INCH-POUND
MIL-PRF-49465C
w/Amendment 2
13 July 2017
SUPERSEDING
MIL-PRF-49465C
w/Amendment 1
29 October 2013

PERFORMANCE SPECIFICATION

RESISTOR, FIXED, METAL ELEMENT, POWER TYPE, VERY LOW RESISTANCE VALUES, GENERAL SPECIFICATION FOR

This specification is approved by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for power type, low value (1 ohm and below), fixed resistors (2 terminal and 4 terminal) for use in electrical, electronic, communications, and associated equipment. Included are precision resistors of ±1 percent, ±3 percent, and ±5 percent initial resistance tolerances with power ratings ranging from 3 watts to 5 watts at +25°C derated to 0 power at +275°C.

1.2 Classification.

1.2.1 Part or Identifying Number (PIN). The PIN is in the following form, and as specified (see 3.1).

M4946501	T	R0100	F
Specification and specification sheet	Characteristic (1.2.1.1)	Resistance (1.2.1.2)	Resistance tolerance (1.2.1.3)

1.2.1.1 Characteristic. The characteristic is identified by a single letter, that signifies the level of stability through various electrical and environmental tests and operating characteristics. Characteristic T is available with the stability as noted (see table I).

1.2.1.2 Resistance. The nominal resistance expressed in ohms is identified by five digits. The letter “R” is substituted for one of the significant digits to represent the decimal point. The succeeding digits of the group represent the significant figures. Minimum and maximum resistance values are as specified (see 3.1). The standard resistance values for each decade follows the sequence demonstrated for the 0.01 to 0.1 decade in table II for all resistance tolerances. Only those resistance values that follow the sequence of values listed in the 0.01 to 0.1 decade in table II are considered as conforming to this specification. The resistance value designations are shown in table III.

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, Ohio 43218-3990 or by email Resistor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil/.

AMSC N/A

FSC 5905

TABLE I. Characteristics.

Test or condition	Symbol T	Units
Resistance temperature characteristic (3.12)	(see 3.1)	ppm/^{O}C
Maximum ambient temperature at rated wattage (see figure 1)	25	^{O}C
Maximum ambient temperature at zero power (see figure 1)	275	
Thermal shock (3.11)	0.2	Maximum percent change in resistance 1/
Short time overload (3.14)	0.5	
Terminal strength (3.18)	0.1	
Dielectric withstanding voltage (3.15)	0.1	
Insulation resistance (3.16)	1,000 MΩ	
High temperature exposure (3.22)	2.0	
Moisture resistance (3.17)	0.2	
Low temperature storage (3.13)	0.2	
Shock, specified pulse (3.19)	0.1	
Vibration, high frequency (3.20)	0.1	
Life (3.21)	2.0	
Tolerance	1, 3, 5	± percent

1/ 0.0005 ohm additional allowed for measurement error.

1.2.1.3 Resistance tolerance. The resistance tolerance, when applicable, is identified by a single letter in accordance with table IV.

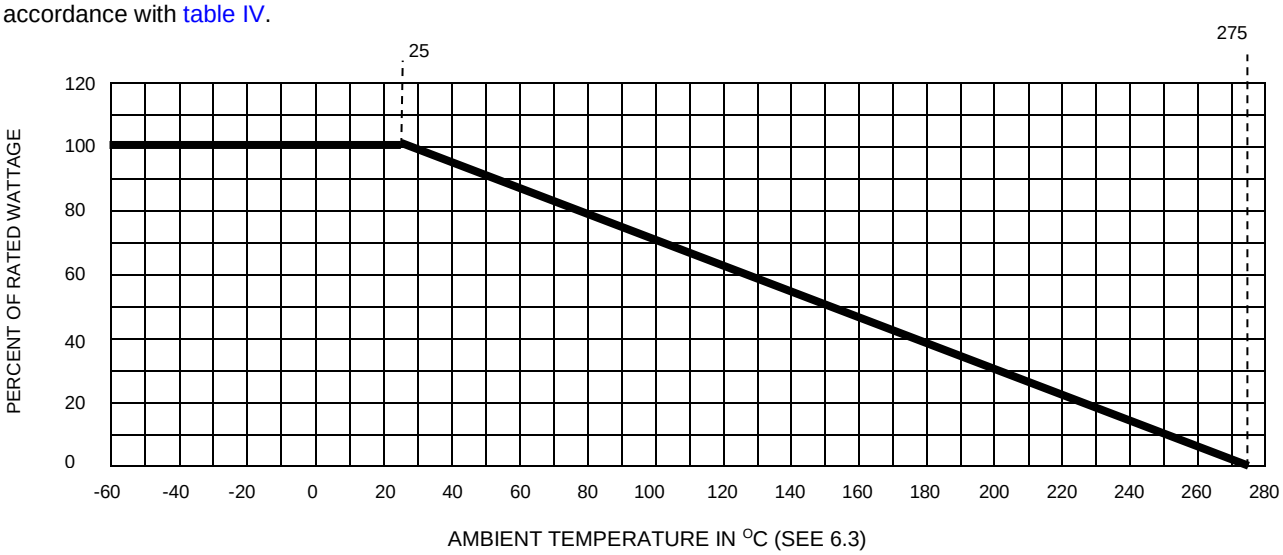

FIGURE 1. Derating curve for ambient temperatures.

TABLE II. Standard resistance values.

F (1.0)	H (3.0) J (5.0)
0.0100	0.0100
0.0102	
0.0105	
0.0107	
0.0110	0.0110
0.0113	
0.0115	
0.0118	
	0.0120
0.0121	
0.0124	
0.0127	
0.0130	0.0130
0.0133	
0.0137	
0.0140	
0.0143	
0.0147	
0.0150	0.0150
0.0154	
0.0158	
	0.0160
0.0162	
0.0165	
0.0169	
0.0174	
0.0178	
	0.0180
0.0182	

F (1.0)	H (3.0) J (5.0)
0.0187	
0.0191	
0.0196	
0.0200	0.0200
0.0205	
0.0210	
0.0215	
	0.0220
0.0221	
0.0226	
0.0232	
0.0237	
	0.0240
0.0243	
0.0249	
0.0255	
0.0261	
0.0267	
	0.0270
0.0274	
0.0280	
0.0287	
0.0294	
	0.0300
0.0301	
0.0309	
0.0316	
0.0324	
	0.0330

