

MIL-S-83519A
 21 June 1984
SUPERSEDING
 MIL-S-83519
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MILITARY SPECIFICATION

SHIELD TERMINATION, SOLDER STYLE, INSULATED, HEAT-SHRINKABLE, ENVIRONMENT RESISTANT GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers environment resistant, heat-shrinkable solder type shield terminations. They may be used on data-bus, RF and shielded cables in applications where the operating temperature does not exceed 150°C.

1.2 Classification

Class I - Terminations which conform to all the requirements of this specification.

Class II - Terminations which conform to all the requirements of this specification except the thermal indicator - not to be stocked, stored or issued by the military or listed on the specification sheet or qualified products list.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL QQ-S-571

Solder, Tin Alloy, Tin-Lead Alloy, and Lead Alloy

MILITARY

MIL-P-116

Methods of Preservations

MIL-H-5606

Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordinance

MIL-T-5624

Turbine Fuel, Aviation, Grades JP-4 and JP-5

MIL-L-7808

Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

MIL-T-7928

Terminals, Lug; Splices, Conductor: Crimp Style, Copper, Insulated

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to:
 2750th Air Base Wing Electronic Support Division(2750thABW/ES)
 Centile AFS, Dayton, Ohio, 45444 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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MIL-A-8243 Anti-icing and De-icing - Defrosting Fluid

MIL-W-22759 Wire, Electric, Fluoropolymer-Insulated, Copper or Copper Alloy

MIL-I-23053/8 Insulation Sleeving, Electrical, Heat-Shrinkable, Polyvinylidene Fluoride, Semi-Rigid Crosslinked

MIL-L-23699 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

MIL-C-25769 Cleaning Compound, Aircraft Surface, Alkaline Waterbase

MIL-C-27500 Cable, Electrical, Shielded and Unshielded, Aerospace

MIL-T-83507 Tool Kits, Electrical Connectors, Contacts, and Connector and Cable Accessories: General Specification for

MIL-S-83519/1 Splice, Shield Termination, Solder Style, Insulated, Heat-Shrinkable, Environment Resistant for Cables Rated at 105°C and Above

MIL-S-83519/2 Splice, Shield Termination, Solder Style, Insulated, Heat-Shrinkable, Environment Resistant With Preinstalled Lead for Cables Rated at 105°C and Above

MIL-W-81381 Wire, Electric, Polyimide-Insulated Copper or Copper Alloy

STANDARDS

MILITARY

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

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-202 Test Method for Electronic and Electrical Component Parts

MIL-STD-454 Standard General Requirements for Electronic Equipment

MIL-STD-883 Test Methods and Procedures for Microelectronics

DOD-STD-2000-3 Soldering Technology, High Quality/High Reliability

MIL-STD-45662 Calibration System Requirements

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

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2.2 Source of documents. Copies of listed military standards, specifications, and associated documents listed in the Department of Defense Index of Specifications and Standards (DoDISS), should be obtained from DoD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of industry association documents should be obtained from the sponsor. Copies of all other listed documents should be obtained from the contracting activity or as directed by the contracting officer.

3. REQUIREMENTS

3.1 Specification sheets. The requirements for the individual shield terminations shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The terminations furnished under this specification shall be a product which is qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.1 and 6.6). The provisions for periodic qualification re-evaluation are included in this specification (see 4.4.6). Qualification of Class I terminations are required for a qualification of both classes of terminations.

3.3 Materials. The material used shall be as specified herein:

3.3.1 Solder preform. The solder preform shall be fabricated from solder conforming to QQ-S-571. The alloy shall be as specified on the applicable specification sheet.

3.3.2 Flux. The flux may be contained within or coated on the surface of the solder preform and shall conform to QQ-S-571, type RMA or RA as specified on the applicable specification sheet.

3.3.3 Insulation sleeve. The insulation sleeve shall be transparent, heat-shrinkable, cross-linked polyvinylidene fluoride in accordance with the performance requirements of MIL-I-23053/8.

3.3.4 Sealing inserts. The sealing material shall be a thermally stabilized thermoplastic. The material shall have a melt viscosity suitable to meet the performance requirements when using a recommended heat source (see 6.2).

3.3.5 Preinstalled ground lead. When specified the preinstalled lead shall conform to the requirements of the applicable wire specification.

3.4 Design and construction. Unless otherwise specified, the termination shall consist of a heat-shrinkable insulation sleeve with an integral solder preform with flux and thermal indicator (Class I termination only) and two integral rings of sealing material. The termination shall, when specified, contain a preinstalled ground lead. The termination shall conform in all respects to the design, dimension and construction specified herein and on the applicable specification sheet.

3.4.1 Insulation. The termination shall exhibit no evidence of splitting as a result of the heating operation.

3.4.2 Squirting. The solder shall not squirt or exude out of the insulation sleeve as a result of the heating operation.

3.4.3 Fillet. A solder fillet shall be clearly visible along at least one side of the ground lead (see figures 2 and 3).

3.4.4 Transparency of insulation. The insulation sleeve shall remain sufficiently transparent after the heating operation to permit visual inspection of the solder joint.

