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INCH-POUND

MIL-DTL-26633F
3 October 2014
SUPERSEDING
MIL-DTL-26633E
17 January 2007

DETAIL SPECIFICATION

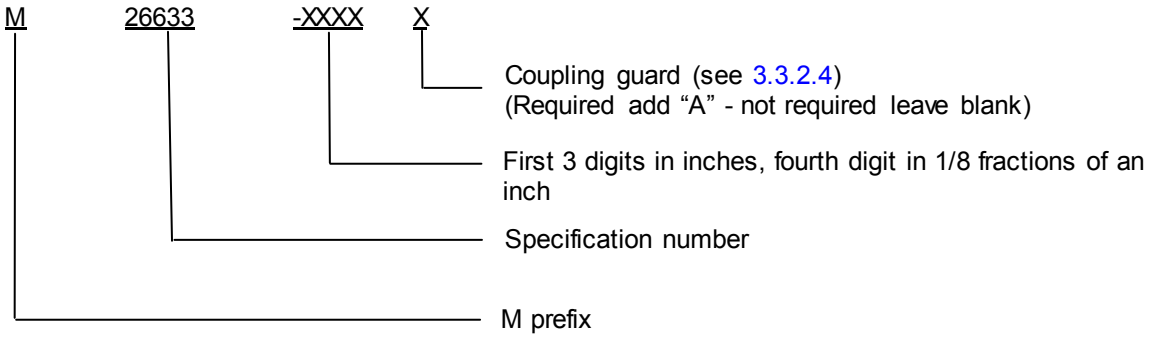
# HOSE ASSEMBLY, NONCONDUCTIVE, POLYTETRAFLUOROETHYLENE, OXYGEN

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

## 1. SCOPE

1.1 Scope. This specification covers one type of hose assembly, nonconductive, polytetrafluoroethylene, oxygen having a nominal working pressure of 3,000 psig (206.84 bar) in the operating temperature range from -65°F to +160°F (-53.89°C to 71.11°C).

1.2 Part or Identifying Number (PIN). The definitive specification PIN will be formatted to identify each item covered by this specification. The PIN format will consist of the letter M, specification number, length (in feet), and coupling guard (as required) as follows:




Example: M26633-9004A - 75 foot 1/2 inch length hose assembly with coupling guard.

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, Attn: 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.

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## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 of 4 of this specification. This section does not include documents 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 cited in sections 3 of 4 of this specification, whether or not they are listed.

2.2 Government documents.

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

DEPARTMENT OF DEFENSE STANDARDS

| | | |
|---|---|---|
| MIL-A-8625 | - | Anodic Coatings For Aluminum and Aluminum Alloys |
| MIL-DTL-8789 | - | Fitting End, Attachable, Hydraulic, High Pressure (3,000 psi), General Specification for |
| 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 |
| MS28760 | - | Fitting End, Attachable, Hydraulic and Pneumatic, High Pressure Hose (3,000 PSI) Flared Tube |
| AN818 | - | Nut, Tube Coupling, Short |

(Copies of these documents are available online at http://assist.daps.dla.mil or http://assist.daps.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.

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

| | | |
|---|---|---|
| NAS 847 | - | Caps and Plugs, Protective, Dust and Moisture Seal |

(Copies of these documents are available from www.aia-aerospace.com or Aerospace Industries Association, 1000 Wilson Blvd., Suite 1700, Arlington, Virginia, 22209-3901.)

ASTM INTERNATIONAL

| | | |
|---|---|---|
| ASTM D792 | - | Plastics, Specific Gravity and Density of, By Displacement |
| ASTM D2000 | - | Standard Classification System for Rubber Products in Automotive Applications SAE-J200 |
| ASTM G93 | - | Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment used in Oxygen-Enriched Environments |

(Copies of these documents are available from http://www.astm.org/ or ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, USA 19428-2959.)

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

| | | |
|---|---|---|
| ISO/IEC17025 | - | 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.)

SAE INTERNATIONAL

| | | |
|---|---|---|
| SAE-AMS2700 | - | Passivation of Corrosion Resistant Steels |
| SAE-AS611 | - | Hose Assembly and Tubing, Polytetrafluoroethylene, Cleaning Methods for |
| SAE-AS1339 | - | Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced, 3000 psi, 400 Degrees Lightweight, Hydraulic and Pneumatic |
| SAE-AS2078 | - | Test Methods, Hose Assemblies, Polytetrafluoroethylene (PTFE) |
| SAE-AS4395 | - | Fitting End, Flared Tube Connection, Design Standard |
| SAE-ARP1153 | - | Method for Determining Relative Specific Gravity Polytetrafluoroethylene Tubing |

(Copies of these documents are available online at http://www.sae.org or from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In 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 Qualification. The hose assemblies furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3).

3.2 Materials. Materials shall be as specified herein and in referenced specifications and standards and other referenced documents. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification. Materials shall be free of defects, which adversely affect performance of the finished product.

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

3.2.2 Rubber goods. Rubber goods utilized, such as seals, covers, friction layers, etc. shall be fabricated from rubber components conforming to ASTM D2000.

