

Grade UR2507Cu is a registered trade name of the ArcelorMittal group. The grade was previously designated UR52N+.

2507Cu is specified as UNS S32520 for plate (in ASTM A240M) and pipe (in ASTM A790M) but retains the older designation UNS S32550 for bar (in ASTM A276M). The specified compositions and mechanical properties of these alternatives are slightly different.

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

Corrosion Resistance

2507Cu has excellent general corrosion resistance, superior to virtually all other stainless steels. It has high resistance to intergranular corrosion. Because of its high strength it performs well in abrasion/corrosion conditions.

A PRE guaranteed to be at 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 approaching that of the 6% Molybdenum "super austenitic" grades. The crevice corrosion resistance of 2507Cu can be in excess of that of the 6% Mo grades in some cases. Copper adds resistance to sulphuric and other reducing acids, particularly in the very aggressive "mid concentration" range.

Because of its duplex structure 2507Cu has excellent resistance to stress corrosion cracking, resistant to all concentrations of chlorides up to over 200°C, and also resists SCC in sulphide (sour gas) environments.

2507Cu is a grade of choice for severe hot sea water environments and for chemical and petrochemical processing, including strong acids.

Consult Atlas Technical Assistance for specific environmental recommendations.

Heat Resistance

Although super duplex grades have good high temperature oxidation resistance they suffer from embrittlement if held for even short times at temperatures above +270°C. If embrittled this can only be rectified by a full solution annealing treatment.

Low Temperature Performance

2507Cu is not generally recommended for use below -50°C because of its ductile-to-brittle-transition, again common to all duplex stainless steels.

Heat Treatment

Solution Treatment (Annealing)

Annealing - heat to 1080 - 1120°C and cool rapidly.

Duplex and super duplex grades cannot be hardened by thermal treatment.

Welding

Weldable by standard methods, without pre-heat. Consumables over-alloyed with nitrogen and nickel are generally recommended. TIG (GTAW), MIG (GMAW) and all positional manual (MMAW) electrodes are available. Nickel-based consumables (eg Alloy C22) give higher corrosion resisting welds. As for other duplex stainless steels the coefficient of thermal expansion is lower than for austenitic grades, reducing distortion and residual stresses. Post weld annealing increases the corrosion resistance of welds.

Fabrication

2507Cu is a high strength steel, so high forces will be required for cold forming. The ductility of the grade is quite adequate for most operations, but heavy deformation, such as cold forging, is not possible. If more than about 20% cold work is required an intermediate solution anneal is required.

Typical Applications

Oil and gas exploration, processing and support systems, pollution control including flue gas desulphurisation, marine and other high chloride environments, 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 as Grade S32520, for pipe in ASTM A790M (also as Grade S32520) and for bar in specification ASTM A276, as Grade S32550, Condition A. Similar but not necessarily identical properties are specified for other products in their respective specifications.

Composition Specification (%)

Grade & Spec.		C	Mn	Si	P	S	Cr	Mo	Ni	Cu	N
S32520 ASTM A240M	min.	-	-	-	-	-	24.0	3.0	5.5	0.5	0.20
	max	0.030	1.50	0.80	0.035	0.020	26.0	4.0	8.0	2.0	0.35
S32520 ASTM A790M	min.	-	-	-	-	-	24.0	3.0	5.5	0.5	0.20
	max	0.030	1.5	0.80	0.035	0.020	26.0	5.0	8.0	3.0	0.35
S32550 ASTM A276M	min.	-	-	-	-	-	24.0	2.9	4.5	1.5	0.10
	max	0.040	1.50	1.0	0.040	0.030	27.0	3.9	6.5	2.5	0.25

Mechanical Property Specification

Grade & Specification	Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness	
				Rockwell C (HR C) max	Brinell (HB) max
S32520 – A240M & A790M	770	550	25	-	310
S32550 – A276 Cond A	750	550	25	-	290

Physical Properties

(typical values in the annealed condition)

Grade	Density (kg/m ³)	Elastic Modulus (GPa)	Mean Coefficient of Thermal Expansion			Thermal Conductivity		Specific Heat 20°C (J/kg.K)	Electrical Resistivity (nΩ.m)
			20-200°C (μm/m/°C)	20-300°C (μm/m/°C)	20-500°C (μm/m/°C)	at 20°C (W/m.K)	at 200°C (W/m.K)		
2507Cu	7850	200	13.5	14.0	14.5	17	19	450	850

Grade Specification Comparison

Grade	UNS	Euronorm		Swedish SS	Japanese JIS
	No	No	Name		
2507Cu	S32520 S32550	1.4507	X2CrNiMoCuN25-6-3	-	-

European 1.4507 is closer to S32520 than S32550, but is not exactly the same as either. 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.

Possible Alternative Grades

Grade	Why it might be chosen instead of 2507Cu
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.
Nickel Alloys	A corrosion resistance even higher than 2507Cu is required, and a higher cost structure is acceptable.

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