



Designation: B246 – 15 (Reapproved 2021)

Standard Specification for Tinned Hard-Drawn and Medium-Hard-Drawn Copper Wire for Electrical Purposes¹

This standard is issued under the fixed designation B246; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers tinned hard-drawn and medium-hard-drawn round copper wire for electrical purposes.

1.2 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.

1.2.1 *Exception*—For density, resistivity and temperature, the values stated in SI units are to be regarded as 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. For hazard statement, see Sections 10 and 13.*

1.4 *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 The following documents of the issue in effect on the date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:²

B5 Specification for High Conductivity Tough-Pitch Copper Refinery Shapes

B49 Specification for Copper Rod for Electrical Purposes

B170 Specification for Oxygen-Free Electrolytic Copper—Refinery Shapes

B193 Test Method for Resistivity of Electrical Conductor Materials

2.3 *National Bureau of Standards*:³

NBS Handbook 100—Copper Wire Tables

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Quantity of each size,

3.1.2 Wire size, diameter in inches (see 5.1 and Table 1),

3.1.3 Type of copper, if special (see 4.2),

3.1.4 Temper (see 7.1 and Table 1),

3.1.5 Package size (see 18.1),

3.1.6 Special package marking, if required, and

3.1.7 Place of inspection (Section 16).

4. Materials

4.1 The tinned wire shall be made by coating hard-drawn and medium-hard-drawn copper wire with commercially pure tin (see Note 1). For purposes of this specification, the tin shall be considered commercially pure if the total of other elements, exclusive of copper, does not exceed 1 %. Notwithstanding the previous sentence, chemical analysis of the tin coating or of the tin used for coating shall not be required under this specification. Adequacy of the tin coating is ensured by the continuity of coating and adherence of coating requirements (Sections 9 and 13, respectively).

4.2 The copper shall be copper of such quality and purity that the finished product shall have the properties and characteristics prescribed in this specification.

NOTE 1—Specification B49 defines copper suitable for use.

4.3 Copper bars of special qualities, forms, or types, as may be agreed upon between the manufacturer and the purchaser, and which will conform to the requirements prescribed in this specification may also be used.

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.04 on Conductors of Copper and Copper Alloys.

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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 Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.



TABLE 1 Tensile Requirements

								Tinned Medium-Hard-Drawn Wire				
								Tinned Hard-Drawn Wire			Tensile Strength, min	
Diameter		Area at 20 °C			Tensile Strength, min		Elongation in 10 in. (250 mm), % min	psi		Mpa		Elongation in 10 in. (250 mm), % min
in.	mm	cmil	in. ²	mm ²	psi	Mpa		min	max	min	max	
0.2043	5.189	41 738	0.03278	21.15	54 100	370.6	1.7	42 400	55 300	290.4	378.8	1.9
0.1819	4.620	33 088	0.02599	16.77	55 100	377.4	1.6	43 300	55 700	296.6	381.5	1.7
0.1620	4.115	26 244	0.02061	13.30	55 900	382.9	1.4	44 100	56 000	302.1	383.6	1.5
0.1443	3.665	20 822	0.01635	10.55	56 700	388.4	1.3	44 900	56 300	307.6	385.6	1.4
0.1285	3.264	16 512	0.01297	8.367	57 300	392.5	1.3	45 500	56 700	311.7	388.4	1.3
0.1144	2.906	13 087	0.01028	6.632	57 900	396.6	1.2	46 000	57 000	315.1	390.4	1.3
0.1019	2.588	10 384	0.008155	5.262	58 400	400.0	1.2	46 500	57 300	318.5	392.5	1.2
0.0907	2.304	8226	0.006461	4.1684	58 900	403.5	1.1	46 900	57 700	321.3	395.2	1.2
0.0808	2.052	6529	0.005128	3.308	59 100	404.8	1.1	47 200	58 000	323.3	397.3	1.1
0.0720	1.829	5184	0.004072	2.627	59 300	406.2	1.1	47 300	58 300	324.0	399.3	1.1
0.0641	1.628	4109	0.003227	2.082	59 600	408.2	1.0	47 600	58 700	326.1	402.1	1.0
0.0571	1.450	3260	0.002561	1.652	59 800	409.6	1.0	47 800	59 000	327.4	404.1	1.0
0.0508	1.290	2581	0.002027	1.308	59 900	410.3	1.0	47 900	59 300	328.1	406.2	1.0

5. Dimensions, Mass, and Permissible Variations

5.1 The wire sizes shall be expressed as the diameter of the coated wire in decimal fractions of an inch to the nearest 0.0001 in. (0.001 mm) (Explanatory Note 5).

5.2 The coated wire shall not vary from the specified diameter by more than +3 % or –1 %.

5.3 Ten percent, but not less than five coils or spools (or all, if the lot is less than five) from any lot of wire shall be taken near each end and one near the middle. If any of these selected coils or spools fails to conform to the requirements prescribed in 5.2, all coils or spools shall be gaged in the manner specified.

6. Workmanship, Finish, and Appearance

6.1 The tin coating shall consist of a smooth continuous layer, firmly adhering to the surface of the copper.

6.2 The wire shall be free from all imperfections not consistent with the best commercial practice.

7. Tensile Properties

7.1 The tinned wire shall conform to the requirements as to tensile properties prescribed in Table 1 (Explanatory Note 1).

7.2 For wire the nominal diameter of which is more than 0.001 in. (0.025 mm) greater than a size listed in Table 1, but which is less than that of the next larger size, the requirements of the next larger size shall apply.

7.3 Tension tests shall be made on representative samples. Determine the elongation of the wire as the permanent increase in length due to the breaking of the wire in tension, measured between gage marks placed originally 10 in. (250 mm) apart upon the test specimen (Explanatory Note 2).

7.4 If any part of the fracture takes place outside the gage marks or in the jaws of the testing machine, or if an examination of the specimen indicates a flaw, the value obtained may not be representative of the material. In such cases the test may be discarded and a new test made.

7.5 Retests—If upon testing a specimen from any coil or spool of wire, the results do not conform to the requirements prescribed in Table 1, two additional specimens shall be tested, and the average of the three tests shall determine the acceptance or rejection of the coil or spool.

8. Resistivity

8.1 Electrical resistivity shall be determined on representative specimens by resistance measurements made in accordance with Test Method B193. At a temperature of 20 °C the resistivity of coated wire shall not exceed the values prescribed in Table 2 (Explanatory Note 3).

9. Continuity of Coating

9.1 The continuity of coating on the wire shall be determined on representative samples taken before stranding or insulating (Explanatory Note 4).

TABLE 2 Electrical Resistivity Requirements

Nominal Diameter		Resistivity at 20 °C			
		lb/mile ²		g/m ²	
in.	mm	Hard	Medium-Hard	Hard	Medium-Hard
0.2043 to 0.103, incl	5.2 to 2.6, incl	943.92	938.85	0.1653	0.1644
Under 0.103 to 0.0508, incl	Under 2.6 to 1.3, incl	910.15	946.06	0.1594	0.1657