3.2.3 Other materials. Materials not otherwise specified shall conform to applicable specifications and to the requirements specified herein. All materials that are not specifically described shall be of the highest quality and suitable for the purpose intended. There shall be no presence of cadmium, titanium, magnesium, mercury, or beryllium (see 6.1.4).

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3.2.4 Fungus proof materials. Materials that are nutrients for fungi shall not be used where it is practical to avoid them.

3.3 Design and construction. The hose shall be constructed to meet the requirements specified herein and to retain the end fittings without slipping or leaking when tested as specified. The hose assembly shall be designed for a 99.5 percent purity gaseous oxygen working pressure of 3,000 psig (206.84 bar) and a minimum hydrostatic burst pressure of 12,000 psig (827.37 bar).

3.3.1 Hose construction. The oxygen hoses in this specification shall be non-conductive.

3.3.1.1 Hose. The hose shall consist of a PTFE tube, reinforcement, and outer cover.

3.3.1.2 PTFE inner tube. The PTFE inner tube shall be a seamless, uniform gage extrusion of virgin polytetrafluoroethylene resin (PTFE). It shall be compounded and processed to permit the least amount of effusion of compressed gases consistent with the requirements specified herein. The PTFE inner tube shall have a smooth bore, shall be free from pitting and other defects, and shall be cleaned to be free of dirt, foreign material, or mandrel lubricants. The tube shall be non-conductive and shall not contain carbon black. Carbon black can support combustion or explosion in an oxygen atmosphere; particularly in a "shock" condition.

3.3.1.3 Reinforcement. The reinforcement shall consist of one or more spirally wrapped or braided (or combination thereof) plies of stainless steel wires. Reinforcement separation materials, if used, shall permit gas effusion from the PTFE inner tube to escape to the atmosphere. There shall be no broken or spliced reinforcing wires nor shall any wires be omitted in any length of hose.

3.3.1.4 Outer cover. A cover at least .029 inch (0.74 mm) thick shall be furnished on the outside of the hose. The cover shall consist of an abrasion, oil, and ozone-resistant chloroprene polymer or equivalent synthetic material compound to meet the requirements specified herein. The cover need not be bonded to the outermost reinforcement ply, but shall not be free to slip or turn along the length of the hose. The cover shall permit gas that may effuse from the PTFE inner tube to escape to the atmosphere.

3.3.2 Dimensions and configuration.

3.3.2.1 Diameter. The inside and outside diameters of the hose shall be within the limits shown on figure 1.

3.3.2.2 Length. The hose assembly shall be furnished in lengths as specified by the procuring activity. The hose shall be measured as shown on figure 1.

3.3.2.3 End fittings. The end fittings shall conform to MS28760 (general configuration), and shall be made of stainless steel (socket material may be aluminum in accordance with MIL-DTL-8789), and shall mate with -5 fitting in accordance with SAE-AS4395. The swivel nut dimensions across flats shall conform to AN818 size -5. Provisions for wrenching by a hex or flats on the fitting body shall be optional. The nipple bore diameter shall conform to the limits shown on figure 1. The end fittings shall be designed for a working pressure of 3,000 psig (206.84 bar) and a minimum burst pressure of 16,000 psig (1103 bar). The end fittings shall be retained on the assembly without slipping or leaking when coupled to the hose and tested as specified.

3.3.2.3.1 Finish.

3.3.2.3.1.1 Corrosion resistant steel. Corrosion resistant steel shall be passivated in accordance with SAE-AMS2700.

3.3.2.3.1.2 Aluminum alloy. Anodic treatment, in accordance with MIL-A-8625, type II.

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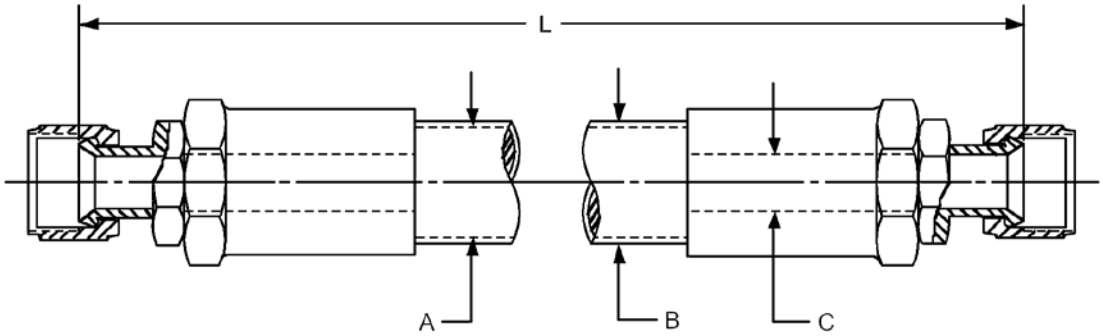
3.3.2.4 Coupling guard. When specified (see 6.2), a coupling guard shall be securely attached to each end of the hose assembly. The coupling guard shall protect the end portions of the hose assembly as necessary to minimize hose failure due to bending at or near the coupling.

