



## EC70600 (UNS C70600) 90 / 10 COPPER-NICKEL ALLOY

Electralloy's EC70600 is a 90 percent copper, 10 percent nickel wrought alloy that demonstrates good resistance to all forms of corrosive attack in fresh water and seawater, including general attack, pitting, stress corrosion, and surface fouling from marine organisms.

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

|                             |            |  |       |
|-----------------------------|------------|--|-------|
| Copper ( <i>min</i> ) ..... | 86.5       | Manganese ( <i>max</i> ) .....                         | 1.0   |
| Nickel .....                | 9.0 / 11.0 | Phosphorus .....                                       | 0 .02 |
| Zinc ( <i>max</i> ) .....   | 0.50       | Sulfur ( <i>max</i> ) .....                            | 0.02  |
| Iron .....                  | 1.0 / 1.8  | Carbon ( <i>max</i> ) .....                            | 0.05  |
| Lead ( <i>max</i> ) .....   | 0.02       | Copper, plus sum of named elements ( <i>min</i> ) .... | 99.50 |

### TYPICAL APPLICATIONS

Electralloy's **EC70600** is widely used in marine applications, seawater piping, desalination plants, power plants, and in condensers and evaporators in petro-chemical plants. The alloy was originally developed as a cost effective alternative to higher nickel alloys such as Electralloy's EC71500. The addition of iron improves corrosion resistance, particularly to impingement attack in high velocity seawater and erosion by sand or silt. This alloy is more resistant to fouling by marine organisms than EC71500. Although the alloy has excellent resistance to corrosion by fresh water, it is not recommended for use in heavily polluted water.

**EC70600** can be supplied to meet requirements of the following specifications, and more . . .

**ASTM B151, ASTM B122**  
**MIL-C-15726, MIL-C-24679**

**EC70600** is available in a wide variety of sizes and forms, including ingot, billet, bar, and rod.

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## PHYSICAL PROPERTIES

|  |  |                                 |                                |
|--|--|---------------------------------|--------------------------------|
| <b>Melting Range:</b>                    | 2010°F to 2100°F<br>(1100°C to 1150°C)               |                                 |                                |
| <b>Density:</b>                          | 0.323 lb./in <sup>3</sup> (8.94 gm/cm <sup>3</sup> ) |                                 |                                |
| <b>Magnetic Permeability:</b>            | 1.05   |                                 |                                |
| <b>Specific Heat:</b>                    | (68°F) 0.09 Btu/lb/°F<br>(20°C) 0.09 cal/g/°C        |                                 |                                |
| <b>Coefficient of Thermal Expansion</b>  |  |                                 |                                |
| Temperature (°F)                         | Temperature (°C)                                     | u/in./°F                        | u/m/°C                         |
| 68 to 572                                | 20 to 300  | 9.5                             | 17.1                           |
| <b>Thermal Conductivity</b>              |  |                                 |                                |
| Temperature                              |  |                                 |                                |
| °F                                       | °C   | Btu/ft <sup>2</sup> /ft./hr./°F | cal/cm <sup>2</sup> /cm/sec/°C |
| 68                                       | 20   | 26                              | 0.11                           |
| <b>Electrical Resistivity:</b>           | 68°F 115 ohms(mil/ft) (annealed)                     |                                 |                                |
| <b>Electrical Conductivity: (%IACS)</b>  | 9.0 (annealed)                                       |                                 |                                |
| <b>Modulus of Elasticity : (tension)</b> | 18 x 10 <sup>6</sup> psi                             |                                 |                                |

## HEAT TREATMENT

Typical annealing temperature for EC70600 is 1100-1500°F (600-815°C). This alloy cannot be hardened by any heat treatment. High sulfur fuels are to be avoided since the alloy is susceptible to sulfur embrittlement.

## WORKABILITY

EC70600 exhibits good formability by both hot and cold working. It does not work harden rapidly, permitting severe drawing and bending operations. Recommended hot working temperature range for this alloy is 1250-1750°F (675-955°C).

## CORROSION RESISTANCE

EC70600 exhibits excellent general corrosion, pitting, stress-cracking, and crevice attack resistance to seawater. The copper-nickel alloys are more resistant to impingement attack caused by high velocities than other copper alloys. In addition, the alloy demonstrates very good resistance to fouling by marine organisms. High velocity sea water conditions (>5 meters/second) should be avoided.

## TYPICAL MECHANICAL PROPERTIES

|                                    |            |     |                 |     |           |
|------------------------------------|------------|-----|-----------------|-----|-----------|
| <b>Tensile Data: (bar and rod)</b> |            |     |                 |     |           |
| <b>Room Temp. Condition</b>        | <b>UTS</b> |     | <b>0.5 % YS</b> |     | <b>EI</b> |
|                                    | ksi        | MPa | ksi             | MPa | %         |
| Soft                               | 40         | 275 | 20              | 135 | 40        |
| <b>Typical Hardness: (soft)</b>    |            |     |                 |     | HRB 25    |

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## WELDING

Alloy is very suitable for joining by brazing and soldering. Fair to good weldability by oxyacetylene method can be achieved. Excellent weldability can be obtained using gas shielded arc, metallic arc, and resistance welding. Carbon arc welding is not recommended.

## MACHINING

Machinability rating of EC70600 is approximately 20% of free-cutting brass.

## MECHANICAL PROPERTIES

The copper-nickel wrought alloys exhibit only moderate strength in the annealed (soft) condition. When extra strength is needed the alloys may be used in the cold worked condition. These alloys retain their strength at elevated temperatures better than most other copper alloys. EC70600 retains high ductility and toughness at low temperature and is suitable for some cryogenic applications.



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