Stainless Steel 310/310S

The **Stainless steel grade 310S alloy** is a moderate austenitic stainless steel that is commonly utilized in the elevated temperature operations such as furnace parts and heat processing equipments. It is utilized at temperature 1150oC in the continuous operations and 1035oC in the intermittent operations. The 310S grade is a steel comprising of low concentration of carbon.

Corrosion Resistance

The Stainless steel 310S alloy is made of 25% chromium and 20% nickel that makes it widely resistant to oxidation and corrosion. The nominal carbon magnitude makes it less inclined to embrittlement and sensitization while in use. The high magnitude of chromium and nickel makes the steel suitable for the operation in the reducing sulfur. The Stainless steel 310S alloy is extensively used in carburizing conditions as found in petrochemical conditions. In the rigorous carburizing environments other heat resistant alloys are chosen. The stainless steel 310S is preferred for using in rapid liquid cooling as it may get the heat stroke. It is commonly used in the cryogenic applications for its stiffness and lower magnetic permeability.

Just like other stainless steel alloys, **310S steel** cannot be toughened by heat processing. It can be toughened by cold processing, though this method is rarely used.

Chemical composition of stainless steel 310S alloy

Elements	310 steel	310S steel
C	0.25 max	0.08 max
Mn	2.00 max	2.00 max
Si	1.50 max	1.50 max
P	0.045 max	0.045 max
S	0.030 max	0.030 max
Cr	24.00 - 26.00	24.00 - 26.00
Ni	19.00 - 22.00	19.00 - 22.00

Mechanical features of stainless steel 310S alloy

Properties	Steel value
Grade 0.2 % Proof Stress MPa (min)	205
Tensile Strength MPa (min)	520
Elongation % (min)	40
Hardness (HV) (max)	225

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Physical properties of stainless steel 310S alloy

Properties	Temp	Value
Density		8,000 kg/m3
Electrical Conductivity	25oC	1.25 %IACS
Electrical Resistivity		0.78 Micro ohm.m
Modulus of Elasticity		200 GPa
Shear Modulus		77 GPa
Poisson's Ratio		0.30
Melting Point		1400-1450oC
Specific Heat		500 J/kg.oC
Relative Magnetic Permeability		1.02
Thermal Conductivity	100oC	14.2 W/m.oC
Coefficient of Expansion	0-100oC	15.9 /oC

Short time high temperature tensile Strength

Temperature, °C	550	650	750	850	950	1050
Tensile Strength, MPa	550	430	280	180	90	50

Creeping Strength

Stress applied to develop 1% creep strength in the preferred time at the given temperature:

Time	Temperature°C	550	600	650	700	750	800
10 000 h	Stress MPa	110	90	70	40	30	15
100000 h	Stress MPa	90	75	50	30	20	10

Creep rupturing Stress

Time	Temperature °C	600	700	800	900	1000
1 000 h	Stress MPa	190	110	50	35	15
10 000 h	Stress MPa	170	70	35	20	10
100 000 h	Stress MPa	110	55	25	10	2

Fabrication of Stainless Steel 310/310S

For fabrication stainless steel 310S is forged at temperature up to 975oC to 1175oC. The heavy processing is performed at 1050oC and light finishing is done to the end of range. Subsequent to forging, annealing is preferred to remove the stress from the forming process. The alloy can be readily cold processed by the standard methods and device.

Heat Processing

The stainless steel 310/310S is solution annealed through heating up from 1040oC to 1065oC, kept at this temperature for completely bathe then water cooling is done.

Heat Resistance

Steel 310/310S offers excellent oxidation resistance property while intermittent service at temperatures 1035oC and at 1050oC while in regular use in the presence of air. It is a superior resistant to carburization, oxidation and sulphidation.

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Machining

The machinability of stainless steel 310S alloy is identical to the machining of 304L steel. The process of toughening may cause an issue and it is easy to remove the work toughened surface through nominal speeds and massive cuts with the sharp systems and better lubrication. The strong machines and robust tools are utilized.

Welding of Stainless Steel 310S

The stainless steel 310/310S are welded through similar electrodes and filler metals. These are readily weldable through SMAW, GMAW, GTAW and SAW. The preferred electrodes are AWS A5.4 E310-XX and A 5.22 E310T-X and filler metal is AWS A5.9 ER310. Argon is used as a shielding gas. Preheating and post heating are not essential, however for performance in the corrosive liquids, complete post solution annealing processing is required. Pickling and passivation of metal are required to eradicate the elevated temperature metal oxides and make the steel fully corrosion resistance subsequent to welding. This processing is not essential for elevated temperature functions, but welding slag should be completely eradicated.

Applications of stainless Steel 310/310S

1. Vessel hanger for petroleum processing and steam boiler
2. Coal gasifier
3. Furnaces and fluidized bed combustors
4. Internal parts, lead pots
5. Food processing systems
6. Annealing covers and cryogenic configurations
7. Welding filler wire and electrodes

Stainless Steel 310/310S Product Forms Available:

Wire, Wiremesh Screen, Strip, Sheet, Pipe, Tubing, Plate, Ribbon, Tape

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