

Acceptance Criteria and Workmanship Standards at Semicon Associates

Michael P. Effgen, Special Project Manager, Semicon Associates
695 Laco Drive, Lexington, Kentucky 40510
meffgen@semiconassociates.com -- Tel: 859-255-3664 x195

This abstract presents a limited review of work accomplished by Semicon Associates in the project area of “Acceptance Criteria” for dispenser cathodes. This work was funded by Department of Defense Title III program office, and managed by the Manufacturing Technology Information Analysis Center operated by IIT Research Institute, for work specified in the Statement of Work entitled “Supply Chain Viability for the U.S. Microwave Tube Industry.”

The goal for the project was for Semicon Associates in conjunction with the Title III Vacuum Electron Device working group to jointly agree upon language, photographs and/or illustrations for inclusion in developing the industry standard and to promote consistent interpretation of product quality during and after manufacturing. Additionally, Semicon Associates project called for developing internal acceptance in 14 critical to quality processing steps to provide for consistent internal interpretation, and where possible, provide the instructional means for training and training validation, as well as defining some of the unusual terminology found within the standard. The 14 critical manufacturing operations defined within the project were:

- Surface finish requirement and defect recognition for Tungsten Pellets, Molybdenum Bodies, Potting, Heaters, and Machining;
- Various Braze Joints for cold braze acceptance, % of seal, and visual criteria
- Impregnation for visual appearance, and weight gain;
- Chemical and Mechanical Cleaning,
- Heater Test for repeatability; and
- Final Inspection.

The methodology applied to this project was started with a complete gap analysis on all applicable customer, industry, and Semicon Associates specifications. In those cases where analysis showed, for the most part, across the board agreement within the specification types, those attributes were classified or grouped for “Acceptance Criteria by Product Feature”, (i.e. Feature Potting – Cracks, ..., etc). Those requirements which were determined to be more product specific or customer specific were classed as Acceptance Criteria by Product/Part Number.” In all cases where minor differences existed between specifications, the more stringent requirement was deemed as taking precedence and Acceptance Criteria was built around that requirement.

This program has resulted in improved training efficiency, documented internal acceptance criteria, an electronic library of photographs detailing defects and methods of recognition, assembly and fabrication methods, and written instructions. All of which has contributed to improved manufacturing efficiency, productivity and significantly reduced the costs associated with scrap and rework. The results of this program have improved Semicon Associates quality system and resulted in several spin-off projects aimed at future process improvement initiatives.

Approved By: _____
Date: _____ Rev. A




Feature: Potting Cracks

Acceptance Criteria:

- o Cracks that exceed .003 in width are cause for rejection.
- o No more than four cracks in potting allowed. The acceptable cracks (3 or less) shall:
 - a. Start and end at point on the cathode sleeve that subtend an arc of 135 degrees or greater of the potting circumference.
 - b. Radiate from the heater leg to the wall, and
 - c. Radiate from the center post to the wall for toroidal heaters.

In all cases if the heater element is visible through the crack the part must be rejected.

In all cases where the operator and or the department supervisor do not feel confident in making a pass or fail decision using this document, contact a Process Engineer for a disposition and explanation.

	Pass Two cracks radiate from heater leg to sleeve. (Semicon internal specification sets minimum separation at 20 degrees) Condition B
	Pass One crack on potting, subtended arc is greater than 135 degrees. Condition A
	Fail One crack in potting, subtended arc is less than 135 degrees. Condition B

This document contains information proprietary to Semicon Associates, and may not be reproduced without written approval.
Permission to reprint this document as a part of the Title III effort to develop an Industry Standard for the Vacuum Electron Device Industry has been granted by Semicon Associates.

Page 1 of 4

Definition:

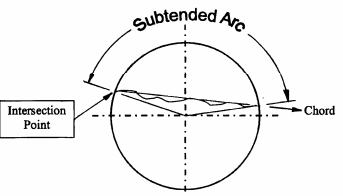
Cracks in Potting - Any separation in the potting that exceed .0005 of width in dimension. Separations in potting that are less than .0005 in width are not defined as cracks, and as such are excluded from consideration when determining fitness for use.

Ocular - An ocular is a graduated eyepiece that can be added to a microscope to measure certain attribute at a fixed magnification. (See your department supervisor for instructions of use.)

"Subtends an arc of 135 degrees or greater": Determining if an arc subtends an angle of 135 degrees or greater is accomplished as follows:

Center the potted surface in the field of view with the angle degree ocular, such that the center point angle degree ocular is at the center of the potting diameter. Rotate the ocular 0 degree line to the intersection point of end of the crack and sleeve wall. To complete the measurement, read the degrees of separation at the opposite crack to sleeve intersection point, if the angle is 135 degrees or greater the part is acceptable.

Finding Subtended Angle: Hypothetically draw a line from one intersection point to the other; this line is geometrically known as a chord. The subtended arc is the generated by angle opposite the chord.

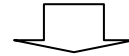


This document contains information proprietary to Semicon Associates, and may not be reproduced without written approval.
Permission to reprint this document as a part of the Title III effort to develop an Industry Standard for the Vacuum Electron Device Industry has been granted by Semicon Associates.

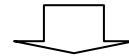
Page 4 of 4

Realizing that Acceptance Criteria is a defect recognition system which once deployed to the shop floor must meet its clients' needs, Semicon Associates approach to this process was:

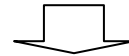
First,
provide the verbatim statement of the feature as described in the specification.



Then breakdown the language within the specification into pictures or illustrations, showing pass/fail or marginal uses representations.



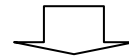
Develop descriptions of each representation that carefully describes the defect in detail and states whether it passes or fails.



Then identify any special handling or lighting conditions that will assist in defect detection.



Then define the terms. Develop definition for terminology contained within the standard to assure compliance and understanding.



And finally, place appropriate controls on the document such as approval, revision, and calibration control.

The author wishes to thank the Title III Cathode Working Group for their contributions to this effort. And I believe, we collectively agree that as additional document such as these are incorporated into a wider industry specification; we as an industry will all benefit.