INCH-POUND
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PERFORMANCE SPECIFICATION

RESISTOR, FIXED, METER MULTIPLIER, EXTERNAL (HIGH VOLTAGE, FERRULE TERMINAL TYPE)

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

1. SCOPE

1.1 Scope. This specification covers the requirements for high-voltage, external, meter-multiplier, fixed resistors of the ferrule-terminal type for use with direct-current (dc) instruments drawing 1 milliampere at full-scale deflection. Designers are CAUTIONED on using these resistors in pulse applications (see 6.5).

1.2 Classification.

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

MFC	504
Style (1.2.1.1)	Resistance (1.2.1.2)

1.2.1.1 Style. The style is identified by a three-letter symbol. The first two letters, MF, identify high voltage, external, meter-multiplier, fixed resistors of the ferrule-terminal type. The third letter identifies the particular physical dimensions.

1.2.1.2 Resistance. The nominal resistance in ohms is designated by a three-digit number. The first two digits represent the first two significant figures of the figures of the resistance value, the third digit indicates the number of zeros to follow.

1.2.1.2.1 Resistance range. Resistors have a resistance range of 0.5 ohm to 20 megohms.

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

1.2.1.2.2 Nominal resistance and rated voltage. Nominal resistance and rated voltages are as specified in table I.

TABLE I. Nominal resistance and rated voltage.

Type designation	Nominal resistance in megohms	Rated voltage in kilovolts	Type designation	Nominal resistance in megohms	Rated voltage in kilovolts
MFC504	0.5	0.5	MFB355	3.5	3.5
MFC804	0.8	0.8	MFA355	3.5	3.5
MFC105	1.0	1.0	MFA405	4.0	4.0
MFB105	1.0	1.0	MFA505	5.0	5.0
MFB155	1.5	1.5	MFA605	6.0	6.0
MFB205	2.0	2.0	MFD106	10.0	10.0
MFB255	2.5	2.5	MFE156	15.0	15.0
MFB305	3.0	3.0	MFF206	20.0	20.0

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 or contract (see 6.2).

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202 - Test Methods Standard Electronics and Electrical Components Parts.

MIL-STD-1285 - Marking of Electrical and Electronic Parts.

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

2.3 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, 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.

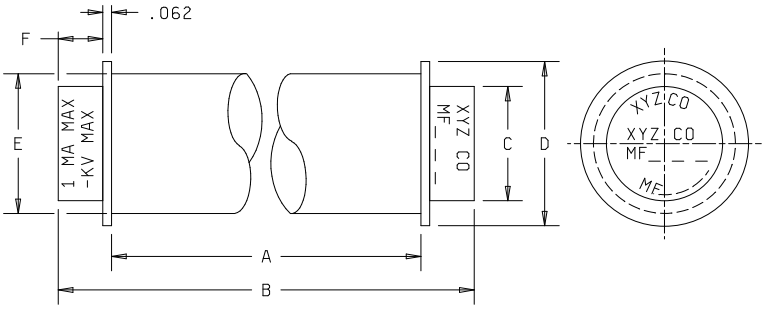
3. REQUIREMENTS

3.1 Requirements for individual resistor types. Requirements or exceptions applicable to individual resistor types are specified on FIGURE 1 (see 6.2).

3.2 Qualification. Resistors furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.4 and 6.3).

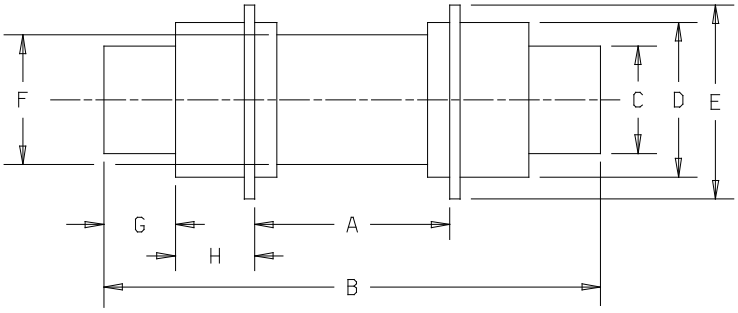
3.3 Materials. Materials shall be used which will enable the resistors to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Fume-emitting material. Material that emits deleterious or toxic fumes at a temperature of 110°C or lower shall not be used.



