NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

INCH-POUND

MIL-PRF-122A
AMENDMENT 4
24 April 1995
SUPERSEDING
AMENDMENT 3
15 February 1994

PERFORMANCE SPECIFICATION

RESISTORS, FIXED, FILM, PRECISION, ESTABLISHED RELIABILITY
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-R-122A, dated 19 February 1990 and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 1

1.2.1, delete and substitute:

"1.2.1 Part or Identifying Number (PIN). The resistors specified herein shall be identified by a PIN which shall consist of the basic military specification sheet and a coded number. The number will be coded to provide information concerning the resistance characteristic, resistance tolerance and failure rate, resistance value, decimal point location, and temperature characteristic. The PIN shall be in the following form with the coded number derived as indicated."

PAGE 6

* 2.1.1, SPECIFICATION, MILITARY, delete:

"MIL-F-14256 - Flux, Soldering, Liquid (Rosin Base).
MIL-P-28809 - Printed Wiring Assemblies."

* 2.1.1, STANDARDS, MILITARY, following MIL-STD-1285, delete:

"MIL-STD-45662 - Calibration Systems Requirements."

* 2.2, Non-Government publications, add:

"AMERICAN NATIONAL STANDARD INSTITUTE

ANSI/NCSL Z540-1 - Calibration Laboratory and Measuring and Test Equipment, General Requirement for.

(Application for copies should be addresed to the American National Standard Institute, 11 West 42 Street, New York, NY 10036.)

"AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B545 (Standard Specification for Electrodeposited Coating of Tin).

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)"

PAGE 7

3.2, delete and substitute:

"3.2 Qualification. The resistors furnished under this specification shall be products which are qualified for listing on the applicable qualified product list (QPL) at the time set for opening bids (see 4.4 and 6.3). In addition, the manufacturer shall obtain certification from the qualifying activity that the reliability assurance requirements of 4.1.2 have been met and are being maintained. Authorized distributors that are approved to MIL-STD-790 distributor requirements by the QPL manufacturer are listed in the QPL."

PAGE 8

3.5.3, add new paragraphs:

"3.5.3.1 Solder dip (retinning) leads. The manufacturer (or his authorized category B or C distributor) may solder dip/retin the leads of product supplied to this specification provided the solder dip process has been approved by the qualifying activity.

"3.5.3.1.1 Qualifying activity approval. Approval of the solder dip process will be based on one of the following options:

a. When the original qualified lead finish was hot solder dip lead finish 52 of MIL-STD-1276. (NOTE: The 200-microinch maximum thickness is not applicable.) The manufacturer shall use the same solder dip process for retinning as was used in the original manufacture of the product.

b. When the original qualified lead finish was not hot solder dip lead finish 52 of MIL-STD-1276 as prescribed in 3.5.3.1.1a., approval for the process to be used for solder dip shall be based on the following test procedures:

(1) Thirty samples of any resistance value for each style and lead finish are subjected to the manufacturer's solder dip process. Following the solder dip process, the resistors shall be subjected to the direct current resistance test and other group A electrical tests. No defects are allowed.) (NOTE: If hermetic seal testing is required in group A, these tests shall also be performed.) No defects are allowed.

(2) Ten of the 30 samples are then subjected to the solderability test. No defects are allowed.

(3) The remaining 20 samples are subjected to the resistance to solder heat test followed by the moisture resistance test (or hermetic seal test if the device is hermetically sealed). No defects are allowed.

"3.5.3.1.2 Solder dip/retinning options. The manufacturer (or the authorized category B or C distributor) may solder dip/retin as follows:

a. After the 100-percent group A screening tests and following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, 100-percent screening tests shall be repeated on 100 percent of the lot. (NOTE: The manufacturer may solder dip/retin prior to the 100 percent electrical measurements of the group A, subgroup 1 tests.) Lot rejection criteria shall be the same as for subgroup 1. (NOTE: If hermetic seal is required in group A, subgroup 1, this test shall be performed after the solder dip/retinning process or the tests will have to be repeated.)

b. As a corrective action, if the lot fails the group A solderability test.

c. After the group A inspection has been completed and following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, 100 percent screening test shall be repeated on 100 percent of the lot. The PDA for the electrical measurements shall be the same as for subgroup 1 tests. (Note: If hermetic seal testing is required in the group A, subgroup 1 tests, these tests shall be repeated.) Following these tests, the manufacturer shall submit the lot to the group A solderability test as specified in 4.7.7.

