

DETAIL SPECIFICATION

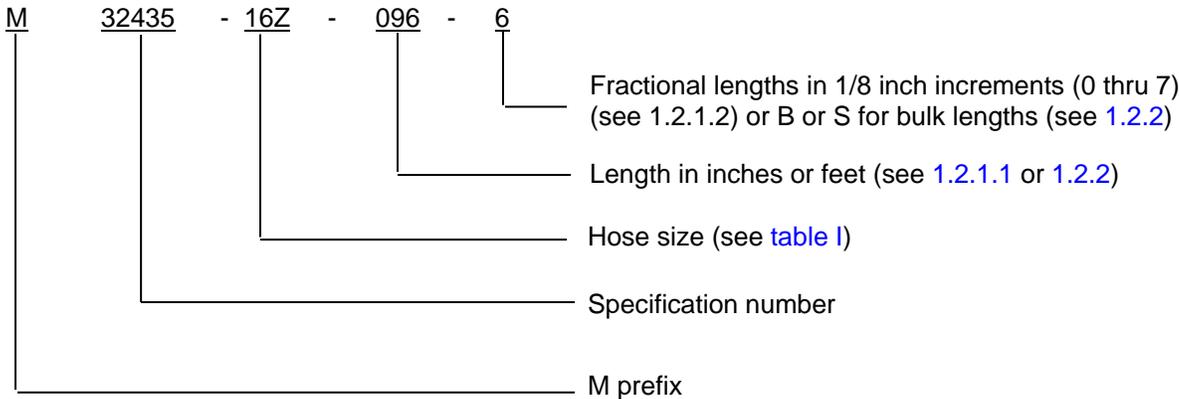
HOSE, POLYTETRAFLUOROETHYLENE,
CONVOLUTED, 450°F, MEDIUM PRESSURE

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

1. SCOPE

1.1 Scope. This specification covers the requirements for a medium pressure, high temperature, convoluted polytetrafluoroethylene (PTFE) hose reinforced with corrosion-resistant (CRES) steel wire (see 3.4.2).

1.2 Part or Identifying Number (PIN). The hose PIN consists of the letter M, the basic specification number, a dash, hose size in dash number, a "Z" for double braid" and no code for "single braid, a dash, hose length, a dash, and hose length tolerance in 1/8th fraction of an inch or the letter B or S for bulk hose.



PIN examples:

- M32435-08-014-5 (1/2 inch single braided PTFE convoluted hose, 14 5/8 inches long).
- M32435-16Z-050-B (1 inch double braided PTFE convoluted hose, 50 feet bulk length).
- M32435-04-025-S (1/4 inch single braided PTFE convoluted hose, 25 feet specific length).

1.2.1 Hose lengths.

1.2.1.1 Lengths of hose. Lengths of hose are represented by inches and 1/8 of an inch unless bulk hose or specific length of hose is required which are given in feet, (see 1.2.2).

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, Attn: DSCC-VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to FluidFlow@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

1.2.1.2 Fractions. Fractions are expressed in 1/8 inch increments (0 thru 7). Not applicable to bulk or specific hose lengths.

1.2.2 Bulk hose lengths. Bulk hose lengths are represented by the letter B or S. Bulk lengths are in increments specified in [table I](#). The S designator is used to define specific lengths in feet (see [3.4.5.1](#)).

TABLE I. Hose lengths per full order of bulk hose.

| Dash sizes | Maximum percentage of lengths ranging from 3 to 14 ft ^{1/} | Minimum percentage of lengths above 14 ft |
|-------------------|---|---|
| -4 through -8 | 35 | 65 |
| -10 through -16Z | 45 | 55 |
| -20Z through -24Z | 60 | 40 |

^{1/} Hoses of 3-foot lengths should not be more than 5% of the full order.

Note: For the inch designator insert the number zero in front of designator for lengths less than 100 inches (2540 mm).

Examples:

When 12 7/8 inch length is required the designator is: 012-7

When 96 inches is required the designator is: 096-0

When 90 feet total length is required the designator is: 090-B

When 30 feet continuous length is required with a 1% tolerance the designator is: 030-S

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections [3](#), [4](#), or [5](#) of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections [3](#), [4](#), or [5](#), of this specification, whether or not they are listed.

2.2 Government documents.

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

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DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-DTL-32434 - Hose Assembly, Polytetrafluoroethylene, Convoluted, High Temperature, Medium Pressure, General Specification for
- MIL-DTL-32434/6 - Hose Assembly, Polytetrafluoroethylene Convoluted, Permanently Attached Fittings, High Temperature, Medium Pressure, Flare-To-Flare
- MIL-DTL-32434/7 - Hose Assembly, Polytetrafluoroethylene Convoluted, Permanently Attached Fittings, High Temperature, Medium Pressure, Flareless-To-Flareless
- MIL-DTL-32434/8 - Hose Assembly, Polytetrafluoroethylene Convoluted, Permanently Attached Fittings, High Temperature, Medium Pressure, Flare-To-Flange
- MIL-DTL-32434/9 - Hose Assembly, Polytetrafluoroethylene Convoluted, Permanently Attached Fittings, High Temperature, Medium Pressure, Flareless-To-Flange
- MIL-DTL-32434/10 - Hose Assembly, Polytetrafluoroethylene Convoluted, Permanently Attached Fittings, High Temperature, Medium Pressure, Flange-To-Flange
- MIL-DTL-27272 - Fittings, Polytetrafluoroethylene Hose, High Temperature, Medium Pressure, General Specification for
- MIL-PRF-680 - Degreasing Solvent
- MIL-PRF-5606 - Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance
- MIL-PRF-7808 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
- MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537
- MIL-PRF-87257 - Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile

