



<b>AEROSPACE STANDARD</b>	<b>AS21608™</b>	<b>REV. B</b>
	Issued 1999-06 Revised 2021-10	
Superseding AS21608A		
Ferrule, Shield Terminating, Crimp Style		FSC 5940

## RATIONALE

Update references and add note referring to ARP7503 for installation instructions.

### 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 AS22520.

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.

### 2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of the other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

#### 2.1 Issues of Documents

##### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

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SAE WEB ADDRESS:

For more information on this standard, visit  
<https://www.sae.org/standards/content/AS21608B/>

AIR1351	Manufacturers' Identification of Aerospace Electrical and Electronic Wiring Devices and Accessories
ARP7503	Methods of Shield Termination for Two-Piece, Crimp Style Ferrule on Shielded Cables
AS18121*	Ferrule, Outer, Insulated, Shield Terminating, Type II, Two Piece, Class I, for Shielded Cable
AS21980*	Ferrule, Outer, Uninsulated, Shield Terminating, Type I, Two Piece, Class I, for Shielded Cable
AS21981*	Ferrule, Inner, Uninsulated, Shield Terminating, Type I, Two-Piece, Class I, for Shielded Cable
AS22520/5	Crimping Tools, Type 2, Terminal, Hand, Wire Termination, for Coaxial, Twinaxial, Triaxial, Shielded Contacts and Ferrules, Terminal Lugs, Splices and End Caps
AS22520/10	Crimping Tools, Terminal, Hand, Wire Termination, Small for Coaxial, Shielded Contacts, Ferrules, Terminal Lugs, Splices, and End Caps.
AS25036	Terminal, Lug, Crimp Style, Copper, Insulated, Ring Tongue, Bell Mouth, Type II, Class 1
AS50861	Wire, Electric, Polyvinyl Chloride Insulated, Copper or Copper Alloy

\*AS21608 detail specifications.

#### 2.1.2 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-DTL-17	Cable, Radio Frequency, Flexible and Semirigid, General Specification for
MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-2073-1	Military Packaging, Standard Practice for
MIL-STD-31000	Technical Data Packages
SD-6	Provisions Governing Qualification

#### 2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM B339	Pig Tin
ASTM B545	Tin, Electrodeposited Coatings of

#### 2.1.4 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada), 001-800-514-1564 (Mexico), or +1-414-272-8575 (all other locations), [www.asq.org](http://www.asq.org).

ASQ/ANSI Z1.4 Sampling Procedures and Tables for Inspection by Attributes

#### 2.1.5 National Conference of Standards Laboratories (NCSL) Publications

Available from NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301, Tel: 303-440-3339, [www.ncsli.org](http://www.ncsli.org).

NCSL Z540-3 General Requirements for Calibration Laboratories and Measuring and Test Equipment Calibration of Measuring and Test Equipment, Requirements for

### 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 (see 4.3 and 6.3).

#### 3.2 Detail Specification Requirements

The components requirements shall be as specified herein and in accordance with the applicable detail specification. In the event of any conflict between the requirements of this specification and the detail specification, the latter shall govern (see 2.1).

#### 3.3 Materials

The ferrules shall be fabricated from the materials specified on the applicable detail specification.

#### 3.4 Design and Construction

Class 1 ferrules shall be constructed in accordance with the applicable detail specification and shall be designed 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 AS22520 detail specification. 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 insulation 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 ASTM B545 OR ASTM B339, Type I.

#### 3.5 Performance Requirements

The ferrules shall be designed to meet the following 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 mV for "initial" voltage drop and 9 mV for "after test" voltage drop, except for vibration testing. Before vibration testing, initial voltage drop shall not exceed 8 mV, and after tests, 11 mV.

### 3.5.2 Temperature Cycling

The ferrules shall be subjected to the temperature cycling tests (4.5.2.2) 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 (refer to AS50861) and not less than 19 pounds for size M5086/1-20-9 ground wire. After being subjected to the tensile strength test (4.5.2.3), 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 (4.5.2.4), 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 (4.5.2.5). At the completion of this test, the basic metal of the ferrule shall not be exposed.

### 3.5.6 Ferrule Insulation (Dielectric Strength - Type II)

The insulation on the Type II ferrule shall have a minimum dielectric strength of 500 Vrms at 60 Hz for 1 minute (see 4.5.2.6).

### 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 (4.5.2.7), 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 (see 4.5.2.8).

## 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 4.3.3).

## 3.7 Identification of Product (Class 1)

The manufacturer's identification and the part number, including the dash number, shall be included in the marking for shipment and shall be in accordance with MIL-STD-129 (see 5.2). If a symbol or abbreviation is used, it shall be listed in AIR1351.

