

JOINT SERVICE SPECIFICATION K1001

APPENDIX VI

LIFE TESTS

1. FOREWORD

Electronic valves, other than Reliable types, are not normally subject to life tests as a specification requirement. See, however, Section 13.

2. Cancelled

3. Cancelled

4. Cancelled

5. RELIABLE VALVES

The life testing of Reliable Valves shall be on a Sampling Inspection basis. The Inspection Levels and Acceptance Quality Levels for individual and group tests will be given in the individual Test Specifications. The sampling plans shall be in accordance with Appendix XI and the provisions for transfer between Normal, Tightened or Reduced Inspection given therein shall apply except as follows:-

Normal Inspection shall be used initially and until Reduced or Tightened Inspection is merited in accordance with paragraphs 7.1.2 and 7.1.3 of Appendix XI.

Selection of Sampling Plans. The sampling plans shall be in accordance with Table IIIA of Appendix XI except that lot sizes between 301 and 800 valves shall be considered in accordance with paragraph 2.6.1 of Appendix IX and lots containing more than 8000 valves shall be considered to consist of 8001 valves. Either single or double sampling may be used at the option of the manufacturer. Multiple sampling is not recommended for this application because of the time factor.

The life tests shall be divided into three classes:-

- (a) Stability life tests
- (b) Intermittent life tests of 500 hours
- (c) Intermittent life tests of 1,000 hours

Individual test specifications may require all or part of the above procedure to be performed and may state alternative and/or additional test periods.

5.1. Stability Life Test

- (a) Serially mark all valves from the sample
- (b) Record referenced characteristic measurements after a maximum operation of 15 minutes at life test voltage and current conditions on the entire sample
- (c) Operate at life test conditions for one hour (plus 30 minutes minus 0 minutes)

- (d) Record referenced characteristic measurements at the end of this life test period. These measurements shall be taken immediately following the life test, or, alternatively, the valves may be pre-heated for 15 minutes under life test conditions, the 15 minutes preheating time being considered as part of the life test time.
- (e) A defective valve shall be defined as a valve having a percentage change in a referenced characteristic greater than that specified in the individual test specification.

$$\text{Percentage change} = \frac{\text{Initial value} - \text{one hour value}}{\text{Initial value}} \times 100$$

- (f) A lot failing to comply with the requirements of this test may be resubmitted but once for re-evaluation
- (g) The conditions for the 15 minute preheating period specified in sub-paragraphs (b) and (d) above shall be deemed to have been met provided the electrode voltages and currents on a valve with nominal characteristics are the same as they would be on the same valve at life test conditions.

5.2. (This paragraph has been amended and incorporated in the introductory paragraphs above).

5.3. Intermittent Life Tests - 500 and 1000 hours

The valves used for intermittent life test may be selected at random from the valves used for the stability life test. When the stability life test is not included in the Test Specification the valves shall be selected from the lot.

The valves shall be operated under specified life test conditions. The mean electrode potentials shall not deviate by more than 5% from the specified values and the rated electrode dissipations shall not be exceeded. The heater or filament potential shall be maintained as close as practical to the specified value. If a heater-cathode potential is required during the life test, the resistance applied in series with this potential shall not exceed 5000 ohms.

Valves shall be operated intermittently with not less than 12 interruptions occurring per 24 hours of life testing. The maximum frequency shall be one interruption per hour and the valves shall be operating for approximately 20 hours out of the 24-hour period. The 'on' and 'off' periods shall consist of the immediate application of the filament voltage and then the removal of filament voltage. Other electrode potentials may be applied continuously at the option of the manufacturer. The accumulation of the 'on' time shall be the only time considered in determining the life test time. The filament supply impedance shall not exceed 10% of the hot filament load impedance.

5.3.1. Regular Life Test

Regular life test shall be conducted for 1000 hours and acceptance shall be on the basis of the 500-hour and 1000-hour requirements stated on the individual Test Specification. Regular life test shall be in effect initially and shall continue in effect until the conditions for reduced hours life test have been met.

5.3.2. Reduced Hours Life Test

Reduced hours life test shall be conducted for 500 hours or as otherwise stated in the Test Specification and acceptance shall be based on the 500-hour end-point limits or as qualified above.

In the event of no lot failure in three consecutive 1000-hour life test batches the subsequent batches become eligible for reduced hours life test.

Loss of eligibility for reduced hours life test shall be based on two or more life test lot failures occurring in the last three 500-hour life tests.

5.3.3. The life test sample shall be read at the start of the life test period and at 500 hours plus 48 hours minus 24 hours and at 1000 hours plus 48 hours minus 24 hours when applicable. Additional reading periods may be stated in the test specification and may also be used at the discretion of the manufacturer.

5.3.4. Acceptance Conditions

The lot shall be accepted providing:-

(a) The change in the average characteristic in the life test sample specified for life test control of averages is not exceeded. The average percentage change shall be computed from the individual changes for each valve in the life test sample from the zero hour value for the referenced characteristic or characteristics. For the purposes of computation of this average percentage change the absolute values of the individual changes for each valve in the life test sample shall be used. Any valve found inoperative during the life testing shall not be considered in the calculation of this average.

(b) The specified group and individual AQLs are not exceeded.

5.3.5. A lot failing to comply with the requirements of this test, may be resubmitted but once for re-evaluation.

5.4. Equivalents of Intermittent Life Test Conditions

These shall be defined as those conditions which yield the same incidence of failures. These conditions shall be interpreted as having the same heater voltage, heater-cathode voltage and interruptions as the intermittent life test.

The electrode voltages shall be selected to give element dissipations which are approximately equal to those specified for intermittent life test, i.e. not less than 80%.

The voltages shall be selected to be within plus 100% and minus 50% of the intermittent life test voltages.

5.5. All valves shall be tested at room temperature.

5.6. Order of Evaluation of Life Test Defects

In the event of a valve being defective for more than one attribute characteristic, the lowest number characteristic in the following table shall constitute the failure:-

1. Inoperatives (see paragraph 5.14)
2. Heater current
3. Heater-cathode leakage
4. Grid current
5. Mutual conductance
6. Anode current
7. Electrode insulation
8. Mutual conductance change