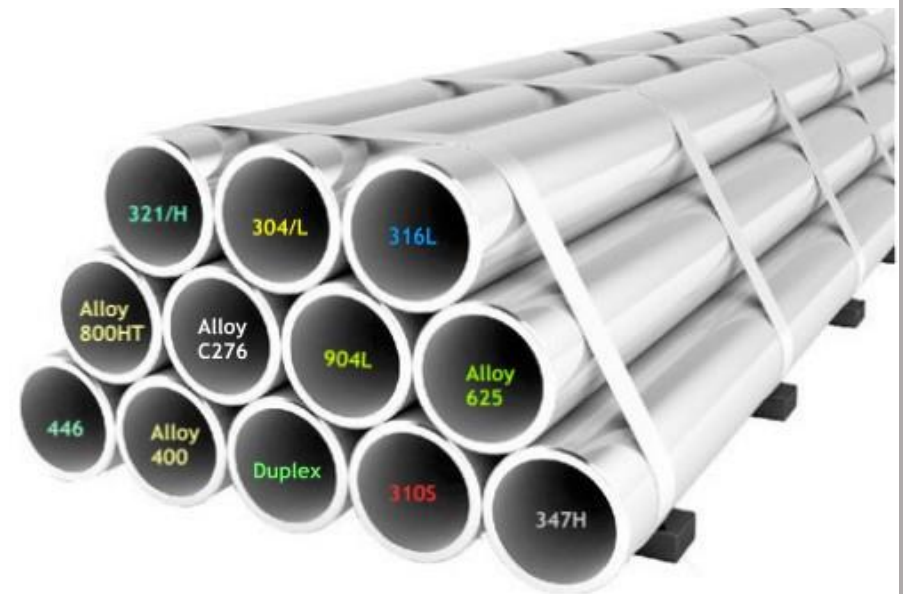


310/310S STAINLESS STEEL

Datasheet for Stainless Steel 310/310S

- Pipes & Tubes
- Sheets & Plates
- Bars & Rods, Forgings
- Fittings & Flanges
- Nuts & Bolts
- Valves



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Datasheet for Stainless Steel 310/310S

UNS S31000 (1.4841), UNS S31008 (1.4845)

What is 310/310S Stainless Steel?

- Alloy 310 (UNS S31000) is an austenitic stainless steel developed for use in **high temperature corrosion resistant applications**. The alloy resists oxidation up to 2010°F (1100°C) under mildly cyclic conditions. Because of its high chromium and moderate nickel content, Alloy 310 is resistant to sulfidation and can also be used in moderately carburizing atmospheres.
- The more severe carburizing atmospheres of thermal process equipment usually require nickel alloys such as 330 (UNS N08330). Alloy 310 can be utilized in slightly oxidizing, nitriding, cementing and thermal cycling applications, albeit, the maximum service temperature must be reduced. Alloy 310 also finds usage in cryogenic applications with low magnetic permeability and toughness down to -450°F (-268°C). When heated between 1202–1742°F (650–950°C) the alloy is subject to sigma phase precipitation. A solution annealing treatment at 2012–2102°F (1100–1150°C). Grade 310 (UNS S31000) and its various subgrades combine excellent high temperature properties with good ductility and weldability.
- Grade 310S (UNS S31008) is used when the application environment involves moist corrodents in a temperature range lower than that which is normally considered "high temperature" service. The lower carbon content of 310S does reduce its high temperature strength compared to 310H. 310S (UNS S31008) is the low carbon version of the alloy. It is utilized for ease of fabrication. 310H (UNS S31009) is a high carbon modification developed for enhanced creep resistance.

Stainless Steel 310/310S Products & Manufacturing Standards

Type	Sizes	Schedules	ASTM Standards
Bar	1/2" thru 6"		A276, A479
Butt Weld Fittings	1/2" thru 12"	Sch 10, 40, 80, 160 & XXH	A403
Forgings			A182
Pipe Welded & Seamless	1/4" thru 16"	Sch 10, 40, 80, 160 & XXH	A312
Tube, Welded			A249
Tube, Seamless			A213

Plate			A240
Flange & Pressure Fittings	1/2" to 60"	Sch 10, 40, 80, 160 & XXH	A182

What is the Difference Between Stainless Steel 310 and 310S?