Style	Dimensions						
	A max.	B ±.031	C ±.015 (dia)	D ±.015 (dia)	E (dia) Min.	E (dia) Max.	F
MFA	8.687	9.781	1.140	1.390	.812	1.312	.515 ±.015
MFB	4.187	5.281					
MFD	13.5	16.5	1.156				1.5 +0.010 -0.000
MFE	20.5	23.5					
MFF	27.5	30.5					

Resistor styles: MFA, MFB, MFD, MFE, and MFF.



Resistor styles MFC.

Style	Dimensions								
	A max.	B ±.031	C ±.015 (dia)	D	E ±.015 (dia)	F (dia) Min.	F (dia) Max.	G	H
MFC	1.781	2.937	.812	.937	1.0	.687	1.078	.515 ±.015	.437

NOTES:
1. All dimensions are in inches.
2. These resistors should be supported by ferrule-terminals only.

FIGURE 1. Fixed Resistor.

3.3.2 Ferrous material. Ferrous material shall not be used for current-carrying parts.

3.3.3 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 specified herein. Resistors shall consist of a resistance element or series of elements of the wirewound or film type.

3.4.1 Protective coating or enclosure. The resistor assemblies shall be protected by a coating or enclosure of insulating and moisture-resistant material which shall completely cover the exterior of the resistance element, including connections between any two elements or between any element and a terminal ferrule. This material shall afford adequate protection against the effects of prolonged exposure to high humidity. The protective coating or enclosure shall be such as to minimize the establishment of leakage paths between terminals, resulting from collection of moisture film on the exterior surface of the resistor.

3.4.2 Resistance elements.

3.4.2.1 Wirewound. Each resistance element shall be wound on a suitable form with resistance wire. The design of the winding shall be such as to preclude shorting of turns or arcing between turns under the potential imposed between any adjacent turns.

3.4.2.1.1 Resistance wire. The resistance wire shall posses a substantially uniform cross section of conductor and insulation. The wire shall be as free as practicable from particles of impurity and grain growth or other factors contributing to spot weakness.

3.4.2.2 Film. Films shall be uniformly deposited. The film shall be free of blister, thin spots, areas inadequately bonded to core, discolored spots, or other blemishes likely to cause flaking or a non-uniform ribbon when spiraled (helixed). Where used, spiraling shall occupy no less than 70 percent of resistor element actual length. The resistor element actual length shall be defined as the nominal distance between terminal bands less three sixty-fourths of an inch. Designers are CAUTIONED on using these resistors in pulse applications (see 6.5)

3.4.3 Engagement of threaded parts. When threaded parts are used, they shall engage by at least four full threads.

3.4.3.1 Locking of screw-thread assemblies. Screw-thread assemblies shall not loosen as a result of tests specified herein.

3.5 Terminals. The ends of the resistance element shall be connected to ferrule type terminals, which shall serve for mechanical mounting and electrical connection. The lead wires from the active resistance element to the ferrules shall be so arranged and connected that they will be protected from being cut by or placed in contact with the mounting clips at any angle of rotation of the unit.

3.6 Concentricity and parallelism of ferrules. The ferrules shall be so aligned with respect to each other and the resistor body that the maximum permissible departure from concentricity shall be as shown on figure 2.

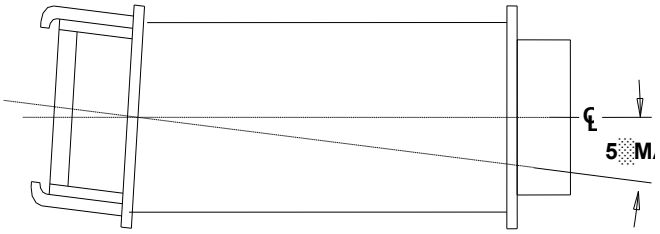


FIGURE 2. Maximum permissible departure from concentricity.

