



IPC-TM-650 TEST METHODS MANUAL

1.0 Scope The test specifies a standard procedure for determining the viscosity of solder paste in the range of 300,000 to 1,600,000 centipoise.

2.0 Applicable Documents None

3.0 Test Specimen Paste to be tested shall be stabilized at $25^{\circ} \pm 1^{\circ}\text{C}$ for a minimum of 24 hr. prior to testing. The paste volume shall be sufficient to fill a test container having a minimum diameter of 5 cm and a minimum depth of 5 cm.

4.0 Equipment/Apparatus The equipment used shall be a spindle type viscometer (Brookfield RVT or equivalent) with a reversible helipath stand and pen recorder. A TF spindle shall be used for tests and operated at 5 rpm. Other equipment may be used provided the results can be empirically correlated as mutually agreed upon with the following test. Additional shear rates may be specified by the user or supplier provided one data point is based as specified below.

5.0 Procedure

5.1 Preparation

5.1.1 Open the supply container(s); remove any internal cover(s), scrape off paste adhering to the lid(s), internal covers, and the container walls; and add this material to the paste in the supply container(s).

5.1.2 Using a spatula, stir the paste gently for 1 to 2 minutes to homogenize it; taking care to avoid the introduction of air.

5.1.3 If necessary, gently transfer the paste to the test container having the specified volume; without introducing air.
Note: If the supply container meets the volume and size requirements a separate test container is not needed.

5.1.4 The test container shall be placed in a constant temperature environment at $25 \pm 0.25^{\circ}\text{C}$. The solder paste shall remain stationary for a minimum of two hours to reach temperature and rheological equilibrium. For freshly manufactured

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products, products which require significant adjustment with thinner (greater than 1/2% by weight), or products having rheological characteristics requiring longer time to stabilize, the stabilization time shall be increased to four hours or as mutually agreed upon by user and supplier.

5.1.5 Set the bottom stop for helipath travel to position the T spindle at 2.8 cm below the surface of the solder paste in the test container. The bottom stop of the spindle shall be a minimum of 1 cm above the bottom of the container. Set the upper stop to position the spindle at 0.3 cm below the surface of the solder paste.

5.2 Test

5.2.1 Immerse the spindle in the solder paste and record data for 10 minutes (5 cycles). The temperature of the solder paste during the test shall be maintained at $25 \pm 0.25^{\circ}\text{C}$.

5.3 Evaluation Viscosity is to be expressed at the value calculated from the average of the peak and valley of the last two cycles. If the average for the first two cycles is more than 10% higher than the last two cycles, the test is invalid and additional equilibrium time is required. Record data and enter in Table 1, "Test Report on Solder Paste."

6.0 Notes

6.1 Test Equipment Sources The equipment sources described below represent those currently known to the industry. Users of this test method are urged to submit additional source names as they become available, so that this list can be kept as current as possible.

6.1.1 Spindle Type Viscometer Equipment

Brookfield Engineering Laboratories, Inc.
240 Cushing Street
Stoughton, MA 02072
(617) 344-4310

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Table 1 Test Report on Solder Paste

Enter appropriate information in top portion of report and complete report by entering the test results or checkmarks in the appropriate spaces.

Inspection Purpose:

Qualification
 Quality Conformance A
 Quality Conformance B
 Shelf-Life Extension
 Performance

QPL I.D. Number: _____
 Manufacturer's Identification: _____
 Manufacturer's Batch Number: _____
 Date of Manufacture: _____
 Original Use-By Date: _____
 Revised Use-By Date: _____

Date Inspection Completed: _____ Overall Results: Pass Fail
 Inspection Performed by: _____ Witnessed by: _____

Inspections	User's Actual Requirement	Test Result	P/F (*)	Tested by & Date
Material				
Visual				
Metal Content				
Viscosity				
Solder Ball				
Slump				
Alloy				
Flux				
Powder Size				
% In Top Screen				
% In Next Screen				
% In Bottom Screen				
% In Receiver Bottom				
Max. Powder Size				
Powder Shape				
Tack				
Wetting				

* P/F = PASS/FAIL; enter P if test results are within tolerance of actual requirement; otherwise, enter F