



Standard Practices for Determining Hermeticity of Electron Devices by Dye Penetration¹

This standard is issued under the fixed designation F 97; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (€) indicates an editorial change since the last revision or reapproval.

€¹ NOTE—Warning notes were editorially moved into the standard text in May 2003.

1. Scope

1.1 These practices cover procedures that will normally detect and locate the sites of gross leaks in electron devices.

1.2 These procedures are suitable for use on selected parts during receiving inspection or to verify and locate leakage sites for production control. They are not quantitative; no indication of leak size can be inferred from the test.

1.3 These procedures are most suitable for use on transparent glass-encased devices; all methods are applicable to transparent parts with an internal cavity. Method A, Penetrant-Capillary, is also applicable to parts, such as terminals, end seals or base assemblies, without an internal cavity, and Method C, Penetrant-Pressure Followed by Vacuum, can be used on opaque parts with an internal cavity. Method B, Penetrant-Pressure, can also be used on opaque parts with an internal cavity if the part is opened after dye penetration and before inspection. Parts that have an internal cavity may either contain gas (such as air, nitrogen, nitrogen-helium mixture, etc.) or be evacuated. These procedures are not suitable for use on grease-filled components.

1.4 Because of the possibility of dye entrapment between the component and an attached part, components with mechanically attached parts, such as a radiator on a power transistor, should be tested before the attachment is made or after it has been removed.

NOTE 1—Alternative methods for determining hermeticity of electron devices may be found in Practices F 98 (see 2.1) and Test Methods F 134 (see 2.1).

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use. For specific hazard statement, see Section 8.

2. Referenced Documents

2.1 ASTM Standards:

E 165 Practice for Liquid Penetrant Examination²

F 98 Practices for Determining Hermeticity of Electron Devices by a Bubble Test³

F 134 Test Methods for Determining Hermeticity of Electron Devices with a Helium Mass Spectrometer Leak Detector⁴

2.2 Other Standards:

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes⁵

MIL-STD-883 Test Methods and Procedures for Microelectronics⁶

3. Summary of Practice

3.1 In these methods, a penetrant dye solution is applied locally to an area of the component to be tested for leaks, or the entire component is immersed in a bath of the penetrant. After contact with the penetrant dye for a specified time, the device is cleaned and visually inspected for dye penetration.

3.2 *Method A, Penetrant-Capillary*—The penetrant dye is applied locally, or the device is immersed in a bath of the dye. This method, in which no external pressure is exerted to force the penetrant dye through the leak, is particularly suited to components and subassemblies without an internal cavity or to subassemblies that cannot be totally immersed.

² Annual Book of ASTM Standards, Vol 03.03.

³ Discontinued. See 1991 Annual Book of Standards, Vol 10.04.

⁴ Discontinued. See 1995 Annual Book of ASTM Standards, Vol 10.04.

⁵ Available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402.

⁶ Available from Standardization Documents, Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, ATTN: NPODS.

¹ These practices are under the jurisdiction of ASTM Committee F01 on Electronics and are the direct responsibility of Subcommittee F01.03 on Metallic Materials.

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