F44 (UNS S31254) 6% Mo AUSTENITIC STAINLESS STEEL ALLOY

Electralloy's F44 is a 6% Mo, high performance, austenitic stainless steel alloy, UNS S31254, with a typical PREN of 43. The alloy, with relatively high levels of Mo, Cr, and N, was originally designed to resist localized pitting corrosion in seawater and paper pulp bleaching environments. The high Nickel stabilizes the austenite and provides good general acid and stress corrosion cracking resistance. The high nitrogen imparts greater strength to the alloy vs. similar alloys without nitrogen.

CHEMICAL COMPOSITION (Nominal Analysis, weight percent)

Carbon *(max)*	**0.020**	**Nickel**	**17.5 /18.5**
Manganese *(max)*	**1.00**	**Copper**	**0.50 / 1.00**
Silicon *(max)*	**0.80**	**Nitrogen**	**0.18 / 0.22**
Chromium	**19.50 / 20.50**	**Iron**	**Balance**
Molybdenum	**6.00 / 6.50**	**Sulfur**	**0.010**
Phosphorus	**0.030**		

TYPICAL APPLICATIONS

F44 is typically used in any chemical, petro-chemical, pulp & paper, and seawater process equipment, except in strong reducing or hot sulfuric acid environments. It is particularly suited to piping and heat exchangers handling ambient saltwater (even treated with chlorine), and pulp & paper bleaching equipment.

Electralloy's **F44** can be supplied to meet all the requirements of the following specifications, and more…

ASTM A182 (F44), A193(S31254)
A213, A276, A312, A473, A479
NACE MR0175

Electralloy's **F44** is available in a wide variety of sizes and forms, including ingot, billet, and bar.

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PHYSICAL PROPERTIES

Melting Temperature:	2420°F to 2550°F (1425°C to 1455°C)
Density:	0.287 lb./in^3 (7.95 gm/cm^3)
Magnetic Permeability:	1.003
Specific Heat:	(68°F) 0.12 Btu/lb./°F

Coefficient of Thermal Expansion

Temperature		
°F	°C	In./in./°F
68 to 212	20 to 100	9.4 x 10^{-6}

Thermal Conductivity

Temperature		
°F	°C	Btu/ft/hr./°F
68	20	8.1

Electrical Resistivity

°F	°C	Micro ohm in.
68	20	33.5

Modulus of Elasticity (E)

Temperature		Tension	
°F	°C	10^3 ksi	10^{3}MPa
68	20	29	200

TYPICAL MINIMUM MECHANICAL PROPERTIES

Tensile Data: *(solution annealed)*

Test Temp.		UTS		YS		EL in 2" (50.8 mm) or 4D	RA
°F	°C	ksi	MPa	ksi	MPa	%	%
70	21	95	650	44	300	35	50

Typical Hardness: *223 BHN maximum*

TYPICAL ELEVATED TEMPERATURE TENSILE STRENGTH

Tensile Data: *(solution annealed)*

Test Temp.		UTS		YS	
°F	°C	ksi	MPa	ksi	MPa
200	93	90	620	35	241
400	204	80	552	28	193
600	316	75	517	25	172

HEAT TREATMENT

Electralloy's F44, like other austenitic stainless steels, is not hardenable by heat treatment. Alloy is typically solution annealed at between 2100°F and 2200°F, followed by rapid cooling to prevent precipitation of sigma phase, or other intermetallic phases, and maximize corrosion resistance.

HOT WORKING

Recommended hot working temperature range for F44 is 2200°F down to 1800°F (1200°C to 980°C). F44 is considerably stronger and more crack sensitive than ordinary austenitic stainless steels (300 series).

CORROSION & OXIDATION RESISTANCE

Electralloy F44, with its high alloy content provides exceptionally good uniform corrosion resistance. The relatively high Cr, Mo, and N content instills very good resistance to localized pitting corrosion and resistance to acids with chloride ions present. The high Ni and Mo contributes to very good resistance to stress corrosion cracking, particularly in dilute chloride environments.

WELDING

F44 exhibits good weldability using most fusion techniques, but is not amenable to oxy-acetylene welding processes, because carbon pick-up will adversely affect corrosion resistance. Pre-heating or post weld heat treatment is not typically necessary. Autogenous welding is usually avoided since segregation upon solidification of weld leads to some loss of corrosion resistance. If autogenous welding is utilized, post weld solution anneal at 2100°F minimum is recommended with a water quench.

MACHINING

The alloy can be machined using techniques & equipment similar to 300 series stainless, except F44 is much harder and stronger, and has higher work hardening rate. It requires slower speeds, sharp tools, adequate depth of cuts, and very rigid set-ups. High speed tools can be utilized, but carbide tipped tooling is more prevalent and will increase machining speeds.

ELECTRALLOY
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