3.3.3 Lubricants. With the exception of clean water, lubricants shall not be used in the assembly of hose components unless such lubricants have been specifically approved by the qualifying activity (see 6.1.2 and 6.1.3).




| End fitting to mate with | Hose dash size | Nominal OD of rigid tube (ref) | Hose ID minimum "A" | Hose OD maximum "B" | Coupling ID minimum "C" | Hose minimum inside bend radius |
|---|---|---|---|---|---|---|
| MS33656-5 | -4 | .250 (6.35 mm) | .212 (5.38 mm) | .703 (17.86 mm) | .109 (2.77 mm) | 3.250 (82.55 mm) |

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Tolerances: Length L:

| | |
|---|---|
| L under 24 inches (61 cm) | ± .125 (3.18 mm) |
| L from 24 to 36 inches (61 to 91 cm) | ± .250 (6.35 mm) |
| L from 36 to 50 inches (91 to 127 cm) | ± .500 (12.70 mm) |
| L over 50 inches (127 cm) | ± 1 percent |

FIGURE 1. Hose assembly details and length.

3.4 Performance.

3.4.1 Performance tests on PTFE inner tube.

3.4.1.1 Density and relative density. When tested in accordance with 4.8.2.1, the PTFE inner tube specific gravity shall not exceed 2.155 apparent and 2.210 relative.

3.4.1.2 Tensile and elongation. When tested In accordance with 4.8.2.2, the tensile strength shall be a minimum of 2200 psi (16.17 MPa) and the elongation shall be a minimum of 200%.

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3.4.1.3 Tube rolling. When tested In accordance with 4.8.2.3, the PTFE inner tube shall meet the gap dimensions for rolling requirements in accordance with SAE-AS2078 for size 04. The PTFE inner tube shall not leak, split, burst, or show any evidence of failure.

3.4.1.4 Tube proof pressure. The tube without any reinforcing wires shall not leak, burst, or show any evidence of permanent deformation when tested in accordance with 4.8.2.4.

3.4.2 Hose and hose assembly.

3.4.3 Proof. When tested In accordance with 4.8.4, the hose assembly shall show no indication of leakage, distortion, or other defects.

3.4.4 Leakage. When tested In accordance with 4.8.5, the hose assembly shall show no indication of pressure loss. The minimum room temperature burst pressure shall be 16,000 psig (827.37 bar).

3.4.5 Stress degradation. The air leakage rate, when tested in accordance with 4.8.6, from the hose and two end fittings when held at 3000 psig (206.84 bar) after the stress degradation test shall not exceed 2.0cm$^3$/in/min.

3.4.6 Elongation and contraction. When tested In accordance with 4.8.7, the hose assembly shall withstand 3,000 psig (206.84 bar) without a change in its free length greater than ±2 percent.

3.4.7 Burst. Four hose assemblies shall be burst tested, 2 at room temperature (see 3.4.7.1) and 2 at high temperature (see 3.4.7.2).

3.4.7.1 Room temperature burst pressure test. When tested in accordance with 4.8.8, the hose assembly shall withstand 16,000 psig (1103.16 bar) minimum without bursting.

3.4.7.2 High temperature burst pressure test. When tested in accordance with 4.8.8, the hose assembly shall withstand 12,000 psig (413.69 bar) minimum without bursting.

3.4.8 Impulse. When tested in accordance with 4.8.9, using a minimum bend radius of 3.250 inch (82.55 mm), the hose assembly shall show no indication of cracking, splitting, distortion, or leakage.

3.4.9 Tensile strength. The hose assembly when tested in accordance with 4.8.10 shall withstand a tensile pull of 1,000 pounds (453.59 kg).

3.4.10 Overtightening torque. The end fittings, specified in 3.3.2.3, when tested in accordance with 4.8.11 shall withstand an overtightening torque of 315 pound-inches (35.59 N m).

3.5 Identification of the product. For hose lengths under 4 feet (1.22 m) each hose assembly shall be identified by a permanently attached snug-fitting aluminum or stainless steel band around the hose near the end fitting. Hose assemblies 4 feet (1.22 m) and greater in length, a band shall be attached near each end fitting of the assembly. The metal band shall be marked in raised, etched, or stamped lettering shall contain the following information appropriately identified:

a. Unique serial number.
b. Date of hose assembly manufacture expressed in month and year.
c. The rated working pressure in PSI, followed by the word “OXYGEN”.
d. Hose assembly manufacturer’s commercial and government entity (CAGE).
e. Hose manufacturer’s CAGE if different from hose assembly manufacturer.
f. Specification PIN (see 1.2).

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3.6 Cleaning instructions.

3.6.1 General cleaning instructions. Prior to and during assembly, metal chips, hose cuttings, and other foreign material shall be removed during and after final assembly. Hose assembly components shall be cleaned in accordance with the highest commercial standards. Precautions shall be used during handling and assembly to preclude contamination of component parts. Final assembly and inspection shall be done in a laminar-airflow clean work area whenever possible. Following completion of fabrication and assembly operations, the hose assembly shall be thoroughly cleaned, see 3.6.2. The hose assembly shall not be adversely affected by the cleaning method or procedures. The organization performing the cleaning services shall have responsibility for all safety aspects of oxygen cleaning procedures. Guidance for safe procedures can be found in ASTM G93.

