



Designation: B1018 – 21

Standard Specification for Seamless Copper-Iron Tube for Air Conditioning and Refrigeration Field Service¹

This standard is issued under the fixed designation B1018; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification establishes the requirements for seamless copper-iron tube intended for use in the connection, repairs, or alternations of air conditioning or refrigeration units in the field.

1.2 The tube shall be produced from the following copper alloy:

Copper UNS No.

C19400

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The following safety caveat pertains only to the test method(s) described in this specification:

1.4.1 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.04 on Pipe and Tube.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

B153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing
B251/B251M Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
B846 Terminology for Copper and Copper Alloys
B900 Practice for Packaging of Copper and Copper Alloy Mill Products for U.S. Government Agencies
E8/E8M Test Methods for Tension Testing of Metallic Materials
E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)³
E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)³
E243 Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes
E478 Test Methods for Chemical Analysis of Copper Alloys
2.2 ASME Standard:⁴
ASME Boiler and Pressure Vessel Code Application

3. General Requirements

3.1 The following sections of Specification B251/B251M constitute a part of this specification:

- 3.1.1 Sampling,
- 3.1.2 Number of tests and retests,
- 3.1.3 Dimensions and permissible variations,
- 3.1.4 Test specimens, and
- 3.1.5 Significance of numerical limits.

3.2 When a section with an identical title to those referenced in 3.1 appears in this specification and is in conflict with the section appearing in Specification B251/B251M, the section in this specification shall prevail.

4. Terminology

4.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology B846.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

TABLE 1 Chemical Composition—Weight %

Copper or Copper Alloy UNS No.	Composition %				
	Copper	Iron	Zinc	Lead, max	Phosphorus
C19400	97.0 min	2.1–2.6	0.05–0.20	0.03	0.015–0.15

5. Ordering Information

5.1 Include the following specified choices when placing orders for product under this specification, as applicable:

- 5.1.1 ASTM designation and year of issue;
- 5.1.2 Copper UNS No. C19400 (or other internationally recognized copper) designation;
- 5.1.3 Temper (Section 8);
- 5.1.4 Dimensions, diameter, and wall thickness (Section 12);
- 5.1.5 How furnished: straight lengths or level wound coils;
- 5.1.6 Quantity—total weight or total length or number of pieces of each size; and
- 5.1.7 Intended application.

5.2 The following options are available but may not be included unless specified at the time of placing of the order, when required:

- 5.2.1 Heat identification or traceability details,
- 5.2.2 Expansion test (10.1),
- 5.2.3 Cleanness test (10.2 and 17.2.4),
- 5.2.4 Sealed coil ends,
- 5.2.5 Certification,
- 5.2.6 Test report,
- 5.2.7 If product is purchased for agencies of the U.S. government, and
- 5.2.8 If product is ordered for ASME Boiler and Pressure Vessel Code Application.

6. Materials and Manufacture

6.1 *Materials*—The material of manufacture shall be billets, bars, or tube of UNS No. C19400 of such purity and soundness as to be suitable for processing into the tubular products prescribed.

6.2 Manufacture:

6.2.1 The product shall be manufactured by such hot-working, cold-working, and annealing processes as to produce a uniform wrought structure in the finished product.

6.2.2 The product shall be hot or cold worked to the finished size and subsequently annealed, when required, to meet the temper properties specified.

6.2.3 Straight lengths specified as O61 annealed temper or H80 hard-drawn temper shall be cleaned and capped, plugged, or otherwise closed at both ends so as to maintain the internal cleanness of the tubing under normal conditions of handling and storage.

7. Chemical Composition

7.1 The material shall conform to the chemical composition requirements in Table 1 for UNS No. C19400.

7.1.1 These composition limits do not preclude the presence of other elements. By agreement between the manufacturer and purchaser, limits may be established and analysis required for unnamed elements.

8. Temper

8.1 The standard tempers for products described in this specification are given in Table 2.

9. Mechanical Property Requirements

9.1 Tensile and Yield Strength Requirement:

9.1.1 Product furnished under this specification shall conform to the tensile and yield strength requirements prescribed in Table 2 when tested in accordance with Test Methods E8/E8M.

10. Performance Requirements

10.1 Expansion Test:

10.1.1 When specified in the contract or purchase order, tube furnished in the annealed temper (O61) shall withstand an expansion of 30 % of the outside diameter when tested in accordance with Test Method B153.

10.1.2 The expanded tube shall show no cracking or other defects visible to the naked eye.

10.2 Cleanness of Interior Surface:

10.2.1 When specified in the contract or purchase order, this test shall be performed by the manufacturer.

10.2.2 After evaporation of the cleaning solvent, the residue weight shall not exceed 0.0035 g/ft² (0.038 g/m²) of the interior surface.

TABLE 2 Tensile and Yield Strength Requirements

Form	Temper Designation		Tensile Strength, min		% Elongation min. in 2 in. (50 mm)	Yield Strength 0.2 % Offset, min		Yield Strength 1.0 % Offset, min	
	Standard	Former	ksi ^A	MPa ^B		ksi ^A	MPa ^B	ksi ^A	MPa ^B
	O61	Soft annealed	45	(310)	30	20	(140)	23	(160)
	H80	Hard drawn	61	(420)	5	...	...	...	...

^A ksi = 1000 psi.

^B See X1.2.