Designation: B1001 – 17

Standard Specification for Copper Electrode Wire Used for Welding Seams of Steel Cans[1]

This standard is issued under the fixed designation B1001; 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 drawn, soft annealed round copper electrode wire used in welding machines for the purpose of seam welding of cans.

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

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B49 Specification for Copper Rod for Electrical Purposes

B193 Test Method for Resistivity of Electrical Conductor Materials

B224 Classification of Coppers

B250/B250M Specification for General Requirements for Wrought Copper Alloy Wire

B258 Specification for Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

E8/E8M Test Methods for Tension Testing of Metallic Materials

E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry

E2575 Test Method for Determination of Oxygen in Copper and Copper Alloys (Withdrawn 2017)[3]

F16 Test Methods for Measuring Diameter or Thickness of Wire and Ribbon for Electronic Devices and Lamps

2.2 *NIST Document:*[4]

NBS Handbook 100 Copper Wire Tables

3. General Requirements

3.1 The following sections of Specification B250/B250M, as applicable, constitute a part of this specification:

3.1.1 Terminology,
3.1.2 Materials and Manufacture,
3.1.3 Workmanship, Finish, and Appearance,
3.1.4 Sampling,
3.1.5 Number of Tests and Retests,
3.1.6 Test Methods,
3.1.7 Significance of Numerical Limits,
3.1.8 Inspection,
3.1.9 Rejection and Rehearing,
3.1.10 Certification,
3.1.11 Test Report, and
3.1.12 Packaging and Package Marking.

4. Ordering Information

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

4.1.1 ASTM designation and year of issue,
4.1.2 Copper [Alloy] UNS No. designation (see Classification B224),
4.1.3 Temper (Temper Section 7),
4.1.4 Form (wire) and size (diameter) (Dimensions and Permissible Variations Section 11),
4.1.5 How furnished: straight length or coils,
4.1.6 Quantity; weight for each size and form,
4.1.7 Intended application, and
4.1.8 Package type (stem, reel, bulk or drum).
4.1.9 The following options are available but may not be included unless specified at the time of placing the order, when required:
4.1.9.1 Heat identification or traceability details,
4.1.9.2 Electromagnetic (eddy current) examination,

[1] This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes and Forgings.

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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.

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

[4] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

4.1.9.3 Certification, and
4.1.9.4 Mill Test Report.

5. Materials and Manufacture

5.1 *Materials:*

5.1.1 The material of manufacture shall be drawn wire of the designated copper UNS number of such purity to be suitable for use prescribed herein.

5.2 *Manufacture:*

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

5.2.2 The product shall be hot- or cold-worked to the finished size and subsequently annealed to meet the temper properties specified.

6. Chemical Composition

6.1 The material shall conform to the chemical composition requirements in Table 1 for the copper UNS number designation specified in ordering information.

6.2 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 specific elements.

7. Temper

7.1 The standard temper for the product described in this specification include:

7.1.1 O60 Soft Annealed or Hard Temper H04.

8. Physical Properties

8.1 Electrical resistivity in annealed condition at 20 °C: 0.15328 $\Omega \cdot g/m^2$ Maximum (100.00 % IACS Minimum). (See NBS Handbook 100.)

9. Mechanical Properties

9.1 Product furnished to this specification shall conform to the tensile requirements prescribed in Table 2.

9.1.1 Tensile requirements for product diameters not covered in Table 2 shall be agreed upon by the manufacturer and the supplier.

9.2 Acceptance or rejection based upon mechanical properties shall depend upon tensile strength and elongation.

9.2.1 Tensile tests performed on samples containing a rod joint (weld) shall provide a tensile strength of at least 95 % of the minimum requirement provided in 9.2.

10. Other Requirements

10.1 The surface of electrode wire shall be free of oxides visible to the eye.

TABLE 1 Chemical Composition

UNS Number Copper Type	C11000[A] ETP	C11020[A] FRHC
Copper incl silver, min	99.90 %	99.90 %
Oxygen	<650 ppm	<650 ppm

[A] See Specification B49.

10.2 The surface of electrode wire shall be free of flaws that may interfere with the welding or feeding process.

10.3 The surface of electrode wire shall be free of oils and other contaminants that may interfere with welding.

11. Dimensions, Mass, and Permissible Variations

11.1 Electrode wire diameter sizes shall be expressed as the nominal diameter of the wire in decimal fractions of a millimeter to the nearest 0.001 mm.

NOTE 1—This specification considers the normal range of nominal electrode wire diameters to range from 1.200 to 2.500 mm (0.047 to 0.098 in.). Dimensional requirements outside of this range shall be addressed in the purchase order or contract.

11.2 The diameter (individual measurements and the mean) of the wire shall not vary more than plus 1 % or minus 2 % from the stated nominal value of the electrode wire.

12. Workmanship, Finish, and Appearance

12.1 Electrode wire shall be free from defects that would render it unsuitable for its intended application.

13. Sampling

13.1 For routine sampling of electrode wire for conformance, the method of sampling shall be in accordance with 14.1 unless otherwise agreed upon by the purchaser and the supplier.

