Designation: B 389 – 81 (Reapproved 1998)

Standard Test Method for Thermal Deflection Rate of Spiral and Helical Coils of Thermostat Metal [1]

This standard is issued under the fixed designation B 389; 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 covers the determination of the thermal deflection rate of spiral and helical coils of thermostat metal.

1.2 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

1.3 *This standard does not purport to address all of the safety problems, 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:*

E 77 Test Method for Inspection and Verification of Thermometers [2]

3. Terminology

3.1 *thermostat metal*—a composite material, usually in the form of sheet or strip, comprising two or more materials of any appropriate nature, metallic or otherwise, that, by virtue of differing expansivities of the components, tends to alter its curvature when its temperature is changed.

3.2 *thermal deflection rate*—the ratio of angular rotation to temperature change. It is a measure of the coil's thermal activity. It may have the units of angular degrees per degree Fahrenheit, or Celsius, and is expressed by the equation $D = (A_2 - A_1)/(T_2 - T_1)$ where A_2 and A_1 are angular positions at temperature T_2 and T_1 respectively.

3.3 *spiral coil*—a part made by winding strip on itself. Fig. 1 and Fig. 2 show typical spiral coils, which can be wound with the low-expansive side inside or outside, mounted on the specimen holder.

3.4 *helical coil*—a part made by winding strip in a form wherein the plane of the width of the strip is parallel to the axial length. Fig. 3 shows a typical helical coil, which can be wound with the low-expansive side inside or outside, and right-hand or left-hand, mounted on the specimen holder.

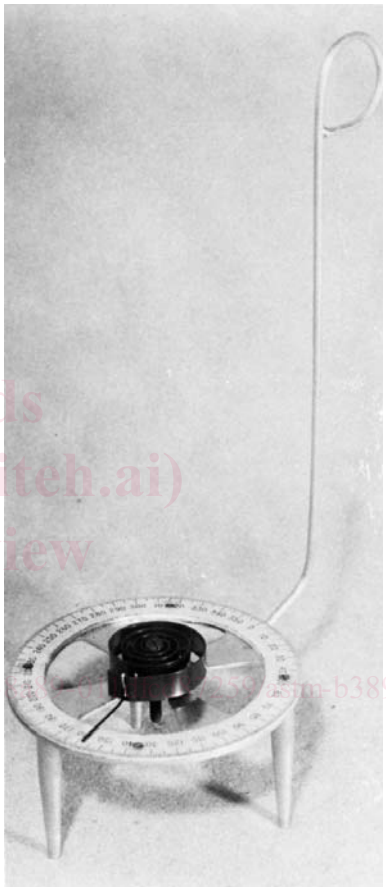

FIG. 1 Spiral Coil

4. Summary of Test Method

4.1 The test for thermal deflection rate of spiral and helical coils consists of measuring the angular rotation that a coil undergoes in response to a known temperature change.

[1] This test method is under the jurisdiction of ASTM Committee B-2 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.10 on Thermostat Metals.

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[2] *Annual Book of ASTM Standards*, Vol 14.03.

