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 SUPERSEDING
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MILITARY SPECIFICATION

FERRULE, SHIELD TERMINATING, CRIMP STYLE

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

1. SCOPE

1.1 Scope. This specification covers crimp style, insulated and uninsulated, shield terminating ferrules for RF cable and shielded cable.

* 1.2 Classification. Shield terminating ferrules covered by this specification shall be of the following classes and types, as specified (see 6.2):

- | | |
|---------|--|
| Type I | -Ferrule, uninsulated, two-piece |
| Type II | -Ferrule, insulated, two-piece |
| Class 1 | -Ferrules that conform to all the requirements of this specification when installed with the applicable crimping tool conforming to MIL-C-22520. |
| Class 2 | -Ferrules that conform to the material requirements of this specification, are replaceable by Class 1 ferrules, and conform to the performance requirements of this specification when crimped with a tool having crimping dies and motion conforming to the ferrule manufacturer's control drawing required by 3.6. |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

* SPECIFICATIONS

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MIL-C-17	-Cable, Radio Frequency, Flexible and Semirigid, General Specification for
MIL-P-116	-Preservation - Packaging, Methods of
MIL-D-1000	-Drawings, Engineering and Associated Lists
MIL-W-5086	-Wire, Electric, Polyvinyl Chloride-Insulated, Copper or Copper Alloy
MIL-T-10727	-Tin Plating, Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals
MIL-E-17555	-Electronic and Electrical Equipment, Accessories, and Repair Parts, Packaging and Packing of
MIL-B-22191	-Barrier Materials, Transparent, Flexible, Heat Sealable
MIL-C-22520/5	-Crimping Tools, Terminal, Hand, Wire Termination, Large For Coaxial, Shielded Contacts and Ferrules, Terminal Lugs, Splices, and End Caps
MIL-C-22520/10	-Crimping Tools, Terminal, Hand, Wire Termination, Small for Coaxial, Shielded Contacts, Ferrules, Terminal Lugs, Splices, and End Caps.

* STANDARDS

MILITARY

MIL-STD-105	-Sampling Procedures and Tables for Inspection by Attributes
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STANDARDS

MILITARY (Continued)

MIL-STD-129	-Marking for Shipment and Storage
MIL-STD-202	-Test Methods for Electronic and Electrical Component Parts
MS18121	-Ferrule, Outer, Insulated, Shield Terminating, Type II, Two Piece, Class I, for Shielded Cable
MS21980	-Ferrule, Outer, Uninsulated, Shield Terminating, Type I, Two Piece, Class I, for Shielded Cable
MS21981	-Ferrule, Inner, Uninsulated, Shield Terminating, Type I, Two-Piece, Class I, for Shielded Cable
MS25036	-Terminal, Lug, Crimp Style, Copper, Insulated, Ring Tongue, Bell Mouth, Type II, Class 1

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Qualification. The ferrules furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3).

3.2 Precedence. The requirements specified herein apply to crimp-style ferrules covered by applicable Military Standards (MS). Additional requirements are specified on the individual MS. In the event of conflict between this specification and the MS, the latter shall govern.

3.3 Materials. The ferrules shall be fabricated from the materials specified on the applicable MS.

3.4 Design and construction. Class 1 ferrules shall be constructed in accordance with the applicable MS and shall be designed

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for attachment to appropriate size shielded cable by having the ferrule reshaped around the conductor shield. The reshaping operation shall be accomplished by means of a tool conforming to the applicable MIL-T-22520 specification sheet. The reshaping operation for the Class 2 ferrule shall be accomplished by means of tooling recommended by the ferrule manufacturer. The ferrule shall exhibit no evidence of fracturing or spalling as a result of being crimped to a suitable cable.

3.4.1 Insulation. Type II ferrules shall be insulated over their outer surfaces. The insulator shall remain in its original position on the ferrule before and after crimping.

3.4.2 Finish. Ferrule conductor parts shall be tin plated over their entire surface in accordance with MIL-T-10727, Type I.

3.5 Performance requirements. The ferrules shall be designed to meet the following test requirements when crimped to each of the specified cable sizes with the applicable tool.

3.5.1 Voltage drop. The voltage drop through the ferrules, when carrying test current, shall not exceed 6 millivolts for "initial" voltage drop and 9 millivolts for "after test" voltage drop, except for vibration testing. Before vibration testing, initial voltage drop shall not exceed 8 millivolts, and after tests, 11 millivolts.

3.5.2 Temperature cycling. The ferrules shall be subjected to the temperature cycling tests (4.6.2.2) after which they shall meet the "after test" voltage drop (3.5.1) and tensile strength (3.5.3) requirements.

3.5.3 Tensile strength. The mechanical connection between the ground wire and the ferrules shall have a tensile strength of not less than 15 pounds for size M5086/1-22-9 ground wire (see MIL-W-5086) and not less than 19 pounds for size M5086/1-20-9 ground wire. The mechanical connection shall not break or become distorted at tensile stresses less than the minimum values specified above.

3.5.4 Vibration. After being subjected to the vibration test (4.6.2.4), the ferrules shall meet the "after test" voltage drop (3.5.1) and tensile strength (3.5.3) requirements.