13.2 *Electrode Wire Lot*—A container, or group of containers, of electrode wire with homogenous test results in a quantity of 4536 kg (10 000 lb) or less.

13.3 In case of dispute concerning chemical composition, electrical resistivity, mechanical properties, or size, the method of sampling shall be in accordance with Section 15 with a sample from each container under dispute. If the test sample passes the appropriate test(s), the product in the specific container shall be considered to conform to the requirements of this specification. If the test piece sample fails the appropriate test(s) the product in the specific container shall be determined not to conform to the requirements of this standard specification.

13.4 In case of special requirements specified in the purchase order or contract, the method of sampling shall be as agreed between the supplier and the purchaser.

14. Number of Tests and Retests

14.1 *Tests:*

14.1.1 Chemical composition of electrode wire may be determined from the analysis of rod used as feedstock for the production of the wire.

14.1.1.1 If chemical composition cannot be determined from rod feedstock analysis, chemical composition shall be determined as the mean of at least two replicate analyses of each sample of wire.

14.1.2 Electrical resistivity shall be determined from the results of at least one sample per lot. Electrical resistivity may be determined from results of rod feedstock used to fabricate the electrode wire.

TABLE 2 Tensile Requirements

Copper Types UNS C11000 ETP or C11020 FRHC				
Diameter[A]	Temper Designation	Tensile Strength		Elongation in 254 mm (10 in.)
		MPa	ksi[B]	%
1.20–2.50 mm (0.047–0.098 in.)	O60 Soft	220–285	31.9–41.3	22–28
1.20–2.50 mm (0.047–0.098 in.)	H04 Hard	400–440	58.0–63.8	N/A

[A] See Specification B258.
[B] ksi=1000 psi.

14.1.3 Tensile strength (when required by contract) and elongation shall be determined from the results of at least one sample per lot.

14.1.4 Diameter shall be determined by the mean value of three measurements taken on the sample. In order to meet the specification, each individual measurement, as well as the average, shall conform to requirements.

14.2 *Retests:*

14.2.1 When requested by the manufacturer, or supplier, a retest shall be permitted when results of tests obtained by the purchaser fail to conform to the requirements of the product specification.

14.2.2 The retest shall be as directed in the product specification for the initial test, except that the number of test specimens shall be twice that normally required for the specified test.

14.2.3 All test specimens shall conform to the product specification requirement(s) in retest. Failure to conform shall be cause for rejection.

15. Specimen Preparation

15.1 For testing, specimen preparation shall be at the discretion of the preparer.

15.2 In the case of special requirements specified in the purchase order or contract, specimen preparation shall be as agreed by the supplier and the purchaser.

15.3 In the case of dispute concerning specimen preparation for chemical composition, resistivity, size, or tensile, specimen preparation shall be in accordance with requirements referenced in Section 16.

TEST METHODS

16. Test Methods

16.1 The product furnished shall conform to specified requirements when subjected to testing in accordance with the following table:

Tensile strength and elongation	E8/E8M
Chemical purity	E53
Oxygen content	E2575
Resistivity	B193
Diameter	F16

17. Rejection and Rehearing

17.1 *Rejection:*

17.1.1 Product that fails to conform to the specification requirements when tested by the purchaser or purchaser's agent shall be subject to rejection.

17.1.2 Rejection shall be reported to the manufacturer, or supplier, promptly. In addition, a written notification of rejection shall follow.

17.1.3 In case of dissatisfaction with results of the test upon which rejection is based, the manufacturer, or supplier, shall have the option to make claim for a rehearing.

17.2 *Rehearing:*

17.2.1 As a result of product rejection, the manufacturer, or supplier, shall have the option to make claim for a retest to be conducted by the manufacturer, or supplier, and the purchaser. Samples of the rejected product shall be taken in accordance with the product specification and subjected to test by both parties using the test method(s) specified in the product specification, or alternatively, upon agreement of both parties, an independent laboratory may be selected for the test(s) using the test method(s) specified in the product specification.

18. Certification

18.1 When specified in the purchase order or contract, the purchaser shall be furnished certification stating samples representing each lot have been tested and inspected as indicated in this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results or certification shall be furnished. Test reports or certificates may be transmitted to the purchaser by electronic services. The content of the electronically transmitted document shall conform to any existing agreement between the purchaser and the seller.

19. Test Report

19.1 When specified in the contract or purchase order, a report of test results shall be furnished.

20. Packaging and Package Marking

20.1 *Packaging:*

20.1.1 The product shall be separated by size, composition, and temper, and prepared for shipment by common carrier, in such a manner as to afford protection from the normal hazards of transportation.

20.2 *Package Marking:*

20.2.1 Each shipping unit shall be legibly marked with the UNS number or copper type, wire diameter, gross and net weight, and the name of the supplier.

21. Keywords

21.1 can; electrode; seam; UNS No. C11000; UNS No. C11020; welding; wire