F (1.0)	H (3.0) J (5.0)
0.0332	
0.0340	
0.0348	
0.0357	
	0.0360
0.0365	
0.0374	
0.0383	
	0.0390
0.0392	
0.0402	
0.0412	
0.0422	
	0.0430
0.0432	
0.0442	
0.0453	
0.0464	
	0.0470
0.0475	
0.0487	
0.0499	
	0.0510
0.0511	
0.0523	
0.0536	
0.0549	
	0.0560

F (1.0)	H (3.0) J (5.0)
0.0562	
0.0576	
0.0590	
0.0604	
0.0619	
	0.0620
0.0634	
0.0649	
0.0665	
	0.0680
0.0681	
0.0698	
0.0715	
0.0732	
0.0750	0.0750
0.0768	
0.0787	
0.0806	
	0.0820
0.0825	
0.0845	
0.0866	
0.0887	
0.0909	
	0.0910
0.0931	
0.0953	
0.0976	

TABLE III. Designation of resistance values.

Designation	Resistance (ohms)
R0100 to R0976 inclusive	.0100 to .0976 inclusive
R1000 to R9760 inclusive	.1000 to .9760 inclusive
1R000	1.000

TABLE IV. Resistance tolerance.

Symbol	Percent
F	1.0
H	3.0
J	5.0

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-49465/1	-	Resistor, Fixed, Metal Element, Power Type, Style RLV10
MIL-PRF-49465/6	-	Resistor, Fixed, Metal Element, Power Type, Style RLV30
MIL-PRF-49465/7	-	Resistor, Fixed, Metal Element, Power Type, Style RLV31

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202	-	Tests Methods for Electronic and Electrical Components Parts.
MIL-STD-202-106	-	Test Method Standard Method 106, Moisture Resistance
MIL-STD-202-107	-	Test Method Standard Method 107, Thermal Shock
MIL-STD-202-108	-	Test Method Standard Method 108, Life (At Elevated Ambient Temperature)
MIL-STD-202-204	-	Test Method Standard Method 204, Vibration Frequency
MIL-STD-202-208	-	Test Method Standard Method 208, Solderability
MIL-STD-202-211	-	Test Method Standard Method 211, Terminal Strength
MIL-STD-202-213	-	Test Method Standard Method 213, Shock (Specified Pulse)
MIL-STD-202-215	-	Test Method Standard Method 215, Resistance to Solvents
MIL-STD-202-301	-	Test Method Standard Method 301, Dielectric Withstanding Voltage
MIL-STD-202-302	-	Test Method Standard Method 302, Insulation Resistance
MIL-STD-202-303	-	Test Method Standard Method 303, DC Resistance
MIL-STD-202-304	-	Test Method Standard Method 304, Resistance-Temperature Characteristic
MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests.
MIL-STD-1285	-	Marking of Electrical and Electronic Parts.

(Copies of these documents are available online at http://quicksearch.dla.mil).

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents cited in the solicitation or contract (see 6.2).

INTERNATIONAL ORGANIZATION for STANDARDS (ISO)

ISO 10012	-	Measurement Management Systems - Requirements for Measurement Processes and Measuring Equipment

(Copies of this document are available online at http://www.iso.org/.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

NCSL Z540-3	-	Laboratories, Calibration, and Measuring and Test Equipment.

(Copies of this document are available from http://www.ncsli.org/.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence unless otherwise noted. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern (see 6.2).

3.2 Qualification. Resistors furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) at the time of award of contact (see 4.4 and 6.3).

3.3 Material. The material shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the resistors to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of resistor components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.4).

3.4 Interface and physical dimension requirements. Resistors shall meet the interface and physical dimensions as specified (see 3.1).

3.4.1 Construction. Internal construction shall consist of a metallic resistive element that has no joints, welds, or bonds, except at end terminals where welding, brazing, or silver solder only shall be employed. The resistive element shall be as free as practicable from particles or impurities, grain growth, or other factors contributing to spot weakness. Where abrasive resistance value adjustment is used, the abrasion must be evenly distributed across the resistive element.

3.4.1.1 Protective coating or enclosure. Resistor assemblies shall be protected by an enclosure of moisture resistant insulating material that shall completely cover the exterior of the resistance element, including connections or terminations. This material shall afford adequate protection against the effects of prolonged exposure to high humidity. The enclosure shall be free from holes, fissures, chips, and other faults. Small cracks and molding flaws which do not adversely affect the unit's ability to meet all environmental requirements of this specification will not be considered a cause for rejection.

3.4.1.2 Terminals. Terminals shall be made of a solid conductor of the length and diameter as specified (see 3.1).

3.4.1.2.1 Solder dip (retinning) leads. The manufacturer may solder dip/retin the leads of product supplied to this specification provided the solder dip/retin process (see appendix) has been approved by the qualifying activity.

3.4.1.3 Weight. Resistors shall not exceed the maximum weight as specified (see 3.1).

3.5 Power rating. Resistors shall have a power rating based on continuous full load operation at an ambient temperature of +25°C (see 3.1). For temperatures in excess of +25°C, the load shall be derated in accordance with figure 1.

3.6 Voltage rating. Each resistor element shall have a rated dc continuous working voltage or an approximate sine-wave root mean square (rms) continuous working voltage corresponding to the wattage (power) rating, as determined from the following formula:

$$E = \sqrt{PR}$$

Where: E = Continuous rated dc or rms working voltage in volts.
P = Rated wattage in watts.
R = Nominal resistance in ohms.

In no case shall the rated voltage be greater than the applicable maximum voltage (see 3.1).

3.7 Current rating. Resistors that have a maximum current rating shall be as specified (see 3.1).

3.8 DC resistance. When resistors are tested as specified in 4.8.2, the dc resistance shall be within the specified tolerance of the nominal resistance (see 3.1).

3.8.1 Resistance value deviations. All maximum deviations as specified in this section are to be considered absolute limits with the exception of the contact resistance adjustments.

3.9 Solderability. When resistors are tested as specified in 4.8.3, they shall meet the criteria for wire lead terminal evaluation in the test method.

3.10 Resistance to solvents. When resistors are tested as specified in 4.8.4, there shall be no evidence of mechanical damage and the markings shall remain legible.

3.11 Thermal shock. When tested as specified in 4.8.5, resistors shall not change in resistance in excess of ±(0.2 percent +.0005 ohm), nor show any evidence of mechanical damage. There shall be no change in resistor enclosure or other part that will result in degradation in performance.