3.5.5 Corrosion resistance. The ferrules shall meet the "after test" voltage drop (3.5.1) and tensile strength (3.5.3) requirements after being subjected to the corrosion resistance test (4.6.2.5). At the completion of this test, the basic metal of the ferrule shall not be exposed.

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3.5.6 Ferrule insulation (dielectric strength - Type II). The insulation on the Type II ferrule shall have a minimum dielectric strength of 500V rms at 60 Hz for 1 minute.

3.5.7 Conductor insulation distortion. The completed crimped termination shall not scratch, mar, or distort the inner conductor insulation. When subjected to the conductor distortion test (4.6.2.7), the force necessary to remove the basic conductor from the crimped ferrule shall not exceed 9 pounds. Inner ferrules up to 0.134 inch ID shall have only one ground wire attached for this test.

3.5.8 Axial load (Type II). The insulation sleeve of Type II ferrules shall withstand a minimum axial force of 8 pounds in either direction without moving more than 1/32 inch on the barrel of the ferrule. This requirement applies to ferrules before and after installation.

3.6 Manufacturer's control drawing. The ferrule manufacturer shall prepare a control drawing for the crimping dies used to crimp his Class 2 ferrules for the applicable tests. The control drawing shall specify the critical dimensions and motion of the dies and shall also specify the acceptance and in-service gaging requirements. The ferrule manufacturer shall certify to the ferrule user that the user's dies are in accordance with the control drawing and shall furnish to the user the acceptance and in-service gaging requirements (see 4.3.2.1).

3.7 Identification of product (Class 1). The manufacturer's identification and the MS part number, including the dash number, shall be included in the marking for shipment and shall be in accordance with MIL-STD-129 (see 5.3).

3.8 Interchangeability. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other and with respect to installation and performance. The drawing number requirements of MIL-D-1000 shall govern changes in the manufacturer's part numbers.

3.9 Workmanship. Ferrules shall be uniform in quality and free from all defects which may affect their serviceability and appearance.

4 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection Unless otherwise specified in the contract or purchase order, the supplier is responsible

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for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The examination and testing of ferrules shall be classified as follows:

- (a) Qualification inspection (4.3)
- (b) Quality conformance inspection (4.4)

4.3 Qualification inspection. Qualification inspection shall be performed at a laboratory designated by the Government (see 6.3) for Class 1 ferrules (see 4.3.1) and in-plant by the supplier for Class 2 units (see 4.3.2).

4.3.1 Class 1 qualification inspection sample sizes. Qualification samples shall consist of 80 each of outer ferrules of MS18121 and MS21980 ferrule designations - 128, and 40 each of outer ferrules of MS18121 and MS21980 ferrule designations - 175, 187, 205, 225, 232, 261, 275, 327, 348, and 460; and 80 each of inner ferrules of MS21981 ferrule designations - 058, 071, 101, 124, 128, 134, 149, 175, 205, 225, 266, 287, and 348. In addition, five ferrules shall be submitted for each dash number represented by the qualifying ferrules designation.

When approved:

MS18121 and MS21980

<u>Outer ferrules</u>	<u>Will qualify</u>
-128	-101, -128, -149
-175	-156, -175, -187
-205	-194, -199, -205
-225	-219, -225, -232
-275	-261, -275, -281, -287
-348	-297, -312, -327, -348, -359
-460	375, 405, 415, 460, 500

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When approved:

MS21981

<u>Inner ferrules</u>	<u>Will qualify</u>
-058	-046, -058, -063
-071	-071, -080, -090
-101	-096, -101, -109
-124	-115, -124, -128
-149	-134, -149, -156
-175	-165, -175, -187
-205	-194, -205, -219
-225	-225, -232, -250
-266	-261, -266, -275
-287	-281, -287, -297
-348	-312, -348, -375

Class 1 ferrules shall be crimped with a tool conforming to MIL-C-22520/5 or MIL-C-22520/10.

4.3.1.1 Samples for qualification shall be packed in accordance with Section 5 and forwarded to the activity responsible for qualification as designated in the letter of authorization (see 6.3). Each qualification sample shall be identified by marking each package with the following information:

Sample for qualification
 Specification MIL-F-21608E
 MS part number _____ (Class 1 items)
 FERRULE, SHIELD TERMINATING, CRIMP STYLE
 Type _____
 Name of supplier
 Supplier's part number
 Submitted (date) under authorization (reference letter
 authorizing the inspection).

4.3.2 Class 2. Qualification inspection shall be performed by the supplier and the test report shall be furnished to the activity responsible for qualification (see 6.3). Upon approval by the activity responsible for qualification, the control drawing number for the crimping dies (see 3.6) shall be listed in the applicable Qualified Products List.

4.3.2.1 Test reports. The supplier shall furnish the activity responsible for qualification a certified test report, in duplicate, showing quantitative results for Class 2 ferrules as required by this speci-

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fication, and further certified in the forwarding letter by an officer of the supplier. The report shall designate the equivalent MS part number of the Class 1 ferrule which will replace the Class 2 ferrule submitted. The report shall include the manufacturer's control drawings as specified in 3.6 and the part number of the crimping tool used to perform the qualification inspection.

