



Standard Test Method for Ductility of Nonoriented Electrical Steel¹

This standard is issued under the fixed designation A 720; 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 determination of ductility utilizing Epstein test strips and a bending device for bending the strip over a predetermined radius. It is intended for commercial silicon-bearing steel sheet or strip of nonoriented types in the thickness range from 0.010 in. [0.25 mm] to 0.031 in. [0.79 mm], inclusive.

1.2 *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.*

1.3 The values stated in either customary (cgs-emu and inch-pound) units or SI units are to be regarded separately as standard. Within this test method, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with this method.

2. Referenced Documents

2.1 ASTM Standards:

- A 34 Practice for Sampling and Procurement Testing of Magnetic Materials²
- A 677 Specification for Nonoriented Electrical Steel Fully Processed Types²
- A 677M Specification for Nonoriented Electrical Steel, Fully Processed Types (Metric)²
- A 683 Specification for Nonoriented Electrical Steel, Semi-processed Types²
- A 683M Specification for Nonoriented Electrical Steel, Semiprocessed Types (Metric)²
- E 290 Test Methods for Bend Testing of Material for Ductility³

3. Summary of Test Method

3.1 A test strip is placed in the special test apparatus designed to clamp one end of the specimen securely while the

other end is free to move, but held in tension by a spring. The specimen is repeatedly bent through 180° reversals until a crack appears at the bend or until sudden failure occurs by complete rupture. The number of reversals until failure is taken as a measure of the ductility.

4. Significance and Use

4.1 This is a specialized bend test for nonoriented electrical steel not covered under the provisions of Test Methods E 290.

4.2 This test is applicable to nonoriented silicon steel such as described in Specifications A 677, A 677M, A 683, and A 683M in commercial thicknesses.

4.3 It is not intended to be applied to steels considered inherently ductile.

5. Apparatus

5.1 The apparatus, Fig. 1, consists of a set of stationary jaws and a movable arm to which is attached another set of jaws and a spring.

5.1.1 The stationary jaws shall have working edges with radii of approximately 0.5 cm [5 mm] over which the test specimen is bent. Stationary jaws shall be of the quick-clamping type.

5.1.2 The jaws attached to the movable arm shall allow the specimen to move freely during bending.

5.1.3 The spring clamped to the free end of the specimen shall provide sufficient tension in the specimen to localize the bend.

5.1.4 Design of the movable arm shall permit a rotation of approximately 180°.

6. Sampling

6.1 Select samples from at least two well separated locations in each test lot or lift.

6.1.1 The test specimens may be cut from samples used for the core loss or other tests in accordance with the practice in Practice A 34.

6.1.2 Cut test specimens from near each end of each sample coil and from the middle and the end of each sample sheet.

7. Test Specimen

7.1 The test specimens shall be about 3 cm [30 mm] in width and not less than 15 cm [150 mm] in length.

7.2 The number of test specimens representing each test lot shall not be less than ten.

¹ This test method is under the jurisdiction of ASTM Committee A-6 on Magnetic Properties and is the direct responsibility of Subcommittee A06.01 on Test Methods.

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² Annual Book of ASTM Standards, Vol 03.04.

³ Annual Book of ASTM Standards, Vol 03.01.