

SEMI F10-0698

TEST METHOD TO DETERMINE THE INTERNAL PRESSURE REQUIRED TO PRODUCE A FAILURE OF A TUBE FITTING CONNECTION MADE OF FLUOROCARBON MATERIALS

This Standard was technically approved by the Facilities Global Technical Committee. Available at www.semi.org in June 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 internal pressure required to produce failure of 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 Test 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 may 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 Referenced Standards and Documents

3.1 *ASTM Standard*¹

ASTM D 1599 — Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Summary of Method

4.1 This Test Method consists of pressurizing tube fitting connections made of fluorocarbon materials to failure by continuously increasing the internal hydraulic pressure. New tubing and fitting samples are required at each specific elevated fluid temperature condition, and failures are to occur within 60 to 70 seconds from initial exposure to the high pressure fluid.

5 Significance and Use

5.1 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

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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 pressure limits can be made.

5.2 It is the intent of this Test Method to provide a procedure to determine the maximum pressure limits of tube fitting connections made of fluorocarbon materials. By using this Test Method, accurate comparisons of various tube fitting designs can be achieved.

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

5.4 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.

6 Terminology

6.1 Definitions

6.1.1 *characterize* — to describe the quality of.

6.1.2 *failure* — any external leakage of fluid through the tube wall or the tube fitting connection, whether it be catastrophic or a slow leak.

6.1.3 *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.

6.1.4 *isolation valve* — a valve used to separate the high temperature fluid from the high pressure fluid or to separate the samples from each other.

NOTE 1: This definition is used in only this Test Method.

6.1.5 *pressure containing envelope* — the internal area of a specimen which contains the fluid media.

6.1.6 *standard deviation* — a measure of the variation among the members of a statistical sample.

6.1.7 *subject* — to expose to.

7 Description of Test Equipment

7.1 This Test Method requires the use of two hydraulic systems.

7.1.1 A high pressure system capable of applying a continuous increase of the internal hydraulic pressure to the test specimen.

7.1.2 A low pressure, high temperature circulation system capable of controlling a fluid temperature within $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$) of a specified test temperature.

7.1.2.1 The pressure is to be 75 kPa (11 psig) or less for all temperatures, within the range of 25°C to 200°C (77°F to 392°F).

7.2 *Test Fluid* — When testing at or below 82°C (180°F), an SAE 20 weight hydraulic oil may be used. When testing at elevated fluid temperatures, use a synthetic oil that is acceptable for elevated temperatures of up to 200°C (392°F) and compatible with the test stand and test specimens.

7.3 An instrument to record the peak pressure within 1% of full scale.

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

7.5 *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.

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

7.7 See Figure 1 for basic pressure and circulation system.