ASTM B88 / B88M Standard Specification for Seamless Copper Water Tube

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

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1. Standard Overview & Scope

ASTM B88 (inch-pound units) / B88M (SI units) is the predominant North American standard for seamless copper tube used in potable water, heating, cooling, and other general plumbing service systems. It establishes requirements for tube suitable for connection by soldering, brazing, flaring, compression fittings, or press-connect systems.

Key Characteristics: Defines three standardized wall-thickness types (K, L, M) with fixed outside diameters, ensuring compatibility with standardized fittings and predictable pressure ratings.

Regulatory Status: Recognized by all major plumbing codes (IPC, UPC, CSA) and often required for plumbing system approvals.

2. Material Requirements

Copper UNS Numbers:

Primary Grade: C12200 – Phosphorus Deoxidized Copper, High Residual Phosphorus (DHP). This is the overwhelmingly standard material due to its resistance to hydrogen embrittlement during soldering/brazing.

Optional Grade: C10200 – Oxygen-Free Electronic Copper (OFE). Used only by agreement for specialized applications requiring maximum purity.

Chemical Composition: Complies with ASTM B846 for C12200 or B152 for C10200.

Temper: Available in both hard-drawn (H58, H55) and annealed (soft) tempers (O60), depending on application and joining method.

3. Dimensions, Tolerances, and Types

This is the most critical section of B88, as it defines the standardized dimensional system.

3.1 The Type System (K, L, M)

All three types share the same outside diameters (ODs) but have different wall thicknesses, leading to different inside diameters (IDs) and pressure ratings.

Type	Wall Thickness	Primary Application & Characteristics
Type K	Heaviest	Underground service, main distribution lines, high-pressure applications, and where external corrosion or physical damage is a concern.
Type L	Medium	The most commonly used type for interior plumbing distribution (hot/cold water) in residential and commercial buildings. Offers the best balance of strength, cost, and capacity.
Type M	Thinnest	Economical choice for above-ground, low to moderate pressure residential water distribution, typically in short-run applications. Not permitted underground by many codes.

3.2 Complete Dimension Table (Nominal Sizes - Types K, L, M)

Below is a comprehensive table of the most common sizes. Note: Nominal sizes are approximate to standard pipe sizes but have actual ODs slightly larger.

Nominal Size (inch)	Outside Diameter (OD)	Type K Wall	Type L Wall	Type M Wall
	(in) / (mm)	(in) / (mm)	(in) / (mm)	(in) / (mm)
1/4	0.375 / 9.52	0.035 / 0.89	0.030 / 0.76	0.025 / 0.64
3/8	0.500 / 12.70	0.035 / 0.89	0.030 / 0.76	0.025 / 0.64
1/2	0.625 / 15.88	0.049 / 1.24	0.035 / 0.89	0.028 / 0.71
3/4	0.875 / 22.22	0.049 / 1.24	0.042 / 1.07	0.032 / 0.81
1	1.125 / 28.58	0.065 / 1.65	0.050 / 1.27	0.040 / 1.02
1 1/4	1.375 / 34.93	0.065 / 1.65	0.055 / 1.40	0.042 / 1.07
1 1/2	1.625 / 41.28	0.072 / 1.83	0.060 / 1.52	0.049 / 1.24
2	2.125 / 53.98	0.083 / 2.11	0.070 / 1.78	0.058 / 1.47
3	3.125 / 79.38	0.109 / 2.77	0.090 / 2.29	0.072 / 1.83
4	4.125 / 104.78	0.134 / 3.40	0.110 / 2.79	0.095 / 2.41
6	6.125 / 155.58	0.180 / 4.57	0.160 / 4.06	0.135 / 3.43

3.3 Dimensional Tolerances

Outside Diameter: ± 0.004 inches (± 0.10 mm) for sizes up to 8 inches.

Wall Thickness: ± 10% of the specified nominal wall thickness for the respective type (K, L, M).

Length (Straight): +1/4 inch, -0 inch for random lengths; closer tolerances for cut lengths.

Straightness: Maximum deviation of 0.020 in/ft for drawn temper; 0.040 in/ft for annealed temper.

4. Mechanical Properties and Performance Ratings

Properties vary by temper (drawn vs. annealed). Type K, L, M have the same mechanical properties for a given temper and material.

Typical Mechanical Properties (Drawn Temper H58 - C12200):

Tensile Strength: 40 - 52 ksi (275 - 360 MPa)

Yield Strength (0.5% extension): Min. 40 ksi (275 MPa)

Elongation: Min. 10% in 2 inches

Typical Mechanical Properties (Annealed Temper O60 - C12200):

Tensile Strength: Min. 30 ksi (205 MPa)

Yield Strength: Min. 8 ksi (55 MPa)

Elongation: Min. 40% in 2 inches

Hydrostatic Pressure Test: Each tube must withstand a minimum hydrostatic pressure calculated by formula $P = 2St / (D - 0.8t)$, where:

S = allowable fiber stress (e.g., 3000 psi / 20.7 MPa for annealed tube; 6000 psi / 41.4 MPa for drawn tube up to 3.5" OD).

D = OD, t = minimum wall thickness.

5. Testing and Inspection

Chemical Analysis: To verify copper grade.

Tension Test: To confirm mechanical properties.

Hydrostatic Test: Mandatory for every length of tube.

Flaring Test (for annealed tube): A sample must withstand flaring to a specified increase in diameter without cracking (e.g., 25% for tube under 1-1/8" OD).

Nondestructive Electric Test: May be used as an alternative to the hydrostatic test by agreement (eddy current or ultrasonic).

Visual/Dimensional Inspection: For surface quality and dimensional conformity.

6. Purchasing, Application, and Selection Guide

6.1 How to Order/Specify:

A complete specification must include:

Standard: ASTM B88 or B88M.

Material: Copper UNS C12200 (or C10200 if specified).

Type: K, L, or M.

Temper: Drawn (for rigid runs) or Annealed (for easy bending).

Size: Nominal Size (e.g., 1/2 inch) and confirmation of Type.

Length & Quantity: e.g., 50 pieces, 20 ft, drawn temper.

Certification: Mill Test Report (MTR) if required.

6.2 Application Selection Guide

Application	Recommended Type	Typical Temper
Underground Water Main	Type K	Drawn
In-wall Water Distribution (Residential/Commercial)	Type L	Drawn
Short-run, above-ground exposed lines (Residential)	Type M	Drawn
Hydronic (Radiant) Heating Piping	Type L or PEX-AL-PEX*	Annealed (for bending)
Domestic Hot/Cold Water Lines	Type L	Drawn
Repair/Retrofit requiring bending	Type L	Annealed

6.3 Pressure-Temperature Ratings

Pressure ratings are calculated per ASME B31.9 and depend on Type (wall thickness). Consult engineering tables. As a general rule for water at 100°F (38°C):

Type K: Highest pressure rating.

Type L: Standard pressure rating (~400 psi for 1/2" drawn).

Type M: Lowest pressure rating (~250 psi for 1/2" drawn).

7. Related and Companion Standards

ASTM B251 / B251M: General requirements for wrought seamless copper and copper-alloy tube. Essential companion document.

ASME B16.18 / B16.22 / B16.26: Standards for cast and wrought copper alloy fittings (solder-joint).

ASME B16.50 / CSA LC4: Standards for wrought copper and copper-alloy braze-joint pressure fittings.

NFPA 13: Standard for Installation of Sprinkler Systems (often references Type K or L).

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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