



EC25540 (UNS S32550) CARLSON SUPER DUPLEX STAINLESS STEEL ALLOY

Electralloy's EC25540 is a Duplex stainless steel alloy, UNS S32550, with restricted chemistry to ensure a minimum 40 PREN. The duplex structure of approximately equal portions of austenite and ferrite provides higher strength than austenitic stainless steels with useful ductility and toughness. The ductile to brittle fracture transition temperature for EC25540 is typically below -50°F . The alloy delivers good combination of general corrosion, and stress corrosion cracking, resistance at moderate cost because it does not contain large amounts of Nickel.

TYPICAL APPLICATIONS

Typical applications include pumps, shafts, valves, flanges, and fasteners for offshore oil & gas platforms, pulp & paper processing, pollution control, and structural parts on naval vessels. The higher nitrogen and molybdenum in EC25540 provide minimum "pitting resistance equivalent number" (PREN) of 40, and as such is listed in NACE MR0175 for use in sour gas environments. EC25540 is limited to approximately 525°F maximum continuous operating temperature.

Electralloy's EC25540 can be supplied to meet all the requirements of the following specifications, and more...

ASTM A182 (F61), A240 (255), A276, A473, A479, NACE MR0175

Electralloy's EC25540 is available in a wide variety of sizes and forms, including ingot, billet, and bar.

CHEMICAL COMPOSITION (NOMINAL ANALYSIS, WEIGHT PERCENT)

Carbon, max.	0.03	Copper, max..	1.5 min. – 2.5 max.
Manganese, max.	1.00	Nitrogen	0.10 min. – / 0.25 max.
Silicon, max.	1.00	Iron	Balance
Chromium	24.0 min. – 27.0 max.	Sulfur, max.	0.02
Molybdenum	2.9 min. – 3.9 max.	Phosphorus, max.	0.035
Nickel	4.5 min. – 6.5 max.		

The information and data contained in this Product Data sheet are intended for general information do not constitute any warranty, expressed or implied, of suitability for any applications or design.

HEAT TREATMENT

EC25540, like austenitic and other duplex stainless steels, is not hardenable by heat treatment. EC25540 is typically solution annealed at between 1950°F and 2050°F, followed by rapid cooling to prevent precipitation of deleterious sigma phase and reduction in toughness

HOT WORKING

Recommended hot working temperature range for EC25540 is 2200°F down to 1800°F (1205°C to 980°C).

CORROSION & OXIDATION RESISTANCE

Electralloy EC25540 with its high chromium content exhibits very good general corrosion resistance, and in combination with the molybdenum content achieves good chloride pitting and crevice corrosion resistance. Its excellent chloride stress corrosion cracking resistance makes it good choice for various saltwater applications. The copper contributes to its resistance to sulfuric acid and along with its resistance to phosphoric and organic acids makes it useful in oil & gas, pulp & paper, and pollution control equipment.

WELDING

EC25540 is weldable using most fusion techniques, but is not amenable to electron beam or oxy-acetylene welding processes due. Pre-heating or post weld heat treatment is not typically necessary, however large sections may require re-solution annealing. EC25540 may be welded to carbon steel, austenitic stainless steel, and other duplexes using appropriate consumable filler material.

MACHINING

The alloy can be machined using techniques & equipment similar to 300 series stainless, even though EC25540 is considerably harder. It requires slower speeds, sharp tools, and rigid set-ups. High speed tools can be utilized, but carbide tipped tooling is more prevalent and will increase machining speeds. The alloy can surface cold work during machining and like other high strength materials may “move” during machining. While not significant in most cases, heavy machining, or very close tolerances may require stress relieving.

PHYSICAL PROPERTIES

Melting Temperature	~2600 to 2650°F (1425 to 1455°C)
Density	0.282 lb./in ³ (7.81 gm/cm ³)
Magnetic Permeability	Magnetic
Specific Heat	0.116 Btu/lb./°F (68°F)

Coefficient of Thermal Expansion		
Temperature		
°F	°C	In./in./°F
68 to 392	20 to 200	7.5 x 10 ⁻⁶
68 to 572	20 to 300	7.8 x 10 ⁻⁶

Thermal Conductivity		
Temperature		
°F	°C	Btu/ft./hr./°F
68	20	9.8

Electrical Resistivity		
Temperature		
°F	°C	Micro ohm in
68	20	33.5

Modulus of Elasticity (E)			
Temperature		Tension	
°F	°C	ksi	MPa
68	20	29.7 x 10 ⁶	205,000

TYPICAL MINIMUM MECHANICAL PROPERTIES

Tensile Data (1950°F solution anneal)							
Test Temp.		UTS		YS		EI	RA
°F	°C	ksi	MPa	ksi	MPa	%	%
70	21	110	758	80	552	25	50
Typical Hardness		297 BHN maximum					

Charpy Impact Data (1950°F solution anneal)					
Test Temp.		Force		Charpy impact values vary considerably with cross section.	
°F	°C	ft*lbs	Joules		
68	20	150	200		
-50	-46	33	45	≥4" to <6" (102mm to 152mm)	
-50	-46	25	34	≥6" to 10" (152mm to 254mm)	

Contact Electralloy for specific charpy impact toughness requirements.