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Resistance to Penetration at Elevated Temperatures of Electrical Grade Tapes

1. DEFINITION

1.1 Resistance to penetration is the ability of film backed tape to withstand high unit pressure, as determined by the temperature at which the penetrator punctures the tape under the conditions of loading and temperature rise specified in this method.

2. SIGNIFICANCE

2.1 Pressure sensitive electrical tapes often are used in contact with irregular contours. The high areas of these contours may press against other surfaces and produce small areas of high pressure which are potential sources of electrical failure at the operating temperature. This test gives a measure of resistance of film-backed tapes to penetration. Differences in penetration temperature of less then 3°C have no significance.

3. TEST SPECIMENS

3.1 Five specimens approximately 24 mm (1") long shall be prepared according to Appendix D at standard conditions according to Appendix A.

4. EQUIPMENT

4.1 Penetration tester. A penetration tester as shown in Figure 1 is recommended.

The component parts of the penetration tester are: (See Figures 2 and 3.)

4.1.1 Load-bearing system, composed of a 1.6 mm (1/16") magnetized steel rod, recessed at one end to hold a 1.6 mm (1/16") diameter steel ball bearing against the test specimen mounted on a 102 mm x 30 mm x 3 mm (4 x 1.25 x 0.124") stainless steel plate.

4.1.2 Weight system, capable of exerting a force of 1000 g on the magnetized steel rod, including a counter-balance with a rider capable of being adjusted to neutralize the pressure of the ball bearing against the steel plate at no load.

4.1.3 Light C-clamp, containing the steel rod, counter-balance, and weight, mounted on a bearing capable of giving the unit the necessary freedom of rotation.

4.1.4 Electrical circuit, with a 110-V AC supply and containing a 110-V glow lamp.

4.2 An oven capable of holding the penetration tester and raising the temperature of the steel plate at a rate of 1.0°C (1.8°F) per 2 min.

4.3 A device for measuring the temperature of the steel plate immediately below the point of contact of the ball bearing. A thermocouple should be used for this application.

5. TEST METHOD

5.1 With no load on the rod, each specimen shall be inserted between the steel ball and the steel plate with the adhesive surface of the tape facing the plate. The tape shall be smooth against the plate and shall not be stretched.

5.2 Connect the electric circuit in such a way that when the steel ball comes in contact with the plate (when the specimen fails), the lamp outside the oven lights.

5.3 Apply the compression load of 1000 g to the specimen in the oven at room temperature. Uniformly raise the temperature of the steel plate at the rate of 1°C (1.8°F) per 2 min. until failure of specimen is indicated by current flowing through the circuit, thus lighting the glow lamp outside the oven.

6. REPORT

6.1 Average thickness of the specimen.

6.2 Temperature in degrees C or F at which each specimen failed.

6.3 Average temperature in degrees C or F of failure of the five specimens.

NOTE - To facilitate testing, the initial temperature may be taken at 40°C (104°F). For convenience, five penetration testers may be constructed to test simultaneously the required number of specimens.

Other methods for measuring the resistance to penetration at elevated temperature of electrical grade tapes include ASTM D 876 and ASTM D 1000.