Both types 310 Stainless Steel and 310S are typically used for elevated temperature applications.

- **Stainless Steel 310S** was designed to be the low carbon version of **SS 310**. 310S has many of the same characteristics and applications as 310, such as the ability to withstand high temperatures, resistance to oxidation and corrosion, and machinability similar to that of Type 304.
- Composed of 20% nickel and 25% chromium, 310S is efficient in reducing environments such as those that contain sulfur. Combined with its low carbon content, the metal is also effective at resisting embrittlement. **The metal is commonly utilized in extreme conditions, such as furnace manufacturing and heat-treating equipment.** While both hot and work practices can be applied, cold working is not commonly done on Stainless Steel 310S; however, it is the only way to work harden the metal. This resistance to cold temperatures is useful in cryogenic environments, as 310S is incredibly tough. However, it can be subject to thermal shock and therefore should be treated and hot-worked with care.
- In ASTM 310S, The S stands for the special treatment of the **ASTM 310 stainless steel**, mechanical properties superior to ASTM 310 stainless steel, therefore, ASTM 310S stainless steel temperature is higher than the ASTM 310 stainless steel.

310	310S
High Hardness	Low Hardness
Less Corrosion Resistance	Better Corrosion Resistance
High Carbon Content	Low Carbon Content
Less Difficult to Smelt	More Difficult to Smelt
Similar	Similar

Properties and Processing Characteristics of Stainless Steel 310/310S

Alloy 310S, like 309S, is best known for high temperature service. Both alloys work well up to 2000 °F, especially if oxidation resistance is required. 309 and 310S are the premier high temperature performers among the common stainless grades available from our stock. High nickel and chromium content and a coarse grain structure result in:

- Improved resistance to cyclic oxidation
- Increased resistance to sulfidation
- Better high temperature strength
- Improved resistance to inter granular corrosion

310S stainless steel provides superior corrosion resistance properties against carburization, oxidation and other conditions. It is fabricated to offer excellent performance in the elevated temperature conditions on the industrial level that need high resistance to carburization and thermal cycling corrosion. It shows austenitic nature in the whole temperatures and doesn't show embrittlement. The excellent strength and resistance to high temperature oxidation properties are purposeful in the commercial incinerators, kilns and food processing equipments.

Processing Characteristics of 310S Stainless Steel: -

Speaking of the processing characteristics of the 310s stainless steel plate, first of all, we actually need to do this, then the hot processing will be divided into three types: point heating, linear heating, and triangular heating. And the point heating in the 310s stainless steel plate is mainly used to correct the uneven deformation of the sheet. Under normal circumstances, the larger the thickness of the 310s stainless steel plate, the larger the deformation will appear. The more the reinforcement, the larger the diameter, the smaller the distance will appear. For the linear heating of 310s stainless steel plate, there will be three basic forms at this time. The main ones will include linear, curved, and 310s stainless steel plate loop heating. When applying in detail, you should pay attention to the selection as appropriate. When the triangle is heated, it will first be used for the bending deformation of the pay steel beam and structural planning.

The 310s stainless steel plate thermal processing method will also be called flame rectification. In this method, the temperature of the flame is used to heat some of the 310s stainless steel plate, which is why it is cooling. Some new changes have occurred in the fire, and then it is enough to offset the old deformation and reach the purpose of correction.

When the 310s stainless steel plate is subjected to hot working, it is necessary to pay attention to the accurate selection of the heating direction at this time, and the temperature and the cooling time can also obtain a relatively good correction effect to a large extent. The higher the heating temperature, the more robust the 310s hot working correction is, the lower the heating temperature is. Generally speaking, it should be controlled to be between 1200-1600 °C. And when the 310s stainless steel plate

is actually processed, it should be noted that it cannot exceed 1900 ° C, the hot processing method of the 310s stainless steel plate, often using the heating of the gas welding torch. In this case, the thermal processing method is also used for the 310s stainless steel plate planning and some general low alloy steel planning.

