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.

Designation: B279 – 13 (Reapproved 2019)

Standard Test Method for Stiffness of Bare Soft Square and Rectangular Copper and Aluminum Wire for Magnet Wire Fabrication[1]

This standard is issued under the fixed designation B279; 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 test method, known as the low-stress elongation (LSE) test, covers the procedure for determining the stiffness of bare soft square and rectangular copper and aluminum wire in terms of the permanent elongation resulting from the application of a tensile stress.

1.2 The SI values for the mass of the specimen are regarded as the standard. For all other properties, the inch-pound values are to be regarded as standard and the SI units may be approximate.

1.3 *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 document forms a part of this test method to the extent referenced herein:

2.2 *ASTM Standards:*[2]

E4 Practices for Force Verification of Testing Machines

3. Significance and Use

3.1 This test method is designed as an inspection or acceptance test of new bare soft square and rectangular wire intended for subsequent fabrication into magnet wire.

NOTE 1—Since the applied unit stress and the time of application are constant for all wire sizes, the test enables comparisons of stiffness to be made between wires of the same or different size on the basis of the permanent elongation resulting from the application of a low unit stress.

4. Apparatus

4.1 Tensile testing machines used for the low-stress elongation test shall conform to the requirements of Practices E4.

5. Test Specimens

5.1 The test specimens shall be taken from the finished reel or coil with a minimum amount of handling and distortion, retaining the original curvature of the package to the greatest extent possible. Test specimens having the full cross-sectional area of the wire shall be used. The standard gage length for the measurement of elongation of wire shall be 10 in. (254 mm). The total length of the specimens shall be at least equal to the gage length plus the length of wire required for the full use of the grips employed.

6. Procedure

6.1 Straighten the test specimens carefully by hand with a minimum amount of distortion or cold work. Improperly prepared test specimens often cause unsatisfactory test results.

6.2 Cut off a test specimen of sufficient length as described in 5.1. Measure the length to the nearest 0.01 in. (0.25 mm) with any measuring device accurate to 0.1 % (Note 2). Measure the mass of this specimen to the nearest 0.01 g on a balance accurate to 0.1 %. The load required to apply a stress to the specimen equal to 15 000 psi (103 MPa) for copper, and 8 000 psi (55 MPa) for aluminum shall be obtained from the following:

$$P = \frac{KW}{L}$$

where:

P = Required load, lbs (N),
W = mass of specimen, g,
L = length of specimen, in., and
K = 102.74 for copper specimens, length in in., required load in lb, or
K = 11 612.7 for copper specimens, length in mm, required load in N, or
K = 180.5 for aluminum specimens, length in in., required load in lb, or
K = 20 401.9 for aluminum specimens, length in mm, required load in N.

[1] This test method is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.02 on Methods of Test and Sampling Procedure.

Current edition approved Oct. 1, 2019. Published October 2019. Originally approved in 1953. Last previous edition approved in 2013 as B279 – 13. DOI: 10.1520/B0279-13R19.

[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.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States