



**BUILD  
ELECTRONICS  
BETTER**

3000 Lakeside Drive, Suite 105 N  
Bannockburn, Illinois 60015-1249

# IPC-TM-650 TEST METHODS MANUAL

Number <b>2.6.2</b>	
Subject <b>Moisture Absorption, Flexible Printed Wiring</b>	
Date <b>05/22</b>	Revision <b>E</b>
Originating Task Group <b>Flexible Circuits Test Methods Subcommittee (D-15)</b>	

**1 Scope** This test method defines the procedures to determine the moisture absorption properties of metal clad or unclad flexible dielectrics.

**2 Applicable Documents** None

**3 Test Specimens** Prepare three specimens 10 cm x 10 cm [approx. 4 in x 4 in].

## 4 Apparatus

**4.1 Test Chamber** Oven capable of maintaining the specimen at 105 - 110 °C [221 - 230 °F].

### 4.2 Analytical Balance

Analytical balance having an accuracy of ± 0.001 gram.

### 4.3 Miscellaneous

**4.3.1** Vessel for holding distilled water

**4.3.2** Etcher

**4.3.3** Chemical etchants

**4.3.4** Desiccator - Capable of holding 30% RH at 23 °C ± 2 °C [73.4 °F ± 3.6 °F]

**4.3.5** 40 mm dia. x 125 mm long (minimum size) glass stoppered evaluating bottles

**4.3.6** Absorbent, lint-free paper

**4.3.7** 25-30 mm [approx. 5-6 in] wide, 25 mm [approx. 1 in] diameter, elastomeric (70-80 durometer hardness Shore A) roller

**4.3.8** Dry polyethylene film that is cut larger in size than work area

**4.3.9** Hard, flat, non-absorbent surface (e.g., plate glass)

**4.3.10** Distilled Water

**4.3.11** Thermometer for distilled water

## 5 Procedure

### 5.1 Preparation

**5.1.1** If the specimen under test is a metal clad dielectric, proceed to 5.1.2. If it is an adhesive coated dielectric, laminate it with a release sheet next to adhesive or laminate to copper foil using time, temperature, and pressure, which will impart a normal state of cure to the adhesive. If the specimen is a bare dielectric, proceed directly to 5.1.3.

**5.1.2** Etch away all copper from the specimen using the chemical etchants and etcher and wash thoroughly with distilled water.

**5.1.3** Weighing Bottle Tare Weight Dry a weighing bottle and its glass stopper for each specimen at 105 °C - 110 °C [221 °F - 230 °F] for a minimum of one hour. Immediately place both the bottle and its stopper in a desiccator, allow both to cool to room temperature, stopper the bottle and then weigh and record to nearest 0.001 gram. Return each stoppered weighing bottle to desiccator.

### 5.2 Test

**5.2.1** Dry the specimen(s) from 5.1.3 in an oven at 105 °C - 110 °C [221 °F - 230 °F] for one hour ± 5 minutes. Place each specimen in a tared weighing bottle, re-stopper and then weigh to nearest 0.001 gram. Repeat the drying cycle at least once or until constant weight is reached. Record this constant weight. Return weighing bottles to desiccator.

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**5.2.2** Immerse the specimen for 24 hours - 0 minutes/+30 minutes in a container filled with distilled water at a temperature of 23 °C ± 2 °C [73.4 °F ± 3.6 °F]. Specimens should rest individually on edge, supported by a racking system in the container and **shall not** be in surface-to-surface contact with each other.

**5.2.3** Remove the specimens individually from the water and lay on a panel of dry polyethylene film, which, in turn, is laid on a flat surface. Using an elastomeric roller, roll the surface of the specimen three or four times in one direction until the surface is free of water. Turn the specimen over on a dry area of the polyethylene film and repeat the preceding step. Place the specimen between layers of absorbent paper and roll three or four times. Repeat until there is no apparent absorption by the paper. Place immediately into the tared weighing bottle, cover the bottle, weigh and record to the nearest 0.001 gram.

**NOTE:** This is the most critical part of the test. Care must be given to removing moisture from the specimens. Limit time between removal from water to putting in weighing bottle to ≤30 seconds.

**5.3 Evaluation** Calculate the water absorption for each specimen as follows:

$$\text{Percent of Absorption} = \frac{W_2 - W_1}{W_1} \times 100$$

where:

$W_1$  = weight before immersion (see 5.2.1)

$W_2$  = weight after immersion (see 5.2.3)

Average the results of the three specimens and report this average to nearest 0.1%.

**NOTE:** If the range of results for the three individual specimens exceeds 1%, the test must and **shall** be repeated.