

SEMI F12-0998

TEST METHOD TO DETERMINE THE SEALING CAPABILITIES OF FITTINGS, MADE OF FLUOROCARBON MATERIAL, AFTER BEING SUBJECTED TO A HEAT CYCLE

This Standard was technically approved by the Facilities Global Technical Committee. Available at www.semi.org in September 1998; originally published in 1993.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Purpose

1.1 This Test Method provides a uniform procedure to determine the sealing capabilities of fluorocarbon resin fittings, after they have been subjected to an elevated ambient temperature and cooled to room temperature (hereafter referred to as a 'Heat Cycle').

2 Scope

2.1 This Test Method can be used to characterize the thermal characteristics of tube fitting connections on the basis of test data obtained under the conditions described herein, but the results are not intended to imply a performance rating.

2.2 When using this Test Method, a fitting body temperature range of 23°C to 125°C (73°F to 257°F) should be maintained.

2.3 Tube defined in this Test Method is made of fluorocarbon materials.

2.4 Tube fittings defined in this Test Method are made of fluorocarbon materials for all parts in contact with the internal fluid. Parts such as nuts and grippers are not limited to being made of a fluorocarbon material.

2.5 Only the seal between the tube and tube fitting being evaluated is within the scope of this Document. All other seals are beyond the scope of this Document.

2.6 When using this Test Method for making comparisons between various tube fitting manufacturers, the user must be specific in the selection of the tube and tube fittings to be evaluated.

NOTE 1: The International System of Units (SI) is used as the standard unit of measure in this Document. The U.S. Customary Units are in parentheses for reference purposes only and have been rounded to the nearest whole value.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Summary of Method

3.1 Measure the leakage of the tube fitting connection after being exposed to a heat cycle by subjecting the fitting to an internal pressure with nitrogen.

4 Significance and Use

4.1 In the manufacturing of semiconductor products, many types of hazardous chemicals and solvents are required. As a result, tubing and various fittings made of fluorocarbon materials (which are chemically resistant to these fluids) are used to transport those fluids. It is important to control the testing process when evaluating various fitting designs, so that accurate comparisons of the sealing capabilities of tube fitting connections can be made.

4.2 It is the intent of this Test Method to provide a procedure which evaluates the sealing capability of the tube fitting connection when subjected to a change in ambient temperature.

4.3 The results obtained when using this Test Method are applicable only to conditions that specifically duplicate the procedures used within this Test Method.

4.4 When using this Test Method, it is assumed that the test specimens are truly representative of the material and manufacturing process specified for that product. Departure from this assumption could introduce discrepancies that are greater than those introduced by departure from the details of the procedure outlined in this method.

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *O.D.* — outside diameter

5.1.2 *P/N* — part number

5.2 Definitions

5.2.1 *constant temperature oven* — hot-air oven used to condition the specimens to the specified temperature.

5.2.2 *excessive leakage* — gas leakage (measured in bubbles) from a fitting connection greater than can be humanly counted.

5.2.3 *seal cap* — an end closure or plug to block the open end of a tube or fitting to allow the specimen to be pressurized with nitrogen gas.

5.2.4 *subject* — to expose to.

5.2.5 *submersion tank* — a transparent tank filled with room temperature isopropyl alcohol used for observing leakage of nitrogen from the tube fitting connection. A cover or lid that does not create an air-tight seal is recommended while the specimen is being subjected to pressure.

6 Apparatus

6.1 Constant Temperature Oven

6.1.1 The constant temperature oven must have sufficient capacity to accommodate the specimens and control the temperature within $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$).

6.1.2 See Figure 1 for test set-up.

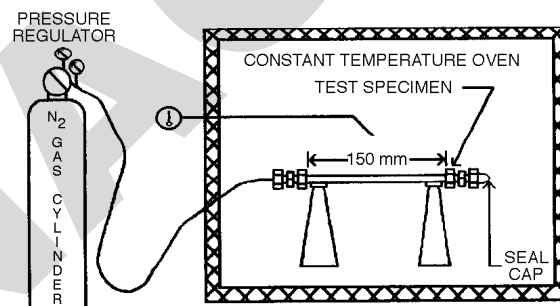


Figure 1
Test Set-Up

6.2 Nitrogen Supply

6.2.1 The supply of nitrogen must have a pressure regulator to control the pressure to the specimens accurately.

6.2.2 The nitrogen supply must include an instrument for monitoring pressure to within 2% of the test range (650 kPa, 94 psi).

6.3 *Submersion Tank* — The submersion tank is used for observing leakage of nitrogen from the fitting connection. (See Figure 2.) It consists of a container capable of holding enough isopropyl alcohol to allow the specimen to be submerged 25 ± 5 mm (1 ± 0.2 in.) below the fluid surface at a $45^{\circ} \pm 5^{\circ}$ angle.

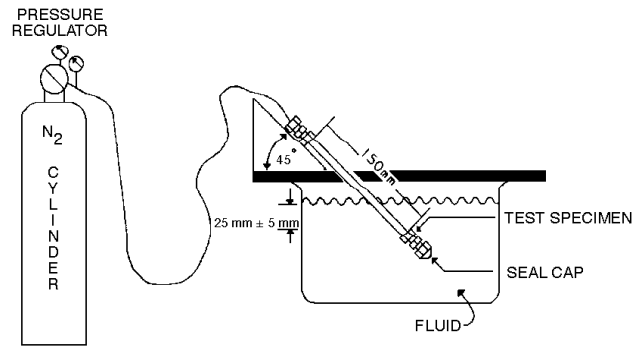


Figure 2
Submersion Tank for Observing

7 Safety Precautions

7.1 **WARNING:** This Test Method will subject test specimens to conditions that may exceed the normal performance ratings of the products under evaluation. Adequate precautions must be taken to prevent injury to the person conducting the test.

8 Test Specimens and Conditioning

8.1 *Sample Size* — Test at least three specimens at each test condition.

8.2 *Specimen Tubing Length* — At least 150 mm (6 in.).

8.3 *Specimen Surface* — All surfaces of the specimens shall be free of visible flaws, scratches, or other imperfections, unless typically found on a representative sample of the product.

8.4 All specimens must be conditioned for a minimum of one hour in an air environment of $23^{\circ}\text{C} \pm 2.8^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) prior to being subjected to test.

9 Test Procedure

9.1 A representative specimen must be assembled and should accompany the test specimens during the heat cycle but will be used for the sole purpose of monitoring temperature.

NOTE 2: The representative specimen must be of the same size and type as the test specimens being tested. The representative specimen shall not be pressurized during any portion of the test.

9.1.1 Insert a temperature probe into the center of the representative fitting specimen. Ensure that the temperature probe is sealed from the oven environment to prevent any of the heated air from entering the specimen (see Figure 3).

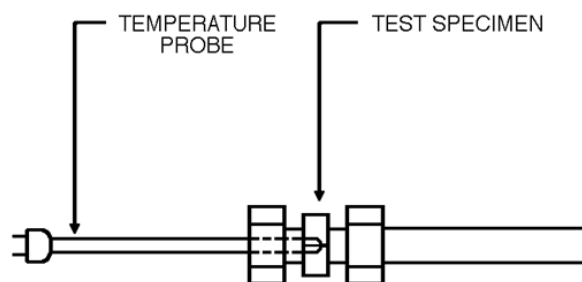


Figure 3
Placement of Probe