3.12 Resistance temperature characteristic. When resistors are tested as specified in 4.8.6, the resistance temperature characteristic between -55°C and +275°C shall not exceed the value as specified (see 3.1).

3.13 Low temperature storage. When resistors are tested as specified in 4.8.7, there shall be no evidence of mechanical damage. The change in resistance between initial and final resistance measurements at +25°C ±5°C shall not exceed ±(0.2 percent + .0005 ohm).

3.14 Short time overload. When resistors are tested as specified in 4.8.8, there shall be no evidence of arcing, burning, or charring; and the change in resistance shall not exceed ±(0.5 percent + .0005 ohm).

3.15 Dielectric withstanding voltage. When resistors are tested as specified in 4.8.9, the leakage rate shall not exceed 500 microamperes; there shall be no evidence of flashover, mechanical damage, arcing, or insulation breakdown, and the change in resistance shall not exceed ±(0.1 percent + .0005 ohm).

3.16 Insulation resistance. When resistors are tested as specified in 4.8.10, the insulation resistance shall not be less than 1,000 megohms

3.17 Moisture resistance. When resistors are tested as specified in 4.8.11, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed ±(0.2 percent + .0005 ohm). In addition, the dielectric withstanding voltage shall be as specified in 3.15, and the insulation resistance shall be 100 megohms minimum.

3.18 Terminal strength. When resistors are tested as specified in 4.8.12, there shall be no evidence of breaking or loosening of terminals from the resistor form, chipping of enclosure, or other evidence of mechanical damage. The change in resistance shall not exceed ±(0.1 percent + .0005 ohm).

3.19 Shock, specified pulse. When resistors are tested as specified in 4.8.13, there shall be no evidence of breaking or loosening of terminals from the resistor form, chipping of enclosure or other evidence of mechanical damage. The change in resistance shall not exceed ±(0.1 percent + .0005 ohm). There shall be no electrical discontinuity during the test.

3.20 Vibration, high frequency. When resistors are tested as specified in 4.8.14, there shall be no evidence of mechanical damage. The change in resistance shall not exceed ±(0.1 percent + .0005 ohm). There shall be no electrical discontinuity during the test.

3.21 Life. When resistors are tested as specified in 4.8.15, the change in resistance between the initial measurement and the succeeding measurements shall not exceed ±(2.0 percent + .0005 ohm). There shall be no evidence of mechanical damage.

3.22 High temperature exposure. When resistors are tested as specified in 4.8.16, there shall be no damage. The change in resistance shall not exceed ±(2.0 percent + .0005 ohm).

3.23 Fungus. All external materials shall be nonnutrient to fungus growth or shall be treated to retard fungus growth. The manufacturer shall verify by certification that all external materials are fungus resistant or shall test the resistors as specified in 4.8.17. There shall be no evidence of fungus growth on the external surfaces.

3.24 Marking. Resistors shall be marked with the type designation, date code, and source code. Date and source code shall be in accordance with MIL-STD-1285. At the option of the manufacturer, the PIN number may appear on two lines. In this event, the PIN shall be divided between the characteristic letter and the last digit of the Department of Defense specification number. The following is an example of the complete marking:

12345	-	Source code.
9933J	-	Date code.
M4946501	-	Department of Defense specification.
TR0100F	-	Characteristic, resistance type designation, tolerance.

3.24.1 Minimum marking. When the physical size of the resistor style precludes the marking of all the information cited in the example in 3.24 the minimum marking required shall be as specified in the associated specification sheet (see 3.1). Marking shall remain legible at the end of all tests. In those cases where full marking requirements are not on the resistor body, full marking shall be marked on the unit package.

3.25 Use of conductive inks. Conductive inks shall not be used to coat the body of the resistor as preparation for marking or used for marking of resistors.

3.26 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.27 Workmanship. Resistors shall be processed in such a manner as to be uniform in quality, and shall be free from holes, fissures, chip, corrosion, and malformation. The terminals shall be unbroken and not crushed or nicked; and the resistors shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.4).
b. Conformance inspection (see 4.6).
c. Periodic inspection (see 4.7).

4.2 Test equipment and inspection facilities. The supplier shall establish and maintain a calibration system in accordance with NCSL Z540-3, ISO 10012, or equivalent system as approved by the qualifying activity.

4.3 Inspection conditions and precautions.

4.3.1 Conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the GENERAL REQUIREMENTS of MIL-STD-202.

4.3.2 Precautions. Adequate precautions shall be taken during tests to prevent condensation of moisture on resistors, except during the moisture resistance tests.

4.4 Qualification. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample. The number of sample units comprising a sample of resistors to be submitted for qualification inspection shall be as specified in the appendix to this specification. The sample shall be taken at random from a production run and shall be produced with equipment and procedures normally used in production. The sample units shall have been subjected to and passed the requirements of group A inspection (see 4.6.2). Qualification shall not be granted if group A inspection requirements are not met. Each resistor style shall be qualified separately (see 3.1).

4.4.2 Test routine. Sample units shall be subjected to the qualification inspection specified in table V in the order shown. All sample units, with the exception of those for groups II and VIII inspection, shall be subjected to the inspections and tests of group I. The sample units shall then be divided as specified in table V for group III, group IV, group VI, and group VII, and subjected to the inspection for their particular group. In addition, four unenclosed sample units shall be selected and subjected to group V inspection. An additional 14 sample units shall be subjected to group II tests, with 6 sample units to the solderability test and 8 sample units to the resistance to solvents test. Ten samples shall be subjected to the tests of group VIII.

4.4.3 Failures. Failures in excess of those allowed in table V shall be cause for refusal to grant qualification approval.

4.5 Retention of qualification. Every 12 months, the manufacturer shall verify the retention of qualification to the qualifying activity. In addition, the manufacturer shall immediately notify the qualifying activity whenever the group B inspection results indicate failure of the qualified product to meet the requirements of this specification. Verification shall be based on meeting the following requirements:

a. The manufacturer has not modified the design of the item.
b. The specification requirements for the item have not been amended so far as to affect the character of the item.
c. Lot rejection for group A inspection does not exceed the group A sampling plan.
d. The requirements for group B inspection are met.

When group B requirements were not met and the manufacturer has taken corrective action satisfactory to the Government, group B inspection retesting shall be instituted.