## 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-STD-31000 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 herein, the contract or purchase order, the supplier is responsible for the performance of all contract inspection requirements. Except as otherwise specified herein, the contract or purchase order, the supplier may use any facilities suitable for the performance of the inspection requirements. The Qualifying Activity has the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

#### 4.1.1 Responsibility for Compliance

All items must meet all technical requirements of the product standard. The inspection set forth in this standard shall become a part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the standard shall not relieve the supplier of the responsibility of assuring that all products comply with all requirements of the contract or purchase order. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to acceptance of defective material

#### 4.1.2 Test Equipment and Inspection Facility

Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI/NCSL Z540-3 or equivalent standards.

#### 4.1.3 Inspection Conditions

The conditions for the inspections are specified as applicable and all test data shall be compiled in accordance with an acceptable method, such as chapter 4 of SD-6.

### 4.2 Classification of Inspection

The examination and testing of ferrules shall be classified as follows:

- a. Initial Qualification Inspection (4.3)
- b. Retention of Qualification (4.3.6)
- c. Quality Conformance Inspection (4.4)

#### 4.3 Initial Qualification Inspection

Initial qualification inspection shall be performed or witnessed by the qualifying activity (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). Sample units shall be subjected to the qualification inspection specified in Table 3. 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 3 and subjected to the inspection in sequence for their particular group.

#### 4.3.1 Qualification Inspection Procedure

A request for qualification shall be made to the qualifying activity (see 6.3) prior to initiating testing. Testing cannot begin until the supplier has received an authorization letter. The supplier is recommended to provide the qualifying activity a test plan based on the authorization letter to ensure the supplier and qualifying activity maintain communication and document changes as needed. The qualifying activity shall not approve a component that does not meet the requirements specified herein. The qualifying activity has the authority to impose specific specification test requirements to resolve test failures/discrepancies and to waive testing to verify specific product manufacturing change. Any change in the supplier's process control inspections, quality conformance inspections, or manufacturing control drawings (editorial changes are acceptable) without the express approval of the qualifying activity may result in loss of qualification for that product.

4.3.2 Class 1 initial qualification inspection sample sizes: Samples shall consist of those designations in Table 1 (see Table 2). Corresponding Inner Ferrules will be selected based upon the Outer Ferrule and the conductor under test. Once testing has been completed the inner ferrules selected shall be representative of the entire product line. Class 1 ferrules shall be crimped with a tool conforming to AS22520/5 or AS22520/10. The conductor lead wire may be folded back on itself prior to being crimped.

**Table 1 - Qualification samples**

MS18121 Outer Ferrule (36 samples for each dash number)		MS21980 Outer Ferrule (36 samples for each dash number)	
Ferrule sample	Ferrules Qualified by Similarity	Ferrule Sample	Ferrules Qualified by Similarity
-128	-101, -128, -149	-149	-101, -128, -149, -156, --175
-175	-156, -175, -187	-199	-187, -194, -199, -205, -219
-205	-194, -199, -205	-261	-225, -232, -261, -275, -281
-225	-219, -225, -232	-312	-287, -297, -312, -327, -348
-275	-261, -275, -281, -287	-405	-359, -375, -405, -415, -460, -500
-348	-297, -312, -327, -348, -359		
-460	-375, -405, -415, -460, -500		

4.3.2.1 Class 1 samples for qualification shall be packed in accordance with Section 5 and forwarded to the qualifying activity 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 AS21608  
 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).

#### 4.3.3 Class 2 Initial Qualification Inspection

Class 2 initial qualification inspection shall be performed by the supplier. Class 2 ferrules shall be replaceable with Class 1 ferrules. The control drawing number for the crimping dies (see 3.6) shall be listed in the applicable Qualified Products List (see 6.3.2).

##### 4.3.3.1 Class 2 Initial Qualification Inspection Sample Sizes

Samples shall consist of those designations in Table 1 (see Table 2). Class 2 ferrules shall be crimped with a tool conforming to the supplier's drawings. The conductor lead wire may be folded back on itself prior to being crimped.

#### 4.3.4 Ferrule to Cable Assembly Samples

The ferrule shall be reformed on the shielded cable listed in Table 2 and installed according to ARP7503 using the appropriate tool. An AS25036 terminal, size 22-18, shall be attached to the free end of the ground wire, using the AS22520/5 or AS22520/10 tool.

**Table 2 - Test cable sizes and types**

Cable Type MIL-C-17	AS18121 Dash No.	AS21980 Dash No.	AS21981 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

#### 4.3.5 Qualifying Activity Test Report

The qualifying activity shall provide the supplier a data package of all Class 1 ferrule tests performed in accordance with Table 3. The qualifying activity test method procedures shall be made available to the supplier upon request.