4.3.3 Qualification sample. The number of ferrules specified in Table I for each cable size for which qualification is sought shall be submitted for qualification inspection. Fifteen additional Class 1 ferrules shall be submitted to the activity responsible for qualification for any additional testing deemed necessary. The sample size shall be the same for Class 1 and Class 2 ferrules.

4.3.4 Test routine. Sample units shall be subjected to the qualification inspection specified in Table I, in the order shown. All sample units shall be subjected to the inspection of Group I. The sample units shall then be divided into Groups II through VIII as shown in Table I and subjected to the inspection for their particular group.

4.3.5 Failures. Any failure shall be cause for refusal to grant qualification.

4.3.6 Retention of qualification. To retain qualification, the supplier shall forward at 36-month intervals to the activity responsible for qualification a summary of Group A and B tests, indicating as a minimum, the number of lots which passed and the number which failed, and a summary of the results of Group C tests, including the number and type of any part failures. The summary of the test shall include those tests performed during that 36-month period. If the summary of the test results indicate nonconformance with specification requirements, action shall be taken to remove the failing product from the Qualified Products List. Failure to submit the summary shall result in loss of qualification for that product. In addition to the periodic submission of inspection data, the supplier shall immediately notify the activity responsible for qualification at any time during the 36-month period that the inspection data indicates failure of the qualified product to meet the requirements of the specification.

4.4 Quality conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of Group A and Group B inspection. Except as specified in 4.4.3.2, delivery of products which have passed Group A and B inspection shall not be delayed pending the results of Group C inspection.

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TABLE I. Inspection routine.

Group	Examination and test	Requirement paragraph	Examination or test paragraph	Number of samples	
				No. 22 ground wire	No. 20 ground wire
I	Visual and dimensional	3.3, 3.4, 3.4.2	4.6.1.1	24	12
II	Voltage drop	3.5.1	4.6.2.1	3	3
	Temperature cycling	3.5.2	4.6.2.2		
	Voltage drop	3.5.1	4.6.2.1		
	Tensile strength	3.5.3	4.6.2.3		
III	Voltage drop	3.5.1	4.6.2.1	3	3
	Vibration	3.5.4	4.6.2.4		
	Voltage drop	3.5.1	4.6.2.1		
	Tensile strength	3.5.3	4.6.2.3		
IV	Voltage drop	3.5.1	4.6.2.1	3	3
	Corrosion resistance	3.5.5	4.6.2.5		
	Voltage drop	3.5.1	4.6.2.1		
	Tensile strength	3.5.3	4.6.2.3		
V	Tensile strength	3.5.3	4.6.2.3	3	3
VI	Ferrule insulation (dielectric strength -type II)	3.5.6	4.6.2.6	3	
VII	Conductor insulation distortion	3.5.7	4.6.2.7	3	--
VIII	Axial load (type II)	3.5.8	4.6.2.8	<u>1</u> /6	--

1/ Test samples required for axial load test consist of three samples with No. 22 ground wire installed, and three samples not installed.

4.4.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all ferrules of a single type, class, or size manufactured under essentially the same conditions.

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4.4.2 Group A inspection. Group A inspection shall consist of the examination and tests specified in Table II.

4.4.2.1 Sampling plan. The procedure for continuous production sampling is to select a single sampling plan from MIL-STD-105 for normal inspection, Inspection Level II, based on the specified Acceptable Quality Level (AQL) in Table II. Classification of defects shall be as specified in MIL-STD-105 and Table III. A manufacturer's normal quality control tests and production tests may be used to fulfill Group A inspection provided they at least equal the quality required by Table IV.

TABLE II. Group A inspection.

Examination or test	Requirement paragraph	Method paragraph	(AQL) (percent defective)	
			Major	Minor
Visual and dimensional Materials Workmanship	3.4	4.6	1.0	4.0
	3.3	4.6.1.1	1.0	---
	3.9	---	---	4.0

TABLE III. Classification of defects.

Examination of product	Major 1.0	Minor 4.0
Dimensions:		
Outside diameter (max)	X	--
Cable barrel diameter (max)	X	--
All other dimensions	--	X
Materials	X	--
Workmanship	--	X

TABLE IV. Group B inspection.

Test	Requirement paragraph	Method paragraph
Ferrule insulation, Type II only (dielectric strength)	3.5.6	4.6.2.6
Tensile strength	3.5.3	4.6.2.3

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4.4.3 Group B inspection. Group B inspection shall consist of the tests specified in Table IV. Group B inspection shall be made every 6 months on ferrules that have passed Group A inspection.

4.4.3.1 Sampling plan. A random sample of 20 units shall be selected from each lot for the given cable size and type. In those cases where a ferrule covers a range of cable sizes, 20 units shall be selected for the maximum and minimum cable size within the range. The type cable specified in Table V shall be used when performing the specified tests.

4.4.3.2 Failures. If one or more units fail to pass Group B inspection, the sample shall be considered to have failed and the lot rejected.