In the event that no production has occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during 2 consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit (the products, a representative product of each type, grade, class, etc.) to testing in accordance with the qualification inspection requirements.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.6.1.1 Inspection lot. An inspection lot, as far as practical, shall include resistors of any style within a given group shown in table VI without regard to resistance value or resistance tolerance, produced under essentially uniform conditions and offered for inspection at one time. Resistors that differ in design, construction, materials, and terminal type shall not be included in one lot.

4.6.1.2 Production lot. A production lot consists of parts manufactured from the same basic raw materials, processed under the same specifications and procedures, and produced with the same equipment. Each production lot of parts should be a group identified by a common manufacturing record through all significant manufacturing operations.

4.6.2 Group A inspection. Group A inspection shall consist of the inspections specified in table VI, and shall be made on the same set of sample units, in the order shown.

4.6.2.1 Subgroup 1. Subgroup 1 tests shall be performed on a production lot basis on 100 percent of the products supplied under this specification. Units that are out of resistance tolerance, or which experience a change in resistance greater than that permitted for the tests of this subgroup shall be removed from the lot. Lots having more than 10 percent total rejects, due to exceeding the specified resistance change limit shall not be furnished on contracts.

4.6.2.2 Subgroup 2. A sample of parts from each inspection lot shall be randomly selected in accordance with table VII, if one or more defects are found, the lot shall be rescreened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table VII, if one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.6.2.3 Subgroup 3 (solderability).

4.6.2.3.1 Sampling plan. Six samples shall be selected randomly from each inspection lot and subjected to the subgroup 3 solderability test. If there are one or more defects, the lot shall be considered to have failed.

TABLE V. Qualification inspection.

Inspection	Requirement Paragraph	Method paragraph	Number of sample units 1/	Number of failures allowed
Group I Visual and mechanical inspection 2/ DC resistance 3/	3.1, 3.3 to 3.4.1.3 inclusive, 3.24 to 3.27 inclusive 3.8	4.8.1 4.8.2	All samples 80	1
Group II 4/ Solderability Resistance to solvents	3.9 3.10	4.8.3 4.8.4	6 8	
Group III 4/ Thermal shock Resistance temperature characteristic Low temperature storage Short time overload Dielectric withstanding voltage Insulation resistance Moisture resistance Terminal strength	3.11 3.12 3.13 3.14 3.15 3.16 3.17 3.18	4.8.5 4.8.6 4.8.7 4.8.8 4.8.9 4.8.10 4.8.11 4.8.12	20 (10 highest 10 lowest)	
Group IV 4/ Shock (specified pulse) Vibration, high frequency	3.19 3.20	4.8.13 4.8.14	20 (10 highest 10 lowest)	
Group V (unenclosed) 4/ 5/ Visual and mechanical inspection	3.1, 3.3, 3.4, 3.24, 3.24.1, and 3.27	4.8.1 as applicable	4 (2 highest 2 lowest)	0
Group VI 4/ Life	3.21	4.8.15	20 (10 highest 10 lowest)	1
Group VII 4/ High temperature exposure	3.22	4.8.16	20 (10 highest 10 lowest)	1
Group VIII 4/ Fungus	3.23	4.8.17	10	0

1/ See appendix.

2/ Marking shall be considered defective only if illegible or missing. Marking shall remain legible at the end of all tests.

3/ Tests shall not be performed if a manufacturer presents certified data proving tests have been performed on the qualification sample.

4/ Items subjected to group II through VIII inclusive, must meet requirements of group I.

5/ Unenclosed sample units shall be subjected to visual and mechanical inspection in accordance with group I only.

TABLE VI. Group A inspection.

Inspection	Requirement paragraph	Method paragraph	Number of samples
Subgroup 1 DC resistance	3.8	4.8.2	100 percent inspection
Subgroup 2 Visual and mechanical inspection Terminals Markings	3.1, 3.3 to 3.4.1.1, 3.4.1.3, and 3.24 3.4.1.2 3.24, 3.24.1	4.8.1	See table VII
Subgroup 3 Solderability	3.9	4.8.3	6

TABLE VII. Group A sampling plan.

Lot size			Subgroup 2 sample size
2	to	13	100%
14	to	150	13
151	to	280	20
281	to	500	29
501	to	1,200	34
1,201	to	3,200	42
3,201	to	10,000	50
10,001	to	35,000	60
35,001	to	150,000	74
150,001	to	500,000	90
500,001	and over		120

4.6.2.3.2 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 4.8.3. 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 4.6.2.3.2b.
b. The manufacturer submits the failed lot, to a 100 percent solder dip using an approved solder dip process in accordance with the appendix. Following the solder dip the electrical measurements required in group A, subgroup 1 tests shall be repeated on 100 percent of the lot. Lot acceptance for the electrical measurements shall be as for the subgroup1 tests. Six additional samples shall then be selected and subjected to the solderability test with zero defects allowed. If the lot fails this solderability test the lot may be reworked a second time and be retested. If the lot fails the second rework, the lot shall be considered rejected and shall not be furnished against the requirements of this specification.

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

4.7 Periodic inspection. Periodic inspection shall consist of group B. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.7.3), delivery of products which have passed group A shall not be delayed pending the results of these periodic inspections.

4.7.1 Group B inspection. Group B inspection shall consist of the tests specified in table VIII, in the order shown. The specified number of sample units shall be selected from inspections lots that have been subjected to and have passed group A inspections. A separate sample shall be selected from lots as defined 4.7.1.1 for each enclosure material and element technology. Group B samples shall be representative of production.

4.7.1.1 Sampling plan.

4.7.1.1.1 Semiannually (subgroup 1 and subgroup 2). Every 6 months the specified number of sample units shall be subjected to the examination and test of table VIII. The samples shall be selected from a lot as defined 4.6.1.1, and where possible shall be representative of the styles included in the lot. The manufacturer should select samples so that a maximum variety of styles produced are tested. A separate set of samples shall be tested for each enclosure material.

4.7.1.1.2 Annually (subgroup 1, subgroup 2, and subgroup 3). Sample units and tests shall be as specified in table VIII. The test sample should include all styles allowed to be combined for lot formation (see 4.6.1.1) as practicable. A complete separate sample shall be selected for each enclosure material.

4.7.2 Disposition of sample units. Sample units that have been subjected to group B inspection shall not be delivered on the contract or purchase order.