DEPARTMENT OF DEFENSE STANDARD

- MIL-STD-130 - Identification Marking of U.S. Military Property

(Copies of these documents are available online at <https://assist.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

ASTM INTERNATIONAL

- ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids
- ASTM D792 - Density and Specific Gravity (Relative Density) of Plastics by Displacement
- ASTM D4895 - Polytetrafluoroethylene (PTFE) Resin Produced from Dispersion

(Copies of these documents are available online at <http://www.astm.org> or from ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO 17025 - General requirements for the competence of testing and calibration laboratories

(Copies of these documents are available online at www.ansi.org or from the ANSI Customer Service Department, 25 W. 43rd Street, 4th Floor, New York, NY 10036.)

NCSL INTERNATIONAL

- NCSL Z540.3 - Requirements for the Calibration of Measuring and Test Equipment

(Copies of these documents are available online at <http://www.ncsli.org> or from NCSL International 2995 Wilderness Place, Suite 107 Boulder, Colorado 80301-5404)

SAE INTERNATIONAL

- SAE-ARP1153 - Determining Relative Specific Gravity Polytetrafluoroethylene Tubing, Method for
SAE-AS2078 - Test Methods, Hose Assemblies, Polytetrafluoroethylene (PTFE)

(Copies of these documents are available online at www.sae.org from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, and Tel: 877-606-7323 [inside USA and Canada] or 724-776-4970 [outside USA], email at CustomerService@sae.org.)

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.5.

3.2 Components. The hose shall consist of a convoluted conductive PTFE tube reinforced with a corrosion resistant steel (CRES) wire braiding.

3.3 Materials. Materials shall conform to the requirements specified herein. Materials which are not covered by specifications, or which are not specifically described herein, shall be of the quality appropriate for the purpose intended (see 6.1).

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

3.4 Design and construction.

3.4.1 Helical (right hand) convoluted inner tube. The tube shall be a seamless, uniformly convoluted virgin PTFE resin, see figure 1. The base resin shall conform to ASTM D4895 except for the specific gravity requirement (see 3.5.2.4). Additives may be included in the compound from which the tube is extruded.

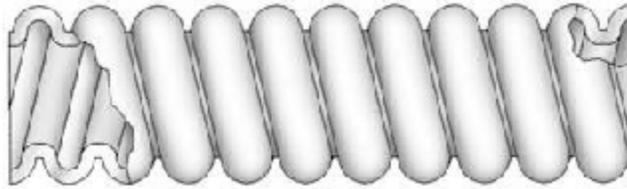


FIGURE 1. Helical (right hand) convoluted tube.

3.4.2 Reinforcement. The reinforcement of the hose shall be braided CRES wires, see [figure 2](#). Hoses under size 16Z shall have a single layer of braiding while size 16Z and above shall have two layers of braiding. The letter “Z” is used to indicate that two layers of wire braiding are required. The arrangement of the wires over the tube shall provide sufficient strength to ensure conformance to the requirements specified herein. Hoses with crossed-over reinforcing wires shall not be cause for rejection; however, hoses with broken or missing reinforcing wires shall not be accepted.

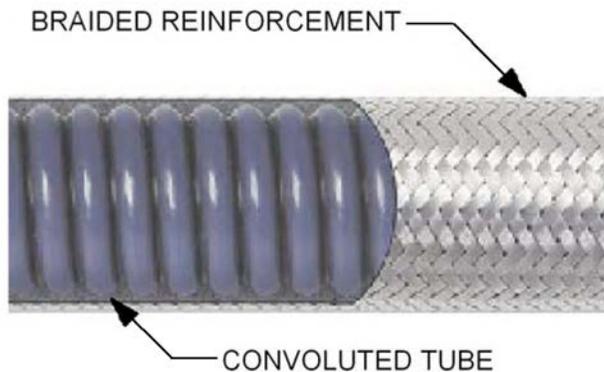


FIGURE 2. Single braided reinforcement over convoluted tube.

3.4.3 Hose end fittings. Hose shall be compatible with reusable fittings qualified in accordance with MIL-DTL-27272 and permanent fittings in accordance with MIL-DTL-32434/6 through MIL-DTL-32434/10, as applicable.

3.4.4 Dimensions. The cross section of the hose shall meet the applicable requirements specified in [table II](#).

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TABLE II. Hose dimensional requirements. 1 2/

| Dash size | Inside diameter Inch (mm) | | Tube wall thickness Inch (mm) | | Over-braid outside diameter Inch (mm) | |
|-----------|------------------------------|--------------------------------|----------------------------------|--------------------------------|---|--------------------------------|
| -4 | .188 (4.78) | ±.015 (0.38) | .040 (1.02) | + .007 (0.18) - .005 (0.13) | .312 (7.92) | + .031 (0.79) - .008 (0.20) |
| -5 | .250 (6.35) | | .040 (1.02) | | .375 (9.53) | + .031 (0.79) - .008 (0.20) |
| -6 | .313 (7.95) | | .040 (1.02) | | .446 (11.33) | + .023 (0.58) - .016 (0.41) |
| -8 | .406 (10.31) | | .043 (1.09) | | .562 (14.27) | + .023 (0.58) - .016 (0.41) |
| -10 | .500 (12.70) | | .047 (1.19) | | .656 (16.66) | + .031 (0.79) - .015 (0.38) |
| -12 | .625 (15.88) | | + .020 (0.51) - .010 (0.25) | | .047 (1.19) | .789 (20.04) |
| -16Z 3/ | .875 (22.23) | + .031 (0.79) - .024 (0.61) | .047 (1.19) | 1.109 (28.17) | ±.031 (0.79) | |
| -20Z 3/ | 1.125 (28.58) | + .031 (0.79) - .024 (0.61) | .050 (1.27) | 1.359 (34.52) | ±.031 (0.79) | |
| -24Z 3/ | 1.375 (34.93) | ± .031 (0.79) | .070 (1.78) | 1.672 (42.47) | ±.031 (0.79) | |

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3/ The letter "Z" is used to indicate that two layers of braiding are required for reinforcement of these sizes (see 3.4.2).

