

STAINLESS STEEL PLATE, SHEET & COIL 309/309S Technical Data

Summary

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 309 improves resistance to sulphur attack at high temperatures. It is tough and ductile, and can be readily fabricated and machined. 309S is the low-carbon version of 309, and is recommended for applications where sensitisation, and subsequent corrosion by high temperature gases or condensates during shutdown may pose a problem.

309 is manufactured to ASTM A 167 and 309S to ASTM A240 specifications.

Typical Applications

309/309S is used exclusively for its high temperature oxidation resistance. It is common for 309, 310 and 321 to be used in the same piece of equipment in the various temperature regions.

Chemical Composition (SATM A240)

	C	Mn	P	S	Si	Cr	Ni
309	0.20 max	2.00	0.045	0.030	1.00	22.0 -	12.0 -
309S	0.08 max	max	max	max	max	24.0	15.0

Typical Properties in the Annealed Condition

The properties quoted in this publication are typical of mill production and unless indicated should not be regarded as guaranteed minimum values for specification purposes.

1. Mechanical Properties at Room Temperature

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

2. Properties at Elevated Temperatures

The values quoted are those for 309

Short Time Elevated Temperature Tensile Stress

Temperature	°C	550	650	750	850	950	1 050
Tensile Stress	MPa	440	360	240	150	70	30

Creep Data

Stress to develop a creep rate of 1% in the time indicated at the temperature indicated.

Time	Temperature °C	550	600	650	700	750	800
10 000 h	Stress MPa	100	80	60	30	25	10
100 000 h	Stress MPa	75	50	30	20	10	5

Creep Rupture Stress

Time	Temperature °C	600	700	800	900	1 000
1 000 h	Stress MPa	180	90	35	20	5
10 000 h	Stress MPa	150	50	30	10	2
100 000 h	Stress MPa	100	40	20	5	-

Maximum Recommended Service
Temperature
(Oxidising Conditions)

Continuous	1 100°C
Intermittent	980°C

1. Thermal Processing

Annealing. Heat between 1 050°C and 1 150°C and water quench. This treatment ensures that all carbides are in solution.

2. Stress Relieving 250-400°C for 1 hour.

3. Hot Working

Initial forging and pressure:- 1 150-1 200°C

Finishing temperature:- 1 000°C

Note: Soaking times to ensure uniformity of temperature are up to 12 times that required for mild and carbon steels.