"3.5.3.1.2.1 Tin plated finishes. Use of tin plating is prohibited as a final finish and as an undercoat (see 6.3.1). Use of tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is 3 percent."

PAGE 9

* 3.5.5, delete in its entirety.

PAGE 12

3.25, delete in its entirety.

3.26, delete and substitute:

"3.26 High temperature exposure. When resistors are tested as specified in 4.7.20, there shall be no evidence of mechanical damage. The change in resistance shall not exceed ±(.2 percent +.001 ohm) for nonhermetically and hermetically sealed resistors. Following this test, the dielectric withstanding voltage shall be as specified in 3.18, and the insulation resistance shall be 1,000 megohms minimum."

PAGE 14

4.1.3, after the last sentence, add:

"In addition, the manufacturer shall demonstrate resistance temperature characteristic (RTC) control in the process."

PAGE 16

TABLE VII, group VI, delete "Storage life", and associated paragraphs in their entirety.

PAGE 17

4.4.5, last sentence, delete in its entirety.

PAGE 20

TABLE VIII, delete and substitute:

" TABLE VIII. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of samples
Subgroup I			
Power conditioning	3.8	4.7.2	100
Thermal shock	3.9	4.7.3	percent
Overload 1/	3.10	4.7.4	
DC resistance 2/	3.11	4.7.5	
Subgroup II			
DC resistance (ppm-2)	3.11	4.7.5	See table
Visual and mechanical (ppm-3) (dimensions only)	3.5	4.7.1	IX
Subgroup III			
Visual and mechanical inspection 3/	3.1, 3.3, 3.31, and 3.32	4.7.1	See table IX
Subgroup IV			
Solderability	3.13	4.7.7	13

1/ At the manufacturer's option, the determination of resistance change may be by any method which is within the accuracy requirements of this specification. The determination of resistance change shall be made upon completion of the overload test; the allowable change in resistance for the combined tests shall be specified (see 3.8).

2/ Resistors shall meet the specified initial resistance tolerance after being subjected to the preceding tests. The resistance measurement made upon completion of the overload test may be used if a measurement has been made which can, without conversion, be directly related to nominal resistance value and tolerance.

3/ At the manufacturer's option, marking inspection may be performed after group B inspection; however, if this is done, no defects shall be permitted. Marking shall remain legible at the end of all tests. "

4.6.1.2.4, *delete and substitute:*

"4.6.1.2.4 Subgroup III tests. A sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found, the lot shall be screened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found in the second sample, the lot shall be rejected and the lot shall not be supplied to this specification."

"4.6.1.2.5 Subgroup IV (solderability).

"4.6.1.2.5.1 Sampling plan. Thirteen samples shall be selected randomly from each inspection lot and subjected to the subgroup 4 solderability test. The manufacturer may use electrical rejects from subgroup I screening tests for all or part of the samples to be used for solderability testing. If there are one or more defects, the lot shall be considered to have failed.

"4.5.1.2.5.2 Rejected lots. In the event of one or more defects, the inspection lot is rejected. The manufacturer may use one of the following options to rework the lot:

a. Each production lot that was used to form the failed inspection lot shall be individually submitted to the solderability test as required in 4.7.7 production lots that pass the solderability test are available for shipment. Production lots failing the solderability test can be reworked only if submitted to the solder dip procedure in 4.5.1.2.5.2b.

b. The manufacturer submits the failed lot to a 100 percent solder dip using an approved solder dip process in accordance with 3.5.3.1. Following the solder dip, the electrical measurements required in group A, subgroup I tests shall be repeated on 100 percent of the lot. The percent defective allowable for the electrical measurements shall be the same as for the subgroup I tests. Thirteen additional samples shall then be subjected to the solderability test with zero defects allowed. If the lot fails this solderability test, the lot shall be considered rejected and shall not be supplied to this specification.

"4.6.1.2.5.3 Disposition of samples. The solderability test is considered a destructive test and samples submitted to the solderability test shall not be supplied on this contract."