3.6.2 Cleaning requirements. The hose assembly shall be cleaned in accordance with SAE-AS611 class II to assure compatibility with 99.5 percent purity oxygen at a pressure of 3,000 psig (206.84 bar) and compliance with the cleaning effectiveness requirements of 4.8.12.

3.6.3 Pre-packaging. Immediately after cleaning and drying In accordance with 3.6.2, the end fittings of each hose shall be capped or plugged with closures conforming to NAS 847. Handling and packaging shall be in accordance with SAE-AS611, class II.

3.6.4 Coiling of hose assembly. Each hose assembly shall be coiled with a diameter not less than 10 inches.

3.7 Workmanship. All hose and hose assemblies shall be manufactured and processed in such a manner as to be uniform in quality and shall be free from foreign material and other defects that will affect life, serviceability, strength, assembly or durability see table I. Workmanship shall be such as to enable the hose and hose assemblies to meet the applicable performance requirements of this specification.

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TABLE I. Workmanship defects.

| Defect | Inspection | Reference |
|---|---|---|
| Dimensions affecting interchangeability not within tolerance | Standard inspection equipment (SIE) | 3.3.2.3 and 4.8.1 |
| Hose inside diameter at fitting junction out of tolerance | SIE (hose assembly only) | 3.3.2.1 |
| Under gage cover area | Visual | 3.3.1.4 |
| Depressed area, groove longitudinal corrugations (exceeding specified tolerance) | Visual | N/A |
| Ridge on tube - Severe | SIE | N/A |
| Bunching of tube - Severe | SIE | N/A |
| Loose tube | SIE | N/A |
| Off center -under gage cover | SIE | N/A |
| Hole in tube | SIE | N/A |
| Restriction in the tube | SIE | N/A |
| Nad lap or delamination of tube | SIE | N/A |
| Reinforcement through tube | SIE | N/A |
| Broken or spliced reinforcing wires | Visual | 3.3.1.3 |
| Reinforcement through cover | Visual | N/A |
| Poorly patched cover | Visual | N/A |
| Blistered or loose, patch on cover | Visual | N/A |
| Poor coverlap, opening or lack of adhesion | Visual | N/A |
| Cover missing | Visual | N/A |
| Loose cover (wrinkles when bent) | Visual | N/A |
| Exposed reinforcement braid | Visual | N/A |
| Split, slit or break in cover | Visual | N/A |
| Blister under cover | Visual | N/A |
| Misbranding | Visual | 3.5 |
| Bulge behind the coupling | Visual | N/A |
| Cocked couplings | Visual | N/A |
| Cracked couplings | Visual | N/A |
| Freedom of swivels | Visual | N/A |
| Rusted couplings | Visual | N/A |
| Protective caps or plugs | Visual | N/A |
| Internal contaminants | SIE | N/A |

## 4. VERIFICATION

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

a. Qualification inspection (see 4.4).

b. Conformance inspection (see 4.5).

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in SAE-AS611, SAE-AS2078, 4.8.10, and 4.8.11.

4.2.1 Testing conditions. Unless otherwise specified, room temperature shall be defined as 60°F to 90°F (15.56°C to 32.22°C).

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4.2.2 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 by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment (i.e. Industry Standard and Military Standard) shall be in accordance with ISO/IEC17025 or equivalent.

4.3 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.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the qualifying activity on sample units produced with equipment and procedures used in production. Qualification inspection shall be performed on hose and hose assemblies.

4.4.1 Test plans and qualification reports.

4.4.1.1 Test plans. Test plans shall be prepared and submitted in accordance with the requirements of the qualification activity. The method of qualification proposed by the contractor is subject to the approval of the qualification activity. Manufacturers shall discuss with the qualifying activity the test specimens and test plans. These plans shall state specifically the component requirement to be verified during the test, such as test fixtures, setup, conditions, and identification of the previous failure criteria shall be included as appropriate.

4.4.1.2 Qualification reports. Qualification reports shall be submitted in accordance with requirements of the qualifying activity. As a minimum manufacturers shall submit a report identifying test specimens, and test results.

4.4.3 Samples for qualification. Samples for qualification shall be representative of the products proposed to be furnished to the Government. Samples shall be of one type and nominal size of hose and shall be of the quantity and lengths specified in the applicable test method.

4.4.3.1 Air aging. Air aged samples shall be kept in air at a temperature of +160°F (71.11°C) for seven days.

4.4.3.2. Qualification sampling. Ten hose assemblies, 24 ±6 inches (60.91 ±15.24 cm) long, shall be fabricated from random samples of bulk hose and end fittings using production processes and procedures. These hoses shall be subjected to the qualification tests. Samples for tensile and burst tests may be reduced to 18 ±6 inches (45.72 ± 15.24 cm) long if necessary because of test equipment limitations.