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3.4.5 Thermal indicator. (Class I only) The termination shall incorporate a thermochromic material which shall give a visual indication that sufficient heat has been applied to bring the surfaces to be soldered to a temperature sufficient for wetting (see paragraph 6.1.2). The color of the material shall be easily distinguished from that of the flux, the sleeve or the flux residue. The material shall be in contact with the surfaces to be soldered during the soldering operation and shall not interfere with the flow of the solder or the visual inspection of the completed termination. The characteristics shall meet the requirement of 3.5.1.5.

3.4.6 Installation technique. Terminations shall be capable of being installed with either convection or infrared heat sources (see 6.2).

3.5 Performance. The termination shall conform to the following requirements:

3.5.1 Terminations as received. The terminations, as received, shall conform to the following requirements:

3.5.1.1 Dimensions. The terminations shall conform to all dimensions shown on the specification sheet (see 4.6.1).

3.5.1.2 Unrestricted recovery. The termination shall recover sufficiently to force the sealing inserts to conform to the mandrel (see 4.6.2).

3.5.1.3 Longitudinal change. The longitudinal change shall be no greater than 10 percent (see 4.6.3).

3.5.1.4 Copper mirror corrosion. When examined against a white background in good light there shall be no evidence of copper removal in excess of 10% from any part of the mirror above the bottom .062 inch. Discoloration of the copper film or reduction of its thickness should not be considered corrosion (see 4.6.4).

3.5.1.5 Wetting

3.5.1.5.1 Unacceptable termination (insufficient heat). Insufficiently heated termination as shown in figure 1 shall show definite signs of the presence of the thermal indicator (see 4.6.5.1).

3.5.1.5.2 Acceptable terminations (Minimum) Minimum acceptable solder flow termination as shown in figure 2 shall have traces of the thermal indicators in the fillet area (see 4.6.5.2).

3.5.1.5.3 Acceptable termination (Maximum) Maximum acceptable solder flow terminations as shown in figure 3 shall have little or no evidence of the thermal indicator in the fillet area (see 4.6.5.3).

3.5.2 Assemblies. The terminations shall conform to the following requirements when attached to each of the specified cable/ground lead sizes with the applicable tooling.

3.5.2.1 Voltage drop. The millivolt drop across the termination shall not exceed 4.0 millivolt (see 4.7.1).

3.5.2.2 Insulation resistance. The insulation resistance shall be no less than 1000 megohms (see 4.7.2).

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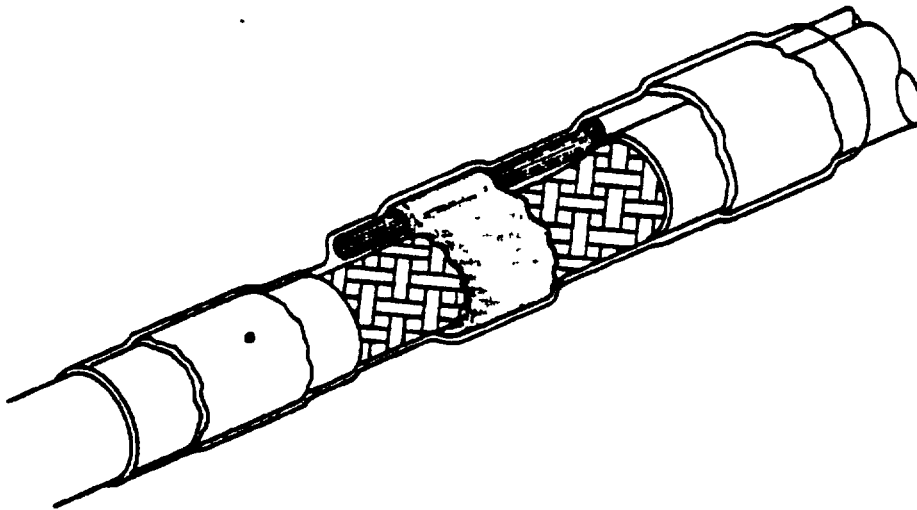
3.5.2.3 Dielectric withstanding voltage. The termination shall show no evidence of damage, arcing or breakdown and the leakage current shall be less than 2 milliamperes (see 4.7.3).

3.5.2.4 Tensile strength. The solder joint shall not break below 15 pounds. Breakage of the ground lead or cable below this value shall constitute meeting this requirement (see 4.7.4).

3.5.2.5 Environmental conditioning. Terminations shall meet the performance requirements listed, when tested in groups and sequences. Discoloration of the materials during these tests shall not be cause for rejection (see 4.7.5). The marking code (3.6) shall be legible after non-destructure tests.

3.5.2.6 Flammability. The termination shall be self-extinguishing within 5 seconds after removal from the flame (see 4.7.6).