3.7 Ferrules. Ferrules shall be of one piece construction and of a corrosion resistant nonferrous material or shall be protected against corrosion by a coating.

3.8 Resistor units. When a resistor unit is constructed by joining a number of individual resistance elements together, a means shall be provided for locking the segments securely together to prelude separation or disassembly in the field. There shall be no relative movement among the resistance elements within the housing of the completed resistor.

3.9 Dielectric withstanding voltage. When resistors are tested as specified in 4.7.2, there shall be no flashover or evidence of insulation breakdown.

3.10 Insulation resistance. When measured as specified in 4.7.3, the insulation resistance shall be not less than 1,000 times the nominal resistance value of the resistor being tested (see 3.1).

3.11 DC resistance. When tested as specified in 4.7.4, resistors shall have a dc resistance ±0.5 percent of the nominal resistance specified .

3.11.1 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.

3.12 Short-time overload. When tested as specified in 4.7.5, resistors shall nor arc, burn, or char, or show evidence of other damage. The change in resistance shall not exceed ±0.5percent.

3.13 Temperature rise. When resistors are tested as specified in 4.7.6, they shall operate continuously without having a hot spot temperature in excess of 110°C. If impregnating compounds are used, there shall be no leakage or external displacement of any of the compounds, regardless of the mounting position, at any ambient temperature up to and including 85°C.

3.14 Resistance temperature characteristics. When resistors are tested as specified in 4.7.7, the resistance change shall not exceed +0.02 percent or -0.005 percent (+200 parts per million (ppm) or -50 ppm) per degree centigrade.

3.15 Thermal shock. When resistors are tested as specified 4.7.8, there shall be no evidence of chipping, crazing, cracking, or spalling of the exterior coating or enclosure. There shall be no evidence of other mechanical damage. The change in resistance shall not exceed 0.5 percent.

3.16 Salt water immersion cycling. When resistors are tested as specified in 4.7.9, there shall be no evidence of mechanical damage. The change in resistance between the initial and any succeeding measurement shall not exceed 1 percent.

3.17 Vibration. When resistors are tested as specified in 4.7.10, there shall be no evidence of mechanical damage. The change in resistance shall not exceed 0.5 percent. The dielectric withstanding voltage and insulation resistance shall be as specified in 3.9 and 3.10, respectively.

3.18 Security of ferrules. When resistors are tested as specified in 4.7.11, there shall be no shifting or loosening of either ferrules or visible relative movement of any of the components of the resistors.

3.19 Mechanical strength. When resistors are tested as specified in 4.7.12, there shall be no evidence of mechanical damage.

3.20 Marking. Resistors shall be marked in accordance with MIL-STD-1285. The type designation and manufacturer's name or code symbol shall be marked on one ferrule (see figure 1), and the maximum rated voltage and current on the other ferrule. There shall be no space between the groups of letters and numbers which comprise the type designation. Marking shall remain legible at the end of all tests.

3.21 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.

3.22 Soldering. When soldering is employed, only noncorrosive fluxes shall be used unless it can be shown that corrosive elements have been satisfactorily removed after soldering. Electrical connections shall be mechanically secure before and electrically continuous after soldering.

3.23 Workmanship. Resistors shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

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

a. Qualification inspection (see 4.4).

b. Retention of qualification (see 4.5).

c. Conformance inspection (see 4.6).

4.2 Reliability and quality.

4.2.1 QPL system. The manufacturer shall established and maintain a QPL system. Evidence of such compliance is a prerequisite for qualification and retention of qualification.

4.3 Inspection conditions.

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

4.4 Qualification inspection. 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 A to this specification. (see A.3.1)

4.4.2 Test routine. Sample units will be subjected to the qualification inspection specified in table II, in the order shown.

TABLE II. Qualification inspection.

