



**DEFENSE LOGISTICS AGENCY
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12 November 2019

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Engineering Practice Study to determine if the Marking legibility after the High Temperature Exposure Test can be waived or pass a second marking test – ELEVATED AMBIENT STORAGE in MIL-PRF-39009.
Project Number 5905-2019-072

The final draft for this subject document, dated 12 November 2019, is now available for viewing and downloading from the DLA Land and Maritime website:

<https://LandandMaritimeApps.dla.mil/Programs/MilSpec/DocSearch.aspx>

The study results are used to help determine appropriate legible marking after the High Temperature Exposure test.

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/signed/
Michael Radecki
Chief
Electronic Components Branch

ENGINEERING PRACTICES STUDY

TITLE: To determine if the Marking legibility after the High Temperature Exposure Test can be waived or passed through a second marking test - Elevated Ambient Storage in MIL-PRF-39009.

12 November 2019

STUDY PROJECT (SEE ATTACHMENT 1)

FINAL

Study Conducted by DLA LAND AND MARITIME

Prepared by:

Andrew Ernst

I. **OBJECTIVES:** DLA Land and Maritime-VAT conducted a survey to determine if the marking legibility after the high temperature exposure test can be waived or if a second marking test needs to be implemented for MIL-PRF-39009.

II. **BACKGROUND:** During military maintenance testing of MIL-PRF-39009 the following resistors were identified with print failures after the HTE test (250°C bake for 2000 hours): RER40 (ENH-5), RER45 (ENH-10), RER50 (ENH-25), RER55 (ENH-50). The print becoming illegible after the test has been reported as sporadic occurrences.

The MIL-PRF-39009 RER style resistors have an anodized aluminum housing which is pad printed with ink. The photos below are representative of print prior to the High Temperature Exposure bake at 250°C on the left, and following the 3 month long bake on the right. Additionally, there have been no customer complaints for print disappearing on the RER resistors after use.



The load life test per MIL-PRF-39009 also has the requirement for the print to remain legible after 10,000 hours of load life. The resistors are meeting the print requirement following load life. When mounted as specified in MIL-PRF-39009 for load life, the resistor housing temperature is less than 150°C. The mil spec de-rating for free-air (no heatsink/chassis mount) results in housing temperatures approaching 156°C.

It is believed that the load life test is more representative as to how the parts are used by customers, in comparison to the High Temperature Exposure bake of 3 months in a 250°C oven. The 34 groups of resistors were on Load Life at that time the samples were inspected for print legibility. The 170 samples had between 4000 and 8000 hours on Load Life. There were no print failures at Load Life. In addition, in the past 10 years they have accumulated more than 211 million load life hours and have zero illegible print occurrences in that testing. The requirement per MIL-PRF-39009 states the marking shall remain legible at the end of all tests, and no print failures are seen in RER resistors after 10,000 hours of load life.

A proposed alternate test for print legibility, Vishay-Dale recommends 2000 hours at 155°C, as this temperature corresponds to the highest temperature of the housing when put on power per MIL-PRF-39009 specifications (see attachment 1). The current HTE test at 250°C would still be performed for measuring change in resistance (delta-R), no evidence of mechanical damage, but the print legibility requirement following the test would be removed.

III. **RESULTS:** All comments on this study have been submitted to andrew.ernst@dla.mil. Resulting coordinated comments have been in favor of relieving the marking requirement after the high temperature exposure test with a new test - Elevated Ambient Storage, that will be run at 155°C (+10°C / -0°C), for a period of 2,000 hours +72 hours, -24 hours and marking shall remain legible.

IV. **CONCLUSIONS:** MIL-PRF-39009E shall have changes made to reflect the results of this EP study.

V. **RECOMMENDATIONS:** DLA Land and Maritime recommends that changes are to be made to the requirements and test method paragraphs, and qualification and group C inspection tables that relate to the relief of the marking requirements of the high temperature exposure test and the a new test Elevated Ambient Storage in MIL-PRF-39009E.

Attachment 1

SURVEY: MIL-PRF-39009 RESISTOR, FIXED, WIREWOUND (POWER TYPE, CHASSIS MOUNTED)

Please answer the following questions:

- 1) Would you agree to eliminate the requirement that the print on the resistor housing remain legible after High Temperature Exposure (HTE) 2000 hours at 250°C?

_____ Yes, eliminate the print legibility requirement after HTE. No additional test required.

_____ Yes, with the addition of an alternate test for print legibility. See Question 2.

_____ No. Print must remain legible after HTE.

- If No, please provide comments and/or concerns as to why the change should not be allowed: _____

- 2) Would you agree to an alternate test, ELEVATED AMBIENT STORAGE, for print legibility?

- The Elevated Ambient Storage test would duplicate the current HTE test except the test chamber would be at 155°C (+10°C / -0°C), which is in line with the maximum housing temperature at rated power.

_____ Yes

_____ No. Comments: _____