



AS/EN/JISQ 9100:2009



## EC600 (UNS N06600) NICKEL ALLOY

EC600 is a nickel-chromium-iron alloy developed for use in severely corrosive environments at elevated temperatures. The high nickel content of this alloy provides excellent resistance to chloride-ion stress corrosion cracking and imparts resistance to corrosion by a number of organic and inorganic compounds. EC600 combines high strength with desirable workability. It has excellent mechanical properties from sub-zero to elevated temperatures.

### CHEMICAL COMPOSITION (Nominal Analysis, weight percent)

Carbon .....	0.030 / 0.080	Nickel ( <i>min</i> ) .....	72.0
Manganese .....	0.10 / 1.00	Copper ( <i>max</i> ) .....	0.50
Phosphorus ( <i>max</i> ) .....	0.030	Cobalt ( <i>max</i> ) .....	0.10
Sulfur ( <i>max</i> ) .....	0.015	Titanium .....	0.10 / 0.50
Silicon ( <i>max</i> ) .....	0.50	Niobium ( <i>max</i> ) .....	1.00
Chromium .....	14.00 / 17.00	Tantalum ( <i>max</i> ) .....	0.05
Aluminum .....	0.05 / 0.35	Magnesium ( <i>max</i> ) .....	0.06
Iron .....	6.0 / 10.0	Boron ( <i>max</i> ) .....	0.01

### TYPICAL APPLICATIONS

#### Chemical Processing

- calcium and magnesium chloride production, hydrofluoric acid processing, tubing, ammonia converters, flanges, and chlorinating equipment

#### Pulp and Paper

- liquid heater tubing for pulp digesters, reactors and piping for disposal of organic wastes

#### Food Processing

- vegetable processing equipment

**Specifications:** ASTM B166, ASTM B564, AMS 5665, MIL-N-23229, MIL-DTL-23229, NACE MR0175

#### Ore Processing

- chlorine preheaters for zirconium and titanium production, cans for purification of zirconium salts, titanium dioxide production

#### Thermal Processing

- equipment for heat treating muffles, retorts, baskets, boxes, furnace fixtures

#### Power Generation

- nuclear reactor components and steam turbine crossover bellows

**Forms:** ingot, billet, bar, rod, and coil rod

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## PHYSICAL PROPERTIES

<b>Melting Temperature:</b>	2470°F to 2575°F (1355°C to 11413°C)	
<b>Density:</b>	0.304 lb./in <sup>3</sup> (8.42 gm/cm <sup>3</sup> )	
<b>Specific Heat:</b>	(@ 70°F) 0.106 Btu/lb./°F	
<b>Magnetic Permeability:</b>	(H=200 Oersteds) Annealed 1.01	
<b>Electrical Resistivity:</b>	(@ 70°F) 40.6 microhm-in.	
<b>Coefficient of Thermal Expansion</b>		
Temperature		
°F	°C	in./in./°F
70 to 200	21 to 93	7.4 x 10 <sup>-6</sup>
70 to 800	21 to 427	8.1 x 10 <sup>-6</sup>
70 to 1600	21 to 871	9.3 x 10 <sup>-6</sup>
<b>Thermal Conductivity</b>		
Temperature		
°F	°C	Btu/ft <sup>2</sup> /ft./hr/°F
200	93	9.1
800	427	12.1
1600	871	16.7
<b>Modulus of Elasticity (E)</b>		
Temperature °F		10 <sup>6</sup> psi
70		30
1800		20

## MECHANICAL PROPERTIES

<b>Tensile Properties: (Annealed)</b>			
	UTS (ksi) (min)	.2%YS (kis) (min)	%EL (min)
ASTM B166	80	35	30
AMS 5665	85	35	30

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## HEAT TREATMENT

EC600 does not harden by heat treatment. Annealing is accomplished by heating between 1650°F -1800°F and water quench.

## WORKABILITY

The recommended hot working temperature range is between 1600°F-2200°F. The recommended ingot breakdown temperature is between 2100°F-2200°F. EC600 is readily cold worked. Cold working will increase tensile and yield strength.

## CORROSION & OXIDATION RESISTANCE

The high alloy content of EC600 provides excellent corrosion resistance to organic acids encountered in the processing of food and alcoholic beverages. EC600 has excellent resistance to many types of acid solutions, ammonium hydroxide, most neutral and alkaline salt solutions, many oxidizing acid salts and dry chloride. EC600 has outstanding strength and oxidation resistance up to 2150°F.

## WELDING

EC600 can be welded using conventional methods such as gas tungsten arc (GTAW), gas metal arc (GMAW), and shielded metal arc (SMAW).

## MACHINING

EC600 can be machined using conventional techniques and the machinability falls between AISI Type 303 and 304 stainless steel. High speed steel or carbide-tipped cutting tools are recommended. Cutting tools should be kept sharp at all times to assure clean burr free cutting.