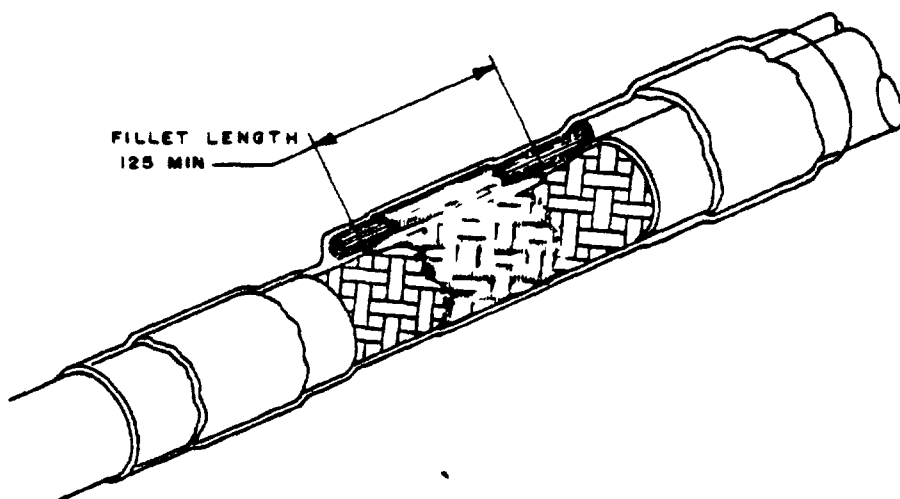
3.5.2.7. Vibration. Terminations shall meet the performance requirements listed, when tested in groups and sequences (see 4.7.7.).

**NOTES:**

1. Thermal indicator readily visible.
2. Contour of solder preform is visible.
3. Meltable inserts have not flowed.
4. Contour of braid and/or lead is obscured by solder.

Figure 1. Unacceptable termination. (insufficient heat)

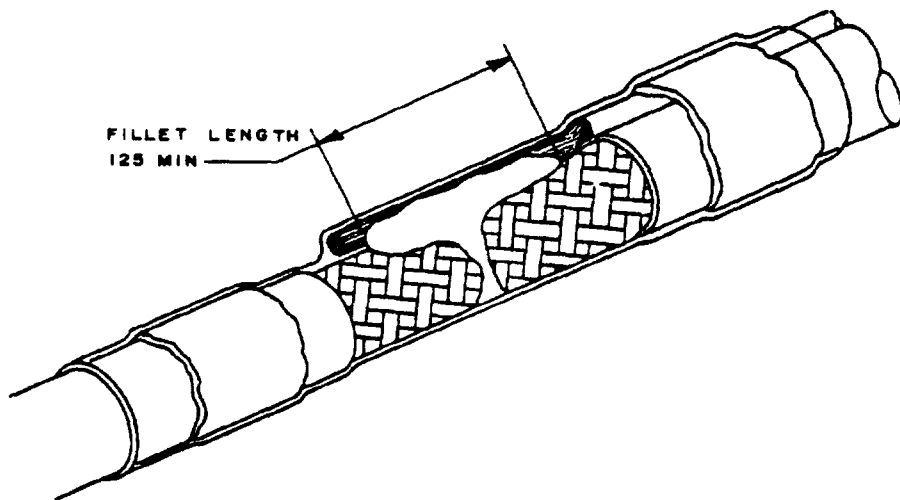
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NOTES:

1. Slight traces of thermal indicator shall be present.
2. Solder has lost all appearance of preform shape.
3. Inserts have melted and flowed along wires.
4. Shield and lead contours are visible.
5. There is a definite fillet visible along the lead and shield interface.

Figure 2. Acceptable termination. (minimum solder flow)



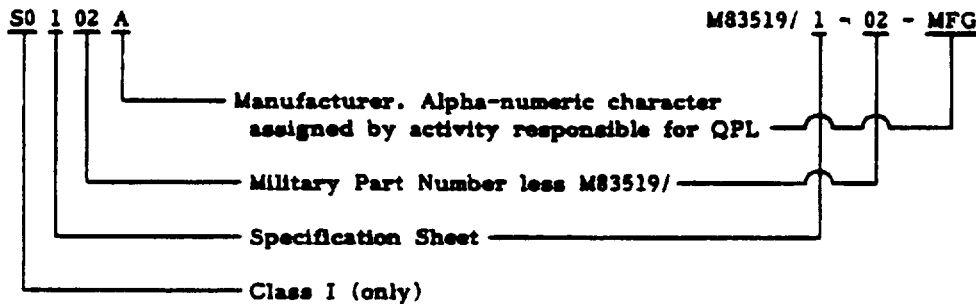
NOTES:

1. Thermal indicator has disappeared.
2. There shall be no traces of thermal indicator in the soldered area. However, slight traces of the thermal indicator in the insert area are acceptable.
3. Fillet is clearly visible between lead and shield.
4. Joint area is visible despite browning of sleeve.

Figure 3. Acceptable termination. (maximum solder flow)

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3.6 Marking code. The Class I termination shall be permanently marked with six (6) alpha-numeric characters in contrasting ink. The Class II splice shall be marked with a four (4) alpha-numeric characters consisting of specification sheet number, a two digit part number and a alpha character manufacturer code assigned by qualifying activity. Marking shall be legible by normal vision after fluid immersion and heat aging.



