

SEMI F11-0998

TEST METHOD TO OBTAIN AN INDICATION OF THE THERMAL CHARACTERISTICS OF TUBE FITTING CONNECTIONS MADE OF FLUOROCARBON MATERIALS

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 thermal characteristics of tube fitting connections made of fluorocarbon materials.

2 Scope

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

2.2 Tube defined in this Test Method has a circular cross section and is made of fluorocarbon materials.

2.3 Tube fittings defined in this Test Method are made of fluorocarbon materials for all parts in contact with the internal fluid.

2.3.1 Parts such as a nut or gripper are not limited to being made of a fluorocarbon material.

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

2.5 When using this method for making comparisons among various tube fittings and/or manufacturers, the user must be specific in the selection of the tube and tube fittings to be evaluated.

2.6 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.

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3 Summary of Method

3.1 Subject tube fitting connections made of fluorocarbon materials to extreme internal pressure and temperature conditions.

3.2 Test specimens are subjected to a constant internal pressure while controlling the increase of fluid temperature in uniform increments, with a cool down period between each elevated temperature condition.

3.3 After completion of the entire temperature range, test a new set of fittings and tubing with an increased pressure.

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 fitting designs 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 thermal characteristics can be made.

4.2 It is the intent of this Test Method to provide a procedure in which thermal transition testing of tube fitting connections made of fluorocarbon materials will be performed. By using this Test Method, accurate comparisons of various tube fitting designs can be achieved.

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

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 Test 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 *characterize* — to describe the quality of.

5.2.2 *free end closure* — a metal tube fitting connection which is securely fastened to the tube and does not contribute to the restraint of the test specimen.

5.2.3 *subject* — to expose to.

5.2.4 *thermal transition* — a change from a specific elevated fluid temperature down to room temperature and then to an elevated temperature higher than previously tested, with the entire process repeated for multiple temperature conditions.

6 Description of Test Equipment

6.1 A hydraulic system capable of applying a constant internal hydraulic pressure to all test specimens while allowing a uniform fluid flow rate through each specimen.

6.1.1 The pressure capability shall range from 100 to 1200, ± 35 kPa (15 to 174, ± 5 psig).

6.1.2 The fluid flow rate shall be adequate to maintain the fluid temperature at each specimen to $\pm 2.8^\circ\text{C}$ ($\pm 5^\circ\text{F}$) of the specified fluid temperature.

6.1.3 The fluid temperature capability shall range from 25°C to 200°C (77°F to 392°F), within a one-hour time interval from hot to cool and vice versa.

6.2 An enclosure that will allow observation of the test specimens and is capable of controlling the ambient temperature to $31^\circ\text{C} \pm 6^\circ\text{C}$ ($88^\circ\text{F} \pm 11^\circ\text{F}$).

6.3 An instrument to monitor pressure within $\pm 1\%$ of full scale.

6.4 An instrument to monitor temperature within $\pm 1^\circ\text{C}$ (2°F).

6.5 An instrument to monitor time.

6.6 *Specimen Support* — Any support is acceptable as long as it does not contribute to the restraint of the specimen in either the circumferential or axial direction.

6.7 See Figure 1 for basic test system.