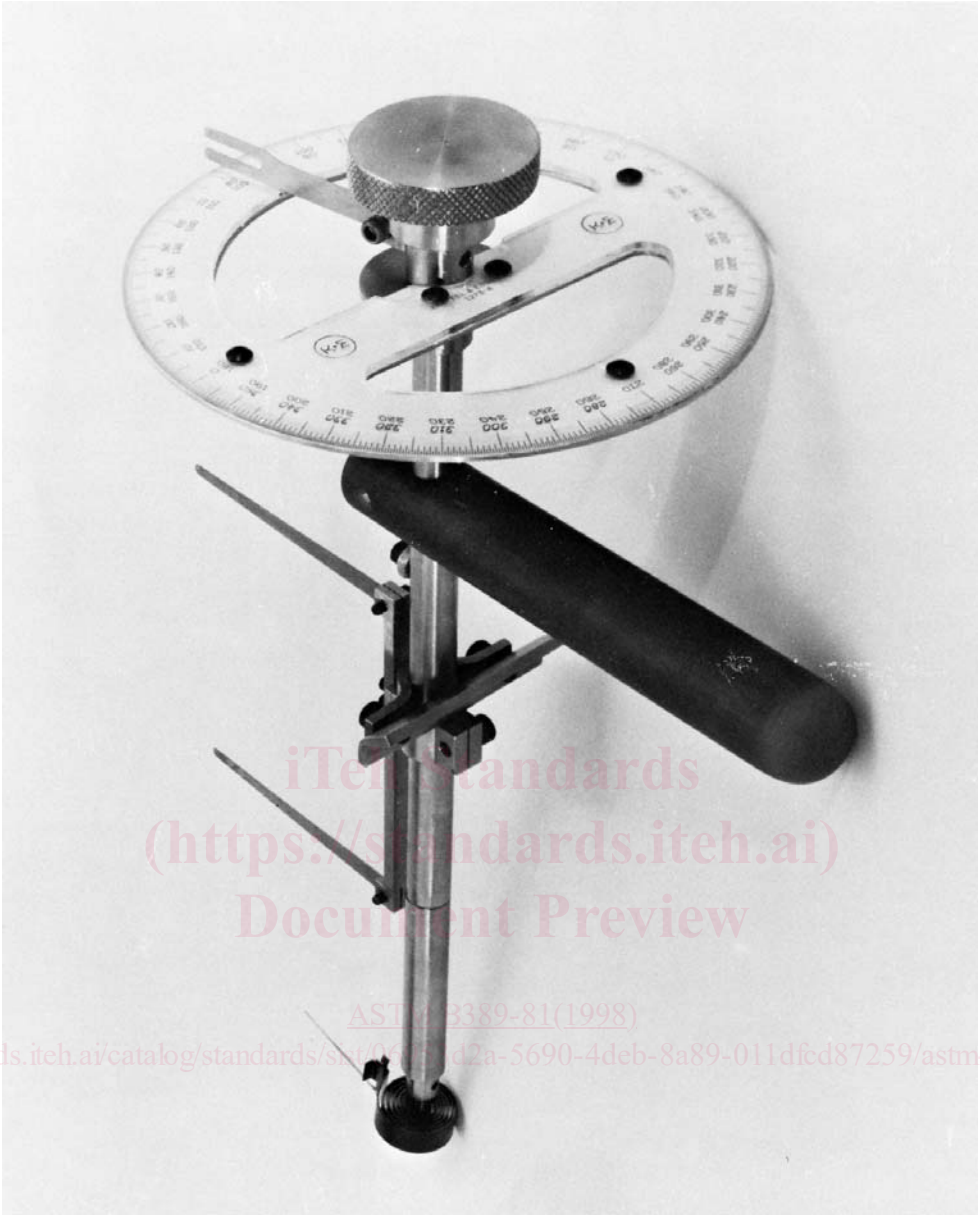

FIG. 2 Spiral Coil

5. Significance and Use

5.1 This test method simulates, to a practical degree, the operation of the thermostat metal coil.

5.2 The thermal deflection properties of a coil may vary from lot-to-lot of thermostat metal material. This method is useful for determining the optimum thickness and length of the material for a given deflection specification.

5.3 This method is useful as a quality test to determine acceptance or rejection of a lot of thermostat metal coils.

6. Apparatus

6.1 *Temperature Bath*—A stirred liquid bath or uniformly heated enclosure in which the specimen and mounting fixture can be placed shall be used. An adjustable heating source is desirable for maintaining the specimen at the desired temperatures with a variation in temperature throughout the specimen not to exceed 0.5°F (0.3°C).

6.2 *Protractor*—The angular position at each test temperature shall be measured by a protractor with a minimum division of 0.5°.

6.3 *Temperature-Measuring Apparatus*—The apparatus for making temperature measurements shall be of such accuracy that the individual temperatures shall be known to be within ±0.5°F (±0.3°C).

6.4 *Specimen Holder*—The preferred methods of holding spiral and helical coils are as follows:

6.4.1 *Spiral Coils*—The specimen holder for spiral coils shall provide means for securely holding the coil. Although other means of support are possible, the holder or mounting arbor shall be preferably circular cross section whose diameter shall be as large as possible without touching the inner turn of the coil under any conditions of test temperatures. The arbor shall be slotted across its diameter and to a depth greater than the width of the specimen. The width of the slot shall be