Inspection	Requirement paragraph	Method paragraph	Number of defects allowed
Visual and mechanical inspection	3.1, 3.3 to 3.7 inclusive, 3.20 to 3.23 inclusive	4.7.1	0
Dielectric withstanding voltage	3.9	4.7.2	
Insulation resistance	3.10	4.7.3	
DC resistance	3.11	4.7.4	
Short-time overload	3.12	4.7.5	
Temperature rise	3.13	4.7.6	
Resistance temperature characteristics	3.14	4.7.7	
Thermal shock	3.15	4.7.8	
Salt water immersion cycling	3.16	4.7.9	
Vibration	3.17	4.7.10	
Security of ferrules	3.18	4.7.11	
Mechanical strength	3.19	4.7.12	

4.4.3 Defectives. Defectives in excess of those allowed in table II shall be cause for refusal to grant qualification.

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 failures 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.

4.6 Conformance inspection.

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

4.6.2 Inspection lot. An inspection lot, as far as practicable, shall consist of all the resistors of the same style, produced under essentially the same conditions, and offered for inspection at one time.

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

TABLE III. Group A inspection.

Test	Requirement paragraph	Method paragraph	Number of samples	Number of defects allowed
Visual and mechanical inspection	3.1	4.7.1	See 4.6.3.1	0
Body and mounting dimensions	3.4			
Marking 1/	3.20			
Concentricity and parallelism of ferrules	3.6			
Workmanship	3.23			
DC resistance	3.11	4.7.4		

1/ Marking defects shall be charged only for illegible, incorrect, or incomplete marking.

4.6.3.1 Sampling plan. A sample of parts from each inspection lot shall be randomly selected in accordance with table IV. 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 IV. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification. Resistance values shall be representative, and where possible, in proportion to the resistors in the inspection lot.

4.6.4 Group B inspection. Group B inspection shall consist of the tests specified in table V, in order shown. They shall be performed on sample units that have passed the group A inspection, unless the Government considers it more practical to select a separate sample from the lot for group B inspection.

4.6.4.1 Sampling plan. Group B inspection shall be performed on an inspection lot basis. A sample of 13 parts shall be randomly selected. If one or more defects are found, the lot shall be rescreened and defects removed. A new sample of 13 parts shall be randomly selected. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification.

TABLE IV. Group A sampling plan.

Lot size			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			102

TABLE V. Group B inspection.

Test	Requirement paragraph	Method requirement	Number of samples	Number of defects allowed
Dielectric withstanding voltage	3.9	4.7.2	13	0
Insulation resistance	3.10	4.7.3		
Short-time overload	3.12	4.7.5		
Resistance temperature characteristic 1/	3.14	4.7.7		

1/ 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 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.

4.7 Methods of inspection.

4.7.1 Visual and mechanical inspection. Resistors shall be examined to verify that the materials, design, construction, physical dimensions, marking and workmanship are in accordance with applicable requirements (see 3.1, 3.3 to 3.7 inclusive, 3.20 to 3.23 inclusive).

4.7.2 Dielectric withstanding voltage. Resistors shall be tested in accordance with method 301 of MIL-STD-202 (see 3.9). The following details and exceptions shall apply:

a. Special preparation: A metal band .500 inch (12.7 mm) wide (.125 inch (3.17 mm) wide for style C) shall be centered and tightly clamped at the midpoint of the resistor body.

b. Magnitude of test voltage: Twice the rated voltage plus 1,000 volts.

c. Points of application of test voltage: Between each ferrule and the metal clamping band.

d. Measurements after test: Resistors shall be examined for evidence of flashover or insulation breakdown.

4.7.3 Insulation resistance. Resistors shall be tested in accordance with method 302 of MIL-STD-202. (see 3.10) The following details and exceptions shall apply:

a. Test condition B or test condition C (whichever is practicable).

b. Special preparation: A metal band .500 inch (12.7 mm) wide (.125 inch (3.17 mm) wide for style C) shall be centered and tightly clamped at the midpoint of the resistor body.

c. Point of measurement: Between each ferrule and the metal clamping band.

4.7.4 DC resistance.

4.7.4.1 Qualification inspection. Resistors shall be tested in accordance with method 303 of MIL-STD-202. (see 3.11) The following details shall apply.

a. Limit of error of measuring apparatus: 0.1 percent, maximum.

b. Test voltage: 100 volts dc, maximum.