4.7.3 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall immediately notify the qualifying activity and the cognizant inspection activity of such failure and take correct action on the materials or processes, or both, as warranted, and on all units of product that can be corrected and that were manufactured under essentially the same materials or processes, and which are considered subject to the same failures. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection that the original sample failed, at the option of the qualifying activity). Group A inspection may be reinstituted; however final acceptance and shipment shall be withheld until the group B re-inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure shall be furnished to the cognizant inspection activity and qualifying activity.

TABLE VIII. Group B inspection.

Inspection	Requirement paragraph	Method paragraph	Number of sample units	Number of failures allowed
Semiannually				
Subgroup 1				
Resistance to solvents	3.10	4.8.4	4	0
Subgroup 2				
Thermal shock	3.11	4.8.5	10 (6 highest 4 lowest)	1
Resistance temperature characteristic	3.12	4.8.6		
Low temperature storage	3.13	4.8.7		
Short time overload	3.14	4.8.8		
Dielectric withstanding voltage	3.15	4.8.9		
Insulation resistance	3.16	4.8.10		
Moisture resistance	3.17	4.8.11		
Terminal Strength	3.18	4.8.12		
Annually				
Subgroup 1				
Life	3.21	4.8.15	20 (10 highest 10 lowest)	1
Subgroup 2				
Thermal shock	3.11	4.8.5	30 (15 highest 15 lowest)	1
Shock (specified pulse)	3.19	4.8.13		
Vibration, high frequency	3.20	4.8.14		
Subgroup 3				
High temperature exposure	3.22	4.8.16	30 (15 highest 15 lowest)	1

4.8 Methods of inspections.

4.8.1 Visual and mechanical inspection. Resistors shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.4 to 3.4.1.3 inclusive, and 3.24 to 3.27 inclusive).

4.8.2 DC resistance (see 3.8). Resistors shall be tested in accordance with MIL-STD-202-303. The following details and exceptions shall apply:

a. Measuring apparatus: Different types of measuring test equipment (multimeters, 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 it can be shown that the performance of the equipment is equivalent or better.
b. Limit or error of measuring apparatus: ±(0.1 percent + 0.00001 ohm), but not exceeding one-fourth of the resistor tolerance or the resistance change limit for which the measurement is being made. Manufacturers, at their option, may use an apparatus of less accuracy, provided the limits are reduced to fully compensate for accuracy deviation.
c. Test voltage and currents: The test voltage and current shall be such that sufficient resolution is obtained (see 4.8.2b) without an excessive amount of heating effect.
d. Points of measurement:
    (1) Two terminal devices: The point to point voltage measurement shall be made at a distance as specified in the associated specification.
    (2) Four terminal devices: The associated specification shall identify voltage and current leads. If no identification is given, a random determination will be made and this combination shall be used for any one test, but not necessarily for all tests.

4.8.3 Solderability (see 3.9). Resistors shall be tested in accordance with MIL-STD-202-208. The following details shall apply:

a. All leads shall be tested.
b. The leads shall be dipped within .062 inch of the body.

4.8.4 Resistance to solvents (see 3.10). Resistors shall be tested in accordance with MIL-STD-202-215. The following details shall apply:

a. The marked portion of the resistor body shall be brushed.
b. The number of sample units shall be as specified in table V and table VIII.
c. Resistors shall be examined for mechanical damage and legibility of markings.

4.8.5 Thermal shock (see 3.11). Resistors shall be tested in accordance with MIL-STD-202-107. The following details and exceptions shall apply:

a. Mounting: In such a manner that there is at least 1 inch of free air space around each resistor, and in such a position with respect to the air stream that the mounting offers substantially no obstruction to the flow of air across and around the resistors.
b. Measurement before cycling: DC resistance shall be measured as specified in 4.8.2.
c. Test condition: B.
d. Climate chamber: The rate of temperature change within the climate chamber shall be not less than 2^{O}C per minute. The temperature shall be maintained at each of the extreme temperatures by means of circulating air. The air temperature shall be measured by a suitable method and as near the center of the group of resistors as possible.
e. When two climate chambers are used: The resistors may be transferred from one chamber to another, in which case they shall be kept at room temperature for not more than 15 minutes between exposures to the extreme temperatures.
f. Measurements after cycling: Not less than 1 hour, but within a 24 hour period after the last cycle, dc resistance shall be measured as specified in 4.8.2.
g. Examination after test: Resistors shall be examined for evidence of mechanical damage.

4.8.6 Resistance temperature characteristic (see 3.12). Resistors shall be tested in accordance with MIL-STD-202-304. The test temperature shall be in accordance with table IX.

TABLE IX. Resistance temperature characteristic test temperatures.

Sequence	Temperature ^{O}C ±3^{O}C (Qualification)	Temperature ^{O}C ±3^{O}C (Periodic) 1/
1	25 2/	25 2/
2	-15	
3	-55	-55
4	25 2/	25 2/
5	125	125
6	200	
7	275	275

1/ At the option of the manufacturer, the reverse sequence may be as specified.

2/ This temperature shall be considered the reference temperature for each of the succeeding temperatures.

1. 275^{O}C ±3^{O}C
2. 125^{O}C ±3^{O}C
3. 25^{O}C ±3^{O}C 1/
4. -55^{O}C ±3^{O}C
5. 25^{O}C ±3^{O}C 1/

4.8.7 Low temperature storage (see 3.13).

4.8.7.1 Mounting. Resistors shall be mounted in such a manner that there is at least 1 inch of fine air space around each resistor, and in such a position with respect to the air stream that the mounting offers substantially no obstruction to the flow of air across and around the resistors.

4.8.7.2 Procedure. DC resistance shall be as specified in 4.8.2. Within 1 hour after this measurement, the resistors shall be placed in a cold chamber at a temperature of -55^{O}C ±2^{O}C for a period of 24 hours ±4 hours. The resistors shall then be removed from the chamber and maintained at a temperature of 25^{O}C ±5^{O}C for a period of approximately 2 hours to 8 hours; the dc resistance shall again be measured as specified in 4.8.2. Resistors shall then be examined for evidence of mechanical damage.

4.8.8 Short time overload (see 3.14). DC resistance shall be measured as specified in 4.8.2. The resistors shall then be mounted by means other than soldering and shall be subjected to an overload voltage which will result in 5 times rated wattage for a 5 second duration. DC resistance shall again be measured after the resistors have cooled to room temperature. Care should be taken so as not to exceed the maximum overload current rating (see 3.1).

