Designation: B598 – 09

StandardPractice for Determining Offset Yield Strength in Tension for Copper Alloys[1]

This standard is issued under the fixed designation B598; 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 Department of Defense.

1. Scope*

1.1 This practice establishes the requirements for determining offset yield strength (0.01 %, 0.02 %, and 0.05 % offset) at room temperature. It is intended for copper alloys in tempers commonly used for spring applications, and materials thicker than 0.010 in. (0.25 mm).

1.1.1 The primary application of this practice is intended for flat strip materials that are used for springs; however, this practice can be used for other product forms, such as wire, rod, and bar.

1.2 *Units*—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.

1.3 *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]

B950 Guide for Editorial Procedures and Form of Product Specifications for Copper and Copper Alloys

E4 Practices for Force Verification of Testing Machines

E6 Terminology Relating to Methods of Mechanical Testing

E8/E8M Test Methods for Tension Testing of Metallic Materials

E74 Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines

E83 Practice for Verification and Classification of Extensometer Systems

3. Terminology

3.1 For definitions of terms relating to mechanical testing refer to Terminology E6.

4. Summary of Practice

4.1 To determine the offset yield strength, it is necessary to acquire data (autographic or numerical) from which a stress-strain diagram may be drawn. The stress at which a specified deviation of strain from the linear portion of the stress-strain curve occurs is the yield strength at that particular offset.

5. Significance and Use

5.1 This practice may be used for approximating a limiting design stress at room temperature and, in some cases, for approximating the range of elastic behavior. Elastic limit, or the greatest stress that a material is capable of sustaining without any permanent strain remaining upon complete release of the stress, is a more technically accurate design parameter; however, the elastic limit is extremely difficult to measure in routine testing. Caution should be used in applying such values to predict the behavior of flat or wire springs in bending, torsion or other stress modes, or at temperatures other than that at which the determination is made.

6. Apparatus

6.1 Standard testing machine of adequate capacity, conforming to the requirements of Practices E4 and E74.

6.2 *Class B-1 or more accurate Extensometers,* conforming to the requirements of Practice E83 and suitable to the tension test specimen required for the application.

6.3 *Extensometer Calibrator,* or similar device accurate to 0.00002 in. (0.0005 mm).

7. Test Specimen

7.1 Tension test specimens shall be selected from Test Methods E8/E8M as appropriate for the product form.

[1] This practice is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.06 on Methods of Test.

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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.

***A Summary of Changes section appears at the end of this standard**