Stock & Production Range of Stainless Steel 310/310S Materials

Product	Stainless Steel 310/310S
Equivalents	AISI 310, AISI 310S, UNS S31000, UNS S31008, WNR. 1.4841, 1.4845
Items	Pipe, Tubes, Tubing, Fittings, Flanges, Valves, Fasteners
Size	6mm to 610mm, 1/2" NB to 48" NB
Pipe Type	Seamless, Welded, ERW, Fabricated, Custom Size Pipes
Specifications	ASTM, ASME, DIN, GOST, JIS
Certification	EN 10204 3.1
Fittings Type	Butt Weld, Screwed & Socket Weld, Flanges, Instrumentation
Other Fittings	Elbows, Tees, Reducers, Caps, Stub Ends, Flanges (ANSI, Table E, D and H), Nuts, Bolts, Screws, Threaded Bars

Equivalents of Stainless Steel 310/310S Materials

AISI	310 / 310S
UNS	S31000 / S31008
Werkstoff Nr.	1.4841 / 1.4845

Chemical, Mechanical & Physical Properties of Stainless Steel 310/310S

Chemical Composition

	SS 310	SS 310S
Ni	19 – 22	19 – 22
Cr	24 – 26	24 – 26
C	0.25 max	0.08 max
Fe	Balance	
Mn	2 max	2 max
MO	1.50 max	1.50 max
S	0.03 max	0.03 max
P	0.045 max	0.045 max

Physical Properties

Density (lb./ in ²) @ RT		0.29
Modulus of Elasticity in Tension (psi x 10 ⁶)		29
Specific Heat (BTU/o F/lb.)	32 to 212 oF	0.12
Thermal Conductivity (BTU/hr/ft ² /ft)	212oF	8
	932oF	10.8

Mean Coefficient of Thermal Expansion (in. x 10 ⁻⁶ per o F)	68 to 212oF	8.8
	68 to 932oF	9.5
	68 to 1832oF	10.5
Electrical Resistivity (micro ohms – cm)	at 70oF	30.7
Oxidation Resistance – Continuous Service(oF)		2000

Mechanical Properties

Grade	Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness	
				Rockwell B (HR B) max	Brinell (HB) max
310	515	205	40	95	217
310S	515	205	40	95	217
310H	515	205	40	95	217

Applications of Stainless Steel 310/310S Plates, Pipes, Fasteners & Forgings

- Cryogenic Components
- Food Processing
- Furnaces—burners, doors, fans, piping and recuperators
- Fluidized Bed Furnaces—coal combustors, grids, piping, wind boxes
- Ore Processing/Steel Plants—smelter and steel melting equipment, continuous casting equipment
- Petroleum Refining—catalytic recovery systems, flares, recuperators, tube hangers
- Power Generation—coal gasifier internals, pulverized coal burners, tube hangers
- Sintering/Cement Plants—burners, burner shields, feeding and discharging systems, wind boxes
- Thermal Processing—annealing covers and boxes, burn

Fabrication Data & Other Properties of Stainless Steel 310/310S

Characteristics of Stainless Steel 310/310S

- Oxidation resistance to 2000°f
- Moderate strength at high temperature
- Resistance to hot corrosion
- Strength and toughness at cryogenic temperatures

Fabrication

Type 310/310s is promptly fabricated by a standard commercial process. In comparison to carbon steel, stainless steels are tougher and tend to work harden quickly. By using all of the common welding processes type 310/310s can be easily welded.

Machining

This alloy machines same as type 304 stainless steel. The chips of this alloy are stringy and it will work harden very quickly. It is compulsory to keep the tool cutting at all times and utilize chip breakers.

Welding

By using fusion or resistance technique most of the austenitic stainless steels can be quickly welded. Oxyacetylene welding is not recommended. Filler Metal should be AWS E/ER 310.

Hot working

After uniform heating to 2150F (1177 Deg C) most common hot work techniques can be successfully performed. Do not forge down 1800F (982 Deg C). Fast cooling is required to maximize corrosion resistance.

