



Designation: A 712 – 97

Standard Test Method for Electrical Resistivity of Soft Magnetic Alloys¹

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1. Scope

1.1 This test method covers the measurement of electrical resistivity of strip or bar specimens of soft magnetic alloys.

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 are stated only in SI units and are to be regarded as standard.

2. Referenced Documents

2.1 ASTM Standards:

A 34 Practice for Sampling and Procurement Testing of Magnetic Materials²

3. Summary of Test Method

3.1 The electrical resistance of a 0.25-m long (minimum) test specimen is measured with a Kelvin-type resistance bridge or a digital multimeter or the potentiometer-ammeter method. The resistivity is then calculated from the resistance measurement and the dimensions of the specimen and is known as the electrical resistivity of the material. This value is equal to the resistance between opposite faces of a cube of unit dimensions.

4. Apparatus

4.1 Kelvin-type resistance bridge or a digital multimeter or a d-c potentiometer and d-c ammeter providing resistance measurements to an accuracy within 0.5 % of the accepted true value.

5. Sampling

5.1 Samples shall be representative of the material in the physical condition as shipped or agreed upon by the manufacturer and the purchaser.

6. Test Specimen

6.1 The test specimen shall be a straight strip or bar or wire

of substantially uniform cross-sectional area.

6.2 It shall have a minimum length of 0.25 m. Strip specimens preferably should have a uniform width of 0.03 m minimum, unless not available.

6.2.1 If width of the strip material to be sampled prevents obtaining a sample of 0.03-m minimum width, the specimen width to be used shall be the maximum obtainable and shall be agreed upon between the manufacturer and the purchaser.

6.2.2 Bars and wires having circular, rectangular, or other sections shall be used in the sectional dimensions as produced, unless they are so large as to require cutting a representative sample of suitable dimensions.

6.3 It shall be free of obvious surface defects.

6.4 The surface shall be cleaned by wiping with a cloth. Oil and grease, if present on the surface, shall be removed with a suitable solvent. Normal surface oxide or core plating need not be removed except in areas in which it is necessary to make satisfactory electrical contact.

7. Procedure

7.1 Measure the electrical resistance of the test specimen using a Kelvin-type resistance bridge or a digital multimeter or potentiometer-ammeter system having separate current and potential leads.

7.2 The distance between each potential lead contact and the corresponding current lead contact shall be at least twice the width of the test specimen with the two potential contacts lying between the current contacts. The distance between the potential contacts shall be not less than 0.12 m.

7.3 The dimension of each potential contact in the direction of the length of the specimen shall be not more than 0.5 % of the distance between potential contacts.

7.4 The contacts to the specimen shall be located centrally with respect to the specimen's width dimension, and the current contacts shall cover more than 80 % of the width. A reliable contact shall be made with the specimen by both the current and potential leads.

7.5 Specimen temperature during test should be about 25°C.

7.6 To eliminate errors as a result of contact potential, take two readings, one direct and one with the current reversed, in close succession.

7.7 The electrical current in the test specimen must be limited to avoid overheating but must be adequate to provide sufficient sensitivity to show an out-of-balance condition when

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.