4.8.9 Dielectric withstanding voltage (see 3.15).

4.8.9.1 Atmospheric pressure. Resistors shall be tested in accordance with MIL-STD-202-301. The following details and exceptions shall apply:

a. Special preparation:
   (1) Axial lead resistors shall be placed in a conductive material which will conform to the resistor surface so that at least 90 percent of the outer periphery is contacted. The resistor leads shall be so positioned that one of the points of contact of the periphery of the resistor with the V-block is the point at which the distance from the surface of the resistor leads to the periphery of the resistor body is a minimum. The minimum distance to the periphery of the resistor body shall be measured from the point of emergence of the resistor lead.

b. Initial measurement: DC resistance shall be measured as specified in 4.8.2.
c. Magnitude of test voltage: 1,000 volts rms.
d. Nature of potential: An alternating current (ac) supply at commercial line frequency and waveform.
e. Duration of application of test voltage: 1 minute for qualification and group B inspection.
f. Rate of application of voltage: The test voltage shall be raised from zero to the application value as uniformly as practicable, at the rate of 100 volts rms per second for group B and qualification testing.
g. Points of application of test voltage: Between the resistor terminals connected together and the mounting hardware, or the V-block, as applicable.
h. Measurement during the test: The leakage current shall be monitored during the application of the test voltage.
i. Measurement after test: The dc resistance shall be measured as specified in 4.8.2.
j. Examinations after test: Resistors shall be examined for evidence of flashover, mechanical damage, arcing, and insulation breakdown.

4.8.10 Insulation resistance (see 3.16). Tests shall be made in accordance with MIL-STD-202-302 with the following exceptions:

a. Test condition: A.
b. Special preparation: In accordance with 4.8.9.1a.
c. Points of measurement: In accordance with 4.8.9.1g.

4.8.11 Moisture resistance (see 3.17). Resistors shall be tested in accordance with MIL-STD-202-106. The following details and exceptions shall apply:

a. Mounting: Soldering by their leads to rigid mounts or terminal lugs. The spacing of the mounts or terminal lugs shall be such that the length of each resistor lead is approximately .375 inch when measured from the edge of the supporting terminal to the resistor body. One half of the sample units shall be covered with a V-shaped metal strap whose width is equal to the length of the resistor body as indicated on figure 2. The strap shall be made of a corrosion resistant metal and shall be kept in contact with the resistor body by supporting the body as indicated on figure 2, with a nonconducting, noncorrosive support whose width is less than that of the body and which will not act as a moisture trap. For group B inspection, each half of the sample shall be apportioned as three highest values, two lowest values for a total of five sample units per half. The mounting straps may be individual for each resistor, or continuous for all resistors.

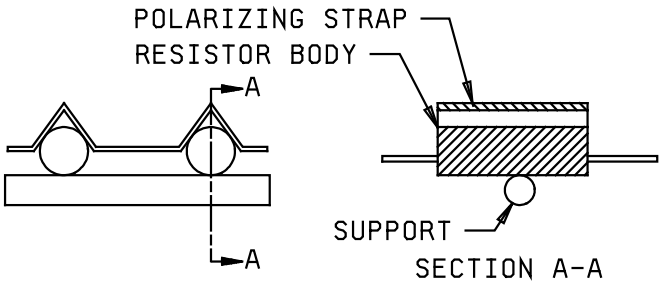

FIGURE 2. Mounting straps for moisture resistance test.

b. Mounting (special body configuration): If the procedure in 4.8.11 does not lend itself to the body configuration, special details shall be as specified in the associated specification (see 3.1).

c. Initial measurement: Immediately following the initial drying period, dc resistance shall be measured as specified in 4.8.2 at test conditions specified in 4.3.1.

d. Polarization and loading voltage:

(1) Polarization voltage: During steps one to six inclusive, a 100 V dc potential shall be applied only to those resistors which have a polarizing strap. This potential shall be applied with the positive lead connected to the resistor terminals tied together, and the negative lead connected to the polarizing straps.

(2) Loading voltage: During the first 2 hours of steps one and four, a dc test potential equivalent to 100 percent rated wattage shall be applied to those resistors which do not have the polarizing strap specified in 4.8.11a.

e. Subcycle: Step 7b shall not be applicable. Step 7a shall be performed during any five of the first nine cycles only.

f. Final measurements: Upon completion of step six of the final cycle, the resistors shall be held at the high humidity condition and a temperature of $+25^{O}C \pm 2^{O}C$ for a period of 1 hour 30 minutes to 3 hours 30 minutes. Resistors shall then be removed from the chamber, and within 30 minutes, the dielectric withstanding voltage (atmospheric), insulation resistance, and dc resistance tests shall be performed as specified in 4.8.9, 4.8.10, and 4.8.2, respectively. The same straps used for polarizing the resistors may also be used for the dielectric withstanding voltage and insulation resistance tests.

g. Examination after test: Resistors shall be examined for evidence of mechanical damage.

4.8.12 Terminal strength (All terminals on each resistor shall be tested) (see 3.18). Tests shall be in accordance with MIL-STD-202-211 with the following exceptions:

a. Test conditions: A and D. (Pull test and twist test, respectively.)
b. Measurement before test (A): DC resistance as specified in 4.8.2.
c. Method of holding (A): Resistors shall be clamped by one terminal lead for axial terminal and by the body for radial lead.
d. Applied force (A): As specified (see 3.1) to each terminal.
e. Applied force (D): If the terminal configuration prevents performance of this test, special details will be as specified (see 3.1).
f. Measurement after test (D): DC resistance as specified in 4.8.2 and examined for evidence of breaking and loosening of terminals and chipping of coating.

