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# 309 & 309S Stainless Steel

## DESCRIPTION

Types 309 Stainless Steel and 309S are austenitic chromium-nickel stainless steels that provide excellent corrosion resistance and heat resistance plus good strength at room and elevated temperatures. Type 309S Stainless Steel is identical to Type 309 except for a lower carbon content that minimizes carbide precipitation and improves weldability. They are essentially nonmagnetic as annealed and become lightly magnetic when cold worked.

## PRODUCT FORMS

Sheet, Strip

## SPECIFICATIONS

ASTM A167 (309), ASTM A240 (309S)

## TYPICAL APPLICATIONS

Furnace parts, heating elements, aircraft and jet engine parts, heat exchangers, sulfite liquor handling equipment, kiln liners, boiler baffles, refinery and chemical processing equipment, and auto exhaust parts

## PROCESSING

These alloys are not hardenable by heat treatment. Anneal at 1900 – 2050°F (1038 – 1121°C), then water quench or rapidly air cool.

## FORMING

Types 309 and 309S Stainless Steels can be roll formed, stamped and drawn readily. In-process annealing is usually required to reduce hardness and increase ductility.

## WELDING

Type 309 is generally considered to have weldability nearly equivalent to the most common alloys of this class, Types 304 and 304L. When a weld filler is needed, AWS E/ER 309 and 310 are most often specified.

## CORROSION

Types 309 and 309S provide excellent general corrosion resistance. They are more resistant to marine atmospheres than Type 304. They exhibit high resistance to sulfite liquors and are useful for handling nitric acid, nitric-sulfuric acid mixtures, and acetic, citric, and lactic acids.



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### CHEMICAL COMPOSITION: (ASTM A167, A240)

<b>Element</b>	<b>Type 309</b>	<b>Type 309S</b>
Carbon	0.20 max.	0.08 max.
Manganese	2.00 max.	2.00 max.
Sulfur	0.030 max.	0.030 max.
Phosphorus	0.045 max.	0.045 max.
Silicon	0.75 max.	0.75 max.
Chromium	22.0 - 24.0	22.0 - 24.0
Nickel	12.0 - 15.0	12.0 - 15.0

### MECHANICAL PROPERTIES: (ASTM A167, A240)

<b>Type</b>	<b>Yield Strength 0.2% offset (KSI)</b>	<b>Tensile Strength (KSI)</b>	<b>% Elongation (2" Gauge Length)</b>
309	30min.	75 min.	40.0 min.
309S	30 min.	75 min.	40.0 min,



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### PHYSICAL PROPERTIES

Density (lb./in <sup>2</sup> ) @ RT		0.29
Modulus of Elasticity in Tension (psi x 10 <sup>6</sup> )		29.0
Specific Heat (BTU/o F/lb.)	32 to 212 oF	0.12
Thermal Conductivity (BTU/hr/ft <sup>2</sup> /ft)	212 oF	9.0
	932 oF	10.8
Mean Coefficient of Thermal Expansion (in. x 10 <sup>-6</sup> per o F)	32 to 212 oF	8.3
	32 to 600 oF	9.3
	32 to 1,000 oF	9.6
	32 to 1,200 oF	10.0
Electrical Resistivity (micro ohms - cm)	at 70 oF	39.8
Melting Point Range (oF)		2550 - 2650
Oxidation Resistance - Continuous Service (oF)		2000
Oxidation Resistance - Intermittent Service (oF)		1800