GNEE METAL

C10100 Oxygen-Free Electronic (OFE) Copper

GNEE's main copper products include copper tubes, copper rods, copper plates, copper wires, copper strips, etc.

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1. Introduction

C10100, also known as Oxygen-Free Electronic (OFE) Copper, is a premium-grade pure copper distinguished by its extremely low oxygen content and very high electrical conductivity. It represents the purest form of copper commercially available, meeting the requirement of 99.99% minimum copper content (with silver counted as copper). This combination of high purity and minimal oxygen makes it the material of choice for critical applications in electronics, aerospace, and high-vacuum environments where superior conductivity, ductility, and resistance to hydrogen embrittlement are paramount.

2. Key Characteristics & Advantages

Exceptional Electrical Conductivity: C10100 has the highest electrical conductivity rating (101% IACS minimum) of any copper alloy, making it a benchmark for efficient electrical and thermal energy transfer.

High Thermal Conductivity: Its excellent thermal conductivity ensures efficient heat dissipation in high-power applications.

Extreme Purity: 99.99% (Cu+Ag) minimum purity ensures minimal signal loss and high performance.

Very Low Oxygen Content: Typically < 10 ppm, which prevents the formation of copper oxide (Cu_2O) within the grain structure. This is critical for preventing "hydrogen embrittlement."

Superior Ductility and Formability: Allows for severe bending, stamping, and

forming without cracking.

Excellent Weldability and Brazability: Performs well with all common joining techniques.

Resistance to Hydrogen Embrittlement: The absence of internal oxygen prevents the reaction with hydrogen (e.g., in annealing atmospheres or service environments) that causes gassing and cracking in lower-purity coppers like C11000 (ETP Copper).

3. Chemical Composition (ASTM F68 / UNS C10100)

Element	Weight % (Minimum)	Weight % (Maximum)
Copper + Silver	99.99%	-
Oxygen	-	0.0005% (5 ppm)
Antimony	-	0.0004%
Arsenic	-	0.0005%
Bismuth	-	0.0003%
Cadmium	-	0.0001%
Iron	-	0.0010%
Lead	-	0.0005%
Manganese	-	0.0003%
Phosphorus	-	0.0003%
Selenium	-	0.0003%
Silicon	-	0.0005%
Sulfur	-	0.0015%
Tellurium	-	0.0003%
Tin	-	0.0005%
Zinc	-	0.0001%
Total Other Elements	-	0.0030%

4. Physical Properties

Property	Value (Typical)	Condition / Note
Density	8.94 g/cm³	At 20°C
Melting Point	1083°C (1981°F)	
Electrical Conductivity	101% IACS (Minimum)	Annealed temper; Equivalent to 58.6 MS/m
Thermal Conductivity	391 W/m·K	At 20°C
Coefficient of Thermal Expansion	17.0 x 10^{-6}/°C	20-300°C
Specific Heat Capacity	385 J/kg·K	At 20°C
Modulus of Elasticity (Tensile)	115 GPa (17,000 ksi)	

5. Mechanical Properties

Mechanical properties vary significantly with temper (cold work condition). The following table outlines typical values per ASTM B152.

Temper Name	Temper Code (ASTM)	Tensile Strength (min, MPa)	Yield Strength (0.5% Ext. under load, min, MPa)	Elongation (in 50 mm, min, %)	Rockwell Hardness (Typical)
Annealed (Soft)	O60	221	69	45	F40 (HRF)
1/4 Hard	H01	248	221	20	F65 (HRF)
1/2 Hard	H02	276	248	12	F80 (HRF)
Hard	H04	310	290	5	B30 (HRB)
Extra Hard	H08	345	324	3	B45 (HRB)

6. Fabrication and Processing

Machining: C10100 is very ductile and gummy, making it challenging to machine. It

requires sharp, positive-rake tools, and coolants are recommended to prevent material adhesion. Its machinability rating is approximately 20% on the scale where free-cutting brass (C36000) is 100%.

Forming: Excellent for cold working operations such as bending, stamping, and drawing. Annealing is required between severe forming steps to restore ductility.

Joining:

Soldering & Brazing: Excellent. Use standard fluxes and filler metals for copper.

Welding: Excellent weldability using Gas Tungsten Arc Welding (GTAW/TIG), Gas Metal Arc Welding (GMAW/MIG), and Resistance Welding.

Heat Treatment (Annealing): A low-temperature anneal (e.g., 300-600°C / 572-1112°F) in a protective or reducing atmosphere is used to relieve stresses and restore softness. Time at temperature depends on section size.

7. Available Forms

Form	Typical Size Range (Imperial)	Typical Size Range (Metric)	Common Specifications	Notes
Sheet & Plate	Thickness: 0.020" to 2.0" Width: 12" to 48" Length: 24" to 144"	Thickness: 0.5 mm to 50 mm Width: 300 mm to 1200 mm Length: 600 mm to 4000 mm	ASTM B152	"Plate" is typically considered thickness above 0.250" (6.35 mm). Supplied with mill-finish or cold-rolled surfaces.
Strip & Foil	Thickness: 0.001" to 0.125" Width: 0.125" to 24" Length: Coiled	Thickness: 0.025 mm to 3.0 mm Width: 3 mm to 600 mm Length: Coiled	ASTM B152	Very thin gauges (Foil) are used for flexible circuits and EM shielding. Precision slit to tight width tolerances.
Rod & Bar	Diameter/Thickness: 0.125" to 12" Length: 12 ft to 20 ft (random) or cut-to-length	Diameter/Thickness: 3 mm to 300 mm Length: 3 m to 6 m (random) or cut-to-length	ASTM B187	Available in round, square, rectangular, and hexagonal shapes. Can be supplied in straight lengths or coils (for smaller diameters).

