Specification Sheet: Alloy 310/310S/310H
(UNS S31000, S31008, S31009) W.Nr. 1.4845

A Multi-Purpose Austenitic Heat Resistant Stainless Steel with Oxidation Resistance Under Mildly Cyclic Conditions to 2010°F (1100°C)

Steel Plants – smelter and steel melting equipment, ... casting equipment
...ning – catalytic recovery systems, flares, recuperators, tube...
...ation – coal gasifier internals, pulverized coal burners, tube...
...nt Plants – burners, burner shields, feeding and ...stems, wind boxes
...ssing – annealing covers and boxes, burner grids, doors, ... retorts, recuperators, walking beams

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) will restore a degree of toughness.

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. In most instances the grain size and carbon content of the plate can meet both the 310S and 310H requirements.

Alloy 310 can be easily welded and processed by standard shop fabrication practices.

Specifications

ASTM .... A 240
ASME .... SA 240
AMS 5521

Chemical Analysis

Weight % (all values are maximum unless a range is otherwise indicated)

Element	310	310S	310H
Chromium	24.0 min.–26.0 max.	24.0 min.–26.0 max.	24.0 min.–26.0 max.
Nickel	19.0 min.–22.0 max.	19.0 min.–22.0 max.	19.0 min.–22.0 max.
Carbon	0.25	0.08	0.04 min.–0.10 max.
Manganese	2.00	2.00	2.00
Phosphorus	0.045	0.045	0.045
Sulfur	0.030	0.030	0.030
Silicon	1.50	1.50	0.75
Iron	Balance	Balance	Balance

Physical Properties

Density
0.285 lbs/in³
7.89 g/cm³

Specific Heat
0.12 BTU/lb-°F (32–212°F)
502 J/kg-°K (0–100°C)

Electrical Resistivity
30.7 Microhm-in at 68°F
78.0 Microhm-cm at 20°C

Modulus of Elasticity
28.5 x 10⁶ psi
196 GPa

Melting Range
2470–2555°F
1354–1402°C

Thermal Conductivity
8.0 BTU/hr/ft²/ft/°F
10.8 W/m-°K

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Corrosion Resistance

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.

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.

Oxidizing conditions (max sulfur content – 2 g/m^3)
1922°F (1050°C) continuous service
2012°F (1100°C) peak temperature

Oxidizing conditions (max sulfur greater than 2 g/m^3)
1742°F (950°C) maximum temperature

Low oxygen atmosphere (max sulfur content – 2 g/m^3)
1832°F (1000°C) maximum temperature

Nitriding or carburizing atmospheres
1562 – 1742°F (850 – 950°C) maximum

The alloy does not perform as well as Alloy 600 (UNS N06600) or llopan/Actu (26)Tj//as welldo.0ieueon fco.0ieeuri, nd(Nitriding or c