
Stainless Steel 2507 Grade Data Sheet

Grade 2507

Grade 2507 is one of a group of "super duplex" grades, combining high strength with exceptional corrosion resistance.

2507 is very highly resistant to general corrosion and to pitting and crevice corrosion in high chloride, hot environments. Its duplex structure also results in excellent resistance to stress corrosion cracking.

Like other duplex (ferritic/austenitic) grades the super duplex grades are not suitable for high or low temperature service. 2507 is not recommended for temperatures below -50°C or above $+300^{\circ}\text{C}$, because of reduced toughness outside this range.

The high strength favours applications in pressure vessels and for marine and other shafts.

Corrosion Resistance

2507 has excellent general corrosion resistance, superior to virtually all other stainless steels. It has high resistance to intergranular corrosion and very high resistance to stress corrosion cracking in both chloride and sulphide environments.

A PRE of least 40 indicates that the material has good pitting and crevice corrosion resistance to warm sea water and other high chloride environments; it is rated as more resistant than grade 904L and approximating that of the 6% Molybdenum "super austenitic" grades.

2507 is the grade of choice for severe high temperature marine environments and for chemical and petrochemical processing, even including some solutions of strong acids.

Heat Resistance

Although super duplex grades have good high temperature oxidation resistance, like other duplex stainless steels they suffer from embrittlement if held for even short times at temperatures above 300°C . If grade 2507 becomes embrittled this can only be rectified by a full solution annealing treatment.

Heat Treatment

Solution Treatment (Annealing)

Heat to $1040 - 1120^{\circ}\text{C}$ and cool rapidly in air or by water quenching. Duplex and super duplex grades cannot be hardened by thermal treatment.

Welding

2507 is weldable by standard methods, without pre-heat. Consumables over-alloyed with nitrogen and nickel are generally recommended such as those with ISO designation "25 9 4 L N". TIG (GTAW), MIG (GMAW) and all positional manual (MMAW) electrodes are available. Heat input should be within the range $0.5 - 1.5\text{kJ/mm}$. Post weld annealing is essential following autogenous welding, but not otherwise. Nickel-based consumables (e.g. Alloy C22) can also be used to give higher corrosion resisting welds. As for other duplex stainless steels the coefficient of thermal expansion of 2507 is lower than for austenitic grades, reducing distortion and residual stresses.

Fabrication

2507 is a high strength steel, so high forming forces will be required and high spring-back should be anticipated. The ductility of the grade is quite adequate for most operations, but heavy

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deformation, such as cold forging, is not possible. If more than about 20% cold work is carried out an intermediate solution anneal is required. Hot forging can be carried out in the temperature range 1200 – 1025°C. Like other duplex grades 2507 has low hot strength, so may need support during heat treatment or forging. Hot forging should be followed by solution treatment.

Typical Applications

Oil and gas exploration, processing and support systems, pollution control including flue gas desulphurisation, marine and other high chloride environments, desalination plants, chemical processing, transport and storage, pulp and paper processing.

Specified Properties

These properties are specified for flat rolled product (plate, sheet and coil) in ASTM A240M and for pipe in ASTM A790M, as UNS S32750. Similar but not necessarily identical properties are specified for other products in their respective specifications.

Composition Specification (%)

Grade		C	Mn	Si	P	S	Cr	Mo	Ni	Cu	N
2507	min.	-	-	-	-	-	24.0	3.0	6.0	-	0.24
	max.	0.030	1.20	0.80	0.035	0.020	26.0	5.0	8.0	0.50	0.32

Mechanical Property Specification

Grade	Tensile Strength (MPa) min.	Yield Strength 0.2% Proof (MPa) min.	Elongation (% in 50mm) min.	Hardness	
				Rockwell C (HR C) max.	Brinell (HB) max.
2507	795	550	15	32	310

Physical Properties (Typical values in the annealed condition)

Grade	Density (kg/m ³)	Elastic Modules (GPa)	Mean Coefficient of Thermal Expansion		Thermal Conductivity at 20°C (W/m.K)	Specific Heat 0-100°C (J/kg.K)	Electrical Resistivity (nΩ.m)
			0-100°C (µm/m/°C)	0-400°C (µm/m/°C)			
2507	7800	200	13.0	14.5	14.2	460	850

Grade Specification Comparison

Grade	UNS No	Euronorm		Swedish SS	Japanese JIS
		No	Name		
2507	S32750	1.4410	X2CrNiMoN25-7-4	2328	-

These comparisons are approximate only. The list is intended as a comparison of functionally similar materials **not** as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted.

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Possible Alternative Grades

Grade	Why it might be chosen instead of 2507
2205	The lower cost and better availability of 2205 are required, and a lower corrosion resistance and strength can be accepted.
6%Mo	Higher ductility of this austenitic grade is needed, and the much lower strength is acceptable. Corrosion resistance is similar in many environments, but needs to be considered case by case.
Ni Alloys	A corrosion resistance even higher than 2507 is required, and a higher cost is acceptable.

Limitation of Liability

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