4.4.3.3 Disposition of samples. Sample units that have been subjected to Group B inspection shall not be delivered on the contract or order.

4.4.4 Group C inspection. Group C inspection shall consist of the examinations and tests specified in Table I, in the order shown, except that tests for ferrule insulation (dielectric strength) shall not be performed.

4.4.4.1 Sampling plan. As specified in 4.3.3, the number of sample units shall be selected from production lots 36 months after the date of notification of qualification, and after each subsequent 36-month period.

4.4.4.2 Failures. If one or more sample units fail to pass Group C inspections, the sample shall be considered to have failed.

4.4.4.3 Disposal of sample units. Ferrules which have been subjected to Group C inspection shall not be delivered on the contract or order.

4.5 Test conditions.

4.5.1 Atmospheric. Unless otherwise specified, all tests shall be performed in accordance with General Requirements paragraph 2.2 of MIL-STD-202.

* 4.5.2 Ferrule to cable assembly. The ferrule shall be reformed on the shielded cable using the appropriate tool. An MS25036 terminal, size 22-18, shall be attached to the free end of the ground wire, using the MIL-C-22520/5 or MIL-C-22520/10 tool.

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4.5.3 Attachment. Ferrules under voltage test shall be suspended by means of a suitable support with minimum clearance of 18 inches. Steel bolts, nuts, and washers, if used, shall be of the appropriate stud size. When assembled, the bolt shall not extend more than 1/8 inch beyond the nut.

4.4.4 Test samples. The test samples shall be fabricated from the indicated cable types and sizes and ferrules listed in Table V for performing the tests specified herein.

TABLE V. Test cable sizes and types.

Cable Type MIL-C-17	MS18121 dash No.	MS21980 dash No.	MS21981 dash No.
RG178A/U	128	128	058
RG174/U	128	128	071
RG122/U	175	175	101
RG180A/U	187	187	124
RG303A/U	205	205	134
RG223/U	225	225	128
RG58C/U	232	232	149
RG59B/U	261	261	175
RG71B/U	275	275	175
RG304A/U	327	327	205
RG212/U	348	348	225
RG213/U	460	460	348

4.6 Inspection methods.4.6.1 Examinations.

4.6.1.1 Examination of product. Ferrules, both before and after crimping, shall be carefully examined to determine compliance with this specification and applicable standards and drawings with respect to materials, form, color coding, and dimensions.

4.6.1.2 Inspection of packaging. Sample packages or packs and the preservation, packaging, packing, and marking for shipment and storage shall be inspected to determine conformance with MIL-E-17555 and Section 5 of this specification.

4.6.2 Tests.

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4.6.2.1 Voltage drop. Millivolt drop of ferrules shall be measured from the intersection of the tongue and barrel of the grounding wire terminal to a point on the shielded wire as shown on Figure 1. Measurements shall be made after the temperature of the cable assembly has stabilized. These voltage drops shall be caused by a test current of 1 ampere.

4.6.2.2 Temperature cycling. Test samples attached to 6-inch lengths of appropriate cable (see Figure 1) shall be subjected to the test specified in 4.6.2.1 prior to being subjected to the temperature cycling test specified in MIL-STD-202, Method 107, condition B. After completion of this test, the samples shall be subjected to the tests specified in 4.6.2.1 and 4.6.2.3.

4.6.2.3 Tensile strength. Crimped ferrule cable-ground wire samples shall be placed in a standard tensile testing machine (see Figure 2) and sufficient force applied to pull the ground wire out of the sample or break the wire sample. The tensile machine load shall be applied with a speed of head travel of 1 inch per minute. The holding surfaces of the tensile machine clamp may be serrated to provide sufficient gripping or holding strength for the ground wire terminal.

4.6.2.4 Vibration. Test samples attached to 6-inch lengths of appropriate size cable (see Figure 1), shall be subjected to the test specified in 4.6.2.1 before the samples are subjected to vibration. The samples shall then be mounted on a vibration table with the shielded cable secured to the vibration table within 2 inches of the grounding ferrule and the free end of the ground wire shall be attached to a stable support with slack allowed in the ground wire (see Figure 3). The samples shall be vibrated in accordance with Method 201 of MIL-STD-202 for 6 hours on each of two axes mutually perpendicular to each other and to the axis of the wire. Following this test, the samples shall be subjected to the tests specified in 4.6.2.1 and 4.6.2.3.

4.6.2.5 Corrosion resistance. Test samples attached to 6-inch lengths of appropriate size cable (see Figure 1), shall be subjected to the test specified in 4.6.2.1 prior to being subjected to the corrosion resistance test. The specimens shall then be subjected to the salt spray (fog) test as specified in MIL-STD-202, Method 101, condition B. The specimens shall be mounted in the salt spray chamber in a horizontal position. Adjoining samples shall be separated by at least 1/4 inch. During the test, the samples shall not come in contact with metallic or wooden objects, and the salt spray (fog) shall have free access to the samples. Following the completion of the salt spray test, the samples shall be washed with distilled or tap water and air dried for a minimum of 1 hour. The samples shall then be subjected to the tests as specified in 4.6.2.1 and 4.6.2.3.

