Afera 4011 Test Method

Electric Strength of Adhesive Tapes

1. Scope

The test method is designed to measure the electric strength of an adhesive tape under standard test conditions and, where applicable, after conditioning at high humidity, and also after conditioning by water immersion.

2. Summary of Test Method

An adhesive tape is subjected to an increasing alternating potential difference until electrical breakdown occurs.

3. Significance and use

The electric strength of an adhesive tape is an indication of its ability to withstand electrical stress.

Note 1: This value does not correspond to the electric strength expected in service but is a numerical value which may be used in purchase specifications as the indication of quality and for comparison of adhesive tapes originating from different batches of manufacture. To a lesser degree this value may be adopted for preliminary design work but then must be revised by experience. The comparison of the electric strengths of different adhesive tapes under differing conditions of humidity produces an indication of the quality of the tape backings as humidity resistant dielectric materials.

4. Apparatus

4.1 Electrodes:

4.1.1 The electrodes shall consist of cylindrical brass rods 6.00 mm in diameter with their edges rounded to a radius of 1.0 mm. They shall be mounted vertically and coaxially, one above the other. The upper movable electrode shall weigh (50 ± 2) grammes.

4.1.2 Mount the electrodes in the electrical apparatus so that the test specimen is held under pressure between strips of suitable insulating material while the voltage is applied.

Note 2: This is to prevent flashover around the edges of the specimen.

4.2 Electrical apparatus:

4.2.1 A suitable device as shown in Fig. 1.

4.3 Humidity Chamber:

4.3.1 The humidity chamber shall consist of a closed vessel containing an aqueous solution of glycerol (Propane-1, 2, 3-triol).

4.4 Solution Composition

4.4.1 The mixture is prepared by adding 30 parts by volume of glycerol to 100 parts of distilled water. The mixture shall be stirred thoroughly and the refractive index adjusted by the dropwise addition of water or glycerol to (1.367 ± 0.005) when measured at 25 °C.

4.4.2 0.1% by weight of copper sulphate shall be added to the solution to avoid mould growth, stirring the mixture thoroughly.

4.4.3 The test chamber is placed in an enclosure controlled at (23° ± 1) °C, this gives a relative humidity in the chamber of (93 ± 2) %.

4.5 Water Tank

4.5.1 A container of any shape can be used, provided it allows the complete immersion of test specimens approximately 300 mm long. It shall be filled with distilled water and placed in the standard test temperature of (23° ± 1) °C.

5. Sampling

5.1. Sampling shall be in accordance with ASTM Practice D 3715/D 3715M

6. Test Specimens

6.1 The specimens shall be 24 mm wide, and a tolerance of ± 0.5 mm shall be allowed. The length shall be approximately 300 mm.

6.2 Discard at least three but no more than six outer wraps of tape from the sample roll before taking the specimens for testing.

6.3. Perform the test on three specimens from each roll. There will be 5 results from each specimen.

6.4 When the tape is less than 24 mm wide, perform the test on a tape of appropriate width from the same batch.

7. Conditioning

7.1 For test under the standard conditions, the specimens are conditioned for 24 hours at (23° ± 1) ° C and (50% ± 5) % relative humidity.

7.2 For tests under high humidity conditions, the specimens are conditioned for 96 hours in an atmosphere of high humidity of (93 ± 2) % relative humidity at (23 ± 1) °C.

7.3 For tests after immersion, the specimens are conditioned by immersion in distilled water for 24 hours at (23 ± 1) °C. The specimens are removed from the water tank one at a time, excess water removed by placing between two layers of absorbent paper and pressing over their entire surface. Tests are carried out immediately, before the specimens can dry out.

8. Procedure

8.1 Before each test, polish and clean the surface of the electrodes which contact the adhesive tape. A satisfactory method is to polish the surface with a fine emery paper, rinse in acetone and then dry with a cloth.

8.2 Place the samples in the test apparatus, adhesive side downward, and clamp firmly in place.

8.3.1 Carry out the test using an alternating voltage of approximately 50 cycles per second. The wave form of the voltage shall be approximately sinusoidal and the ratio between the peak value and the root mean square value shall lie between the limits: √2 ± 7% (= 1.32 to 1.51)

8.3.2 Where the wave form cannot be determined use a transformer of at least 2kVA rating for voltages not exceeding 50 kV.

8.4 Raise the voltage from zero to the breakdown point at a uniform rate of 0.5 kV per second. Carry out all measurements in air.

8.5 Perform 5 breakdown measurements on each specimen by using each pair of electrodes in turn.

8.6. The peak value of the test voltage may be measured by a peak voltmeter. In which case, take the root mean square value as being the value of the peak voltage thus measured divided by √2.

8.6.1 The test voltage can also be measured by means of a voltmeter suitably connected to the input or output of the test transformer and calibrated against a sphere gap in place of the test electrodes. When the voltage is measured by an instrument connected to the input of the transformer, care must be taken to ensure that the leakage current of a poor sample does not reduce the output voltage and so give false results.

8.7 After each set of 5 tests, examine the strips of insulating material, used to prevent flashover around the test specimens, for evidence of flashover or puncture. Disregard any test in which flashover has occured and repeat with a new specimen using new strips of insulating material.

9. Results

9.1.1 Record the nominal and measured thickness of the tested specimens.

9.1.2 Record the method of conditioning.

9.1.3 Record the minimum, maximum and central values of the voltage at breakdown for each of the specimens, expressed in kV for each specimen and kV/mm thickness for each specimen.

10. Test Report

The report shall contain the following:

- Statement that this test method was used and any deviations from the method as written.

- Complete identification, if available, of the PSA tape tested, including the type, source, manufacturer’s code, lot number, and form in which it was received.

- The results obtained.

- Date of the test.

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