TABLE IX, delete and substitute:

" TABLE IX. Sampling plan for ppm categories.

Lot size	Sample size ppm-2	Sample size ppm-3 and subgroup III
1 - 13	100%	100%
14 - 125	100%	13
126 - 150	125	13
151 - 280	125	20
281 - 500	125	29
501 - 1,200	125	34
1,201 - 3,200	125	42
3,201 - 10,000	125	50
10,001 - 35,000	294	60
35,001 - 150,000	294	74
150,001 - 500,000	345	90
500,001 and over	435	102

"

4.6.1.3.1.1, delete and substitute:

"4.6.1.3.1.1 Subgroup I. A sample of parts shall be randomly selected in accordance with table X-1. If one or more defects are found, the lot shall be screened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table X-1. If one or more defects are found in the second sample, the lot shall be rejected and the lot shall not be supplied to this specification."

4.6.1.3.1.2, delete and substitute:

"4.6.1.3.1.2 Subgroup II. A sample part shall be randomly selected in accordance with table X. If one or more defects are found, the lot shall be screened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table X-1. If one or more defects are found in the second sample, the lot shall be rejected and the lot shall not be supplied to this specification."

PAGE 22

TABLE X, delete and substitute:

" TABLE X. Group B inspection. 1/

Inspection	Requirement paragraph	Test method paragraph	Number of samples
Subgroup I			
Resistance temperature characteristic	3.15	4.7.9	See 4.6.1.3.1.1
Subgroup II			
Resistance to solvents	3.14	4.7.8	8

1/ If manufacturer can demonstrate that these tests have been performed five consecutive times with zero failures, the frequency of these tests, with the approval of the qualifying activity, can be performed on an annual basis. If the design, material, construction or processing of the part is changed, or if the there are any quality problems or failures, the qualifying activity may require resumption of the original test frequency. "

* Add new table:

" TABLE X-1. Group B sampling plan.

Lot size	Sample size
1 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1,200	19
1,201 to 3,200	23
3,201 to 10,000	29
10,001 to 35,000	35
35,001 to 150,000	40
150,001 to 500,000	40
500,001 and over	40

"

TABLE XI, delete and substitute:

* TABLE XI. Group C inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of sample units for inspection	Number of failures allowed
Monthly				
Subgroup I				
Life	3.24	4.7.18	5 units minimum per test	See 4.6.2.1.1.1
Subgroup II 1/				
Resistance to soldering heat	3.20	4.7.14	30	1
Moisture resistance	3.21	4.7.15		
Quarterly 1/				
Dielectric withstanding voltage	3.18	4.7.12	30	1
Insulation resistance	3.19	4.7.13		
Low temperature storage and operation	3.16	4.7.10		
Terminal strength	3.17	4.7.11		
Semiannually				
Subgroup I 1/				
Shock (specified pulse)	3.22	4.7.16	30	
Vibration, high frequency	3.23	4.7.17		
Subgroup II 2/				
High temperature exposure	3.26	4.7.20	30	1
Annually 1/				
Subgroup I				
Thermal EMF	3.30	4.7.25	20	1
Voltage coefficient (resistors of 1,000 ohms and over)	3.29	4.7.23		
Current noise	3.28	4.7.22		
Maximum allowable reactance	3.27	4.7.21		

1/ If the manufacturer can demonstrate that these tests have been performed five consecutive times with zero failures, these tests, with the approval of the qualifying activity, can be deleted. The manufacturer, however, shall perform these tests every three years after the deletion as part of long term design verification. If the design, material, construction or processing of the part is changed, or if there are any quality problems, the qualifying activity may require resumption of the specified testing. Deletion of testing does not relieve the manufacturer from meeting the test requirements in case of dispute.

2/ If the manufacturer can demonstrate that this test has been performed five consecutive times with zero failures, the frequency of this test, with the approval of the qualifying activity, can be performed on an annual basis. If the design, material, construction or processing of the part is changed, or if there are any quality problems or failures, the qualifying activity may require resumption of the original test frequency.

PAGE 26

4.7.3c, delete and substitute:

c. Test condition:

(1) Qualification inspection: Test condition C, except that the extreme high temperature shall be 150°C +3°C, -0°C for power rating curve A and B, and 125°C, +3°C, -0°C for power rating curve C.