4.4.4 Inspection routine. The samples shall be subjected to the qualification inspections and tests specified in table II. Allocation of test samples and testing shall be specified in table III. Test sequence, besides examination of product, configuration, and cleanliness is at manufacturer’s discretion.

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TABLE II. Qualification inspection and tests.

| Test | Requirement paragraph | Inspection paragraph |
|---|---|---|
| PTFE inner tubes | | |
| Density and relative density 1/ | 3.4.1.1 | 4.8.2.1 |
| Tensile test and elongation | 3.4.1.2 | 4.8.2.2 |
| Tube rolling | 3.4.1.3 | 4.8.2.3 |
| Tube proof pressure | 3.4.1.4 | 4.8.2.4 |
| Hose assembly | | |
| Examination of products | 3.3, 3.3.2, 3.5, and 3.7 | 4.8.1 |
| Configuration | 3.3.2.3 | 4.8.1 |
| Cleanliness | 3.6.2 | 4.8.12 |
| Proof pressure | 3.4.3 | 4.8.4 |
| Leakage | 3.4.4 | 4.8.5 |
| Stress degradation 2/ | 3.4.5 | 4.8.6 |
| Elongation and contraction | 3.4.6 | 4.8.7 |
| Burst pressure | 3.4.7 | 4.8.8 |
| Room temperature burst pressure | 3.4.7.1 | 4.8.8 |
| High temperature burst pressure | 3.4.7.2 | 4.8.8 |
| Impulse 3/ | 3.4.8 | 4.8.9 |
| Tensile strength | 3.4.9 | 4.8.10 |
| Overtightening torque | 3.4.10 | 4.8.11 |

1/ A representative cross sections of the PTFE tube (see SAE-ARP1153 and ASTM D792).

2/ Stress degradation (qualification test) - This test may be qualified due to similarity to hose assemblies qualified and tested in accordance with SAE-AS1339, with the approval of the qualifying activity.

3/ Impulse (qualification test) - This test may be qualified due to similarity to hose assemblies qualified and tested in accordance with SAE-AS1339, with the approval of the qualifying activity.

TABLE III. Qualification inspection requirements.

| Test | Sample number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Examination of product | X | X | X | X | X | X | X | X | X | X |
| Configuration | X | X | X | X | X | X | X | X | X | X |
| Cleanliness | X | X | | | | | | | | |
| Proof pressure test | X | X | X | X | X | X | X | X | X | X |
| Leakage test | X | X | X | X | X | X | X | X | X | X |
| Elongation and contraction | X | X | | | | | | | | |
| Tensile strength | | | X | X | X | X | | | | |
| Burst pressure (room temperature) | | | X | X | | | | | | |
| Burst pressure (high temperature) | | | | | X | X | | | | |
| Overtightening torque | X | X | | | | | | | | |
| Stress degradation | | | | | | | X | X | | |
| Impulse | | | | | | | | | X | X |

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4.4.5 Failures. One or more failures shall be cause for refusal to grant qualification.

4.5 Conformance inspections.

4.5.1. Individual inspection. Individual inspection shall consist of the inspections specified in table IV in the order shown.

TABLE IV. Individual inspections. 1/

| Test | Requirement paragraph | Inspection paragraph | Number of samples |
|---|---|---|---|
| Examination of products | 3.3, 3.3.2, 3.5, and 3.7 | 4.8.1 | 100% |
| Configuration | 3.3.2.3 | 4.8.1 | 100% |
| Cleanliness | 3.6.2 | 4.8.12 | SAE-AS611 |
| Proof pressure | 3.4.3 | 4.8.4 | 100% |

1/ All nonconforming items shall be removed and not supplied to this specification.

4.6 Sampling and periodic inspection. Sampling and periodic inspections shall consist of the inspections specified in table V.

4.6.1 Sampling inspection samples. Samples shall be randomly selected from hose assemblies that have been subjected to and passed all the applicable individual inspections. Note: Cleanliness inspection is performed on a sampling basis and it is understood that samples may or may not have been subjected to this inspection.

4.6.1.1 Number of sampling hose assembly samples. For each size manufactured under essentially the same conditions, sampling control testing shall be performed on either eight (8) samples from every 3,000 hose assemblies produced (large lot option) or 1 sample from every 375 hose assemblies. If there has been some production but the number of hose assemblies produced has not reached 375 for a specific size within three years, the manufacturer shall perform sampling control tests on 1 hose assemblies of that size unless documented approval has been obtained from the qualifying activity. Required sampling tests at the hose assembly or fitting level that were already performed at the bulk hose level may be eliminated if documented approval has been obtained from the qualifying activity. Sampling samples may be subjected to more than one sampling test at the discretion of the manufacturer. However, the manufacturer assumes the risk that the effect of one test will not have a detrimental impact on the following test.

