

Duplex Stainless Steel 2507 (UNS S32750)



Duplex stainless steel 2507 is a super austenitic ferritic stainless steel that offers high strength and corrosion resistance. Great resistance to general and localized corrosion. Good mechanical, welding and forming properties. Duplex 2507 offers excellent resistance to pitting and crevice corrosion and stress corrosion cracking. It offers service temperature up to 316oC or 600oF. Outstanding resistance to organic and inorganic acids and intergranular corrosion. It is used in oil and gas engineering, marine engineering, heat exchangers and desalination plants. This steel grade offers outstanding resistance to chloride stress corrosion cracking and has high thermal conductivity and nominal coefficient of thermal expansion.

Chemical Composition

Chromium (Cr)	24 to 26 %
Nickel (Ni)	6 to 8 %
Molybdenum (Mo)	3 to 5 %
Carbon (C)	0.030 %
Nitrogen (N)	0.24 to 0.32 %
Manganese (Mn)	1.20 %
Silicon (Si)	0.80 %
Copper (Cu)	0.50 %
Phosphorous (P)	0.035 %
Sulfur (S)	0.020 %
Iron (Fe)	Bal %

Physical Properties

Temp	20oC	100oC	200oC	300oC
Property				
Density	7.8	-	-	-
Modulus of elasticity	200	194	186	180
Poissons ratio	0.3	-	-	-
Linear thermal expansion	-	13	13.5	14
Thermal conductivity	15	16	17	18

Thermal capacity	500	530	560	5.90
Electric resistivity	0.80	0.85	0.90	1

Mechanical Properties

The combination of large tensile strength and impact strength with lower coefficient of thermal expansion and large thermal conductivity makes this alloy superior for many applications. The high strength of duplex steel 2507 grade is suitable for using in the structural and mechanical sections. This stainless steel grade is not recommended for using in the operations needing prolonged exposure of wire at the high temperatures exceeding 570oF due to increase in the hardness.

0.2% Offset Yield Strength	80 ksi
Ultimate Tensile Strength	116 ksi
0.1% Offset Yield Strength 0.2%	91 ksi
Elongation in 2 inches, %	15 %
Hardness Rockwell C	32
Impact Energy,	74 ft.-lbs

Room temperature mechanical properties

Tensile strength	800 to 1000 MPa or 116 to 145 ksi
0.2 % proof stress	620 to 720 Mpa or 90 to 105 ksi
Elongation %	25 %
Hardness	320 Hv10 or 32 HRC

Duplex steel grade 2507 offers high impact strength and is utilized for different applications that are broadly conducted at the temperatures over 570oF due to loss of hardness.

High temperature Impact Strength

Temp	Rp0.2	Rm
200 oC	400	640
250 oC	380	630

Fatigue strength

	2304	2205	2507	4404
Rp0.2	446	497	565	280
Rm	689	767	802	578
Fatigue strength	450	510	550	274

Corrosion Resistance

The concentration of chromium and molybdenum in duplex steel 2507 grade provide superior resistance to corrosion by organic acids such as formic acid, acetic acid and inorganic acids primarily chlorides. In the dilute sulfuric acid consisting of chlorides, 2507 grade offers higher corrosion resistance as compare to 904L alloy. The steel 904L has better alloyed austenitic steel configuration that offers wide resistance to sulfuric acid.

Behavior in Acids

Stainless steel 316L is not suggested for employing in hydrochloric acid conditions due to local and uniform corrosion. 2507 grade can be utilized in the presence of hydrochloric acid. The pitting corrosion may not be a risk in this section though crevice attack should be inhibited. The lower concentration of carbon in 2507 decreases the risk of carbide precipitation at the grain boundaries while heat processing, so it offers wider resistance to the intergranular corrosion.

Duplex stainless steel 2507 wire offers superior resistance to chloride stress corrosion cracking. Due to high concentration, it offers extensive resistance to corrosion and has high strength. It is widely purposeful in offshore oil and gas operations and wells with large brine levels or that need brine injected to increase recovery. Different analysis methods are followed to obtain the pitting resistance of steels in the chloride solutions.

The critical pitting temperatures of different high performance steels in 1M sodium chloride solution is evaluated. The results describe the outstanding resistance offered by **Duplex Stainless steel 2507 alloy** to the pitting corrosion. The presence of crevice cannot be inhibited in the practical manufacturing processes and operations that make it more prone to the corrosion in the chloride conditions. Grade 2507 offers excellent resistance to crevice corrosion.

Test media	ASTM G 36, 45 % MgCl	40 % CaCl ₂	40 % CaCl ₂	ASTM G 123, 25 % NaCl, pH 1.5	25 % NaCl	ASTM C 692, 1500 ppm Cl ⁻
Temp	155 oC	100 oC	100 oC	106 oC	106 oC	100 oC
Load	U bend	U-bend	0.9 x R p0.2 (4-PB)	U- bend	U bend	Rp 0.2
4307	Corroded	Corroded	Corroded	Corroded	Corroded	Corroded
4404	Corroded	Corroded	Feasible	Corroded	Feasible	Corroded
LDX 2101	Corroded	Nil	Nil	Nil	Nil	Nil
2304	Corroded	Nil	Nil	Nil	Nil	Nil
LDX 2404	Corroded	Feasible	Nil	Nil	Nil	Nil
2205	Corroded	Nil	Nil	Nil	Nil	Feasible
2507	Corroded	Nil	Nil	Nil	Nil	Nil
254 SMO	Corroded	Nil	Nil	Nil	Nil	Nil

Available Forms

Wire, mesh, strip, foil, Plate, sheet, flanges, rod, pipe, tubing