3.4.5 Length of bulk hose.

3.4.5.1 S designator for specific bulk hose lengths. When the order is for a specific length in feet, a tolerance of ±1% of the required length shall be used.

3.5 Performance.

3.5.1 Operating temperature and pressure. The hose shall operate in the temperature range of -65°F to 450°F (-54°C to 232°C) when assembled into class 1 hose assemblies in accordance with MIL-DTL-32434. The maximum operating pressures shall be as specified in table III.

TABLE III. Performance requirements and hose assembly test sample lengths. 1/ 2/

| Dash size | Length of samples for impulse test inch (mm) <u>3/</u> | Length of samples for all other tests inch (mm) <u>3/</u> | Operating pressure psi (MPa) | Proof pressure psi (MPa) | Room temperature burst pressure psi (MPa) | High temperature burst pressure psi (MPa) | Minimum inside bend radius inch (mm) |
|-----------|--|---|------------------------------|--------------------------|---|---|--------------------------------------|
| -4 | 14.0 (355.60) | 18.0 (457.20) | 1500 (10) | 3000 (20.7) | 12000 (83) | 7000 (48) | 2.00 (50.8) |
| -5 | 16.0 (406.40) | 18.0 (457.20) | 1500 (10) | 3000 (20.7) | 10000 (69) | 6500 (45) | 2.00 (50.8) |
| -6 | 18.0 (457.20) | 18.0 (457.20) | 1500 (10) | 3000 (20.7) | 9000 (62) | 6500 (45) | 4.00 (101.6) |
| -8 | 21.0 (533.40) | 18.0 (457.20) | 1500 (10) | 3000 (20.7) | 8000 (55) | 6000 (41.4) | 4.63 (117.6) |
| -10 | 23.5 (596.90) | 18.0 (457.20) | 1500 (10) | 3000 (20.7) | 7000 (48) | 5500 (38) | 5.50 (139.7) |
| -12 | 27.5 (698.50) | 18.0 (457.20) | 1000 (7) | 2000 (13.8) | 5000 (34.5) | 3500 (24) | 6.50 (165.1) |
| -16Z | 18.0 (457.20) | 18.0 (457.20) <u>4/</u> | 1250 (8.6) | 2500 (17.2) | 5000 (34.5) | 3500 (24) | 7.38 (187.5) |
| -20Z | 18.0 (457.20) | 18.0 (457.20) <u>4/</u> | 1000 (6.9) | 2000 (13.8) | 4000 (27.6) | 3000 (20.7) | 11.00 (279.4) |
| -24Z | 18.0 (457.20) | 18.0 (457.20) <u>4/</u> | 1000 (6.9) | 2000 (13.8) | 4000 (27.6) | 3000 (20.7) | 14.00 (355.6) |

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3/ The number of samples required for first article testing is specified in 4.5.1 and in table VIII.

4/ Samples for the low temperature flexibility and the vacuum tests shall be 30 inches (762 mm) long for these sizes.

3.5.2 Tube. The extruded PTFE tube shall meet the following requirements.

3.5.2.1 Tube roll and tube proof pressure. The tube shall not leak, split, burst, or show any evidence of malfunctioning when tested in accordance with 4.7.2.1.

3.5.2.2 Tensile strength. When tested in accordance with 4.7.2.2, the longitudinal tensile strength for all sizes of tubes shall not be less than 3,000 psi (20.7 MPa). The transverse tensile strength for sizes 10 and larger shall be not less than 2,500 psi (17.2 MPa). For sizes under 10, the transverse tensile strength need not be tested.

3.5.2.3 Elongation. The elongation of the tube shall not be less than 200% when tested in accordance with 4.7.2.2.

3.5.2.4 Specific gravity. When tested in accordance with 4.7.2.3, the apparent specific gravity of the tube shall be not greater than 2.155 and its relative specific gravity shall be not greater than 2.210 for all sizes of tubes.

3.5.2.5 Tube conductivity. When tested in accordance with 4.7.2.4, tube sizes 4 through 8 shall conduct a direct current of not less than 10 μ A. Tube sizes 10 through 24Z shall conduct a direct current of not less than 20 μ A.

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3.5.3 Hose and hose assembly. The hose (braid reinforced PTFE tube) or the hose assembly, consisting of the hose assembled with end fittings (see 3.4.3), shall meet the following requirements.

3.5.3.1 Braid flare. When tested in accordance with 4.7.3.1, the length of hose shall pass, by its own weight, through a ring of applicable inside diameter (see table IV).