4.7.4.2 Conformance inspection. A dc supply of twice the rated voltage specified (see 3.1) shall be applied to the resistors for a period of 1 second. Resistors shall then be subjected to the test specified in 4.7.4.1.

4.7.5 Short time overload. Resistors shall be measured for dc resistance as specified in 4.7.4. A dc supply of twice the rated voltage specified (see 3.1) shall then be applied to the resistors for a period of 30 minutes in free space and still air at an ambient temperature of 25°C. Thirty minutes after removal of potential, resistors shall again be measured for dc resistance as specified in 4.7.4. At the end of this test, resistors shall be examined for evidence of arcing, burning, or charring, or other damage. (see 3.12)

4.7.6 Temperature rise. A dc supply of the rated voltage specified (see 3.1) shall be applied to the resistors while maintained in an oven in free space and still air at a temperature of 85°C. The hot spot temperature shall be determined after a period of 2 hours, using the thermocouple method with a thermocouple having wires no larger in diameter than 0.010 inch (0.25 mm) (No. 30 AWG). Resistors shall be horizontally mounted during this test with the thermocouples junction resting on the hot spot and the thermocouples wires hanging down on opposites sides of the resistor. Weights of at least 2 ounces on each lead shall provide the pressure of the thermocouples junction against the surface of units under test. (see 3.13)

4.7.7 Resistance temperature characteristics. Resistors shall be tested in accordance with method 304 of MIL-STD-202. (see 3.14) The following details shall apply:

a. Reference temperature: Room ambient temperature.

b. Lowest and highest test temperature: -55°C, +110°C

4.7.8 Thermal shock. Resistors shall be measured for dc resistance as specified in 4.7.4 and then placed in an oven which has been heated to a temperature of 85°C. A dc supply of the rated voltage specified (see 3.1) shall be applied to the resistors for a period of 1 hour. Within 5 seconds after removal of potential, resistors shall be removed from the oven and plunged into tap water at a temperature of 0°C. After 5 minutes, resistors shall be removed from the bath and the surface moisture removed. One hour after removal from the bath, the dc resistance shall again be measured as specified in 4.7.4 and compared with the initial resistance value. The resistors shall then be examined for evidence of chipping, crazing, cracking, or spalling of the exterior coating or enclosure, and for other mechanical damage. (see 3.15)

4.7.9 Salt water immersion cycling. Resistance shall be subjected to a total of five daily cycles as specified in 4.7.9.1. Each daily cycle shall be followed by a conditioning period wherein the resistors are maintained, without load, at temperature of 25°C ±5°C for a period of not less than 12 hours nor more than 24 hours. Testing may be discontinued at any time resistors change in resistance more than that allowed by the applicable requirements. (see 3.16)

4.7.9.1 Daily cycle.

a. Step 1: Resistors shall be placed in a dry oven maintained at a temperature of 85°C ±2^{O}C. A dc supply of the rated voltage specified (see 3.1) shall be applied to the resistors for a period of 1 hour. Immediately after removal of this potential, the dc resistance shall be measured while the resistors are in the oven.

b. Step 2: Within 5 seconds after removal from the oven, resistors shall be immersed for a period of 1 hour in a saturated solution of sodium chloride maintained at a temperature of 85°C ±2^{O}C. Within 5 seconds after removal of the bath, resistors shall be immersed for a period of 1 hour in another saturated solution of sodium chloride maintained at a temperature of 0°C +4°C, -0°C. Resistors shall then be thoroughly and quickly washed in tap water and all surfaces wiped or air blasted clean and dry.

c. Step 3: Resistors shall be placed in a dry oven maintained at a temperature of 85°C ±2^{O}C. A dc supply of the rated voltage specified (see 3.1) shall be applied to the resistors for a period of 1 hour. Resistors shall then be subjected again to step 2 and step 1, in that order.