Example: S0102X - Standard configuration without ground lead .145 I.D.
 S0215X - Standard configuration with preinstalled ground
 lead - .300 I.D.

3.7 Workmanship. The integral components shall be held within the termination with sufficient force to withstand dislodging during normal installation. The termination shall be free of defects which could be detrimental to performance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract 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.

4.1.1 Inspection equipment and facilities. Inspection equipment and facilities shall be established and maintained in accordance with MIL-STD-45662.

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

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be made at ambient temperature, and humidity as specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.3.1 Temperature stabilization. All tests performed after exposure to high or low temperature shall be conducted after terminations have been conditioned for at least 1 hour at the inspection conditions specified (see 4.3).

4.3.2 Water bath. Unless otherwise specified in the applicable test method, a water bath containing 0.5% of an anionic wetting agent and 5.0% sodium chloride shall be used whenever immersion is specified. Free ends of cable and lead shall be a minimum of 2 inches from the top surface of water.

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4.4 Qualification inspection. Qualification inspection shall consist of all the tests of this specification.

4.4.1 Sample size. Forty-three (43) terminations of each size for each specification sheet (see 3.1) for which qualification is sought shall be submitted to the activity responsible for qualification (see 6.5). See Paragraph 4.4.7.

4.4.2 Assembly to cables. The terminations shall be attached to the specified cables by the testing activity using the specified tooling. The attachment shall be made in the center of an 8-inch length of cable, the ground lead shall be at least 4.5 inches total. The specified number of sample units shall be divided into four sets of equal size. The four sets shall be installed on the test cables in accordance with the following matrix. The termination shall extend at least .125 inch beyond stripped section of cable after installation.

<u>Set</u>	<u>Cable Size</u>	<u>Heat Source Type</u>
A	Maximum	Infrared
B	Maximum	Convection
C	Minimum	Infrared
D	Minimum	Convection

4.4.3 Forwarding of qualification samples. Samples shall be forwarded to the testing laboratory designated by the activity responsible for qualification (see 6.6) plainly identified by securely attached, durable labels marked with the following information:

Sample for qualification test
 SHIELD TERMINATION, SOLDER STYLE INSULATED,
 HEAT-SHRINKABLE, ENVIRONMENT RESISTANT
 Specification sheet part number
 Manufacturer's name and code number (Publications H4-1 and H4-2)
 Manufacturer's part number
 Place and date of manufacture of sample.
 Submitted by (name) (date) for qualification tests in accordance with the requirements of MIL-S-83519 under authorization (reference authorizing letter).

4.4.4 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 shall then be divided into Groups II through XI as shown in Table I and subjected to the inspection for their particular group.

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TABLE I. Qualification inspection.

Examination or Test	Requirement Paragraph	Test Method Paragraph
GROUP I (43 uninstalled terminations) Visual and Dimensional Examination	3.3,3.5.1.1, 3.6 & 3.7	4.6.1
GROUP II (6 uninstalled terminations) Unrestricted Recovery (3 terminations) Longitudinal Change (3 terminations)	3.5.1.2 3.5.1.3	4.6.2 4.6.3
GROUP III (1 uninstalled termination) Copper Mirror Corrosion	3.5.1.4	4.6.4
GROUP IV (8 uninstalled terminations) Wetting	3.5.1.5	4.6.5
GROUP V (4 cable assemblies) 1 of each set Visual and Dimensional Insulation Resistance Altitude Immersion (1 cycle) Insulation Resistance Altitude Immersion (2 cycles) Insulation Resistance Dielectric Withstanding Voltage Voltage Drop Tensile Strength	3.4 & 3.7 3.5.2.2 3.5.2.5 3.5.2.2 3.5.2.5 3.5.2.2 3.5.2.3 3.5.2.1 3.5.2.4	4.6.1 4.7.2 4.7.5.1 4.7.2 4.7.5.1 4.7.2 4.7.3 4.7.1 4.7.4
GROUP VI (4 cable assemblies) 1 of each set Visual and Dimensional Temperature Cycling Insulation Resistance Dielectric Withstanding Voltage Voltage Drop	3.4 & 3.7 3.5.2.5 3.5.2.2 3.5.2.3 3.5.2.1	4.6.1 4.7.5.2 4.7.2 4.7.3 4.7.1
GROUP VII (4 cable assemblies) 1 of each set Visual and Dimensional Moisture Resistance Insulation Resistance Dielectric Withstanding Voltage Voltage Drop	3.4 & 3.7 3.5.2.5 3.5.2.2 3.5.2.3 3.5.2.1	4.6.1 4.7.5.3 4.7.2 4.7.3 4.7.1
GROUP VIII (6 cable assemblies) 3 each sets Visual and Dimensional Fluid Immersion Insulation Resistance Dielectric Withstanding Voltage	3.4 & 3.7 3.5.2.5 3.5.2.2 3.5.2.3	4.6.1 4.7.5.4 4.7.2 4.7.3
GROUP IX (4 cable assemblies) 1 of each set Visual and Dimensional Vibration Insulation Resistance Dielectric Withstanding Voltage Voltage Drop	3.4 & 3.7 3.5.2.7 3.5.2.2 3.5.2.3 3.5.2.1	4.6.1 4.7.7 4.7.2 4.7.3 4.7.1
GROUP X (4 cable assemblies) 1 of each set Visual and Dimensional Heat Aging Insulation Resistance Dielectric Withstanding Voltage Voltage Drop	3.4. & 3.7 3.5.2.5 3.5.2.2 3.5.2.3 3.5.2.1	4.6.1 4.7.5.5 4.7.2 4.7.3 4.7.1
GROUP XI (2 cable assemblies) Any sets Visual and Dimensional Flammability	3.4. & 3.7 3.5.2.6	4.6.1 4.7.6