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4.6.2.6 Ferrule insulation (dielectric strength - Type II). Ferrules shall be crimped to short lengths of the proper size shielded cable. Test samples shall then be prepared by removing the inner wire (conductor and insulation) from the metal shield and ferrule. The ferrule shall be insulated with a suitable insulating compound to a depth sufficient to seal the end of the ferrule (see Figure 4). (Care should be taken not to cover the crimped portion of the insulating sleeve with compound.) When the compound is hardened, the sample shall be immersed in 5 percent salt water solution to a depth sufficient to cover the crimped areas of the insulation sleeve. The voltage specified in 3.5.6 shall then be applied for 1 minute between the metal shield braid and the salt water.

4.6.2.7 Conductor insulation distortion. Ferrules shall be crimped to 6-inch lengths of appropriate cable. Samples shall be placed in a standard tensile machine (see Figure 5) and sufficient force applied to pull the basic conductor out of the crimped ferrule. The test shall be made with a speed of head travel of one inch per minute.

4.6.2.8 Axial load (Type II). Ferrules of each size shall be subjected to the following test: The insulation shall be subjected to an axial force of 8 pounds in either direction. That part of the machine or device used to apply the axial loads to the insulation of the ferrule shall move at a maximum speed of 1 inch per minute.

5. PACKAGING

5.1 Preservation and packaging. Ferrules shall be preserved and packaged in accordance with Level A or C, as specified in the contract or order (see 6.2).

5.1.1 Level A. Ferrules shall be packaged in accordance with Level A of MIL-E-17555. For Type I ferrules, preservation shall be in accordance with Method III of MIL-P-116. Type II ferrules shall be preserved in accordance with Method IC of MIL-P-116. The barrier material for Type II ferrules shall conform to MIL-F-22191, Type II.

5.1.1.1 Unit packaging. Ferrules shall be packaged in quantities of 100 per unit package for all MS dash numbers.

5.1.2 Level C. When Level C packaging is specified, ferrules shall be packaged in accordance with the manufacturer's commercial practice.

5.2 Packing. Ferrules shall be packed Level A, B, or C, as specified in the contract or order (see 6.2).

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5.2.1 Level A or B. When Level A or B packing is specified, ferrules shall be packed in accordance with Level A or B, as applicable, of MIL-E-17555.

5.2.2 Level C. When Level C packing is specified, ferrules shall be packed in accordance with the manufacturer's commercial practice.

5.3 Marking. In addition to any special marking required by the contract or purchase order, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Ferrules are for use with shielded cables. The cables to which the ferrule is to be attached must be appropriately fitted to the correct size ferrule. These terminations are intended to provide ground or bonding connections for shielded braid of RF cables of MIL-C-17 and other electrical and electronic wiring in locations where the total ambient temperature does not exceed the rated temperature of the cable to which the ferrules are attached (150°C for Type I ferrules and 105°C for Type II ferrules).

6.1.1 Class I ferrules are intended for use by aircraft manufacturers, equipment manufacturers, and Service activities. These ferrules will be the only type stocked by the Services and supplied to their activities.

6.1.2 Class 2 ferrules are intended for use by aircraft manufacturers and equipment manufacturers. These ferrules will not be stocked by or supplied to the Services for maintenance, modification, or overhaul purposes, unless specifically approved by the procuring activity.

6.2 Ordering data. Procurement documents should specify:

- (a) Title, number, and date of this specification.
- (b) Type and class of ferrule desired and applicable MS part No. (see 1.2). (MS part No. will not be applied to Class 2 ferrules).
- (c) Levels of preservation, packaging, and packing required (see 5.1 and 5.2).

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6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, (QPL), whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, 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.

- * 6.3.1 Application for qualification. The activity responsible for the QPL for MIL-F-21608 is the Naval Air Systems Command. The Naval Weapons Support Center Crane, Indiana, has been designated by the Naval Air Systems Command as agent for the establishment of the QPL. Requests for information pertaining to and applications for qualification should be addressed to:

Commanding Officer
Naval Weapons Support Center
Attention Code 30633
Crane, IN 47522

6.3.2 Manufacturers desiring approval of Class 2 ferrules should make available to the designated qualifying activity the tooling necessary for performing the crimping operation (see 4.3.3). At the conclusion of the testing, such tooling will be returned to the manufacturer.

6.4 Application.

6.4.1 Where Class 2 ferrules are used, the installation will be such that Class 1 ferrules will be adequate as a replacement without rework of the installation or ferrule. Parts list will indicate the Class 1 MS ferrules that will be used for service replacement of Class 2 ferrules, if used.

- * 6.4.2 Hand crimping tools conforming to MIL-C-22520/5 or MIL-C-22520/10, and as approved by the activity responsible for qualification will be stocked by the Services for field maintenance.

6.4.3 Hand or power tools used by the military equipment manufacturers to crimp Class 2 ferrules must have crimping dies conforming to the ferrule manufacturer's control drawing as listed in QPL-21608. It is the responsibility of the equipment manufacturer to determine that the crimping dies in his tools conform to this control drawing. These tools are not to be used for overhaul and maintenance purposes by the Services, unless specifically approved by the procuring activity.