TABLE IV. Braid flare dimensional requirement. 1/ 2/

| Dash size | Hose nominal inside diameter Inch (mm) | Expansion diameter Inch (mm) | Maximum flare diameter ring inside diameter Inch (mm) |
|-----------|---|---------------------------------|---|
| -4 | .188 (4.78) | .230 (5.84) | .500 (12.70) |
| -5 | .250 (6.35) | .300 (7.62) | .560 (14.22) |
| -6 | .313 (7.95) | .370 (9.40) | .625 (15.88) |
| -8 | .406 (10.31) | .475 (12.07) | .750 (19.05) |
| -10 | .500 (12.70) | .585 (14.86) | .875 (22.23) |
| -12 | .625 (15.88) | .720 (18.29) | 1.000 (25.40) |
| -16Z | .875 (22.23) | .995 (25.27) | 1.400 (35.56) |
| -20Z | 1.125 (28.58) | 1.270 (32.26) | 1.700 (43.18) |
| -24Z | 1.375 (34.93) | 1.545 (39.24) | 1.950 (49.53) |

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3.5.3.2 Proof pressure. When subjected to the applicable proof pressure specified in table III and tested in accordance with 4.7.3.2, there shall be no leakage through the wall of the hose or around the end fittings during and at the completion of testing. Furthermore, there shall be no visual evidence of permanent deformation or damage.

3.5.3.3 Elongation and contraction. When subjected to the applicable operating pressure specified in table III and tested in accordance with 4.7.3.3, the hose assembly shall not change length by more than +.20 or -.30 inch (+5.08mm or -7.62mm) in 10 inches (254 mm) of length.

3.5.3.4 Impulse. The hose assembly shall not leak, burst, or loosen from the test apparatus and there shall be no evidence of malfunctioning when subjected to 100,000 cycles in accordance with 4.7.3.4.

3.5.3.5 Flexibility. When subjected to the applicable proof pressure specified in table III and tested in accordance with 4.7.3.5, there shall be no leakage through the wall of the hose or around the end fittings during and at the completion of testing. Furthermore, there shall be no visual evidence of permanent deformation or damage.

3.5.3.6 Stress degradation. The effusion rate of the hose assemblies shall not be greater than the values listed in table V when tested in accordance with 4.7.3.6. Following the introduction of hot oil, the hose assembly shall not leak when subjected to the applicable proof pressure test specified in 4.7.3.2.

TABLE V. Effusion requirement after stress degradation test.

| Size | 4 | 5 | 6 | 8 | 10 | 12 | 16Z | 20Z | 24Z |
|------------------------------|---|---|---|---|----|----|-----|-----|-----|
| Effusion rate (cc/in/min) | 8 | 8 | 8 | 4 | 2 | 2 | 2 | 2 | 2 |

3.5.3.7 Room temperature burst pressure. When subjected to testing in accordance with 4.7.3.7, the hose assembly shall not leak or burst below the applicable room temperature burst pressure specified in table III. There shall be no leakage around the end fittings. The end fittings shall not loosen or separate from the hose.

3.5.3.8 High temperature burst pressure. When subjected to testing in accordance with 4.7.3.8, the hose assembly shall not leak or burst below the applicable high temperature burst pressure specified in table III. There shall be no leakage around the end fittings. The end fittings shall not loosen or separate from the hose.

3.5.3.9 Low temperature flexibility. When tested in accordance with 4.7.3.9 and subjected to the applicable inside bend radius specified in table III, the hose assembly shall not leak or exhibit any visual evidence of permanent deformation or damage.

3.5.3.10 Vacuum. The hose shall not collapse or show any evidence of defects when subjected to testing in accordance with 4.7.3.10. The ball shall roll freely through the entire length of the hose, unaided, to indicate that the inside diameter of the hose has not been distorted or reduced.

3.5.3.11 Volumetric expansion. The volumetric expansion, measured in cc/in of free length, shall not be greater than .028 inch (0.71 mm) for size 4 and .040 inch (1.02 mm) for size 5 when tested in accordance with 4.7.3.11.

3.5.3.12 Leakage. There shall be no leakage through the wall of the hose and around the fittings when the hose assembly is tested in accordance with 4.7.3.12.

3.5.3.13 Fuel resistance. When subjected to fuel resistance testing in accordance with 4.7.3.13, the hose assembly shall not leak or show any evidence of deterioration during and at the completion of the test.

3.5.3.14 Corrosion. When subjected to corrosion testing in accordance with 4.7.3.14, the hose assembly shall not leak or malfunction when subjected to the applicable room and high temperature burst pressures specified in table III.

3.5.3.15 Pneumatic leakage. When subjected to pneumatic testing in accordance with 4.7.3.15, a steady stream of bubbles shall not be seen from any area on the hose assembly.

3.5.3.16 Pneumatic effusion. When subjected to pneumatic effusion testing in accordance with 4.7.3.16, the measured effusion rate of the hose assembly shall not be greater than the values listed in table VI.

TABLE VI. Pneumatic effusion requirement.

| Size | 4 | 5 | 6 | 8 | 10 | 12 | 16Z | 20Z | 24Z |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Effusion rate ^{1/} (cc/ft of hose) | 4.0 | 5.0 | 5.0 | 5.0 | 5.0 | 6.0 | 8.0 | 8.0 | 8.0 |

^{1/} Collected during the last 30 minutes of the test.

3.5.3.17 Pneumatic surge. When subjected to pneumatic surge testing in accordance with 4.7.3.17, the hose assembly shall not leak through the hose wall and around the end fittings. The inner tube of the hose shall not exhibit any evidence of degradation when the filter is examined at the completion of the test.