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

4.4.6 Retention of qualification. To retain qualification, the supplier shall forward at 12 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 shall include those tests performed during that 12 month period. If the summary of the test results indicates nonconformance with specification requirements and corrective action acceptable to the qualifying activity has not been taken, action shall be taken to remove the failing product from Qualified Product List. Failure to submit the summary may result in loss of qualification for the product. In addition to the activity responsible for qualification at any time during the 12 month period that the inspection data indicates failure of the qualified product to meet the requirements of the specification.

4.4.7 Extent of qualification. Each size termination listed on an individual specification sheet shall be qualified separately. However, for those styles incorporating preinstalled leads, qualification of the minimum and maximum wire gauge listed in all termination sizes shall qualify all lead gauges on the applicable specification sheet.

4.5 Quality Conformance Inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of Group A inspection. 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 II. Delivery of products which have passed Group A inspection shall not be delayed pending the results of Groups B and C inspection.

4.5.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all terminations of a single size and composition, manufactured under essentially the same conditions and offered for inspection at one time.

4.5.2 Group A inspection. Group A inspection shall consist of the examination and test specified in Table II.

4.5.2.1 Sampling plan. The procedure for continuous production sampling is to select a sampling plan from MIL-STD-105 based on the specified Acceptance Quality Level (AQL) in Table III. Classification of defects shall be as specified in MIL-STD-105 and Table IV.

4.5.2.2 Rejected lots. If an inspection lot is rejected, the supplier shall withdraw the lot and may then rework it to correct the defects or screen out the defective units. Such lots shall be kept separate from new lots and shall be reinspected. Such lots shall be reinspected using tightened inspection.

TABLE II. Group A inspection.

Examination or Test	Requirement Paragraph	Test Paragraph	ADL (% defective)		Sampling Plan
			Major	Minor	
Visual and dimensional examination	3.1	4.6.1	1.0	4.0	S-4
Marking code	3.6				
Workmanship	3.7				

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4.5.2.3 Classification of defects. Classification of defects for visual and dimensional examination shall be as specified in Table III.

TABLE III. Classification of defects.

Examination of Product	Major	Minor
Dimensions:		
Overall length	X	
Inside diameter of termination	X	
Location of components	X	
All other dimensions		X
Materials	X	
Workmanship and marking		X
All other criteria		X

4.5.3 Periodic inspection. Periodic inspection shall consist of Groups B and C inspection.

4.5.3.1 Group B inspection. Group B inspection shall consist of the tests specified in Table IV. Group B inspection shall be made on terminations selected from inspection lots which have passed Group A inspection. Group "B" inspection specimens shall be prepared per 4.4.2.

TABLE IV. Group B inspection.

Test	Requirement Paragraph	Method Paragraph
Altitude immersion (1 cycle)	3.5.2.5	4.7.5.1
Insulation resistance	3.5.2.2	4.7.2
Dielectric withstanding voltage	3.5.2.3	4.7.3
Voltage drop	3.5.2.1	4.7.1

4.5.3.1.1 Sampling plan. Sixteen (16) terminations covered by a single specification sheet shall be selected 12 months after the date of notification of qualification and after each subsequent 12 month period. This sample shall be selected so as to be representative of all sizes of terminations covered by that specification sheet manufactured during the preceding 12 month interval.

4.5.3.1.2 Failures. If 1 or more units fail to pass Group B inspection, the sample shall be considered to have failed.

4.5.3.2 Group C inspection. Group C inspection shall consist of the examinations and tests specified in Table I in the order shown.

4.5.3.2.1 Sampling plan. As specified in 4.4.3, sample units of each style shall be selected from production lots 36 months after the date of notification, and after each subsequent 36 month period.

4.5.3.2.2 Failures. If 1 or more units fail to pass Group C inspection, the sample shall be considered to have failed.

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4.5.3.3 Noncompliance. If a sample fails to pass Group B or Group C inspection, the supplier shall take corrective action on the materials or process, or both, as warranted and on all units of product which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action, acceptable to the government, has been taken. After the corrective action has been taken, Group B or Group C inspection, as applicable, shall be repeated on additional units (all inspections, or the inspection which the original sample failed, at the option of the government). Group A inspection may be reinstated in the event of failure of Group B inspection. Final acceptance shall be withheld until the Group B or Group C reinspection, as applicable, has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and corrective action taken shall be furnished to the qualifying activity.