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* 6.4.4 The crimping tool gages (MIL-C-22520/3) are intended to insure that the crimping dies of MIL-C-22520/5 or MIL-C-22520/10 crimping tools are in conformance with the applicable specification sheet. The crimping dies should be checked at least once a month.

6.5 Reference.

6.5.1 The following may be used as a reference for the replacement of superseded MS25311 one-piece ferrules, depending on the outer diameter (O.D.) of the shielded cable.

Superseded MS25311 one- piece ferrule dash No.	Replaceable two-piece combinations	
	MS21981 inner ferrule dash No.	MS21980 and MS18121 outer ferrule dash No.
-90	-058	-128, -149, -156
-100	-063	-156, -175
-110	-080	-156, -175, -187
-120	-101	-187, -194, -199
-130	-115	-199, -205, -219
-150	-134	-225, -232, -261
-160	-156	-232, -261, -275
-180	-175, -187	-287, -297
-200	-205, -219	-312, -327, -348

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

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Review activities:
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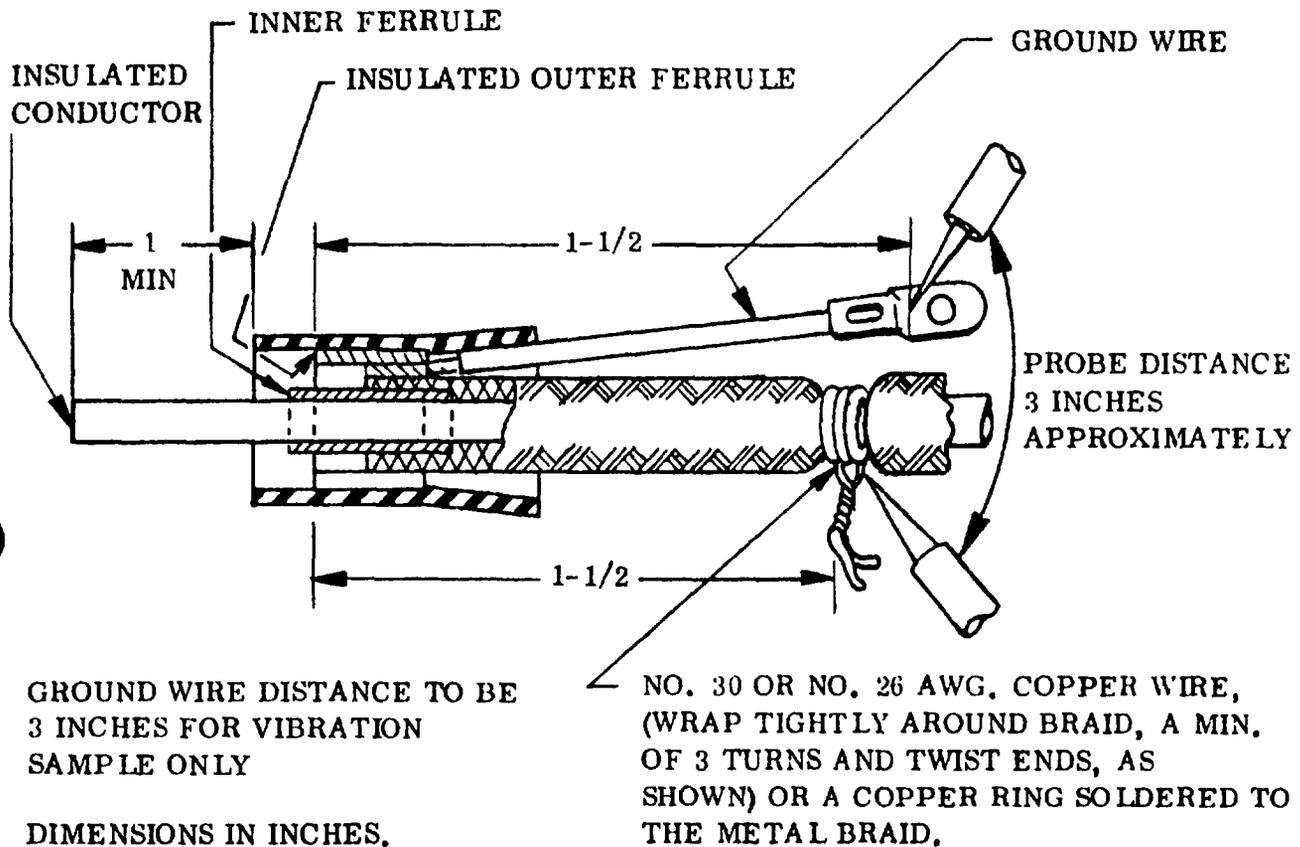
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FIGURE 1. Voltage drop.