4.8.13 Shock (specified pulse) (see 3.19). Resistors shall be tested in accordance with MIL-STD-202-213. The following details and exceptions shall apply:

a. Special mounting means: Resistors shall be rigidly mounted on appropriate jig fixtures with their bodies restrained from movement and their leads supported at a distance of .375 ±.062 inch from the resistor body. These fixtures shall be constructed in a manner to insure that the points of the resistor mounting supports will have the same motion as the shock table. Test leads used during this test shall be no larger than AWG size 22 stranded wire, so that the influence of the test lead on the resistor will be held to a minimum. The test lead length shall be no longer than necessary. In all cases, the resistors shall be mounted in relation to the test equipment in such a manner that the stress applied is in the direction which would be considered most detrimental.
b. Measurement before shock: DC resistance shall be measured as specified in 4.8.2.
c. Test condition: I.
d. Number and direction of applied shocks: The resistors shall be subjected to a total of 10 shocks in each of two mutually perpendicular planes, one perpendicular and the other parallel to the longitudinal axis of the resistor.
e. Measurement during shock: Each resistor shall be monitored to determine electrical discontinuity by a method which shall at least be sensitive enough to monitor or register, automatically, any electrical discontinuity of 0.1 millisecond or greater duration.
f. Measurement after shock: DC resistance shall be measured as specified in 4.8.2.
g. Examination after test: Resistors shall be examined for evidence of mechanical and electrical damage.

4.8.14 Vibration, high frequency (see 3.20). Resistors shall be tested in accordance with MIL-STD-202-204. The following details and exceptions shall apply:

a. Mounting of specimens: Resistors shall be mounted on appropriate jig fixtures with their bodies restrained from movement and their leads supported at a distance of .375 ±.062 inch from the resistor body. These fixtures shall be constructed in a manner to insure that the points of the resistor mounting supports will have the same motion as the vibration within the test frequency range, and the fixture shall be monitored for these features on the vibration table. Test leads used during this test shall be no larger than AWG size 22 stranded wire, so that the influence of the test lead on the resistor will be held to a minimum. The test cable which may be necessary because of the field surrounding the vibration table, shall be clamped to the resistor mounting jig.
b. Initial measurement: DC resistance shall be measured as specified in 4.8.2.
c. Test condition: D.
d. Direction of motion: In each of two mutually perpendicular directions, one perpendicular and the other parallel to the longitudinal axis of the resistor. Total test time shall be 6 hours in each direction for a total of 12 hours.
e. Measurement during test: Each resistor shall be monitored to determine electrical discontinuity by a method which shall at least be sensitive enough to monitor or register, automatically, any electrical discontinuity of 0.1 millisecond or greater duration.
f. Measurement after vibration: DC resistance shall be measured as specified in 4.8.2.
g. Examination after test: Resistors shall be examined for evidence of mechanical damage.

4.8.15 Life (see 3.21). Resistors shall be tested in accordance with MIL-STD-202-108. The following details and exceptions shall apply:

a. Method of mounting: Resistors shall be mounted on lightweight terminals. The integrity of the terminations shall be determined at each measurement interval. The voltage applied to any resistor shall not be less than 95 percent of the dc, ac line or true rms rated continuous working voltage. Resistors shall be so arranged that the temperature of any one resistor shall not appreciably influence the temperature of any other resistor. If forced air circulation is employed, the air velocity shall not exceed 500 feet per minute, and there shall be no direct impingement of the forced air supply on the resistors.
b. Test temperature: +25°C ±5°C.
c. Initial measurements: Initial resistance shall be measured after mounting at +25°C ±5°C. This initial measurement shall be used as the reference temperature for all measurements.
d. Operating conditions: Resistors shall be operated at full rated wattage by applying dc continuous working voltage, or ac rated continuous working voltage from an ac supply at commercial line frequency, intermittently, 1 hour 30 minutes “on” and 30 minutes “off” for the applicable number of hours (see 4.8.15f). “On time” shall be three fourths of the total elapsed time, the actual test time shall be recorded. Where resulting waveform is other than that of a commercial line, voltages shall be set using a “true rms” voltmeter, and the peak voltage shall not exceed 2.5 times the rated continuous working voltage.
e. Test condition: 2,000 hours for all samples.
f. Measurement during test: Resistance shall be measured at the end of one half hour 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. Measurement shall be made as near as possible to the specified time but may be adjusted so that measurement need not be made other than during normal weekdays.
g. Examination after test: Resistors shall be examined for evidence of mechanical damage.

4.8.16 High temperature exposure (see 3.22).

a. Mounting: Resistors shall be placed in a metal tray or basket.
b. Initial measurements: DC resistance shall be measured as specified in 4.8.2.
c. Procedure: Following initial resistance measurements, resistors shall be placed in a chamber maintained at +275°C ±7°C for a period of 250 hours ±8 hours with no load applied.
d. Measurements during test: 250 hours +48 hours, -0 hours.
e. Final measurements: After removal from the test chamber, resistors shall be permitted to stabilize at room temperature and within 6 hours after removal, cleaning of the leads will be allowed and the dc resistance shall be measured as specified in 4.8.2. Resistors shall be examined for evidence of mechanical damage.

4.8.17 Fungus (see 3.23). Unless certification is provided, resistors shall be tested in accordance with method 508 of MIL-STD-810.

5. PACKAGING.

5.1 Packaging. For acquisition purpose, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military services system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The resistors covered by this specification are military unique due to the fact that these devices must be able to operate satisfactorily in military systems under the following demanding conditions: 20 G's of high frequency vibration, 100 G's of shock (specified pulse), thermal shock (with no more than 1 percent deviation in initial resistance), and a low temperature coefficient of resistance. In addition, these military requirements are verified under a qualification system. Commercial components are not designed to withstand these military environmental conditions.

6.2 Ordering data. Acquisition documents must specify the following:

a. Title, number, and date of this specification, and the complete PIN (see 1.2).
b. Unless otherwise specified (see 2.1), the versions of the individual documents referenced will be those in effect on the date of release of the solicitation.
c. Packaging instructions (see 5.1).
d. Bracket assembly requirements (see 6.6).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Product List 49465 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the QPL and, information pertaining to qualification of products may be obtained from the DLA Land and Maritime, ATTN: VQP, Post Office Box 3990, Columbus, OH 43218-3990. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil or https://landandmaritimeapps.dla.mil/programs/qmlqpl/.

6.4 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.5 Derating. The intention of this specification is to cover resistors capable of full load operation at any ambient temperature up to and including +25°C. However, if it is desired to operate these resistors at ambient temperatures greater than +25°C, the resistors are derated in accordance with figure 1. For efficient and long life operation, resistors are derated by more than 50 percent.