3.5.3.18 Cleanliness. Prior to shipping, the ends of each hose length shall be capped or plugged to prevent entrance of moisture and foreign matter. The caps or plugs shall be securely attached and shall withstand normal strains, jarring and vibrations encountered during shipping, storage and handling. The interior surface of the hose assembly shall be free from oil, grease, dirt, moisture, cleaning solvents and foreign materials. During individual conformance inspection, hose lengths with uncovered ends shall be rejected and considered as failure. The interior of the hose shall not contain any debris or foreign materials when examined in accordance with 4.7.3.18.

3.6 Product identification. The hose shall be marked in accordance with MIL-STD-130. Bulk hose shall have metal or pliable plastic bands placed on each end of the hose and at ten-foot intervals and shall contain the following information:

- a. PIN as described in 6.3.
- b. Operating pressure in psi.
- c. Commercial and Government Entity (CAGE) code.

3.7 Workmanship. The hose shall be uniform in quality, free from foreign inclusions and defects in materials and shall be finished in accordance with good commercial practices.

4. VERIFICATION

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

- a. First article inspection (see 4.5).
- b. Conformance inspection (see 4.6).

4.2 Test equipment and inspection facilities. 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 or identified by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ISO 17025 and NCSL Z540.3 as applicable.

4.3 Inspection conditions. Unless otherwise specified, all required inspections shall be performed in accordance with the test conditions specified in 4.7.

4.4 Responsibility for compliance. All items shall meet all requirements of sections 3, 4, and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material. The supplier's inspection and test records shall clearly demonstrate the products conformance to technical specifications.

4.4.1 Lot records. Manufacturers shall keep lot records for 3 years minimum. Manufacturers shall monitor for compliance to the prescribed procedures, and observe that satisfactory manufacturing conditions and records on lots are maintained for these hose assemblies. The records, including as a minimum, an attributes summary of all quality conformance inspections conducted on each lot, shall be available to review by customers at all times.

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4.5 First article inspection. First article inspection shall consist of the examinations and tests specified in [table VII](#) performed on samples which are representative of the production item, after award of the contract, to determine that the production item meets the requirements of this specification.

4.5.1 Samples for first article inspection. Samples for first article inspection shall be representative of the products proposed to be furnished to this specification. Samples, consisting of 16 hose assemblies and of the lengths specified in [table II](#), shall be subjected to first article testing. Each sample shall be a PTFE hose reinforced with braided CRES wires, as specified herein, and assembled with end fittings. In addition, one 12-inch (304.8 mm) length of braided hose without end fittings and two 14-inch (355.6 mm) lengths of tubing shall also be subjected to first article testing.

TABLE VII. First article inspection requirements.

| Requirement | Requirement paragraph | Test method paragraph |
|---------------------------------|-----------------------|-----------------------|
| Examination of product | --- | 4.7.1 |
| Tube roll & tube proof pressure | 3.5.2.1 | 4.7.2.1 |
| Tensile strength | 3.5.2.2 | 4.7.2.2 |
| Elongation | 3.5.2.3 | 4.7.2.2 |
| Specific gravity | 3.5.2.4 | 4.7.2.3 |
| Tube conductivity | 3.5.2.5 | 4.7.2.4 |
| Braid flare | 3.5.3.1 | 4.7.3.1 |
| Proof pressure | 3.5.3.2 | 4.7.3.2 |
| Elongation & contraction | 3.5.3.3 | 4.7.3.3 |
| Impulse | 3.5.3.4 | 4.7.3.4 |
| Flexibility | 3.5.3.5 | 4.7.3.5 |
| Stress degradation | 3.5.3.6 | 4.7.3.6 |
| Room temperature burst pressure | 3.5.3.7 | 4.7.3.7 |
| High temperature burst pressure | 3.5.3.8 | 4.7.3.8 |
| Low temperature flexibility | 3.5.3.9 | 4.7.3.9 |
| Vacuum | 3.5.3.10 | 4.7.3.10 |
| Volumetric expansion | 3.5.3.11 | 4.7.3.11 |
| Leakage | 3.5.3.12 | 4.7.3.12 |
| Fuel resistance | 3.5.3.13 | 4.7.3.13 |
| Corrosion | 3.5.3.14 | 4.7.3.14 |
| Pneumatic leakage | 3.5.3.15 | 4.7.3.15 |
| Pneumatic effusion | 3.5.3.16 | 4.7.3.16 |
| Pneumatic surge | 3.5.3.17 | 4.7.3.17 |

TABLE VIII. First article inspection sequence.

| First article test | Test method paragraph | Sample number | | | | | | | | |
|----------------------------|-----------------------|---------------|------|------------|------|------|---|---|---|----|
| | | Tubes | Hose | Assemblies | | | | | | |
| | | 1-2 | 3 | 4 | 5 1/ | 6 1/ | 7 | 8 | 9 | 10 |
| Examination of product | 4.7.1 | X | X | X | X | | X | X | X | X |
| Tube roll & proof pressure | 4.7.2.1 | X | | | | | | | | |
| Tensile strength | 4.7.2.2 | X | | | | | | | | |
| Elongation | 4.7.2.2 | X | | | | | | | | |
| Specific gravity | 4.7.2.3 | X | | | | | | | | |
| Tube conductivity | 4.7.2.4 | X | | | | | | | | |
| Braid flair | 4.7.3.1 | | X | | | | | | | |
| Proof pressure | 4.7.3.2 | | | | X | | X | | X | X |
| Elongation & contraction | 4.7.3.3 | | | | | | X | | X | |
| Impulse | 4.7.3.4 | | | | | | | | | |
| Flexibility | 4.7.3.5 | | | X | | X | | X | | |
| Volumetric expansion | 4.7.3.11 | | | | | | | | | X |
| Leakage | 4.7.3.12 | | | | | | | | | |
| Fuel resistance | 4.7.3.13 | | | | | | | | | |
| Stress degradation | 4.7.3.6 | | | | | | | | | X |
| Corrosion | 4.7.3.14 | | | | | | X | | X | |
| Room temp burst pressure | 4.7.3.7 | | | | | | | | X | X |
| High temp burst pressure | 4.7.3.8 | | | | | | X | | | |
| Low temp flexibility | 4.7.3.9 | | | | X | | | | | |
| Vacuum | 4.7.3.10 | | | | X | | | | | |
| Pneumatic leakage | 4.7.3.15 | | | | | | | | | |
| Pneumatic effusion | 4.7.3.16 | | | | | | | | | |
| Pneumatic surge | 4.7.3.17 | | | | | | | | | |