Cold working

In spite of the fact that this alloy has a high work hardening rate, this alloy can be drawn, headed, upset and stamped. To remove internal stress full annealing is required after cold work.

Annealing

1900-2050F (1038-1121 Deg C) water quench.

Hardening

This alloy doesn't reply to heat treatment. Cold work will cause an increase in both hardness and strength.

Corrosion Resistant Properties of Stainless Steel 310/310S

Wet Corrosion

Alloy 310 is not designed for service in wet corrosive environments. The high carbon content, which is present to enhance creep properties, has a detrimental effect on aqueous corrosion resistance. The alloy is prone to intergranular corrosion after long term exposure at high temperatures. However, due to its high chromium content (25%), Alloy 310 is more corrosion resistant than most heat resistant alloys.

High Temperature Corrosion

The high chromium (25%) and silicon (0.6%) content of Alloy 310 make it more resistant to high temperature corrosion in most in-service environments. Operating temperatures are listed below: -

1. Oxidizing conditions (max sulfur content–2 g/m³)
1922°F (1050°C) continuous service
2012°F (1100°C) peak temperature
2. Oxidizing conditions (max sulfur greater than 2 g/m³)
1742°F (950°C) maximum temperature
3. Low oxygen atmosphere (max sulfur content–2 g/m³)
1832°F (1000°C) maximum temperature
4. Nitriding or carburizing atmospheres
1562–1742°F (850–950°C) maximum

The alloy does not perform as well as Alloy 600 (UNS N06600) or Alloy 800 (UNS N08800) in reducing, nitriding or carburizing atmospheres, but it does outperform most heat resistant stainless steels in these conditions.

Our Key Products

<u>Stainless Steel 310/310S Sheet</u>	<u>Stainless Steel 310/310S Plate Cuttings/Profiles</u>	<u>Stainless Steel 310/310S Nuts, Bolts and Fasteners</u>
<u>Stainless Steel 310/310S Plate</u>	<u>Stainless Steel 310/310S Foil, Coil</u>	<u>Stainless Steel 310/310S Wire</u>
<u>Stainless Steel 310/310S Blocks/Slabs</u>	<u>Stainless Steel 310/310S Strip</u>	<u>Stainless Steel 310/310S Ingot</u>
<u>Stainless Steel 310/310S Rod/Bar</u>	<u>Stainless Steel 310/310S Pipes and Tubes</u>	<u>Stainless Steel 310/310S Forgings and Castings</u>
<u>Stainless Steel 310/310S Flanges</u>	<u>Stainless Steel 310/310S Forged Fittings</u>	<u>Stainless Steel 310/310S Buttweld Fittings</u>

About Metallica Metals – The Steel Pipes Factory

- Established in 1975, the Metallica Metals Group (The Steel Pipes Factory) has its operations spread across major cities in India. We are a pioneer in the stainless steel pipes, nickel alloy products, titanium products, carbon steel pipes and alloy steel pipes manufacturing and processing industry. Our products including pipe fittings, flanges, pipes, sheet plates and valves are exported to over 70 countries across the world, while in India we have supplied to even the remote areas. With over 250 tons of sale in stainless steel and carbon steel pipes every day, Metallica has emerged as a prominent vendor for many buyers in India and Overseas
- More than 3000 tons ready from stock and new production ready in just a few weeks.
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Our Key Products

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[Steel Angle Bars](#)

Stainless Steel 316Ti

Stainless Steel 317/317L

Stainless Steel 321/321H

Stainless Steel 347/347H

Stainless Steel 904L

Duplex Steels (UNS S32205, UNS S31803)

Super Duplex Steels (UNS S32760 / UNS
S32750)

Stainless Steel 254 SMO (UNS S31254 / 1.4547)

Hex Steel Bars

Round Steel Bars & Rod

Flat Steel Bars

Forgings, Rings & Forged Blocks

Stainless Steel Pipe

Stainless Steel Seamless Pipe

Stainless Steel Welded Pipe

Stainless Steel Tubes

Stainless Steel Furnace Tubes

Stainless Steel Seamless Tubing

Stainless Steel Heat Exchanger Tubes

Large Diameter Pipe

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