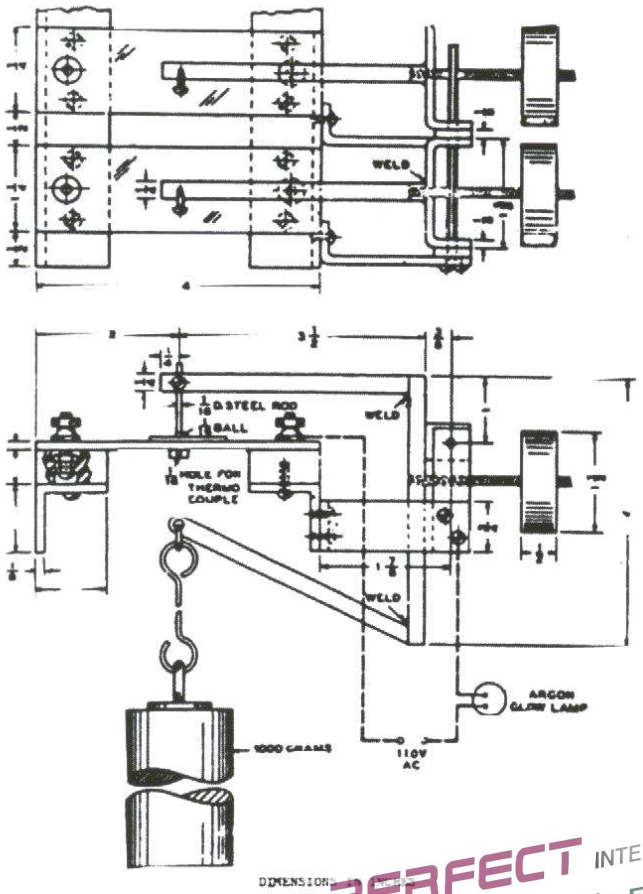

Figure 1. Penetration tester.

Figure 2. Penetration tester side view.

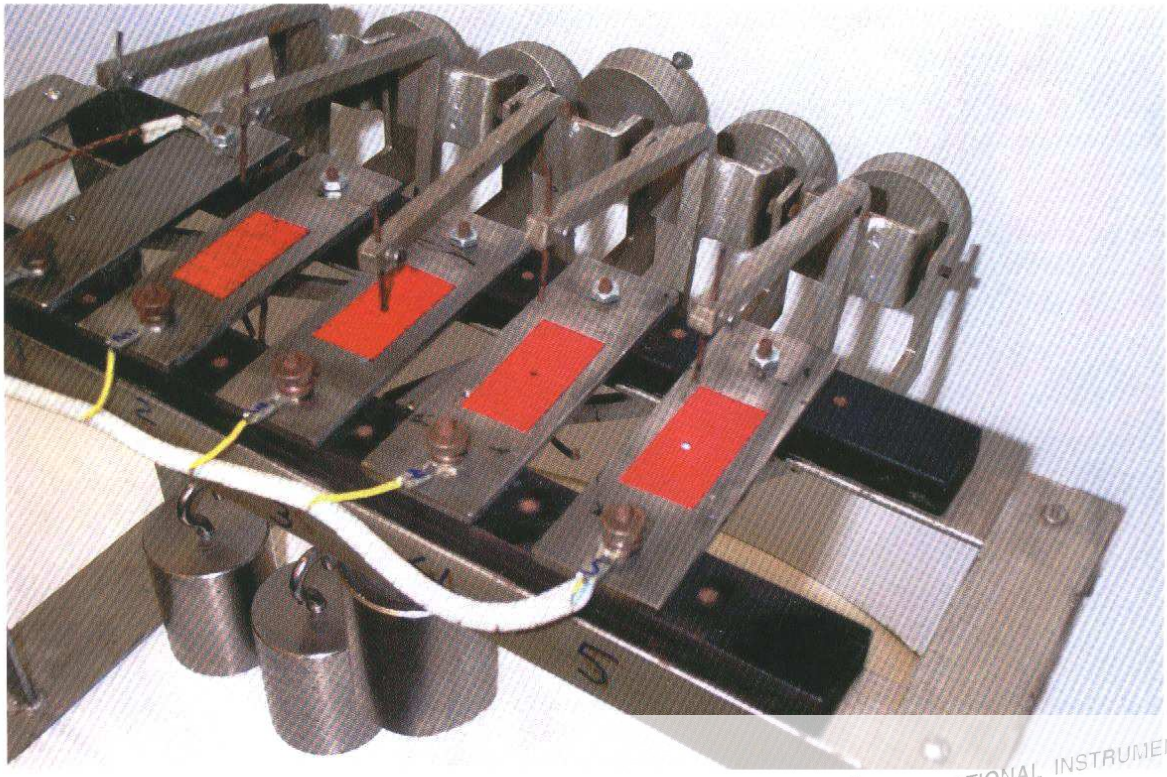

Figure 3. Penetration tester top view.