See note at end of table.

TABLE VIII. First article inspection sequence - Continued.

| First article test | Test method paragraph | Sample number | | | | | | |
|----------------------------|-----------------------|------------------|--|----|------------------|----|-------|-------|
| | | Assemblies | | | | | | |
| | | 11 ^{1/} | | 13 | 14 ^{1/} | 15 | 16-17 | 18-22 |
| Examination of product | 4.7.1 | X | | X | X | X | X | X |
| Tube roll & proof pressure | 4.7.2.1 | | | | | | | |
| Tensile strength | 4.7.2.2 | | | | | | | |
| Elongation | 4.7.2.2 | | | | | | | |
| Specific gravity | 4.7.2.3 | | | | | | | |
| Tube conductivity | 4.7.2.4 | | | | | | | |
| Braid flair | 4.7.3.1 | | | | | | | |
| Proof pressure | 4.7.3.2 | X | | X | X | X | X | X |
| Elongation & contraction | 4.7.3.3 | | | | | | | |
| Impulse | 4.7.3.4 | | | | | | | X |
| Flexibility | 4.7.3.5 | | | | | | | |
| Volumetric expansion | 4.7.3.11 | X | | | | | | |
| Leakage | 4.7.3.12 | | | X | | X | | |
| Fuel resistance | 4.7.3.13 | | | X | X | | | |
| Stress degradation | 4.7.3.6 | X | | | | | | |
| Corrosion | 4.7.3.14 | | | | | | | |
| Room temp burst pressure | 4.7.3.7 | | | | | | | |
| High temp burst pressure | 4.7.3.8 | | | | | X | | |
| Low temp flexibility | 4.7.3.9 | X | | | X | | | |
| Vacuum | 4.7.3.10 | X | | | X | | | |
| Pneumatic leakage | 4.7.3.15 | | | | | | X | |
| Pneumatic effusion | 4.7.3.16 | | | | | | X | |
| Pneumatic surge | 4.7.3.17 | | | | | | X | |

^{1/} These samples shall be 30 inches (762 mm) in length for sizes 16Z, 20Z and 24Z.

4.5.2 Waivers or deviations to specification requirements. All waivers or deviations to specification requirements shall be coordinated through the preparing activity; DLA Land and Maritime, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Fluidflow@dla.mil.

4.5.3 Failures. All samples shall meet all of the contract requirements. Failure of a sample unit to pass any test shall be cause for rejection of the entire lot and refusal to grant first article approval.

4.5.4 First article information. Upon completion of first article inspection, the Government activity responsible for conducting the inspection program (see 6.2), shall report the results of the inspection, with appropriate recommendation, to the contracting officer. Approval of the first article samples or the waiving of first article inspection does not preclude the requirements for performing conformance inspection.

4.6 Conformance inspection.

4.6.1 Individual tests. Inspection of the product for delivery shall consist of subjecting each hose length to the individual inspection specified in [table IX](#). Any item failing to meet the requirements of the individual test shall be immediately removed from the lot.

TABLE IX. Individual inspection.

| Requirement | Requirement paragraph | Test method paragraph |
|----------------|-------------------------|-------------------------|
| Proof pressure | 3.5.3.2 | 4.7.3.2 |

4.6.2 Nonconformance of individual inspection. If one or more defects are identified, then the entire production lot shall be screened for that defect and all defects shall be removed. A second inspection sample shall then be selected from the different lot and the sampling tests shall be performed again. If one or more defects are identified from the second inspection lot, then the entire production lot shall be rejected and not supplied to this specification.

4.7 Test methods. Test methods used shall be as specified in [table VII](#). No alternative methods shall be used unless documented approval has been obtained from the preparing activity. For first article testing, the sequence of tests performed shall be in accordance with [table VIII](#). For all inspections required herein, only class 1 fittings conforming to either MIL-DTL-27272 or as defined in MIL-DTL-32434 shall be used. Unless otherwise specified room temperature shall be defined as 60 to 90°F (15.6 to 32.2°C).

4.7.1 Examination of product. Each hose or each hose assembly shall be visually and physically examined for conformance to the following requirements:

- a. Components (see [3.2](#))
- b. Reinforcement (see [3.4.2](#))
- c. Dimensions (see [3.4.5](#))
- d. Cleanliness (see [3.5.3.18](#))
- e. Product identification (see [3.6](#))
- f. Workmanship (see [3.7](#))

4.7.2 Tube tests.

4.7.2.1 Tube roll and tube proof pressure. Each length of tubing shall be subjected to a tube roll and a tube proof pressure test in accordance with SAE-AS2078, using a proof pressure specified for a 1500 psi (10 MPa) hose. Conformance shall be as specified in 3.5.2.1.

