



E STEEL SDN BHD (891338-A)

NO 3, Lorong Sungai Puloh 7/KU 6,
Kawasan Perindustrian Sungai Puloh, 42100 Selangor D.E
Tel : 03-3292 8686 / 32928666 / 32928777
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Stainless Steel – Grade 431, UNS S43100, 1.4057, SUS431

Chemical Formula

Fe, <0.20% C, 15-17% Cr, 1.25-2.50% Ni, <1.00% Mn, <1% Si, <0.040% P, <0.03% S

Background

This heat treatable martensitic, nickel-bearing grade has the best corrosion resistance properties of all the martensitic grades. It has excellent tensile and torque strength, and good toughness, making it ideally suited to shafting and bolt applications. It can be hardened to approximately 40HRC. Because of its high yield strength, this grade is not readily cold worked and is therefore not recommended for use in operations such as cold heading, bending, deep drawing or spinning.

Martensitic stainless steels are optimised for high hardness, and other properties are to some degree compromised. Fabrication must be by methods that allow for poor weldability and usually also allow for a final harden and temper heat treatment. Corrosion resistance is lower than the common austenitic grades, and their useful operating temperature range is limited by their loss of ductility at sub-zero temperatures and loss of strength by over-tempering at elevated temperatures.

Mechanical Properties.

Tempering Temperature (°C)	Tensile Strength (MPa)	Yield Strength 0.2% Proof (MPa)	Elongation (% in 50mm)	Hardness Brinell (HB)	Impact Charpy V (J)
Annealed *	862	655	20	285 max	-
204	1345	1055	20	388	50
316	1295	1035	19	375	53
427	1350	1080	19	388	#
538	1140	965	19	321	#
593	1015	770	20	293	64
650	960	695	20	277	84

SS431 is frequently stocked and supplied in "Condition T", with specified tensile strength of 850 - 1000MPa.

* Annealed tensile properties are typical for Condition A of ASTM A276; annealed hardness is the specified maximum. SS431 is only rarely stocked in annealed Condition A.

Due to associated low impact resistance this steel should not be tempered in the range 425-600°C



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Grade Specification Comparison

Grade	UNS No	Old British BS	En	Euronorm No	Name	Swedis h SS	Japanes e JIS
SS431	S43100	431S29	57	1.4057	X17CrNi16-2	2321	SUS 431

These comparisons are approximate only. The list is intended as a comparison of functionally similar materials **not** as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted.

Possible Alternative Grades

Grade	Why it might be chosen instead of 431
SS410	Only a lower hardened strength is needed.
SS416	High machinability is required, and the lower hardened strength and lower corrosion resistance of 416 is acceptable.
SUS 440C	A higher hardened strength or hardness than can be obtained from 420 is needed.

Corrosion Resistance

Excellent resistance to a wide variety of corrosive media. Reasonable resistance to salt water in cold southern waters but less resistant than SUS316 in tropical waters. Overall the corrosion resistance of SUS431 is approximately the same as or slightly below that of SUS304.

Performance is best with a smooth surface finish, in the hardened and tempered condition.

Heat Resistance

Resists scaling in intermittent service to 925°C and in continuous service to 870°C, but is generally not recommended for use in temperatures above the relevant tempering temperature, because of reduction in mechanical properties.



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Heat Treatment

Full anneal - not practical for this grade - it hardens even when cooled slowly.

Process Anneal - heat to 620-660°C and air cool.

Hardened by heating to 980-1065°C, holding for about 1/2 hour then quenching in air or oil. Pre-heating at 760-790°C may be useful for complex parts or those already hardened. Temper to suit mechanical requirements, at temperatures as indicated in the accompanying table.

The tempering range 425-600°C should be avoided due to reduced impact toughness, although the effect is less marked than in most other martensitic grades.

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Applications

Typical applications include:

- Nuts and bolts
- Propeller shafting
- Pump shafts
- Beater bars
- Marine hardware
- Laboratory benches & equipment