



IPC-TM-650 TEST METHODS MANUAL

Number 2.4.18.2	
Subject Hot Rupture Strength, Foil	
Date 7/89	Revision
Originating Task Group N/A	

1.0 Scope This method determines the hot rupture strength of foil by measuring the elevated temperature rupture pressure and the bulge height at rupture.

2.0 Applicable Documents

IPC-MF-150

3.0 Apparatus

3.1 EMK Model HD550 Hot Rupture Testing Machine, or equivalent, with fixed apertures for 17 micron [1/2 oz.], 34 micron [1 oz.] and 68 micron [2 oz.] foil.

3.2 Mettler balance, Type H16 Cap 80 gms, or equivalent; and hand shears or precision paper cutter.

4.0 Test Specimen Generation

4.1 Nine (9) test specimens, up to 114 x 114 mm [4.5 x 4.5 inches] in size, are required for each sample lot. Larger sample panels can be cut into specimen squares by the use of a template and hand shears.

4.2 Foil samples should be representative of foil material lots as defined in IPC-MF-150.

4.3 For the rupture testing of in-house PTH copper, electroplate a sample onto a smooth stainless steel panel per existing PWB shop practice. The current density used for sample preparation should be equivalent to that used in PTH production schedules. The deposited thickness should be held within $\pm 5\%$ of 0.018 mm [1/2 oz.], 0.035 mm [1 oz.], or 0.071 mm [2 oz.] foil.

4.4 Thermal strain relief prior to rupture testing is limited to times and temperatures at or below the highest heating cycles used in PWB production.

5.0 Test Procedure

5.1 For Inner-layer foil specimens, record the date, source, lot identification, nominal foil thickness, foil type, foil grade, and the aperture diameter.

5.2 For PTH foil specimens, record the date, source, PTH bath type, the measured thickness and the aperture diameter.

5.3 Aperture Plates Select and install the desired aperture plate for 0.018 mm [1/2 oz.], 0.035 mm [1 oz.] or 0.071 mm [2 oz.] test specimen.

5.3.1 Aperture diameters are fixed at 22.2 + 3.2 mm [0.875 + 0.125" r] for 1/2 oz. foil; 22.2 + 3.2 mm [1.875" + 0.125" r] for 1 oz. foil; and 73 + 3.2 mm [2.875" + 0.125" r] for 2 oz. foil.

5.4 Flow Control Rate of flow is fixed for the stress rupture test. The flow rate is fixed by setting the source pressure at 100 psig, sealing the system and adjusting the flow to reach 50 psig in 5 seconds.

5.5 Test Temperature Set the test equipment for tests, in turn, at room temperature, 350°F [177°C] and 550°F [288°C]. Temperature stabilization for hot tests requires a minimum of 15 minutes at temperature (without foil specimens) before the first test is run.

5.6 Pressure Set the test pressure regulator at the source pressure limit. Re-set the pressure gauge to zero and set the Peak and Hold modes.

5.7 Specimen Insertion Place treated foil specimens in the test fixture with the treated side up, others with either side up. Clamp in place with sufficient force to provide a pressure-tight seal.

5.8 Height Position the height gauge at the center of the aperture. Re-set the height gauge to zero and set the Peak and Hold modes.

5.9 Turn on the test pressure. After rupture occurs, turn the pressure off, and remove the test specimen.

5.10 Record the test temperature, the pressure at rupture, and the bulge height at rupture. With digital gauges, take Peak readings within 10 seconds of rupture (because of an inherent decay in the peak signal).

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5.11 At least three test specimens, per lot, are tested at each test temperature.

5.12 To avoid creep and/or thermal effects, keep the total test cycle time (Steps 5.7 through 5.9) under 2 minutes.

6.0 Evaluation

6.1 The stress rupture test is quantitative for rupture pressure and for bulge height at each test temperature.

6.2 Report the rupture pressure and the bulge height at rupture for each test specimen at each test temperature.

6.3 Discard test specimens with obvious defects and/or evidence of plating artifacts (before or after the rupture test).