#### 4.3.5 Supplier test report

The supplier shall provide a test report to the qualifying activity for the Class 2 ferrule tests specified in Table 3. The report shall designate the equivalent 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. The test report shall be signed by the manufacturing authority responsible for ensuring compliance to the specification requirements. The supplier may combine the qualifying activity test data with the supplier's test data into one final test report. The final test report and/or data package shall remain on file with the supplier for a minimum period of 6 years and be available to the qualifying activity upon request. The supplier test report shall contain as a minimum the following information.

- A summary of quantitative results for tests specified in Group A Table 5 and the authorization letter.
- A tabulated comparison between the dimensions specified herein and each manufacturing control drawing for components qualified by similarity.
- Corrective Action Reports (as applicable).

#### 4.3.6 Failures: Any failure shall be cause for refusal to grant qualification.

**Table 3 - Initial qualification 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	4.5.1.1	24	12
II	Voltage drop	3.5.1	4.5.2.1	3	3
	Temperature cycling	3.5.2	4.5.2.2		
	Voltage drop	3.5.1	4.5.2.1		
	Tensile strength	3.5.3	4.5.2.3		
III	Voltage drop	3.5.1	4.5.2.1	3	3
	Vibration	3.5.4	4.5.2.4		
	Voltage drop	3.5.1	4.5.2.4		
	Tensile strength	3.5.3	4.5.2.3		
IV	Voltage drop	3.5.1	4.5.2.1	3	3
	Corrosion resistance	3.5.5	4.5.2.5		

	Voltage drop	3.5.1	4.5.2.1		
	Tensile strength	3.5.3	4.5.2.3		
V	Tensile strength	3.5.3	4.5.2.3	3	3
VI	Ferrule insulation (dielectric strength -type II)	3.5.6	4.5.2.6	3	N/A
VII	Conductor insulation distortion	3.5.7	4.5.2.7	3	-----
VIII	Axial load (type II) 1/	3.5.8	4.5.2.8	6	-----

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

#### 4.3.7 Retention of Qualification Inspection

Retention of qualification inspection shall occur every 36 months after the initial qualification date. The Qualifying Activity shall provide the supplier an authorization letter to begin testing and may shift the reporting date to accommodate testing schedules, but no later than 18 months from the retention of qualification due date. Retention of qualification consists of the tests specified in Table 4 and shall be performed or witnessed by the Qualifying Activity. Sample units shall be subjected to the qualification inspection specified in Table 4. All sample units shall be subjected to the inspection of Group I. The specified sample units shall then be subjected to the inspection in sequence for their particular group.

4.3.7.1 If no production of the qualified products has occurred for the entire reporting period, the Supplier may provide a certification to the Qualifying Activity that no changes in the product materials, manufacturing processes, or site of production has occurred since the initial Qualification Inspection (see 4.3). Certification for more than one reporting period shall not be permitted. The Supplier shall contact the Qualifying Activity to determine the conditions of the Certification. The Supplier may be required to submit the Certification on a specified form provided by the Qualifying Activity.

4.3.7.2 Retention of qualification sample shall be in accordance with Table 1. If any component in a designated family has been produced in the retention period, one component from that family shall be submitted (see 4.3).

4.3.7.3 The qualifying activity shall provide the supplier a data package of all tests performed in accordance with Table 4. The qualifying activity test method procedures shall be made available to the supplier upon request. The supplier shall provide a test report to the qualifying activity for the tests specified in Group A (see 4.4.2). The test report shall be signed by the manufacturing authority responsible for ensuring compliance to the specification requirements. The supplier may combine the qualifying activity test data with the supplier's test data into one final test report. The final test report and/or data package shall remain on file with the supplier for a minimum period of 6 years and be available to the qualifying activity upon request.

4.3.7.4 The supplier test report shall contain as a minimum the following information.

- a. A summary of quantitative results for tests specified in Group A and the authorization letter.
- b. A tabulated comparison between the dimensions specified herein and each manufacturing control drawing for each component. Not tested if the drawings have changed in the last 36 months. Drawings which have not changed shall be certified as unchanged.
- c. Corrective Action Reports (as applicable).

4.3.7.5 Any failure shall be cause for refusal to grant retention of qualification.

**Table 4 - Retention of qualification 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	4.5.1.1	10	10
II	Voltage drop	3.5.1	4.5.2.1	3	3
	Temperature cycling	3.5.2	4.5.2.2		
	Voltage drop	3.5.1	4.5.2.1		
	Tensile strength	3.5.3	4.5.2.3		
III	Ferrule insulation (dielectric strength -type II)	3.5.6	4.5.2.6	3	N/A

#### 4.4 Quality Conformance Inspection

##### 4.4.1 Inspection of Product for Delivery

Inspection of product for delivery shall consist of Group A inspection in Table 5.

