



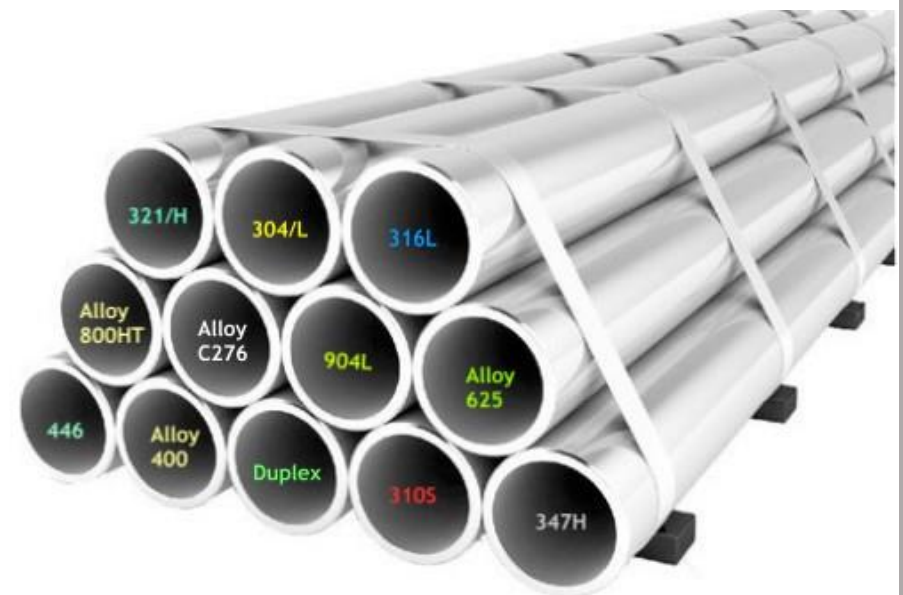
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# 309/309S STAINLESS STEEL

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## Datasheet for Stainless Steel 309/309S

- Pipes & Tubes
- Sheets & Plates
- Bars & Rods, Forgings
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# Datasheet for Stainless Steel 309/309S

## AISI 309 (UNS S30900, 1.4828), AISI 309S (UNS S30908, 1.4833)

### What is 309/309S Stainless Steel?

- Alloy 309 (UNS S30900) is an austenitic stainless steel developed for use in high temperature corrosion resistance applications. The alloy resists oxidation up to 1900°F (1038°C) under non-cyclic conditions. Frequent thermal cycling reduces oxidation resistance to approximately 1850°F (1010°C). A chromium-nickel stainless grade, Alloy 309/309S is suitable for a number of high temperature applications. 23% chromium, approx. 5% more than 304 stainless steel gives Alloy 309/309S an edge over 304 stainless steel when it comes to general corrosion resistance at elevated temperatures.
- AISI 309S stainless steel is an austenitic stainless steel formulated for primary forming into wrought products. Cited properties are appropriate for the annealed condition. 309S is the AISI designation for this material. S30908 is the UNS number. It contains less nickel in its composition than Type 310, moderately low tensile strength and lower amount of carbon in its composition among the wrought austenitic stainless steels thus utilization in areas where high temperature gases may pose a problem. Type 309S is additionally characterized by its resistance to oxidation and creep, along with its ability to withstand high temperatures. Moist environments have no effect on it, due to the higher levels of nickel and chromium in its makeup. Because of this, it is often utilized in marine environments in place of Stainless Steel 304, as it displays a higher resistance. Despite its excellent weldability, Type 309S does have a tendency to work harden.
- AISI 309H (S30909) Stainless Steel. AISI 309H stainless steel is an austenitic stainless steel formulated for primary forming into wrought products. Cited properties are appropriate for the annealed condition. 309H is the AISI designation for this material. S30909 is the UNS number. It has a moderately low tensile strength.

### Product Forms and Standards of 309/309S Stainless Steel

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

### Applications of Stainless Steel 309/309S/309H

- Aircraft and jet engine parts
- Auto exhaust parts
- Heat exchangers
- Waste incinerators
- Glass blowing components
- Rotary kilns
- Furnace anchor bolts
- Hotel
- Artware
- Household Products
- Door
- Cabinet
- Kitchen Appliance
- Industrial
- Related Products
- Thermal Processing
- Paper Mill Equipment
- Petroleum Refinery
- Fluidized Bed Furnaces

### Equivalents of 309/309S/309H Stainless Steel

STANDARD	SS 309S	SS 309H
UNS	S30908	S30909

WERKSTOFF NR.	1.4828	1.4833
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## Chemical Composition & Mechanical Properties of SS 309/309S

### Chemical Composition

ELEMENT	SS 309S	SS 309H
NI	12.0 – 15.0	12.0 – 15.0
C	0.08 max	0.04 – 0.10
MN	2.0 max	2.0 max
P	0.045 max	0.045 max
S	0.030 max	0.030 max
SI	1.0 max	1.0 max
CR	22.0 – 24.0	22.0 – 24.0
MO	0.75 max	

### Physical Properties

DENSITY	7.89 g/cm <sup>3</sup> / 0.285 lb/in <sup>3</sup>
MELTING POINT	1480 – 1530(°C) / 2500 – 2590 (°F)
ANNEALED	1000 – 1150 (°C) / 1832 – 2101 (°F)
QUENCH	Rapid Air/Water

## Mechanical Properties

	309		309S	
	Typical	Minimum	Typical	Minimum
Tensile Strength MPa	560	515	540	515
Proof Stress(0.2% Offset) MPa	285	205	280	205
Elongation (Percent in 50mm)	54	40	54	40
Hardness (Brinell)	164	-	159	-
Endurance (fatigue) limit, MPa	260	-	260	-

## Stainless Steel 309/309S Product Specification

Product	Stainless Steel 309/309S/309H
Equivalents	AISI 309 (UNS S30900, 1.4828), AISI 309S (UNS S30908, 1.4833), AISI 309H (UNS S30909)
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

## Fabrication Data & Other Properties of Stainless Steel 309/309S

Alloy 309 can be easily welded and processed by standard shop fabrication practices.

