MACSTEEL®

Data Sheet

STAINLESS STEEL | 409 AND 1.4509

Description

409 is a 12% chromium, titanium stabilised ferritic stainless steel. It has fair resistance to corrosion and oxidation at high temperatures. In the annealed condition 409 is ductile, does not work harden and can be formed using a variety of roll forming, bending or mild pressing/ stamping operations.

1.4509 is a low carbon, dual stabilized (titanium and niobium) ferritic stainless steel containing 18% chromium. It has good corrosion resistance in moderately corrosive environments and good oxidization and creep resistance at elevated temperatures.

Both 409 and 1.4509 are resistant to stress corrosion cracking but have limited weldablity. They should not be used in the as-welded condition for dynamic or impact loaded structures.

Equivalents

409 – S40910, EN 1.4512
1.4509 – (Similar) S44100, 441

Typical applications

Both 409 and 1.4509 have good corrosion resistance at higher temperatures than standard ferritics and are best utilised in mildly corrosive environments where resistance to scaling at moderate temperatures is required.

These grades were first developed for the automotive industry but have since been used in other applications:

- Exhaust systems and Catalytic converters.
- Electrical distribution boxes, covers and turnstiles.
- Solar water systems and geysers. (1.4509)

Chemical composition

Grade	C	Si	Mn	P	S	N	Cr	Nb	Ni	Others
40910	0.03	1.0	1.0	0.040	0.015	0.03	10.5 11.7		0.5	Ti: 6x (C+N) 0.5
1.4509	0.03	0.75	1.0	0.040	0.015		17.5 18.5	3xC + 0.3 1.00		Ti: 0.1 0.6

Mechanical properties

In accordance with ASTM A240 and EN 10088-2

Grade	R_m (MPa)	$Rp_{0.2}$ (MPa)	El (%)	Max BHN
40910	380 to 560	220	25	179
1.4509	430 to 630	250	18	180

Maximum recommended service temperature

Grade	Continuous (°C)	Intermittent (°C)
40910	620	730
1.4509	850	950

In oxidising conditions

General corrosion resistance

409 is significantly more corrosion resistant than mild or low alloy corrosion resistant steels. It has lower corrosion resistance than the higher chrome standard ferritics. It is best suited in mildly corrosive conditions where aesthetics are not a prime requirement. A light surface patina or discolouration may form and this will, to some extent, retard further corrosion.

1.4509 has good resistance to a wide variety of corrosive environments. It is generally used in the automotive industry for exhaust systems. Atmospheric corrosion is good although in highly polluted or marine environments staining may occur.

Thermal processing and fabrication

Annealing

Annealing (softening) is achieved by heating to the following temperatures at a rate of 3.5minutes/mm followed by air quenching.
409: 820-920^{0}C
1.4509: 920-1,020^{0}C

Stress Relieving

Stress relief after welding is not usually required. Should this be necessary, temperatures between 200°C and 300°C are recommended for 60 minutes per 2.5mm.

Hot-working

Initial forging and pressing temperature range: 950°C to 1050°C Finishing temperature below 750°C. Avoid extended holding times above 1000°C as excessive grain growth takes place which reduces ductility.
Note: All hot working operations should be followed by annealing and then pickling and passivation to restore the mechanical properties and corrosion resistance.

Cold working

409 and 1.4509 have fair formability characteristics with useful mechanical properties. Their ductility allows them to be formed by bending and deep drawing. They do not undergo significant work hardening when cold formed.

Welding

409 and 1.4509 are prone to grain growth in the heat-affected zone. As such, the tensile, fatigue and toughness properties in the welded condition are relatively poor. They should thus not be used for applications where tensile or dynamic loading will be experienced. The use of austenitic filler metals such as types 308L, 309L or 316L will improve the ductility of welds to some extent