Wire	Diameter: 0.010" to 0.500" Length: Coiled on spools, reels, or in straight lengths	Diameter: 0.25 mm to 12.7 mm Length: Coiled on spools, reels, or in straight lengths	ASTM B1, B2, B3	Supplied in various tempers (annealed to hard). Used for conductors, lead wires, and fasteners.
Tubes (Seamless)	Outer Diameter: 0.125" to 6.0" Wall Thickness: 0.010" to 0.500" Length: 12 ft to 20 ft	Outer Diameter: 3 mm to 150 mm Wall Thickness: 0.25 mm to 12.7 mm Length: 3 m to 6 m	ASTM B75, B188	Produced by extrusion or piercing, ensuring a homogeneous structure with no seam. Superior for high-pressure applications.
Tubes (Welded)	Outer Diameter: 0.125" to 3.0" Wall Thickness: 0.005" to 0.100" Length: Coiled or straight lengths	Outer Diameter: 3 mm to 75 mm Wall Thickness: 0.13 mm to 2.5 mm Length: Coiled or straight lengths	ASTM B170	Formed from strip and welded, then often drawn to size. Excellent for plumbing, heat exchangers, and capillary tubes.
Busbar & Profiles	Thickness: 0.032" to 1.0" Width: 0.25" to 10.0" Length: 12 ft to 20 ft	Thickness: 0.8 mm to 25 mm Width: 6 mm to 250 mm Length: 3 m to 6 m	ASTM B187	Rectangular bars are standard busbars. Custom extruded profiles (e.g., L-shape, T-shape) are also available.

8. Applications

C10100 is specified for high-performance applications where its superior properties justify its premium cost.

Electronics & Semiconductors: Lead frames, waveguides, coaxial cables, vacuum tube components, base plates for high-power transistors.

Aerospace & Defense: High-reliability electrical connectors, waveguides, and components for rocket engines.

High-Vacuum Systems: Seals, chambers, and feedthroughs where outgassing must be minimized.
Superconductivity and Cryogenics: Used in particle accelerators and MRI systems for its excellent conductivity at low temperatures.
Power Transmission: High-efficiency busbars and windings in high-power generators and transformers.

9. Comparison with Other Copper Types

C10100 (OFE) vs. C11000 (ETP - Electrolytic Tough Pitch):
C11000 contains 200-400 ppm oxygen. It is less expensive and suitable for most general electrical applications but is susceptible to hydrogen embrittlement and has slightly lower conductivity (~100% IACS).

C10100 (OFE) vs. C10200 (OF - Oxygen-Free):
C10200 is also oxygen-free but has a slightly lower purity requirement (99.95% Cu min). C10100 is the higher-grade, higher-purity version.

C10100 (OFE) vs. C14500 (Tellurium Copper):
C14500 contains tellurium, which dramatically improves machinability (~85%) but reduces electrical conductivity to about 95% IACS.

10. Standards and Equivalents

Standard	Designation
UNS	C10100
ASTM	F68
ASTM	B152 (Sheet, Strip, Plate, Bar)
ASTM	B1/B2 (Wire)
ASTM	B75/B170 (Tube)
CDA (Copper Development Assoc.)	101
European (EN)	Cu-OFE (CW009A)
Japanese (JIS)	C1011

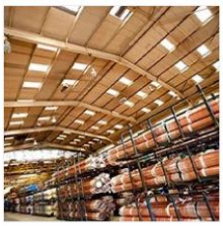
11. Important Notes

Hydrogen Embrittlement: This is a key differentiator. In high-temperature reducing atmospheres (containing H_2), the oxygen in ETP copper (C11000) reacts to form steam, which cannot diffuse out, leading to internal pressure, blisters, and cracking. C10100 is immune to this failure mode.
Surface Finish: C10100 is typically supplied with a clean, bright finish. It is prone to oxidation (tarnishing) in air and may require protective packaging or plating (e.g., tin, silver, nickel) for long-term stability.
Cost: C10100 is one of the most expensive copper grades due to its intensive manufacturing process to achieve extreme purity.

About Us

Plant And Equipment

We rely on a full-process production line of melting, extrusion, drawing, heat treatment and finishing. Our core equipment includes medium-frequency induction furnaces, extruders, cold drawing machines and annealing furnaces, and are equipped with intelligent detection systems to ensure that the copper we produce is of first-class quality and stable performance.







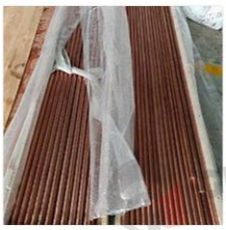



Packaging And Shipping

To ensure our products arrive in perfect condition, we use robust packaging:
Protective End Caps: Prevent damage to tube ends.
Waterproof Wrapping: Protects against moisture and corrosion during transit.

Secured Bundling: Tubes are bundled and strapped onto wooden crates or pallets.
Clear Labeling: Each bundle is clearly labeled with material grade, heat number, and dimensions.





Founded in 2008, GNEE has many years of experience in copper product export. Headquartered in Henan Province, China, adjacent to the Beijing-Hong Kong-Macao Expressway, the company has over 200 dedicated employees, registered capital of RMB 10 million, and covers an area of over 350,000 square meters. GNEE is SGS-certified.

We provide high-quality copper products, excellent service, and highly competitive pricing. We specialize in the production and manufacturing of copper tubes, rods, sheets, coils, and wire.

Our products are exported to over 160 countries worldwide and are widely used in key sectors such as large-scale pipeline construction, petrochemicals, shipbuilding, the automotive industry, and large power plants.

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