

SEMI F9-0998

TEST METHOD TO DETERMINE THE LEAKAGE CHARACTERISTICS OF TUBE FITTING CONNECTIONS MADE OF FLUOROCARBON MATERIALS, WHEN SUBJECTED TO A SIDE LOAD CONDITION

This Standard was technically approved by the Facilities Global Technical Committee. Available at www.semi.org in September 1998; originally published in 1992.

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 leakage characteristics of tube fitting connections made of fluorocarbon materials, when subjected to side loading.

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 All parts of the tube fittings tested by this method in contact with the internal fluid are made of fluorocarbon materials.

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 between 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 Summary of Method

3.1 Subject tube fitting connections made of fluorocarbon materials to a side load condition that is a result of bending the tube in a uniform arc, while maintaining a specified pressure to the internal cavity of the fitting and tube.

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 side load capabilities can be made.

4.2 It is the intent of this Test Method to provide a procedure in which tube fitting connections made of fluorocarbon materials will be subjected to extreme side loading. By using this method, accurate comparisons of various tube fitting designs can be achieved.

4.3 The results obtained when using this Test 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 *bend radius* — the distance from the center of an imaginary circle on which the arc of the bent tube falls to a point on the arc.

5.2.2 *characterize* — to describe the quality of.

5.2.3 *kinking* — a collapse of the tube wall caused by excessive bending.

5.2.4 '*L*' — the tube length required to produce a uniform 180° arc, at a specified tube bend radius.

NOTE 1: The symbol '*L*' is unique in that it is used only in this test method.

5.2.5 '*R*' — the theoretical value to determine the tube bend radius, used during testing.

NOTE 2: The symbol '*R*' is unique in that it is used only in this test method.

5.2.6 *side load* — a result of bending a tube in a specified arc, consequently subjecting the tube fitting connection to a radial stress.

5.2.7 *subject* — to expose to.

5.2.8 *submersion tank* — a transparent tank, filled with isopropyl alcohol, to allow observation of air leakage from a tube fitting connection.

6 Description of Test Equipment

6.1 A supply of compressed air. Pressure to be within $\pm 2\%$ of specified value.

6.2 Isopropyl alcohol.

6.3 An instrument for measuring lengths of tubing (e.g., tape measure).

6.4 A special apparatus which has a fixture for attaching the fitting body, while also providing a means to clamp the free end of tube, to maintain a tube bend radius.

6.4.1 The apparatus shall allow the test specimen to be internally pressurized.

6.4.2 The apparatus shall have a transparent submersion tank capable of containing a fluid for observing leakage. The minimum fluid level shall be 2.5 cm (1 in.) above the test connection.

6.5 See Figure 1 for a basic side load test apparatus.