4.6.1.2 Sampling hose assembly samples. Hose assemblies shall be fabricated using the same manufacturing techniques, processes, and procedures used to supply hose assemblies to this specification. The hose assembly samples shall be 18 ±6 inches (45.72 ± 15.24 cm) long. The hose assemblies shall be tested in accordance with the individual inspections in table III, except cleanliness, and then subjected to the sampling testing in table V.

4.6.2 Sampling inspection nonconformance. If a sample fails to pass any sampling inspection, see table IV, the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure. The manufacturer shall take corrective action on the materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken.

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4.6.3 Periodic inspection samples.

4.6.3.1 Number of periodic hose assembly samples. For each size manufactured under essentially the same conditions, periodic control testing shall be performed on either four (4) samples from every 10,000 hose assemblies produced (large lot option) or 1 sample from every 2,500 hose assemblies. If there has been some production but the number hose assemblies produced has not reached 2,500 for a specific size within three years, the manufacturer shall perform periodic control tests on 1 hose assemblies of that size unless documented approval has been obtained from the qualifying activity. Required periodic control tests at the hose assembly or fitting level that were already performed at the bulk hose level may be eliminated if documented approval has been obtained from the qualifying activity. Periodic samples may be subjected to more than one periodic test at the discretion of the manufacturer. However, the manufacturer assumes the risk that the effect of one test will not have a detrimental impact on the following test.

4.6.3.2 Periodic hose assembly samples. Hose assemblies shall be fabricated using the same manufacturing techniques, processes, and procedures used to supply hose assemblies to this specification. The hose assembly samples shall be 18 ±6 inches (45.72 ± 15.24 cm) long. The hose assemblies shall be tested in accordance with the individual inspections in table III, except cleanliness, and then subjected to the periodic testing in table V.

TABLE V. Sampling and periodic testing.

| Test | Requirement paragraph | Inspection paragraph | Sampling | Periodic |
|---|---|---|---|---|
| Test on PTFE inner tube | | | | |
| Density and relative density | 3.4.1.1 | 4.8.2.1 | | X |
| Tensile test and elongation | 3.4.1.2 | 4.8.2.2 | | X |
| Hose and hose assembly tests | | | | |
| Leakage | 3.4.4 | 4.8.5 | X | |
| Burst | 3.4.7 | 4.8.8 | X | |
| Elongation and contraction | 3.4.6 | 4.8.7 | X | |
| Impulse 1/ | 3.4.8 | 4.8.9 | | X |
| Stress degradation 2/ | 3.4.5 | 4.8.6 | | X |
| Tensile strength | 3.4.9 | 4.8.10 | | X |

1/ Impulse (periodic test) - The production count of MIL-DTL-26633 assemblies, and the production count for SAE-AS1339 assemblies, may be combined due to similarity (instead of maintaining independent counts), for the purpose of determining when the periodic test is due, with the approval of the qualifying activity. The actual test may be performed on either type of hose assembly.

2/ Stress degradation (periodic test) - The production count of MIL-DTL-26633 assemblies, and the production count for SAE-AS1339 assemblies, may be combined due to similarity (instead of maintaining independent counts), for the purpose of determining when the periodic test is due, with the approval of the qualifying activity. The actual test may be performed on either type of hose assembly.

4.6.4 Periodic nonconformance. If a sample fails to pass any periodic inspection, see table V, the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure. The manufacturer shall take corrective action on the materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken.

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4.7 Additional QPL test and reporting requirements.

4.7.1 Retention of qualification. To retain qualification, the manufacturer shall submit a test report to the qualifying activity at 12 month intervals. The qualifying activity shall establish the initial reporting date. Each report shall consist of a summary of test and inspection results required by this specification that were performed during the 12 month reporting interval. As a minimum, the report shall include the following:

a. Number of lots produced and tested, including lot and sample sizes for each lot.
b. Identify which tests were performed.
c. Quantities passed.
d. Quantities failed.
e. All reworked sampling lots shall be accounted for and identified. A summary of corrective action taken shall be included.

4.7.2 Loss of product qualification.

4.7.2.1 Failure to meet test requirements. The manufacturer shall immediately notify the qualifying activity at any time during the 12-month reporting period when the qualified product fails to meet the test and inspection requirements of this specification. The manufacturer shall identify and indicate what corrective action will be taken to correct the problem. Failure to take corrective action acceptable to the qualifying activity may result in removal of the product from the QPL.

4.7.2.2 Failure to submit summary test data report. Failure to submit a test report within 30 days after the end of the 12 month reporting period may result in removal of qualification for the product.

4.7.2.3 Change to manufacturing process, materials or equipment. The manufacturer shall notify the qualifying activity, in writing, of any changes in the manufacturing process, materials, or equipment used to manufacture a QPL product. Subsequently, the qualifying activity will notify the manufacturer, in writing, if a full re-qualification, partial re-qualification, or no additional testing is required as a result of these changes.

4.7.2.4 No production during reporting period. When no production occurs during the reporting period, a report shall be submitted to the qualifying activity certifying that the manufacturer still has the capability and facilities necessary to produce the QPL product. If during two consecutive 12 month reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit QPL products to a full qualification inspection in accordance with this specification.