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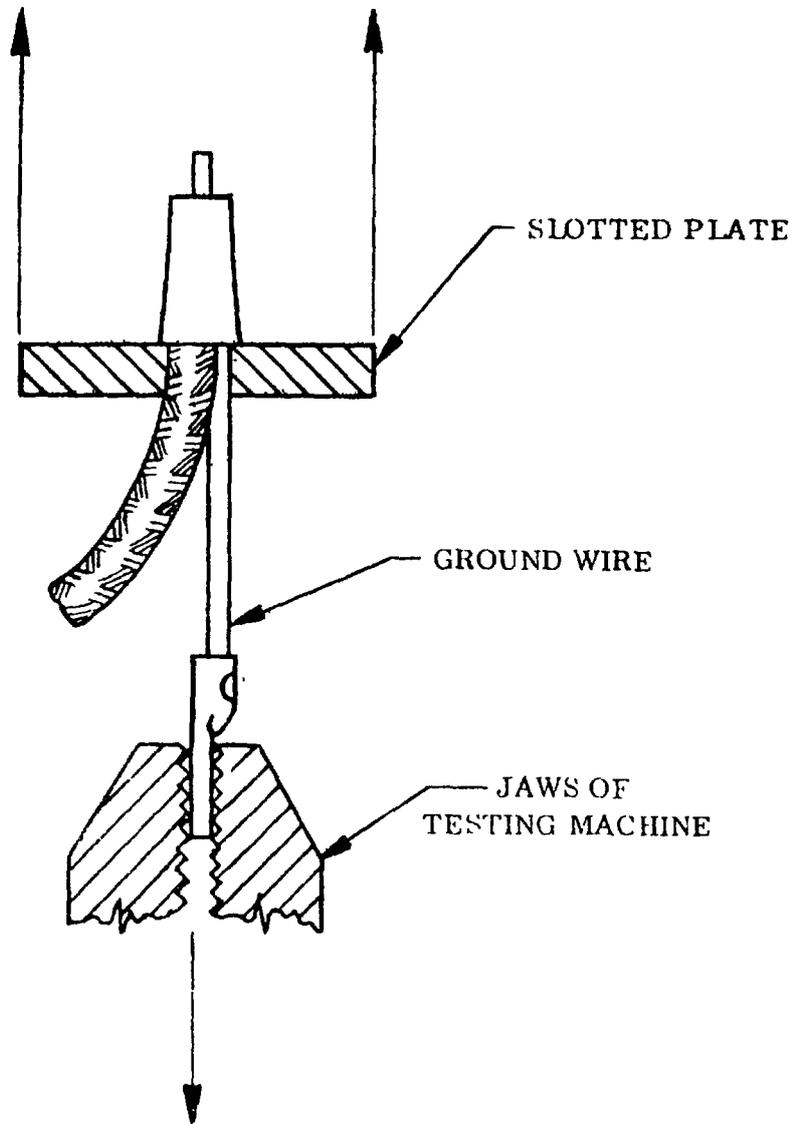
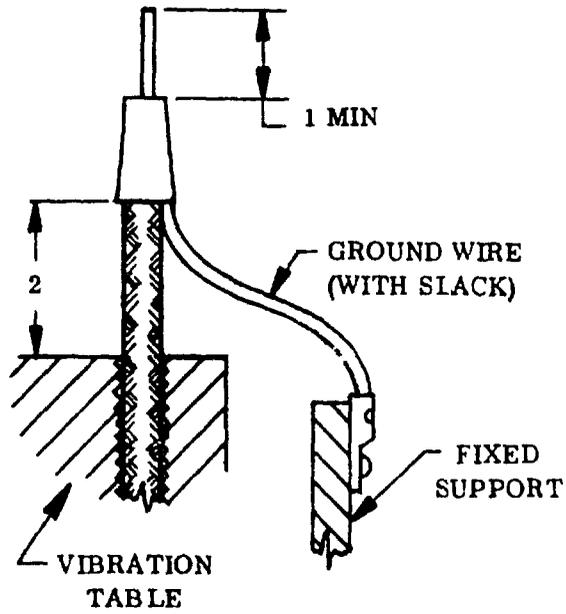


FIGURE 2. Tensile testing machine.

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DIMENSIONS IN INCHES.

FIGURE 3. Vibration setup.