4.5.4 Inspection of preparation for delivery. The sampling and inspection of the packaging and interior package marking shall be in accordance with Group A quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with section 5 and the marking requirements of MIL-STD-129.

4.6 Examinations.

4.6.1 Visual and dimensional examination. Terminations shall be examined to verify that the materials, design, construction and physical dimensions are in accordance with this specification and the applicable specification sheet.

4.6.2 Unrestricted recovery. The solder preforms shall be removed from the terminations, this can be done by squeezing the preform until it collapses and allowing it to drop out of the termination. Place termination on a clean metallic mandrel having a diameter equal to the minimum cable diameter on which the termination must seal. Suspend mandrel horizontally in an oven at $200^{\circ} \pm 2^{\circ}\text{C}$ for 5 minutes. Remove from oven and allow to cool, while still suspended, to ambient temperature (see 4.3). When cool, examine parts to ensure that the sealing rings have recovered tightly around mandrel.

4.6.3 Longitudinal change. Measure the length of the termination to the nearest .001 inch. Place terminations in clean aluminum dish and place in an oven at overall length of termination and calculate longitudinal change.

$$\% \text{ Change} = \frac{L_1 - L_2}{L_1} \times 100$$

L_1 = As supplied length
 L_2 = Recovered length

4.6.4 Copper mirror corrosion. For styles with preinstalled lead, cut lead flush with the end of the termination. For sizes 0.300 inch and larger (as supplied I.D.) the termination shall be cut longitudinally into 4 sections. For sizes smaller than .300 the whole terminations shall be used. The termination or all pieces of cut terminations shall be placed in a clean, dry 1/2 by 12 inch test tube. A copper glass mirror about 1/4 by 1 inch and a calibrated thermometer shall be suspended 6 to 7 inches above the bottom of the test tube by means of a fine, clean copper wire attached to a cork that has been wrapped in clean aluminum foil. A second clean test tube containing only the mirror and thermometer shall be used as a control. The lower 2 inches of the test tube shall be immersed in an oil bath at $121 \pm 3^{\circ}\text{C}$ for $16 \pm .5$ hours. The temperature of that portion of the test tube containing the copper mirror shall be below 60°C . After removal from the oil bath and cooling to ambient temperature (see 4.3), visually examine the mirror for areas of transparency by placing it on a white background in good light. The mirrors shall be vacuum deposited copper with a thickness equal to 10 ± 5 percent transmission of normal light of 5000 Angstroms. They shall be stored in a vacuum and shall be used only if no oxide film is present and the copper is not visibly damaged or contaminated.

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4.6.5. Wetting. Eight terminations shall be installed on the maximum size cables specified in the detail specification (see 3.1).

4.6.5.1 Unacceptable termination (insufficient heat). Heat three specimens using a convection heat source and three using an infrared heat source. Carefully observe the solder preform during the heating operation and remove two assemblies from the heat after the solder preform has collapsed but before it has melted. This unacceptable assembly should have the characteristics shown in figure 1. Examine the exposed cable shield and solder preform for the thermal indicator (see 3.5.1.5.1).

4.6.5.2 Acceptable termination (minimum). After examination of the six unacceptable terminations, return two each to their respective heat sources. Remove from heat at the point where the edges of the solder preform are no longer discernible but the solder has not flowed the full length of the exposed shield and ground lead. This assembly should have the characteristics shown in figure 2. Examine the soldered area for the thermal indicator (see 3.5.1.5.2).

4.6.5.3 Acceptable termination (maximum). Return the last two unacceptable assemblies to their respective heat sources. Remove from the heat when the contour of the shield braid and ground lead strands become discernible along their full length and a solder fillet is still visible along the shield/ground lead interface. This assembly should have the characteristics shown in figure 3. Examine the soldered area for the thermal indicator (see 3.5.1.5.3).

4.6.5.4 Typical termination. The last two specimens shall be heated, one by convection and one by infrared from the initial application of heat until the contour of the shield braid and the ground lead strands become discernible along their full length and a solder fillet is still visible along the shield/ground lead interface. These assemblies should have the characteristics shown in figure 3.

4.7. Test Methods.

4.7.1 Voltage drop. (3.5.2.1) Assemblies shall be tested as follows:

- a. Test Points: Measurements shall be made by exposing the ground lead conductor and the cable shield on opposite sides of the termination at a point 1/2 inch from the center of the termination.
- b. Measurements: The millivolt drop through the assemblies shall be measured while a current of 1 ampere is being applied.

4.7.2 Insulation resistance. (3.5.2.2) Assemblies shall be tested in accordance with Method 302 of MIL-STD-202. The following details shall apply:

- a. Test condition: B.
- b. Conditioning of assemblies: Specimens shall be immersed as specified for 30 minutes prior to start of test (see 4.4.3).
- c. Points of measurement: Between ground lead and water bath.
- d. Electrification time: 1 minute.

