EC625 (UNS N06625) NICKEL-BASED HIGH PERFORMANCE ALLOY

Electralloy's EC625 is a solution strengthened, Nickel-base, high performance alloy providing excellent resistance to both high temperature gaseous corrosion and aqueous corrosion, coupled with good strength and stress rupture properties up to 1800°F (982°C).

CHEMICAL COMPOSITION (Nominal Analysis, weight percent)

Carbon *(max)*	**0.10**	**Columbium**	**3.15 / 4.15**
Manganese *(max)*	**0.50**	**Aluminum** *(max)*	**0.40**
Silicon *(max)*	**0.50**	**Titanium** *(max)*	**0.40**
Chromium	**20.00 / 23.00**	**Iron** *(max)*	**5.00**
Molybdenum	**8.00 / 10.00**	**Nickel** *(min)*	**58.00**
Phosphorus *(max)*	**0.015**	**Sulfur** *(max)*	**0.015**

TYPICAL APPLICATIONS

Because of its unique balance of chromium, molybdenum, and columbium, Electralloy's **EC625** is used in a wide variety of applications. **EC625** exhibits excellent high temperature strength and oxidation resistance making it a prime choice for many gas turbine applications and furnace components. Good resistance to chloride pitting, crevice corrosion, and chloride stress corrosion cracking make it an excellent candidate for many seawater applications including Navy Nuclear propulsion systems. Additionally it finds widespread use in flue gas scrubbers and sour gas well applications where it resists the most severe conditions with virtually no attack.

EC625 can be supplied to meet all the requirements of the following specifications, and more…

AMS 5666
ASTM B446
ASTM B564
MIL-N-24687
NACE MR0175

EC625 is available in a wide variety of sizes and forms, including ingot, billet, bar, and coil rod.

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PHYSICAL PROPERTIES

Melting Temperature:	2350°F to 2460°F (1290°C to 1350°C)
Density:	0.305 lb./in³ (8.44 gm/cm³)
Specific Heat:	(70 to 212°F) 0.098 Btu/lb*°F
Magnetic Permeability:	(H=200 Oersteds) < 1.006

Coefficient of Thermal Expansion

Temperature			
°F	°C	µ/in./°F	µ/m/°C
-400 to 70	-240 to 21	5.0	9.0
70 to 400	21 to 204	7.3	13.2
70 to 1200	21 to 649	8.4	15.1
70 to 1800	21 to 982	9.6	17.3

Thermal Conductivity

Temperature			
°F	°C	Btu/Ft*hr*°F	W/m*K
-200	-129	4.3	7.5
70	21	5.7	9.8
1000	538	10.1	17.4
1800	982	14.6	25.2

Electrical Resistivity

Temperature		Resistivity	
°F	°C	ohm/circ mil/ft	microhm-m
70	21	776	1.29
400	204	806	1.34
1200	649	830	1.38
1800	982	812	1.35

Modulus of Elasticity (E)

Temperature		Tension		Shear		Poisson's Ratio
°F	°C	10^3ksi	MPa	10^3ksi	MPa	
70	21	29.8	206	11.4	79	0.308
400	204	28.4	196	10.8	75	0.312
1200	649	24.4	168	9.2	63	0.328
1800	982	18.7	129	-	-	-

HEAT TREATMENT

EC625 is usually used in the solution treated condition, typically consisting of uniform heating to the 1600°F to 2000°F (870°C - 1095°C) temperature range. Specific mechanical properties depend upon solution treat temperature. While 625 is not normally aged to increase strength, exposure in the 1100°F to 1350°F (595°C - 735°C) range will precipitate a coherent Ni_3Cb (γ) phase which increases strength and decreases ductility and toughness.

TYPICAL MINIMUM MECHANICAL PROPERTIES

Tensile Data: *(Annealed @ 1650°F)*

Test Temp.		UTS		YS		EL
°F	°C	ksi	MPa	ksi	MPa	%
70	21	120	827	60	414	30
600	316	90	621	42	290	30

Typical Hardness: *(Annealed @ 1650°F)* 235 BHN

HOT WORKING

Recommended hot working temperature range for this alloy is 2150°F down to 1850°F (1175°C - 1010°C).

CORROSION & OXIDATION RESISTANCE

Although originally designed for high temperature applications, the high chromium and molybdenum content of the alloy make it extremely corrosion resistant, even in the most severe environments. High molybdenum makes it virtually unaffected by pitting and crevice corrosion in chloride environments (seawater). Electralloy's EC625 has excellent oxidation resistance in both long term and cyclic operations. The alloy is highly resistant to scale loss and spalling at temperatures up to 1800°F (980°C).

WELDING

EC625 is weldable using most fusion techniques; gas shielded arcs, using tungsten or consumable electrodes are recommended. Various resistance welding methods can also be used.

MACHINING

The alloy can be machined using techniques and equipment similar to 300 series stainless. However, because of the alloy's high strength and high work hardening rate, set-ups must be rigid and "overpowered". Lower feeds and speeds are required, and carbide tooling is recommended. Relatively deep, constant feeds must be maintained to prevent work hardening which causes low tool life and breakage.

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