SS 431, Type 431, WNR 1.4057, UNS S43100, AISI 431, Grade 431, AFNOR Z20CN17.2M

Introduction :

Stainless Steel 431 is a martensitic stainless steel it is a heat-treatable grades with excellent corrosion resistance, high toughness, torque strength, and tensile properties. Its properties make them ideal for bolt and shaft applications. Grade 431 steels, are suitable for operations such as spinning, deep drawing, bending or cold heading. Hence it cannot be cold-worked owing to their high yield strength. Hardening and tempering treatments and poor weldability techniques are generally carried out for the fabrication of martensitic steels. Grade 431 steels corrosion resistance properties are lower than that of austenitic grades. By the loss of strength at high temperatures, the operations of grade 431 are limited, due to over-tempering, and loss of ductility at negative temperatures. It is less resistant to tropical water when compared to that of grade 316 steels, but it has considerable resistance to salt water. It has overall corrosion resistance similar to, or slightly lower than, that of grade 304 steels. 431 stainless steel, with a smooth surface finish performs well in tempered and hardened conditions. Grade 431 stainless steel, in intermittent conditions, and 870°C during continuous operations are resistant to scaling at temperatures of 925°C. This grade gets hardened even during slow cooling & full annealing cannot be performed on grade 431 steels.

Chemical Composition

	SS 431	TYPE 431	WNR 1.4057	UNS S43100	AISI 431	GRADE 431	AFNOR Z20CN 17.2M
Carbon	0.20 max	0.20 max	0.20 max	0.20 max	0.20 max	0.20 max	0.20 max
Manganese	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Phosphorus	0.04 max	0.04 max	0.04 max	0.04 max	0.04 max	0.04 max	0.04 max
Sulfur	0.03 max	0.03 max	0.03 max	0.03 max	0.03 max	0.03 max	0.03 max
Silicon	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Chromium	15.0-18.0	15.0-18.0	15.0-18.0	15.0-18.0	15.0-18.0	15.0-18.0	15.0-18.0
Nickel	1.25-3.00	1.25-3.00	1.25-3.00	1.25-3.00	1.25-3.00	1.25-3.00	1.25-3.00

Mechanical Properties

	SS 431	TYPE 431	WNR 1.4057	UNS S43100	AISI 431	GRADE 431	AFNOR Z20CN 17.2M
Tensile Strength, Mpa	940	940	940	940	940	940	940
0.2% Yield Strength, Mpa	750	750	750	750	750	750	750
Elongation in 2" in 50mm%	19	19	19	19	19	20 min	20 min

Standard Available in forms :

- ASTM A182/ ASME SA182 Stainlees Steel Pipe Fittings
- ASTM A213 / ASME SA213 Seamless Stainless Steel Pipes
- ASTM A240/ ASME SA240 Stainless Steels Sheets / Plates
- ASTM A249/ ASME SA249 Stainless Steel Welded Tubes
- ASTM A269/ ASME SA269 Stainless Steel Tubes
- ASTM A270/ ASME SA270 Stainless Steel Sanitary Tubes
- ASTM A312/ ASME SA312 Stainless Steel Pipes
- ASTM A403/ ASME SA403 Stainless Steel Pipe Fittings
- ASTM A554/ ASME SA554 Stainless Steel Welded Tubes
- ASTM A731/ ASME SA731 Stainless Steel Pipes
- ASTM A789/ ASME SA789 Stainless Steel Tubes
- ASTM A790/ ASME SA790 Stainless Steel Pipes
- ASTM A791/ ASME SA791 Stainless Steel Tubes

Products Available in forms :

- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Plates
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Pipes
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Round Bar
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Tube
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Flanges
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Wire
- SS 431,Type 431, WNR 1.4057, UNS S43100, AISI 431 Fittings

Corrosion Resistance

- Grade 431 stainless steels have considerable resistance to salt water, but they are less resistant to tropical water when compared to that of grade 316 steels.
- Grade 431 steels have overall corrosion resistance similar to, or slightly lower than, that of grade 304 steels.
- Grade 431 steels with a smooth surface finish perform well in tempered and hardened conditions.

Heat Resistance

- Grade 431 steels are resistant to scaling at temperatures of 925°C in intermittent conditions, and 870°C during continuous operations.
- In general, these steels are not to be used at temperatures above standard tempering temperatures, owing to loss of mechanical properties.

Heat Treatment

Full anneal —

- Full annealing cannot be performed on grade 431 steels.
- This grade gets hardened even during slow cooling.

Process anneal —

- Grade 431 steels are heated to 620 to 660°C and then air-cooled.
- Grade 431 steels are generally hardened by heating at temperatures from 980 to 1065°C, holding for nearly ½ h, followed by oil or air quenching.
- Complex or hardened parts of grade 431 steels can be pre-heated to temperatures from 760 to 790°C and tempered, to improve their mechanical properties.
- Tempering of these steels at 425 to 600°C should be avoided, owing to the loss of impact toughness at this temperature range.

Welding

- Welding of grade 431 stainless steels is difficult due to the chances of cracking.
- It is recommended to pre-heat the materials to 200 - 300°C before welding, and carry out post-weld heat treatment at 650°C.
- Welding can be performed using grade 410 filler rods, but ductile welds can be achieved using grades 308L, 309 or 310 steels.

Machining

- Grade 431 steels can be easily machined in their annealed state.
- However, it is extremely difficult to machine these steels if they are hardened above 30HRC.

Applications

- Laboratory equipment
- Marine systems
- Beater bars
- Pump and propeller shafts
- Nuts and bolts

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