4.7.3 Dielectric withstanding voltage. (3.5.2.3) Assemblies shall be tested in accordance with Method 301 of MIL-STD-202. The following details shall apply:

- a. Conditioning of assemblies: Specimens shall be immersed as specified for 30 minutes prior to start of test (see 4.4.3).
- b. Magnitude and nature of potential: 2500 volts (RMS).
- c. Points of measurement: Between ground lead and water bath.

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4.7.4 Tensile strength. (3.5.2.4) The specimen shall be placed in a standard tensile testing machine so that the termination is centered between, at least 2 inches from the jaws. The ground lead shall be clamped in one jaw and the cable on the opposite end of the termination shall be clamped in the other jaw. Sufficient force shall be applied to pull the wire out of the termination or break the wire. The travel speed of the lead shall be 1 inch per minute. The clamping surface of the jaws may be serrated to provide sufficient force.

4.7.5 Environmental conditioning. (3.5.2.5) The assemblies shall be exposed to the following conditions. After conditioning specimens shall meet the requirements listed in Table II.

4.7.5.1 Altitude immersion. The assemblies, immersed as specified, shall be placed in a suitable chamber, the free ends shall be placed in a suitable chamber, the free ends shall be within the chamber and shall not be sealed (see 4.3.2). The chamber pressure shall be reduced to 75,000 ft. (26.78 mm of Hg) and maintained for 30 minutes. The chamber shall then be returned to ambient pressure (see 4.3). This shall constitute 1 cycle. A total of 3 cycles shall be run. The assemblies shall remain immersed until the completion of the dielectric withstanding voltage test (see Table I).

4.7.5.2 Temperature cycling. The assemblies shall be tested in accordance with Method 107, test condition F of MIL-STD-202.

4.7.5.3 Moisture resistance. The assemblies shall be tested in accordance with Method 106 of MIL-STD-202 except subcycle 7b shall not be required.

4.7.5.4 Fluid immersion. The assembly shall be immersed in the fluids specified in Table V at the temperature and time period listed.

TABLE V. Fluid immersion.

Specimen number	Test fluid specification	Test Condition
1	MIL-L-7808	a. Immerse assembly in fluid at $120 \pm 3^{\circ}\text{C}$ for 5 minutes. b. Remove and allow to drain for 1 hour at $23 \pm 5^{\circ}\text{C}$ c. Place assembly in a $175 \pm 3^{\circ}\text{C}$ oven for 22 hours d. Repeat (a), (b), and (c) for 7 cycles.
2	MIL-L-23699	
3	MIL-H-5606	Same as above, except immerse in fluid at $85 \pm 3^{\circ}\text{C}$ for step (a). Expose sample to $104 \pm 3^{\circ}\text{C}$ for step (c).
4	MIL-A-8243	Same as MIL-L-7808 except immerse in fluid at $65 \pm 3^{\circ}\text{C}$ for step (a).
5	MIL-C-25769 pH 10-12	
6	MIL-T-5624 JP - 5	Immerse assembly in fluid at $23 \pm 5^{\circ}\text{C}$ for 20 hours. Remove and drain for 4 hours at $23 \pm 5^{\circ}\text{C}$.

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4.7.5.5 Heat aging. Assemblies shall be placed in a forced-convection oven, having a circulating air velocity of 100 to 200 feet per minute, so that the major axis of the assembly is vertical with ground lead down and no assembly is in contact with any of the other assemblies. The samples shall be conditioned at a temperature of $150 \pm 3^\circ\text{C}$ for a period of $750 \pm .5$ hours. After removal from the chamber, the assemblies shall be stabilized. (see 4.3.1)

4.7.6 Flammability. (3.5.2.6) The assemblies shall be suspended horizontally in a draft-free enclosure above a Bunsen burner. The tip of a 1 inch natural gas flame with an inner core 1/3 its height shall be applied to the end of the termination for a period of 20 seconds. The time of burning of the termination after removal of the gas flame is to be recorded.

4.7.7 Vibration. (3.5.2.7) The ground lead shall be cut to a length of $4.00 \pm .01$ inches, measured from the end of the insulation sleeve, and a lug terminal conforming to MIL-T-7928 shall be attached to the end of the lead. The ground leads shall be attached to the vibration table. The cable shall be mounted to a stationary platform so that the end of the splice from which the ground lead exits is adjacent to the edge of the platform nearest the vibration table. The distance between the vibration table and stationary platform shall be adjusted to allow approximately .050 inch movement perpendicular to the axis of the ground lead. The specimens shall be vibrated in accordance with MIL-STD-202, Method 204, Condition B in two axis perpendicular to the axis of the ground lead and to each other.