4.7.2.2 Tensile strength and elongation. The tube shall be subjected to both the tensile strength and the elongation tests in accordance with SAE-AS2078. Conformance for tensile strength shall be as specified in 3.5.2.2. Conformance for elongation shall be as specified in 3.5.2.3.

4.7.2.3 Specific gravity. The apparent specific gravity of the tube shall be determined in accordance with ASTM D792 while the relative specific gravity of the tube shall be determined in accordance with SAE-ARP1153. If test samples are obtained from a braided hose, the braid impressions shall be removed prior to testing. Conformance shall be as specified in 3.5.2.4.

4.7.2.4 Tube conductivity. A 14-inch (355.6 mm) length of tube shall be subjected to testing in accordance with SAE-AS2078, Electrical Conductivity test procedure under "Tests on PTFE Inner Tubes." When test samples are obtained from a braided hose, the braiding shall be removed prior to testing. Conformance shall be as specified in 3.5.2.5.

4.7.3 Hose and assembly tests.

4.7.3.1 Braid flare. A length of hose, no longer than 12 inches (304.8 mm), shall be sized by expanding the flared-out end over a plug. The diameter of the plug shall be as specified in the "Expansion diameter" column of table IV. The plug shall be inserted into the flared-out end of the hose to a depth of .187 inch (4.75 mm) and then removed. After this sizing operation, the sample shall then be inserted through a ring with the bottom of the flare extending 6 inches above the top of the ring. The inside diameter of the ring shall be as specified in the "Maximum flare diameter - Ring inside diameter" column of table IV. From this position, the sample shall be allowed to pass, by its own weight, through the ring. Conformance shall be as specified in 3.5.3.1.

4.7.3.2 Proof pressure. Prior to testing, the hose assembly shall be examined to ensure that it is properly assembled. The test sample shall then be subjected to testing in accordance with SAE-AS2078 using the applicable proof pressure specified in table II of this specification. The test fluid used shall be water; or, fluid conforming to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257 may be used for first article testing. Conformance shall be as specified in 3.5.3.2.

4.7.3.3 Elongation and contraction. Samples shall be subjected to testing in accordance with SAE-AS2078. Test fluid shall be water or fluid conforming to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257. Conformance shall be as specified in 3.5.3.3.

4.7.3.4 Impulse. All test samples, of length as specified in table II, shall be subjected to the proof pressure test (see 4.7.3.2) prior to impulse testing in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.4. The following details shall apply:

- a. For first article testing, 2 of the 6 samples shall be unaged while 2 samples shall be aged in air at $400 \pm 10^{\circ}\text{F}$ ($204.4 \pm 5.6^{\circ}\text{C}$) for 168 hours. The remaining 2 shall be aged by immersion in fluid conforming to MIL-PRF-7808 at $400 \pm 10^{\circ}\text{F}$ ($204.4 \pm 5.6^{\circ}\text{C}$) for 168 hours.
- b. Samples sizes 12 and smaller shall be connected to the rigid supports of the test apparatus and bent to the applicable bend radius specified in table II.
- c. Samples sizes 16Z and larger shall be installed straight, one end may be left free.

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- d. The peak pressure used for samples sizes 4 through 16Z shall be 125 % of the operating pressure specified in [table II](#).
- e. For sizes 20Z and 24Z, the peak pressure shall be equal to but not greater than the operating pressure.

4.7.3.5 Flexibility. Hose assemblies shall be subjected to testing in accordance with SAE-AS2078. Test fluid shall be water or fluid conforming to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257. Conformance shall be as specified in [3.5.3.5](#).

4.7.3.6 Stress degradation. Samples shall be subjected to stress degradation testing in accordance with SAE-AS2078 and shall meet the requirements in [3.5.3.6](#). The following details shall apply:

- a. The assembly shall be flushed with fluid conforming to MIL-PRF-680 or ASTM D471, reference fuel B, after the third cycle and prior to the drying process.
- b. At the completion of the effusion test, the hose assemblies shall be placed in a cold chamber for 8 hours while the temperature is maintained at $-65 \pm 2^{\circ}\text{F}$ ($-54 \pm 1.1^{\circ}\text{C}$).
- c. After 8 hours, fluid conforming to MIL-PRF-7808 and at $400 \pm 10^{\circ}\text{F}$ ($204.4 \pm 5.6^{\circ}\text{C}$) shall be circulated through the samples.
- d. Within 15 seconds after the introduction of the hot fluid, the pressure shall be increased to the applicable proof pressure specified in [table II](#) and held for at least 2 minutes.

4.7.3.7 Room temperature burst pressure. Samples shall be subjected to room temperature burst pressure testing in accordance with SAE-AS2078 and shall meet the requirements of [3.5.3.7](#). The following details shall apply:

- a. Using the applicable room temperature specified in [table II](#).
- b. The test fluid shall be MIL-PRF-5606 or fluid conforming to MIL-PRF-83282 or water.
- c. Samples shall be continuously observed for the duration of the test.
- d. The type of failure and the pressure at which failure occurred shall be recorded.

4.7.3.8 High temperature burst pressure. Samples shall be subjected to high temperature burst pressure testing in accordance with SAE-AS2078 and shall meet the requirements of [3.5.3.8](#). The following details shall apply:

- a. Use the applicable high temperature pressure specified in [table II](#).
- b. The test fluid shall be fluid conforming to MIL-PRF-83282.
- c. Samples shall be continuously observed for the duration of the test.
- d. The type of failure and the pressure at which failure occurred shall be recorded.