### Hot Forming

- Heat uniformly at 1742 – 2192°F (950 – 1200°C). After hot forming a final anneal at 1832 – 2101°F (1000 – 1150°C) followed by rapid quenching is recommended.

### Cold Forming

- The alloy is quite ductile and forms in a manner very similar to 316. Cold forming of pieces with long-term exposure to high temperatures is not recommended since the alloy is subject to carbide precipitation and sigma phase precipitants.

### Welding

- Alloy 309 can be readily welded by most standard processes including TIG, PLASMA, MIG, SMAW, SAW and FCAW.

## Corrosion Resistance of 309/309S Stainless Steel

### Wet Corrosion

- Alloy 309 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 (23%), Alloy 309 is more corrosion resistant than most heat resistant alloys.

### High Temperature Corrosion

Alloy 309 resists high temperature corrosion in most in-service conditions. Operating temperatures are as follows:

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

- Oxidizing conditions (max. sulfur greater than 2 g/m<sup>3</sup>)
  - 1742°F (950°C) maximum temperature
- Low oxygen atmosphere (max. sulfur content – 2 g/m<sup>3</sup>)
  - 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 Alloy 800 (UNS N08800) in reducing, nitriding or carburizing atmospheres, but it does outperform most heat resistant stainless steels in these conditions.

### What is the Difference Between 309 and 309S Stainless Steel?

- Alloy 309 (UNS S30900) is an austenitic stainless steel developed for use in high temperature corrosion resistance applications. The alloy resists oxidation up to 1900°F (1038°C) under non-cyclic conditions. Frequent thermal cycling reduces oxidation resistance to approximately 1850°F (1010°C). Because of its high chromium and low nickel content, Alloy 309 can be utilized in sulfur containing atmospheres up to 1832°F (1000°C). The alloy is not recommended for use in highly carburizing atmospheres since it exhibits only moderate resistance to carbon absorption. Alloy 309 can be utilized in slightly oxidizing, nitriding, cementing and thermal cycling applications, albeit, the maximum service temperature must be reduced.
- 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.
- 309S (UNS S30908) is the low carbon version of the alloy. It is utilized for ease of fabrication. 309H (UNS S30909) 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 309S and 309H requirements. Alloy 309 can be easily welded and processed by standard shop fabrication practices.

### Properties and Processing Characteristics of Stainless Steel 309/309S

- **SS 309** is a highly alloyed austenitic **stainless steel** used for its excellent oxidation resistance, high temperature strength and creep resistance. The lower nickel content of CS309 improves resistance to sulphur attack at high temperatures.
- **SS 309** provides excellent corrosion resistance and heat resistance plus good strength at room and elevated temperatures. The alloy is non-**magnetic** as annealed and becomes slightly **magnetic** when cold worked.

#### Processing

Standard welding processes for this steel grade are:

- TIG-Welding
- MAG-Welding Solid Wire
- Arc Welding (E)
- Laser Beam Welding

In quenched condition the material can be slightly magnetizable. With increasing cold forming the magnetizability increases.

### Our Key Products

<a href="#">Stainless Steel 309/309S Sheet</a>	<a href="#">Stainless Steel 309/309S Plate Cuttings/Profiles</a>	<a href="#">Stainless Steel 309/309S Nuts, Bolts and Fasteners</a>
<a href="#">Stainless Steel 309/309S Plate</a>	<a href="#">Stainless Steel 309/309S Foil, Coil</a>	<a href="#">Stainless Steel 309/309S Wire</a>
<a href="#">Stainless Steel 309/309S Blocks/Slabs</a>	<a href="#">Stainless Steel 309/309S Strip</a>	<a href="#">Stainless Steel 309/309S Ingot</a>
<a href="#">Stainless Steel 309/309S Rod/Bar</a>	<a href="#">Stainless Steel 309/309S Pipes and Tubes</a>	<a href="#">Stainless Steel 309/309S Forgings &amp; Castings</a>
<a href="#">Stainless Steel 309/309S Flanges</a>	<a href="#">Stainless Steel 309/309S Forged Fittings</a>	<a href="#">Stainless Steel 309/309S Buttweld Fittings</a>

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### Our Key Products

#### **STAINLESS STEEL & NICKEL ALLOYS**

Pure Nickel Alloys  
Monel Alloys (Ni-Cu Alloys)

#### **INSTRUMENTATION TUBES & FITTINGS**

Instrumentation Tube  
Hydraulic Tubing

#### **PRODUCTS**

Steel Sheet & Plate  
Steel Coil & Strip



Inconel (Ni-Cr-Mo) Alloys

Incoloy Alloys (Ni-Cr-Fe)

Hastelloy Alloys

Stainless Steel 304/304L

Stainless Steel 309S/309H

Stainless Steel 310/310S

Stainless Steel 316/316L

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)

Seamless Tubing

Instrumentation Tube Fittings

Double Compression Tube Fittings

Precision Pipe Fittings

Needle & Gauge Valves

Manifold Valves

Steel Pipes

Steel Tubes

Electropolish Tube

Heat Exchanger Tubes

Steel Bars/Rods & Wire

Fasteners (Nut, Bolt, Washer)

Steel Angle Bars

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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