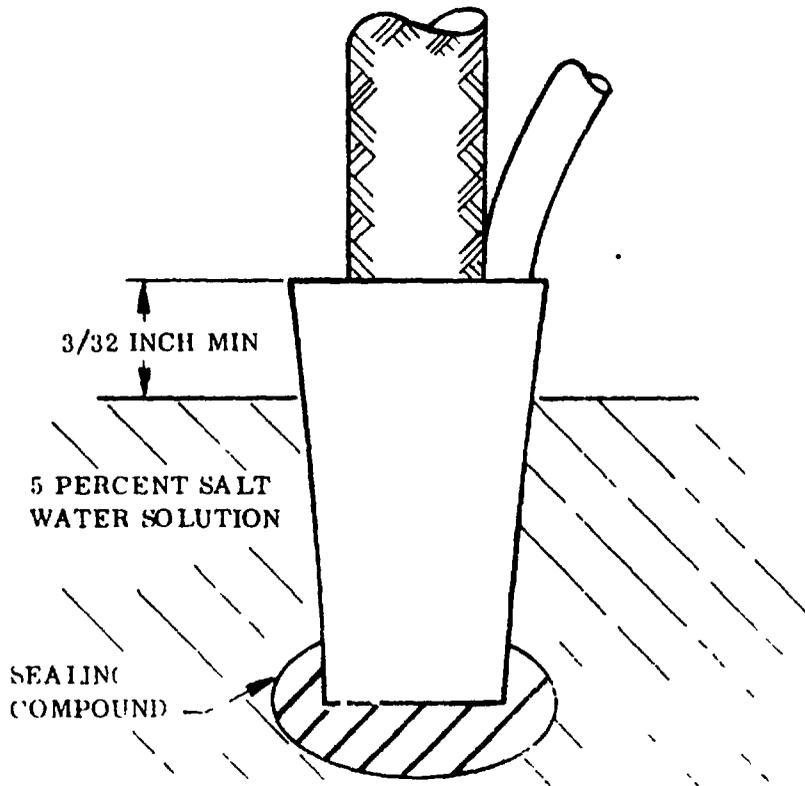


FIGURE 4. Ferrule insulatio.

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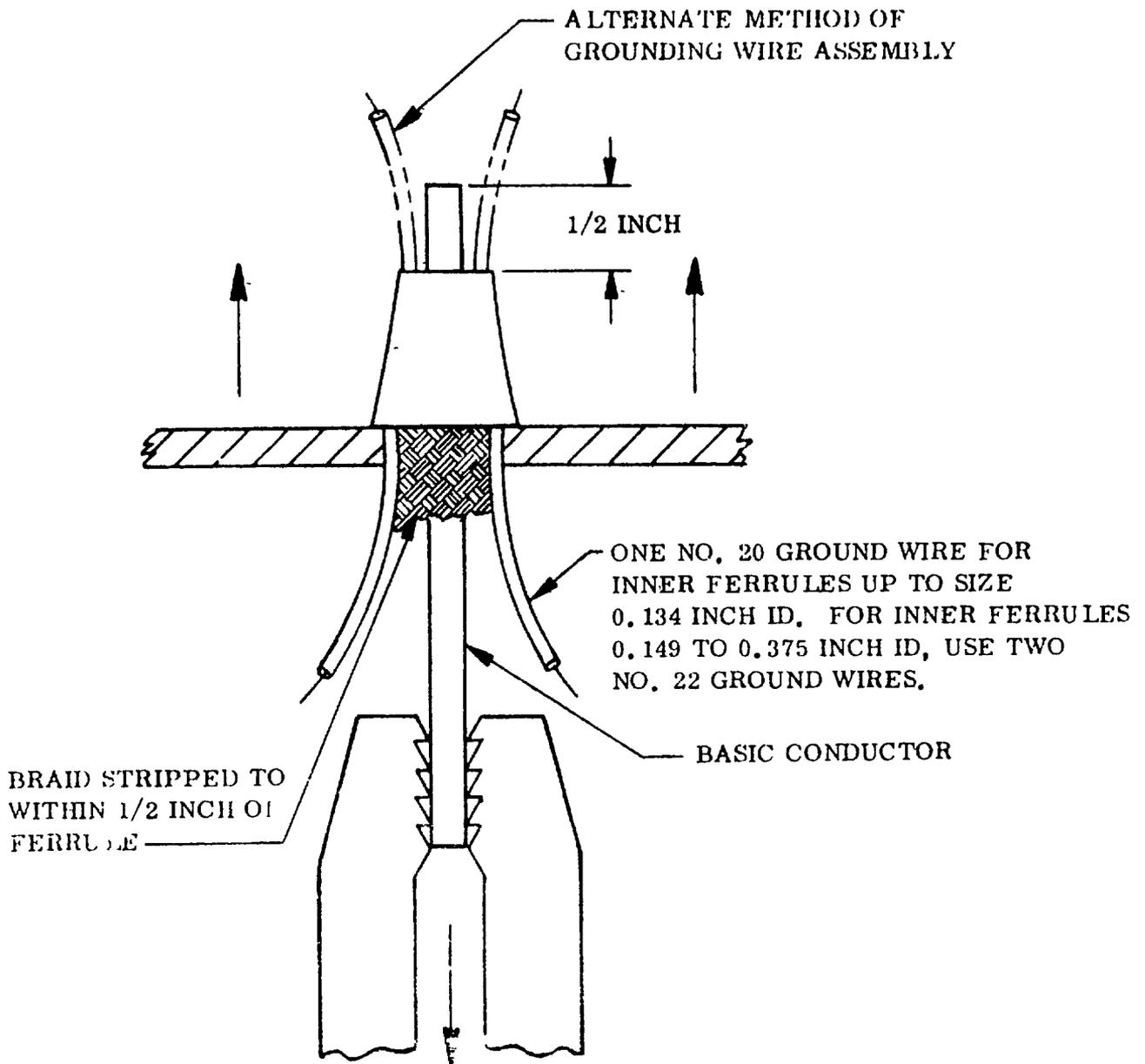


FIGURE 5. Conductor insulation distortion.

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