4.7.10 Vibration. Resistors shall be tested in accordance with method 201 of MIL-STD-202. (see 3.17) The following details and exception shall apply:

a. Measurements prior to vibration: DC resistance measurement shall be as specified in 4.7.4.

b. Method of mounting: Resistors shall be mounted by securely clamping the ferrules to the vibration platform.

c. Tests and measurements after vibration: DC resistance measurements as specified in 4.7.4, dielectric withstanding voltage test as specified in 4.7.2, and insulation resistance test as specified in 4.7.3. Resistors shall then be examined for evidence of mechanical damage.

4.7.11 Security of ferrules. One ferrule of the resistor shall be clamped in a fixed position and a torque of 5 inch-pounds applied to the other ferrule. The torque shall be applied in both clockwise and counterclockwise directions. (see 3.18)

4.7.12 Mechanical strength. Resistors shall be supported .125 inch (3.17 mm) from the outer end of each ferrule and shall be subjected to a transverse load of 25 pounds applied at the center of the unit through a fulcrum having a radius of not less than 0.25 inch (0.64 mm). (see 3.19)

5. PACKAGING.

5.1 Packaging. For acquisition purposes, 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 activity 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. Resistors covered by this specification are intended for use as external resistors for 2.5 inch (63.5 mm) and 3.5 inch (88.9 mm) voltmeters covered by MIL-PRF-10304 "Meters, Electrical Indicating, Panel Type, Ruggedized, General Specification for", or in other high voltage application for which they may be found suitable. Resistors of the power type, intended to operate at hot spot temperature in excess of 110°C, are not covered by this specification. It is not considered good engineering practice to support these resistors except by their ferrules. Resistors covered by this specification are unique due to the fact that these devices must be able to operate satisfactory in military systems under the following demanding conditions: Undergoes a thermal shock, salt water immersion, vibration, and mechanical strength test. In addition, these military requirements are verified under a qualification system. Commercial components are not designed to withstand these military environmental conditions.

6.2 Acquisition requirements. 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 requirements (see 5.1).

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 QPL-29 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DLA land and Maritime-VQP, 3990 East Broad Street, Columbus, OH 43218-3990 or via the internet at:

http://www.landandmaritime.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 Pulse applications. Designers are CAUTIONED on using these resistors in high power pulse applications. Since they have not been qualified nor tested for such applications, damage and premature failure are possible. These resistors only see a half hour (30 minute) short time overload as part of the group B inspection of this specification.

6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website http://www.epa.gov/osw/hazard/wastemin/priority.htm. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

6.7 Subject term (key word) listings.

Concentricity
Direct current
Film
Parallelism
Wirewound

6.8 Amendment notification. The margins of this specification are marked with vertical lines to indicate modification 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 and relationship.

APPENDIX A

PROCEDURE FOR QUALIFICATION INSPECTION

A.1. SCOPE

A.1.1 Scope. This appendix details the procedures for submission 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 is a mandatory part of this specification. The information contained herein is intended for compliance.

A.2. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

A.3. SUBMISSION

A.3.1 Sample. A sample consisting of three sample units of the highest resistance value for which qualification is sought shall be submitted. After qualification has been granted, no change shall be made in materials, design, or construction without prior notification to the qualifying activity.

A.4. EXTENT OF QUALIFICATION

A.4.1 Extent of qualification. Qualification of a resistance value in the style submitted will also qualify all lesser resistance values in the same style, as well as lesser resistance values in other styles, as specified in table A-I. The resistor styles to which qualification is extended shall be of the same general construction and materials as the sample unit submitted.

TABLE A-I. Extent of qualification.

Style submitted for inspection	Styles qualified	Resistance values qualified
MFF	MFF, MFE, MFD, MFA, MFB, MFC	Up to highest resistance value submitted
MFE	MFE, MFD, MFA, MFB, MFC	
MFD	MFD, MFA, MFB, MFC	
MFA	MFA, MFB, MFC	
MFB	MFB, MFC	
MFC	MFC	

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

Review activities:
Army - AR, AT, AV, CR4, MI
Navy - AS, CG, MC, OS
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5905-2015-030)

NOTE: The activities listed above were interested in this document as of the date of 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.