##### 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.

##### 4.4.2 Sampling Plan

The procedure for continuous production sampling is to select a single sampling plan from ASQ/ANSI Z1.4 for normal inspection, Inspection Level II, based on the specified Acceptable Quality Level (AQL) in Table 5. The acceptable quality level (AQL) shall be as specified in table 6. Major and minor defects shall be as defined herein (see 6.7). A supplier'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 5.

**Table 5 - Group A inspection**

Examination or Test	Requirement Paragraph	Method Paragraph	(AQL) (Percent Defective)	
			Major	Minor
Visual and dimensional	3.4	4.6	1.0	4.0
Materials	3.3	4.6.1.1	1.0	----
Workmanship	3.9	----	----	4.0

**Table 6 - 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

##### 4.4.3 Lot Rejection

If one or more units fail to pass a major Group A inspection, the sample shall be considered to have failed and the lot rejected. Corrective action shall be taken and the lot resubmitted to Group A inspection. If one or more units fail to pass a second major Group A inspection, the sample shall be considered to have failed and the lot rejected without retest.

## 4.5 Inspection Methods

### 4.5.1 Examinations

#### 4.5.1.1 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.

#### 4.5.1.2 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-STD-2073-1 and Section 5 of this specification.

### 4.5.2 Tests

#### 4.5.2.1 Voltage Drop

Ferrules 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 (3.2 mm) beyond the nut. 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 at a test current of 1 ampere.

#### 4.5.2.2 Temperature Cycling

Test samples attached to 6-inch (152 mm) lengths of appropriate cable (see Figure 1) shall be subjected to the test specified in 4.5.2.1 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 4.5.2.1 and 4.5.2.3.

#### 4.5.2.3 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 (25.4 mm) 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.

#### 4.5.2.4 Vibration

Test samples attached to 6-inch (152 mm) lengths of appropriate size cable (see Figure 1), shall be subjected to the test specified in 4.5.2.1 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 (51 mm) 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 4.5.2.1 and 4.5.2.3.

#### 4.5.2.5 Corrosion Resistance

Test samples attached to 6-inch (152 mm) lengths of appropriate size cable (see Figure 1), shall be subjected to the test specified in 4.5.2.1 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 (6.4 mm). 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 4.5.2.1 and 4.5.2.3.

#### 4.5.2.6 Ferrule Insulation (Dielectric Strength - Type II)

4.5.2.7 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% 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.

#### 4.5.2.8 Conductor Insulation Distortion

Ferrules shall be crimped to 6-inch (152 mm) 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.

#### 4.5.2.9 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 (3.7 kg) 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 (25.4 mm) per minute.

### 5. PACKAGING

#### 5.1 Preservation and Packaging

Ferrules shall be preserved and packaged as specified in the contract or order (see 6.2). If not specified, packaging shall be in accordance with MIL-STD-2073-1.

#### 5.1.1 Unit Packaging

Unless otherwise specified, ferrules shall be packaged in quantities of 100 per unit package for all MS dash numbers.

#### 5.2 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-DTL-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 [302 °F] for Type I ferrules and 105 °C [221 °F] 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 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).

## 6.3 Qualification

With respect to products requiring qualification by the government, 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 contractors (purchasers) is called to these requirements, and manufacturers (suppliers) 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 for the products delineated in this specification. Qualification is required for U.S. Government procurement.

### 6.3.1 QPL Evaluating Activity

The QPL Evaluating Activity (qualifying activity), for U.S. Department of Defense procurement purposes, is EWIS Qualified Products Lab (QPL), Naval Air Warfare Center- Aircraft Division, Power and Energy Division, Wiring System Branch AB43300, 48298 Shaw Rd., Building 1461, Suite 113B, Patuxent River, Maryland 20670-1900. Application for qualification tests shall be made in accordance with provisions governing qualification in SD-6 (see 2.1.2).

### 6.3.2 QPL Publication

The qualifying activity is required to provide a summarized list of all qualified sources on a public accessible electronic site. The summary shall include but is not limited to the supplier approved part number and related specification part number, a dedicated approval reference number, a supplier location where purchases maybe requested and the manufacturing location of the component. The suppliers and products qualified to this specification are available on the qualifying activity website (<http://www.navair.navy.mil/qpl/>).

### 6.3.3 Class 2 QPL Listing

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 AS22520/5 or AS22520/10, 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.
- 6.4.4 The crimping tool gages (AS22520/6) are intended to ensure that the crimping dies of AS22520/5 or AS22520/10 crimping tools are in conformance with the applicable specification sheet. The crimping dies should be verified prior to use. For field inspection method refer to AS22520/5, Appendix A.