4.7.3 Hose assembly distributor. Hose assembly distributor must be listed on, or approved for listing on, the applicable qualified products list. The qualified hose manufacturer shall certify that the hose assembly distributor is approved for the distribution of the manufacturer's parts. The hose assembly distributor shall use only products supplied by the qualified hose manufacturer. No testing other than configuration examination is required of certified products obtained from the qualified hose assembly manufacturer, except when there is cause for rejection. All assemblies produced at the hose assembly distributor's plant shall be subjected to individual inspection (see table III) to assure that the assembly process conforms to that established at the qualified manufacturing plant. Quality control requirements, including Government inspection surveillance, shall be the same as required for the qualified hose manufacturer. Any subsequent changes regarding the sources of a hose or hose's used in a qualified assembly shall be approved by the qualifying activity.

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4.8 Test methods.

4.8.1 Examination of the product. The hose assembly shall be visually examined to determine compliance with the requirements specified for materials, workmanship, dimensions, design and construction, and marking.

4.8.1.1 Hose dimension inspection. The hose shall be checked to determine compliance with the dimension requirements specified on figure 1. A hose found to exceed the tolerance limits specified shall be cause for rejection.

4.8.1.2 Fitting dimensions inspection. The hose assembly, with end fittings attached, shall be checked to determine compliance with the end fitting dimension requirements specified on figure 1. A hose assembly having end fittings outside the tolerance limits specified shall be cause for rejection.

4.8.2 Tests on PTFE inner tubes.

4.8.2.1 Density and relative density (see 3.4.1.1). When tested in accordance with SAE-AS2078 the specific gravity of the PTFE tube shall meet the requirements of 3.4.1.1.

4.8.2.2 Tensile and Elongation (see 3.4.1.2). The inner PTFE tube when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.1.2.

4.8.2.3 Tube rolling (see 3.4.1.3). The inner PTFE tube when tested in accordance with SAE-AS2078, for size 04, shall meet the requirements of 3.4.1.3.

4.8.2.4 Tube proof pressure (see 3.4.1.4). The inner PTFE tube when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.1.4. The following details shall apply:

a. PTFE tube for size 04 (proof pressure of PTFE inner tube - minimum 3000 and higher psig).
b. An alkaline wetting agent may be added to the water bath to assist in defining the leakage.
c. Minimum testing time should be one minute.

4.8.3 Hose and hose.

4.8.4 Proof pressure (see 3.4.3). All the hose assemblies shall be proof pressure tested in accordance with SAE-AS2078 and shall meet the requirements of 3.4.3. The following details shall apply:

a. All the hose assemblies shall be subjected to 6,000 psig (413.69 bar).
b. Each hose assembly shall be tested twice.
   (1) Once as a hydrostatic test.
   (2) Once with gas under water.

4.8.5 Leakage (see 3.4.4). The hose assembly when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.4.

4.8.6 Stress degradation (see 3.4.5). The hose assembly when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.5, except hydraulic fluid may be in accordance with MIL-PRF-87257 or MIL-PRF-83282.

4.8.7 Elongation and contraction (see 3.4.6). The hose assembly when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.6.

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4.8.8 Burst (see 3.4.7). The hose assembly when tested in accordance with SAE-AS2078 shall meet the requirements of 3.4.7.

4.8.9 Impulse (see 3.4.8). Test in accordance with SAE-AS2078. The following details shall apply:

a. The hose assembly shall be fixed in a semicircular position with the longitudinal axes of the end fittings parallel.
b. The hose assembly shall be visually examined, and then subjected to the leakage test specified in 4.8.5.

4.8.10 Tensile strength (see 3.4.9). Hose assemblies when subjected to the tensile strength assembly test shall meet the requirements of 3.4.9. The following details shall apply:

a. The hose assembly shall be placed in a straight position and pressurized to 3,000 psig (206.84 bar) using a suitable liquid.
b. While pressurized, the hose shall be pulled by the end fittings to 1,000 pounds (453.59 kg) tensile pull at the rate of 1 inch (2.54 mm) per minute.
c. Any failure below 1,000 pounds (453.59 kg) pull shall be cause for rejection (see 3.4.9).

4.8.11 Overtightening torque (see 3.4.10). Hose assemblies when subjected to overtightening torque testing shall meet the requirements of 3.4.10. The following details shall apply:

a. The flared end fittings of the hose assembly shall be assembled on a fitting of steel construction in accordance with SAE-AS4395.
b. The fitting shall be tightened to an over tightening torque of 315 pound-inches (35.59 N m) and loosened.
c. The tightening and loosening sequence shall be repeated until a total of not less than 15 cycles have been performed.
d. The end fittings shall then be removed and examined for damage.
e Evidence of failure, thread damage, or deformation of the end fitting assembly, or binding or difficulty in turning the swivel nut on the nipple by hand, shall be cause for rejection.

