

ENGINEERING PRACTICE STUDY

PROJECT NUMBER: 5961-2015-010

TITLE: MIL-STD-750, PROCEDURE FOR MEASURING THE INTERNAL FREE CAVITY VOLUME OF
ELECTRONIC DEVICES WITH DESIGNED INTERNAL CAVITIES

13 MARCH 2015

FINAL REPORT

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ATTACH 1

I. OBJECTIVES: The objective of this study was to solicit user input to determine whether the proposed procedure for accurately measuring the internal free cavity volume of electronic devices with designed internal cavities, should be adopted for 5961 product tested to the requirements of MIL-STD-750.

II. BACKGROUND: MIL-STD-750, test methods 1018 (Internal Gas Analysis) and 1071 (Hermeticity), require the accurate measurement of internal free cavity volume. Inaccurate cavity volumes have been discovered and reported by multiple certified laboratories. These inaccurate values can affect subsequent hermeticity and internal gas analysis results.

III. RESULTS: The EP Study project was opened and an initial draft was posted on the DLA Land and Maritime website. Inputs were solicited from all interested parties using our entire 5961 stock class email distribution list, which included military services, manufacturers, original equipment manufacturers, and user communities. DLA received no negative feedback regarding the adoption of the proposed procedure.

IV. CONCLUSIONS: The results of this EP Study are sufficient to support the creation of a new MIL-STD-750 test method.

V. RECOMMENDATIONS: Revise MIL-STD-750, with a new test method (see attachment) for measuring the internal free cavity volume of electronic devices with designed internal cavities.

ATTACHMENT 1

INTERNAL FREE CAVITY VOLUME MEASUREMENT.

1. Purpose. The purpose of this test method is to accurately measure the internal free cavity volume of electronic devices with designed internal cavities.
2. Terms and definitions.
 - 2.1 Internal free cavity volume. The internal volume of a device less the area/volume of the die, die attach material, internal conformal coating, and any other internally applied materials.
3. Apparatus: The apparatus required for this test method shall be as follows:
 - a. Drill bit size No. 76 (0.020 inches).
 - b. Isopropyl Alcohol (IPA), A.C.S. (American Chemical Society) Reagent Grade, or isopropyl alcohol in accordance with TT-I-735, grade A or B.
 - c. Graduated syringe with a volumetric scale accurately readable to the second decimal place, (0.0x cc).
 - d. 31 Gauge syringe needle (outside diameter 0.01 inches), or 28 Gauge syringe needle (outside diameter 0.015 inches).
 - e. Vibration platform capable of achieving a frequency of 5-10 Hertz.
4. Procedure.
 - 4.1 The device to be measured shall be drilled with a No. 76 bit into the internal cavity of the device.
 - 4.2 For larger devices (hybrids), the hole shall be drilled in one corner of the device at the highest point of the package lid as show in figure XXXX-1. For smaller devices (integrated circuits and semiconductors), the hole shall be drilled into the lid (or top of the package) at a location that can be tilted to become the highest point of the package as shown in figure XXXX-2.
 - 4.3 The device shall be placed on a surface with the drilled corner elevated above the body of the device.
 - 4.4 The device shall be rigidly fastened to the vibration platform.
 - 4.5 A syringe volume shall be chosen which will hold a volume of IPA greater than the device volume reported by the device manufacturer.
 - 4.6 The syringe shall be filled with IPA.
 - 4.7 The tip of the syringe needle shall be inserted into the cavity of the device.
 - 4.8 IPA shall be dispensed into the device until the cavity fills. To ensure adequate fill, the device being filled shall be vibrated, at a frequency of 5-10 Hz, while IPA is being dispensed. Care shall be taken to ensure that the hole in the package lid remains open and does not become wetted by the IPA.
 - 4.9 The IPA volume dispensed into the device cavity shall be read and recorded.

METHOD XXXX



FIGURE XXXX-1. Drill hole placement for larger devices (hybrids).



FIGURE XXXX-2. Drill hole placement for smaller devices (integrated circuits and semiconductors).