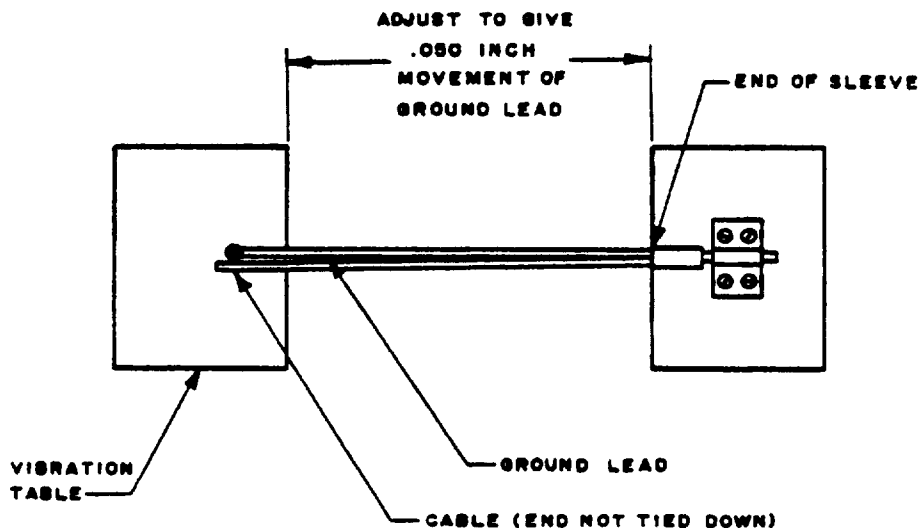


Figure 4. Shield termination.

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5. PREPARATION

5.1 Unit packaging. Terminations shall be packaged in a manner that will afford adequate protection against deterioration and physical damage during shipment from supply source to first receiving activity. Quantity of terminations per unit package shall be even increments of 10.

5.2 Packing. The packaged terminations shall be packed in shipping containers in a manner that will afford adequate protection against damage during direct shipment from supply source to the first receiving activity. These packs shall conform to the applicable carrier rules and regulations.

5.3 Marking. In addition to any special marking required by the contract or order, unit package, intermediate and exterior containers shall be marked in accordance with MIL-STD-129. Unit packages shall be marked with the part number.

5.4 General. Exterior containers shall be of a minimum tare and cube consistent with the protection required and shall contain equal quantities of identical stock numbered items to the greatest extent practicable.

6. NOTES

6.1 Intended use. Terminations covered by this specification are for use in making shield terminations on data bus, RF and shielded cables falling within the diameter range specified on the applicable specification sheet. They will provide environmental protection on cables having jacket material as specified on the applicable specification sheet. They may be used in applications where the operating temperature does not exceed 150°C.

6.1.1 Solderability. Shields and ground leads to be terminated with these terminations must meet the solderability requirements of MIL-STD-454 or MIL-STD-883.

6.1.2 Thermal indicator. The thermal indicator used in these splices is an installation and inspection aid only and evidence of the color change or lack of complete color change shall not be used as a criterion for acceptance of terminated assemblies. Terminated assemblies are to be inspected to the applicable inspection criteria of DOD-STD-2000-3.

6.1.3 Fillet. The length of the fillet shall be at least .125 inch (see figure 3.)

6.2 Heat Source. A heat source to concentrate the heat on all sides of the termination is required for a consistent and reliable termination. Any recommendation of a heat concentrator made by a qualified source of the termination is acceptable, but is not mandatory. The functionality of tool with respect to the termination is the responsibility of the military equipment manufacturer or service activity.

CAUTION

Terminations may be installed on fueled aircraft only with a MIL-T-83507/14 heating device.

6.3 Flux. Type RA flux is intended to be used only with nickel plated shields. Type RA flux is prohibited in aircraft except under very strict conditions.

6.4 Supersession. Supersedes National Aerospace Standards NAS1744, NAS1745 and NAS1746 in part.

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6.5 Ordering data. Procurement documents should specify:

- a. Title, number and date of this specification
- b. Applicable part number
- c. Quantity

6.6 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 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 covered by this specification may be obtained from the qualifying activity: Air Force Electronics Support Division (2750th/ES), Gentile AFS, Dayton, Ohio, 45444.

6.7 Classification. Qualification of Class I terminations are required for a qualification of both classes. Class II terminations may be used by original equipment manufacturer, but require qualification testing approval and will require all testing, except the thermal indicator requirement. Class II qualifiers shall be listed on the Qualified Products Lists, but their part number will not be identified.

6.7.1 Class I. Only Class I terminations are intended for use by military activities. Class I terminations will be the only class stocked by the services and supplied to their activities. Original equipment manufacturers are authorized to use either Class I or Class II terminations.

6.7.2 Class II. Only original equipment manufacturers are authorized to use Class II terminations. Class II terminations are not to be used for replacement purposes.

6.7.2.1 Government Procurement. Class II terminations will not be stocked or supplied to the military services. When a military procurement activity receives a request for Class II terminations, the procurement activity must procure the Class I termination in lieu of the Class II request.

6.7.3 Qualified Product List. All Class I part numbers, military's and manufacturer's, will be listed on the Qualified Product List. Qualified Class II manufacturers will be listed but not with their qualified part numbers. Upon request a copy of the military approval which list the the qualified part numbers may be obtained from the manufacturer. Verbal confirmation of the approval may be obtained from the qualifying activities.

6.8 Patent Rights. Government has received notification that the owner of U.S. Patents 3,243,211 or 3,312,772 will not assert patent rights against the U.S. Government on account of the purchase, manufacture or use by the U.S. Government of any product qualified to Specification MIL-S-83519/1 or /2."

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