6.6 Mounting. Under conditions of severe shock or vibration, or a combination of both, resistors of all sizes described in this specification are mounted in such a fashion that the body of the resistor is restrained from movement with respect to the mounting base. It should be noted that if clamps are used, certain electrical characteristics of the resistor may be altered. The heat dissipating qualities of the resistor will be enhanced or retarded depending upon whether the clamping material is a good or poor heat conductor. Under less severe vibration conditions, axial lead styles may be supported by their leads only. The lead lengths should be kept as short as possible, .250 inch or less preferred, but not longer than .625 inch. The longer the lead, the more likely that a mechanical failure will occur.

6.7 Power dissipation. When higher ambient temperatures exist or when resistors are mounted in enclosures which limit ventilation, the wattage dissipation of any resistor should be reduced so that the maximum hot spot temperature permissible for the resistor is never exceeded under the most severe combination of temperature conditions.

6.8 Spacing. When resistors are mounted in rows or banks, they should be so spaced that, taking into consideration the restricted ventilation and heat dissipation by the nearby resistors, none of the resistors in the bank or row exceeds its maximum permissible hot spot temperature. An appropriate combination of resistor spacing and resistor power rating must be chosen if this is to be assured.

6.9 Secondary insulation. Where high voltages are present between resistor circuits and grounded surfaces on which resistors are mounted, secondary insulation capable of withstanding the voltage conditions should be provided between resistors and mountings or between mountings and ground.

6.10 Choice of styles. The styles of resistors to be used in equipment should be chosen that, when mounted in the equipment, they will not operate at a temperature in excess of their rating. This should be applicable under the worst possible specified conditions, with the equipment operating as follows:

a. In the maximum specified ambient temperature.
b. Under conditions producing maximum temperature rise in each resistor.
c. For a sufficient length of time to produce maximum temperature rise, or for the maximum specified time.
d. With all enclosures in place.
e. With natural ventilation only. (This should permit the use of any special ventilating provisions included as a standard part of the equipment.)
f. At high altitude.

6.11 Standard resistor types. Equipment designers should refer to MIL-HDBK-199, “Resistors, Selection and Use of,” for standard resistor types and selected values chosen from this selection. MIL-HDBK-199 provides a selection of standard resistors for new equipment design.

6.12 Subject term (key word) listing.

Axial leads
Minimum resistance
Precision
Radial leads
Terminals

6.13 Amendment notification. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. 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.

APPENDIX A

PROCEDURE FOR QUALIFICATION APPROVAL

A.1 SCOPE

A.1.1 Scope. This appendix details the procedures for submission of samples for qualification inspection of resistors covered by this specification. The procedure for extending qualification of the required sample to other resistors covered by this specification is also outlined herein. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

A.2 APPLICABLE DOCUMENTS

A.2.1 Government documents.

A.2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation (see 6.2).

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1276 - Leads for Electronic Component Parts

(Copies of this document are available online at http://quicksearch.dla.mil).

A.2.2 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence unless otherwise noted. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

A.3. SUBMISSION

A.3.1 Sample. A sample consisting of 42 highest values 1/ and 42 lowest values, 1/ coated or enclosed resistors in each style, with the lowest resistance tolerance for which qualification is desired, shall be submitted in accordance with section 4 of this appendix. In addition, 14 sample units of any resistance value shall be submitted and subjected to the tests of groups II and 10 sample units shall be submitted to group VIII. Four uncoated or unenclosed resistors (Two at the highest value and two at the lowest value), shall also be submitted in each style. 2/ If enclosures are used in lieu of coatings, four enclosures shall be furnished.

A.4. EXTENT OF QUALIFIACTION

A.4.1 Resistance values. The extent of qualification of resistance values for each style shall range between the highest and lowest values qualified.

A.4.2 Tolerances. The extension of qualification between tolerances shall be in accordance with table A-I:

A.4.3 Styles. The extension of qualification between styles can be accomplished by submitting the largest physical size for which qualification is sought as shown in table A-II. Similar enclosure materials and construction must be utilized for cross qualification.

1/ One additional sample unit of each resistance value shall be submitted to permit substitution for the allowable defect in group 1 inspection.

2/ The uncoated and unenclosed resistors shall be individually packaged to preclude damage in shipment.

APPENDIX A

TABLE A-I. Tolerances

Characteristic	Tolerance qualified	Will qualify
T	F	F, H, and J
	H	H and J
	J	J

TABLE A-II. Extension of qualification between sizes.

Associated specification	Will qualify
-49465/1	/1
-49465/6	/6
-49465/7	/6, /7

A.5. SOLDER DIP (RETINNING) LEADS

A.5.1 Solder dip (retinning) leads. The manufacturer may solder dip/retin the leads of product supplied to this specification provided the solder dip process (see A.5.2 of this appendix) or an equivalent process has been approved by the qualifying activity.

A.5.2 Qualifying activity approval. Approval of the solder dip process will be based on one of the following options:

a. When the original lead finish qualified 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 is used in the original manufacture of the product.
b. When the lead originally qualified was not hot solder dip lead finish 52 of MIL-STD-1276 as prescribed in A.5.2a, approval for the process to be used for solder dip shall be based on the following test procedure:
   (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 are subjected to the dc resistance test and other group A electricals. 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. No defects are allowed.

A.5.3 Solder dip/retinning options. The manufacturer may solder dip/retin as follows:

a. After the group A tests: Following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, shall be repeated on the lot. The group A, subgroup 1, lot rejection criteria shall be used. Following this test, the manufacturer shall submit the lot to the group A solderability test as specified in 4.8.3.
b. As a corrective action, if the lot fails the group A solderability test, the lot may be retinned no more than two times. The lot after retinning shall be 100 percent screened for group A electrical requirements (dc resistance) and parts failing (lot not exceeding PDA for group A, subgroup 1, see 4.6.2.1) these screens shall not be supplied to this specification, if electrical failures are detected after the second retinning operation exceeding 1 percent of the lot, the lot shall not be supplied to this specification.
c. After the group A inspection has been completed: Following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, 100 percent dc resistance shall be repeated on 100 percent of the lot. The PDA for the electrical measurements shall be as for the subgroup 1 tests (see 4.6.2.1). Following these tests, the manufacturer shall submit the lot to the group A solderability test as specified in 4.8.3.

Custodians:
Army - CR
Navy - EC
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

Review activities:
Army - MI
Navy - AS, CG, MC, OS
Air Force - 19, 99

(Project 5905-2017-100)

NOTE: The activities listed above were interested in this document as of the date of the this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the Assist Online database at https://assist.dla.mil.