(2) Quality conformance inspection: Test condition C, except that the extreme high temperature shall be 150°C +3°C, -0°C for power rating curve A and B, and 125°C, +3°C, -0°C for power rating curve C. These extreme temperatures shall be achieved within 6 minutes.

PAGE 27

4.7.5, delete and substitute:

"4.7.5 DC resistance (see 3.11). Resistors shall be tested in accordance with method 303 of MIL-STD-202. The following details and exceptions shall apply:

* a. Measuring apparatus: Different types of measuring test equipment (multimeter, bridges, or equivalent) are permitted to be used on the initial and final readings of this test, provided the equipment is the same style, model, or if it can be shown that the performance of the equipment is equivalent. All test equipment shall be calibrated in accordance with ANSI/NCSL Z540-1.

b. Limit of error of measuring apparatus shall not exceed one-fourth of the resistance tolerance or the resistance change limit for which the measurement is being made. Manufacturers, at their option, may use the apparatus of less accuracy, provided limits are reduced to fully compensate for accuracy deviation.

c. Test voltage for bridges: Measurements of resistance shall be made by using the test voltages specified in table XII. The test voltage chosen, whether maximum or a lower voltage which would still provide the sensitivity required, shall be applied across the terminals of the resistor. This same voltage shall be used whenever a subsequent resistance measurement is made.

d. Measurement energy for electronic test equipment: The measurement energy applied to the unit under test shall not exceed 10 percent of the +25°C rated wattage times 1 second.

e. Resistance measurement point: See 3.1.

f. Temperature: The dc resistance test specified in group I of table VII shall be performed at +25 ±2°C. For all other tests, unless otherwise specified herein, the temperature at which subsequent and final resistance measurements are made in each test shall be made within ±2°C of the temperature at which the initial resistance measurement was made."

PAGE 28

TABLE XIII, delete and substitute:

" TABLE XIII. Resistance temperature characteristic.

Sequence 1/	Temperature
	Qualification and group inspection
	°C
1	Room temperature 2/
2	-15 ±3
3	-55 ±3
4	Room temperature 2/
5	+65 ±3
6	+125 ±3
7	Maximum temperature (see 3.1)

1/ NOTE: At the option of the manufacturer, the reverse sequence of table XIII may be as follows:
1. Room temperature.
2. Series of high temperatures.
3. Room temperature.
4. Series of low temperatures.

2/ Reference temperature for each of the succeeding temperatures. "

PAGE 33

4.7.17d, last sentence, delete and substitute:

"Duration for radial leaded device shall be 4 hours in each plane with the total test time of 12 hours; for an axial leaded device duration shall be 4 hours in two plane with a total test time of 8 hours."

PAGE 34

* 4.7.18f(1) and 4.7.18f(2), delete and substitute:

"(1) Qualification inspection: DC resistance shall be measured at the end of the 30 minutes off period after 250 hours +72 hours, -24 hours; 500 hours +72 hours, -24 hours; 1,000 hours +72 hours, -24 hours; and 2,000 hours +96 hours, -24 hours have elapsed.

(2) Extend life testing: DC resistance shall be measured at the end of the 30 minutes off periods after 250 hours +72 hours, -24 hours; 500 hours +72 hours, -24 hours; 1,000 hours, +72 hours, -24 hours; 2,000 hours +96 hours, -24 hours; every 2,000 hours +96 hours, -24 hours thereafter until the required 10,000 hours +120 hours, -0 hours has elapsed. Measurements shall be made as near as possible to the specified time but may be adjusted so that measurements need not be made during other than normal workdays."

PAGE 34

4.7.19, delete in its entirety.

PAGE 44

6.3, add new paragraph:

"6.3.1 Tin plated finishes. Tin plating is prohibited (see 3.5.3.1.2.1), since it may result in tin whisker growth. Tin whisker growth could adversely affect the operation of electronic equipment systems. For additional information on this matter, refer to ASTM B545."

The margins of this amendment are marked with an asterisk to indicate where changes from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 85

Review activities:
Army - AR, AT, AV, ME
Navy - AS, CG, MC, OS
Air Force - 17, 19, 99

Preparing activity:
DLA - ES

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