



Standard Test Methods for Flexivity of Thermostat Metals¹

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1. Scope

1.1 These test methods cover the determination of flexivity (a measure of thermal deflection rate or deflection temperature characteristics) of thermostat metals.

1.1.1 *Test Method A*—Tested in the form of flat strip 0.015 in. (0.38 mm) or over in thickness.

1.1.2 *Test Method B*—Tested in the form of spiral coils less than 0.012 in. in thickness.

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.

1.3 *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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer; 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

B389 Test Method for Thermal Deflection Rate of Spiral and Helical Coils of Thermostat Metal

3. Terminology

3.1 *Definitions*:

3.1.1 *thermostat metal*, n —a composite material in the form of sheet or strip comprising two or more metallic layers of differing coefficients of thermal expansion, such that the radius of curvature of the composite changes with temperature change.

¹ These test methods are under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and are the direct responsibility of Subcommittee B02.10 on Thermostat Metals and Electrical Resistance Heating Materials.

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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.

3.1.2 *flexivity* (F), n —the change of curvature of the longitudinal center line of the specimen per unit temperature change for unit thickness, given by the following equation:

$$F = t \frac{(1/R_2) - (1/R_1)}{T_2 - T_1} \quad (1)$$

To determine the flexivity between any two temperatures, T_1 and T_2 , it is necessary to measure the curvature $1/R_1$ and $1/R_2$ at temperature T_1 and T_2 , respectively. To find the curvature at either temperature (Fig. 1 and Fig. 2), measure the distance D . The curvature is given by the following equation:

$$1/R = 8D/(Q^2 + 4Dt + 4D^2) \quad (2)$$

where:

R = radius of curvature of the longitudinal center line of the specimen, in. (mm),
 t = thickness of test specimen, in. (mm),
 Q = distance between support points, in. (mm), and
 D = for point support (simply supported beam), = perpendicular distance between the longitudinal center lines of the lower surface of the specimen midway between the point supports and the straight line joining the support points, in. (mm).

4. Significance and Use

4.1 These test methods are used for determining response to temperature change or flexivity of thermostat metal. The flexivity is calculated from the temperatures, dimensions of specimen, and the relative movement of the specimen. The simple beam method (Method A) is the method for certification. Any use of the spiral coil method (Method B) is to be mutually agreed upon between the user and supplier.

TEST METHOD A—FLAT STRIPS

5. Apparatus

5.1 *Specimen Carrier*, provided with two conical supports for locating the specimen. The test length (that is, the distance between the point of contact of the specimen with one support and the point of contact of the specimen with the other support) shall be known to within ± 0.005 in. (0.13 mm), and the line of plane passing through the points of contact shall be horizontal. The specimen carrier and supports shall hold the specimen without constraint so that the curvature, due to its deflection,