4.8.12 Cleaning effectiveness (see 3.6.2). Cleaning effectiveness shall be in accordance with SAE-AS611 class II (quality assurance provisions). If a hose assembly fails any part of the quality assurance inspections the entire lot shall be rejected. If the lot is rejected, the hose assemblies shall be recleaned in accordance with 3.6 and a new sample taken for compliance with this test. If the test shows the cleaning methods to be satisfactory, the hose assemblies shall be cleaned in accordance with SAE-AS611, class II and preserved and packaged with the remainder of the lot.

## 5. PACKAGING

5.1 Packaging requirements. 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.

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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 assembly covered by this specification is intended for use as a servicing hose on aerospace ground servicing equipment. The use is military unique in its intended application the hose assembly will be used in charging aerospace vehicle breathing oxygen systems and must be able to operate satisfactory with a nominal working pressure of 3,000 psig (206.84 bar) at temperatures ranging from -65°F to +160°F (-53.89°C to 71.11°C).

6.1.1 Oxygen system cleanliness needs. This specification does not specify cleanliness levels. Users are cautioned that the hose assembly should be cleaned to their requirements before installing in any equipment. Only qualified technical personnel with knowledge for the selection of cleaning methods for oxygen rich environments should make the determination as to what cleanliness level is acceptable for their application.

6.1.2 Cleaning a component or system for oxygen service. Cleaning a component or system for oxygen service involves the removal of combustible contaminants, including the surface residue from manufacturing, hot work, and assembly operations, as well as the removal of all cleaning agents. These cleaning agents and contaminants include solvents, acids, alkalis, water, moisture, corrosion products, non-compatible thread lubricants, filings, dirt, scale, slag, weld splatter, organic material (such as oil, grease, crayon, and paint), lint, and other foreign materials. Injurious contaminants can be removed by cleaning all parts and maintaining this condition during construction; by completely cleaning the system after construction; or by a combination of the two. The prevention of recontamination before final assembly, installation, and use is essential to safe oxygen system operation.

6.1.3 Potential ignition energy mechanisms. Safe use of oxygen requires the control of potential ignition energy mechanisms within oxygen systems by maintaining scrupulously clean systems. Cleanliness (contamination control) is critical in oxygen components and systems. Contamination can cause ignition of components or systems by a variety of mechanisms, such as particle impact, mechanical or pneumatic impact, or spontaneous ignition. In an oxygen environment, contaminants increase the ignitability of both metallic and nonmetallic materials.

6.1.4 Restricted materials.

a. Cadmium: The toxicity and vapor pressure of cadmium restrict its use.

b. Titanium: Titanium metal is not be used with liquid oxygen at any pressure or with gaseous oxygen or air at oxygen partial pressures above 30 psig. Titanium and its alloys are impact sensitive in oxygen.

c. Magnesium: Magnesium metal is not be used in oxygen systems. In addition, its alloys are not to be used except in areas with minimal exposure to corrosive environments. Reactivity with halogenated compounds constrains its use with lubricants containing chlorine and fluorine.

d. Mercury: Mercury is not be used in oxygen systems in any form because it is toxic; in addition, it and its compounds can cause accelerated stress cracking of aluminum and titanium alloys.

e. Beryllium: Beryllium and its oxides and salts are highly toxic and, therefore, they are not be used in oxygen systems or near oxygen systems where they could be consumed in a fire.

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6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. The complete PIN (see 1.2 and 3.5).

d. Level of preservation, packaging, and marking required (see section 5).

6.2.1 Supplier's responsibility. This specification does not preclude the supplier's responsibility for providing a product that meets the system performance requirements and acceptability for oxygen use. It is considered to be an integral part of the purchase agreement between the vendor and the procuring agency

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contact, qualified for inclusion in Qualified Products List QPL No. 26633 whether or not such products have actually been so listed by that date. The attention of contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, P.O. Box 3990, ATTN: DSCC-VQ, Columbus, Ohio 43218-3990 or emailed to vqp.chief@dla.mil.

6.3.1 Provisions governing qualification (SD-6). Copies of "Provisions Governing Qualification" are available online at http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

6.3.2 QPL hose assembly manufacturer. An assembler must be on the QPL in order to assemble a QPL hose assembly. An assembler may not obtain the components from a QPL source and then assemble it themselves and consider it a QPL item.

6.4 Reliability requirements. Reliability requirement have been removed due to insufficient utility.

6.5 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table VI lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these material should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

TABLE VI. EPA top seventeen hazardous materials.

| | | |
|---|---|---|
| Benzene | Dichloromethane | Tetrachloroethylene |
| Cadmium and compounds | Lead and compounds | Toluene |
| Carbon Tetrachloride | Mercury and compounds | 1,1,1 - Trichloroethane |
| Chloroform | Methyl Ethyl compounds | Trichloroethylene |
| Chromium and compounds | Methyl Isobutyl Ketone | Xylenes |
| Cyanide and compounds | Nickel and compounds | |

6.6 Subject term (key word) listing.

Breathing
Ground support
High pressure

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6.7 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

CONCLUDING MATERIAL

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

Review activities
Navy - CG, MC, SA, SH
Air Force - 71

Preparing activity:
DLA - CC

(Project 4720-2014-031)

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 http://assist.dla.mil.