



Designation: B452 – 22

Standard Specification for Copper-Clad Steel Wire for Electronic Application¹

This standard is issued under the fixed designation B452; 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 bare round copper-clad steel wire for electronic application.

1.2 Four classes of copper-clad steel wire are covered as follows:

1.2.1 *Class 30HS*—Nominal 30 % conductivity high-strength hard-drawn,

1.2.2 *Class 30HS-A*—Nominal 30 % conductivity high-strength annealed,

1.2.3 *Class 40HS*—Nominal 40 % conductivity high-strength hard-drawn, and

1.2.4 *Class 40HS-A*—Nominal 40 % conductivity high-strength annealed.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are in SI units.

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

B193 Test Method for Resistivity of Electrical Conductor Materials²

B258 Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round

Wires Used as Electrical Conductors²

2.3 *NIST Documents*: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 and class,

3.1.2 Wire size, diameter in inches (see **5.3** and **Table 1**),

3.1.3 Class of wire (see **1.2** and **Table 1**),

3.1.4 Packaging and shipping (Section **10**),

3.1.5 If inspection is required (see **6.3.3**), and

3.1.6 Place of inspection (see **6.1**).

4. Material

4.1 The wire shall consist of a core of homogeneous open-hearth, electric-furnace, or basic-oxygen high-strength steel with a continuous outer cladding of copper thoroughly bonded to the core throughout and shall be of such quality as to meet the requirements of this specification (**Note 1**).

NOTE 1—The copper-clad steel wire provides a high-strength conductor for use in wire and cable where greater strength is required and a lower conductivity can be tolerated. At high frequencies the reduced conductivity is less pronounced due to concentration of the current in the outer periphery of the wire. Minimum thickness of 6 % and 10 % of the radius for 30 and 40 % conductivity material, respectively, has been established to facilitate the inspection of thickness on fine wires.

5. General Requirements

5.1 *Tensile Strength and Elongation*—The copper-clad steel wire shall conform to the tensile strength and elongation requirements of **Table 1**. For intermediate sizes not listed in **Table 1**, the elongation requirements of the next smaller size shall apply; in the case of tensile strength, the requirements of the next larger size shall apply.

5.2 *Resistivity*—The electrical resistivity at a temperature of 20 °C shall not exceed the values prescribed in **Table 2**. See **Note 2** for calculating electrical resistance.

NOTE 2—Relationships which may be useful in connection with the

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TABLE 1 Tensile and Elongation Requirements

Diameter		Cross-Sectional Area at 20 °C			Tensile Strength, min psi (kgf/mm ²)				Elongation, min. % in 10 in. (250 mm)	
in.	mm	cmil	in. ²	mm ²	Class 30HS	Class 30HS-A	Class 40HS	Class 40HS-A	Class 30HS and 40HS	Class 30HS-A and 40HS-A
0.0720	1.83	5180	0.00407	2.63	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.5	15
0.0641	1.63	4110	0.00323	2.08	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.5	15
0.0571	1.45	3260	0.00256	1.65	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.5	15
0.0508	1.29	2580	0.00203	1.31	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.5	15
0.0453	1.15	2050	0.00161	1.04	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.5	15
0.0403	1.02	1620	0.00128	0.823	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.0	15
0.0359	0.912	1290	0.00101	0.653	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.0	15
0.0320	0.813	1020	0.000804	0.519	127 000 (89.3)	50 000 (35.2)	110 000 (77.3)	45 000 (31.6)	1.0	15
0.0285	0.724	812	0.000638	0.412	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	15
0.0253	0.643	640	0.000503	0.324	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	15
0.0226	0.574	511	0.000401	0.259	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	15
0.0201	0.511	404	0.00317	0.205	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	10
0.0179	0.455	320	0.000252	0.162	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	10
0.0159	0.404	253	0.000199	0.128	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	10
0.0142	0.361	202	0.000158	0.102	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)	50 000 (35.2)	1.0	10
0.0126	0.320	159	0.000125	0.0804	127 000 (89.3)	55 000 (38.7)	110 000 (77.3)			