

SEMI F8-0998

TEST METHOD FOR EVALUATING THE SEALING CAPABILITIES OF TUBE FITTING CONNECTIONS MADE OF FLUOROCARBON MATERIALS, WHEN SUBJECTED TO TENSILE FORCES

1 Purpose

1.1 This method provides a uniform procedure to determine the sealing capabilities of tube fitting connections made of fluorocarbon materials when the connections are subjected to tensile forces.

2 Scope

2.1 This 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 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.

2.4 Parts such as a nut or gripper 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, threaded seals are beyond the scope of this document.

2.6 When using this 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.

2.7 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: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 Standards*¹

ASTM D3307 PFA — Fluorocarbon Molding and Extrusion Materials

ASTM D3296 — Standard Specification for FEP Fluorocarbon Tube

4 Summary of Method

4.1 Subject tube fitting connections made of fluorocarbon materials to extreme tensile forces, while maintaining a specified pressure to the internal cavity of the fitting and tube.

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 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.

5.2 It is the intent of this method to provide a procedure in which the air pressure and tensile force will be applied to tube fitting connections made of fluorocarbon materials. By using this method, accurate comparisons of various tube fitting designs can be achieved.

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

6 Terminology

6.1 Abbreviations and Acronyms

6.1.1 *O.D.* — Outside diameter

6.1.2 *P/N* — Part number

6.2 Definitions

6.2.1 *characterize* — to describe the quality of.

6.2.2 *failure* — tube separation from a tube fitting connection or tearing of the tube.

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

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

6.2.5 *subject* — to expose to.

6.2.6 *tensile* — longitudinal, so as to lengthen the test object.

7 Description of Test Equipment

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

7.2 Isopropyl alcohol.

7.3 An instrument to record the tensile force applied to the test specimen.

7.4 A test apparatus:

7.4.1 Capable of securing the test specimen while allowing the specimen to be internally pressurized.

7.4.2 Capable of accurately providing a uniform rate of pull to the specimen.

7.4.3 With 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.

7.4.4 The apparatus shall allow the test specimen to be internally pressurized to 250 kPa (36 psig).

7.5 See Figure 1 for basic tensile and leak test apparatus.