; however, welding presents challenges due to cracking. To enhance welding performance, preheating of the material is recommended.

Alloy Designations
Stainless Steel Grade 1.4016/430 is associated with the following designations, although they may not be direct equivalents:

- UNS S43000
- BS 430S17
- EN60

Supplied Forms
We are suppliers and stockholders of round and flat bars in grade 431. Our offerings include diameters that can be sawn to your specified lengths, whether as one-offs or multiple cut pieces. Additionally, we provide 431 ground stainless steel bars, ensuring the delivery of high-quality precision ground diameter bars with tight tolerances.

Applications
Grade 431 stainless steel finds extensive applications in the aircraft and marine industries, particularly for components like shafts, axles, pumps, valves, bolts, and nuts. It is well-suited for applications that demand a combination of high strength, toughness, and reasonable resistance to corrosion.

Corrosion Resistance
431 stainless steel offers the best corrosion resistance of all martensitic stainless steel grades. Optimum corrosion resistance is achieved when used in the hardened and tempered condition. Allowing oxygen to circulate freely on the surface will form an oxide film which protects the surface. Keeping the surface free of scale and foreign particles improves the corrosion resistance and finished components should be passivated. For best machining and corrosion 431 stainless steel is commonly supplied in the ‘T’ condition.

Heat Resistance
The heat treatment of Grade 431 stainless steel involves various parameters such as heat treatment temperatures, rate of heating, cooling, and soaking times. These factors can vary based on the shape and size of each component. Additionally, considerations for the type of furnace, quenching medium, and workpiece transfer facilities play a role in the heat treatment process. For comprehensive guidance on the heat treatment of 431 stainless steel, it is recommended to consult with your heat treatment provider.

Forging
To heat treat Grade 431 stainless steel, it is advisable to preheat the material carefully. Subsequently, raise the temperature to a range of 1150-1200°C and hold it until the temperature is uniform throughout the steel. During forging, it is important not to forge below 900°C. After the forging process, the material should be cooled slowly either in a furnace or using warm ashes. These steps contribute to the desired heat treatment of Grade 431 stainless steel.

Annealing
For the heat treatment process of Grade 431 stainless steel, it is recommended to heat the material slowly to a temperature range of 650-680°C. Hold the steel at this temperature until it becomes uniform throughout the material. After achieving uniformity, soak the material well at this temperature and allow it to cool in the furnace. These steps contribute to the effective heat treatment of Grade 431 stainless steel.

Harding
The recommended heat treatment process for the component involves the following steps:

- Heat the component gradually to a temperature range of 950-1020°C.
- Hold the component at this temperature until it achieves uniformity throughout the steel.
- After sufficient soaking time, quench the component in oil or allow it to air cool.
- Temper the component as soon as the tools are hand warm.
- Following these steps will contribute to the effective heat treatment of the component, ensuring desirable mechanical properties and performance.

Machinabililty
Grade 431 stainless steel is easily machined when in the annealed state, making it a more manageable material for machining processes.

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Weldability

There is a risk of cracking when working with Grade 431 stainless steel. Therefore, it is advisable to use pre-heating as a precautionary measure to minimize the likelihood of cracking during various processes such as welding.

Chemical Composition

EN 10204 3.1. Bar

Element	% Present
Chromium (Cr)	15.00-18.00
Silicon (Si)	0.0 - 1.00
Manganese (Mn)	0.0 - 1.00
Carbon (C)	0.12-0.20
Phosphorous (P)	0.0 - 0.040
Sulphur (S)	0.0 - 0.030
Nickel	15.00-18.00

Physical Properties

Property	Value
Density	7710 kg / cu m
Youngs Modulus	215 GPa
Thermal Expansion	0.0000106 per Deg C
Modulus of Elasticity	200 GPa
Thermal Conductivity	25 W/m.C
Electrical Resistivity	0.60 x10^{-6} Ω .m

Mechanical Properties

EN 10204 3.1. Bar

Property	Value
Proof Stress	665 Min MPa
Tensile Strength	850 - 1000 MPa
Elongation A50 mm	12 Min %

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Datasheet Update: 17/10/23

Disclaimer

This data serves as an indicative reference and should not be used as a substitute for the full specification. Mechanical properties can vary significantly depending on the temper, product, and its dimensions. All the information provided is based on our current knowledge and is given in good faith. The company bears no responsibility for any actions taken by third parties based on this information.

Please be aware that the 'Datasheet Update' date mentioned above does not guarantee accuracy or whether the datasheet is up to date. The information in this datasheet has been compiled from various reliable sources, including EN Standards, well-established industry references (both printed and online), and data from manufacturers. However, we cannot guarantee that the information is the latest available or that these sources are completely accurate.

While the material supplied by the company may vary from the data presented here, it will conform to all relevant and applicable standards.

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Contact

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