

Copper- C110

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| Typical Analysis (Ave. values %) | Cu | Electrolytic Tough Pitch Copper (ETP Copper) | | |
| | >99.90% | Oxygen by agreement, usually 0.04% | | |
| NEAREST STANDARD | UNS | BS | JIS | ISO |
| | C11000 | C101 | C1100 | Cu-ETP |

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| PRODUCT SPECIFICATIONS | AS 1566 | Rolled flat products |
| | AS 1567 | Wrought rods, bars and sections |
| | AS1568 | Forged stock and forgings |
| | AS 1569 | Seamless tubes for heat exchangers |
| | AS 1571 | Seamless tubes for air conditioning & refrigeration |
| | AS 1572 | Seamless tubes for engineering purposes |

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| DESCRIPTION | Electrolytic Tough Pitch Copper (ETP), alloy110, has excellent ductility and high electrical and thermal conductivity, higher than for any other copper metal except oxygen free grades such as C10200. The electrical conductivity is at least 100%IACS (0.5800microhm-1.cm-1) and is often as high as 101.5%IACS. |
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| APPLICATIONS | The dominant use of this alloy is in electrical conductors, and is widely used for gaskets, switches, terminals and connectors, transformers, electronic parts, ball floats, drawn and spun hollow ware. Electrical and heat exchangers. |
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| MECHANICAL APPLICATIONS | | Tensile Strength MPa | Elongation % | Hardness HV |
| | Annealed | 210 | 40 | 55 max |
| | Half hard | 245 | 10 | 75-90 |
| | Hard | 310 | 7 | 90-115 |
| | Finish: - Annealed or cold rolled to temper | | | |

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| FABRICATION PROPERTIES | Cold working | Excellent |
| | Hot working capacity | Excellent |
| | Hot forging rating | 65% of forging brass |
| | Hot working temperature | 750-875°C |
| | Anneal temperature | 375-650°C |
| | Machinability rate | 20% of free cutting brass |
| | Finishing | Excellent |

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| JOINING PROPERTIES | Soldering | Excellent |
| | Brazing | Good |
| | Oxy Acetylene Welding | Not recommended |
| | Carbon Arc Welding | Fair |
| | Gas Shield Arc Welding | Fair |
| | Coated Electrode Welding | Not recommended |
| | Resistance Welding | Not recommended |

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| PHYSICAL PROPERTIES | Density | 8.89(kg/dm ³) |
| | Melting point (Liquidus) | 1083°C |
| | Melting point (Solidus, Eutectic) | 1065°C |
| | Coefficient of thermal expansion | 17.7-10 ⁻⁶ m/(m.K) |
| | Thermal conductivity | 388-W/(m.K) |
| | Thermal capacity | 385-J/(kg.K) |
| | Electrical resistivity | 1.724-Ohm.mm ² /m |
| | Electrical conductivity | 0.58-0.59 Ohm.mm ² /m |
| | Modulus of Elasticity (tension) | 115GPa |
| | Modulus of Elasticity (shear) | 44GPa |
| | Poisons ration | 0.33 |

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| CORROSION RESISTANCE | C11000 has excellent corrosion resistance to weathering and very good resistance to many chemicals. It is often used specifically for corrosion resistance. It is suitable for use with most waters and can be used underground because it resists soil corrosion. It resists non-oxidising mineral and organic acids, caustic and saline solutions. | |
| | Acids | Resists: Hydrochloric, sulphuric, Acetic, Carbolic, Citric, Formic, Oxalic, Tartaric and fatty acids. |
| | Alkalies | Fused sodium and potassium hydroxide. Caustic solutions. |
| | Salt Solutions | Aluminium chloride, Aluminium sulphate, Calcium chloride, Copper sulphate, Sodium carbonate, Sodium nitrate, Sodium sulphate, Zinc sulphate. |
| | Waters | Industrial and mine waters, sea water and brackish water. |
| | Other media | Corrosion resistance is not adequate for ammonia, amines and ammonia salts; oxidising acids such as chromic & nitric and their salts; ferric chloride, persulphates and perchlorates; mercury and mercury salts. Copper may also corrode in aerated non oxidising acid such as sulphuric and acetic acids, although it is practically immune from these acids if air is excluded. Copper is not suited for use with acetylene, which can react to form acetylide which is explosive. C11000 is considered to be immune to stress corrosion cracking in ammonia and similar media which causes cracking in brass and other copper alloys. |
| WELDING | C11000 contains approx. 0.04% oxygen as cuprous oxide. This intentional residue reduces the adverse effect on electrical conductivity of traces of impurity metals. The internal oxide renders the alloy subject to hydrogen embrittlement if heated in reducing atmospheres above 370°C. C11000 is therefore unsuitable for gas welding and high temperature brazing. Oxygen free copper, C10200 or the deoxidised alloy C12200 is preferred where welding is required. | |