4.7.3.9 Low temperature flexibility. The following test specimens shall be subjected to low temperature flexibility testing in accordance with SAE-AS2078 and shall meet the requirements of [3.5.3.9](#). One unaged sample that was subjected to the proof pressure test (see [4.7.3.2](#)), one sample that was subjected to the stress degradation test (see [4.7.3.5](#)), and one sample that was subjected to the fuel resistance test (see [4.7.3.13](#)).

4.7.3.10 Vacuum. The three samples that were subjected to the low temperature flexibility (see [4.7.3.9](#)) shall be emptied then subjected to vacuum testing in accordance with SAE-AS2078 and shall meet the requirements of [3.5.3.10](#). The applicable ball diameter and negative pressure used for this test shall be as specified in [table IX](#).

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TABLE IX. Vacuum test conditions. 1/ 2/

| Size | Nominal ID inch (mm) | Ball diameter inch (mm) | Negative pressure in Hg (cm Hg) |
|------|-------------------------|----------------------------------|------------------------------------|
| 4 | .188 (4.48) | .125 - .132 (3.18 - 3.35) | 28 (71.1) |
| 5 | .250 (6.35) | .187 - .193 (4.75 - 4.90) | 28 (71.1) |
| 6 | .313 (7.95) | .250 - .255 (6.35 - 6.48) | 28 (71.1) |
| 8 | .406 (10.31) | .332 - .337 (8.43 - 8.56) | 28 (71.1) |
| 10 | .500 (12.70) | .421 - .426 (10.69 - 10.82) | 28 (71.1) |
| 12 | .625 (15.88) | .531 - .538 (13.49 - 13.67) | 20 (50.8) |
| 16Z | .875 (22.23) | .770 - .778 (19.56 - 19.76) | 14 (35.6) |
| 20Z | 1.125 (28.58) | .996 - 1.004 (25.30 - 25.50) | 10 (25.4) |
| 24Z | 1.375 (34.93) | 1.246 - 1.252 (31.65 - 31.80) | 8 (20.3) |

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

4.7.3.11 Volumetric expansion. One sample of size 4 and one sample of size 5, shall be tested in accordance with SAE-AS2078 except that the operating pressure used shall be at 1000 psi (6.89 MPa). Conformance shall be as specified in 3.5.3.11.

4.7.3.12 Leakage. Samples shall be leakage tested in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.12. The following details shall apply:

- a. Test fluid shall be water or fluid conforming to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257.
- b. Leakage shall be determined by wrapping a white paper towel tightly around the braids.

4.7.3.13 Fuel resistance. Samples shall be subjected to fuel resistance testing in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.13.

4.7.3.14 Corrosion. Samples shall be subjected to corrosion testing in accordance with and shall meet the requirements of 3.5.3.14. The following details shall apply:

- a. Samples, mounted in a vertical position and subjected to the applicable operating pressure specified in table III, shall be immersed for 5 minutes in a 2.5 % NaCl solution, by weight.
- b. They shall then be air-dried at 140°F ±10°F (60°C ±5.6°C) for 25 minutes.
- c. Continue this cycling for at least 172 hours while maintaining the specified pressure.
- d. Half of the samples shall then be subjected to the room temperature burst pressure test (see 4.7.3.7) while the remaining half shall be subjected to the high temperature burst pressure test (see 4.7.3.8).

4.7.3.15 Pneumatic leakage. Testing shall be in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.15.

4.7.3.16 Pneumatic effusion. Testing shall be in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.16.

4.7.3.17 Pneumatic surge. Testing shall be in accordance with SAE-AS2078 and shall meet the requirements of 3.5.3.17.

4.7.3.18 Cleanliness. Both ends of the hose length shall be visually inspected to determine if caps or plugs are installed and shall meet the requirements of 3.5.3.18.

5. PACKAGING

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

6. NOTES

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

6.1 Intended use. The hose covered by this specification is for high temperature aircraft and missile fuel, lube oil, coolant, hydraulic, ballistic and pneumatic systems requiring fire resistance. It is intended for use in high-temperature fuel, lubricating oil, water-alcohol, chemical-fluid, hydraulic and pneumatic systems that allow some gaseous effusion through the wall of the hose.

6.1.1 Military unique application. The hose covered by this specification is military unique when assembled with fittings qualified to MIL-DTL-27272. This hose assembly has the capability to maintain its operating pressure, as specified in table II, even under extreme temperature conditions ranging from - 65°F to 450°F.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. PIN (1.2)
- d. First article (see 4.5) or whether first article inspection is waived (see 6.3.1).
- c. Packaging requirements (see 5.1).

6.3 First article. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first article samples. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.3.1 Defense Logistics Agency (DLA) waiver of first article test. A waiver of a first article testing will only be considered by DLA when the contractor has delivered the same item within the last three years, has no unfavorable quality history, has not changed processes, or changed any subcontractors. DLA will not accept first article testing results outside the stated requirements.

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

6.5 Subject term (key word) listing.

- Conductive
- Fuel resistance
- High temperature
- Hydraulic systems
- Low temperature
- Pneumatic systems

CONCLUDING MATERIAL

Custodians:

- Army - AV
- Navy - AS
- Air Force - 99
- DLA - CC

Preparing activity:
DLA - CC

(Project 4720-2012-017)

Review activities:

- Army - AR, AT, EA, MI
- Navy - MC, SA, SH
- Air Force - 71

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