AEROSPACE STANDARD

AS4623™	REV. E

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Superseding AS4623D

(R) Hose Assembly, Polytetrafluoroethylene, Para-Aramid Reinforced, 3,000 psi, 275 °F, Heavy Duty, Aircraft Hydraulic Systems

RATIONALE

Add Parts Standards to 2.1.7.

1. SCOPE

This document defines the requirements for heavy-duty polytetrafluoroethylene (PTFE) lined, para-aramid reinforced, hose assembly suitable for use in 275 °F, 3,000 psi aircraft systems where rapid rate pulsing and torsional/longitudinal flexing may occur in addition to normal hydraulic system loading. Size -16 and -20 are limited to +225 °F service.

2. REFERENCES

2.1 Applicable Documents

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

2.1.1 SAE Publications

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

AMS2486	Conversion Coating of Titanium Alloys, Fluoride-Phosphate Type
AMS4928	Titanium Alloy Bars, Wire, Forgings, Rings, and Drawn Shapes, 6AI - 4V, Annealed
AMS4945	Titanium Alloy Tubing, Seamless, Hydraulic, 3AI - 2.5V, Controlled Contractile Strain Ratio, Cold Worked, Stress Relieved
AMS4965	Titanium Alloy, Bars, Wire, Forgings, and Rings, 6.0AI - 4.0V, Solution Heat Treated and Aged

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS4623E

AMS5556	Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18Cr - 11Ni - 0.70Cb (SAE 30347) Solution Heat Treated
AMS5557	Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18.5Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated
AMS5567	Steel, Corrosion Resistant, Seamless or Welded Hydraulic Tubing, 19Cr - 10Ni (SAE 30304) Solution Heat Treated
AMS5570	Steel, Corrosion and Heat-Resistant, Seamless Tubing, 18Cr - 11Ni - 0.40Ti (321) Solution Heat Treated
AMS5571	Steel, Corrosion and Heat-Resistant, Seamless Tubing, 18Cr - 10.5Ni - 0.70Cb (Nb) (347) Solution Heat Treated
AMS5575	Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.70Cb (Nb) (347) Solution Heat Treated
AMS5576	Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated
AMS5636	Steel, Corrosion-Resistant, Bars and Wire, 18Cr - 9.0Ni (SAE 30302) Solution Heat Treated and Cold Drawn, 100 ksi (689 MPa) Tensile Strength
AMS5637	Steel, Corrosion Resistant, Bars and Wire, 18Cr - 9.0Ni (SAE 30302) Solution Heat Treated, Cold Drawn and Stress Relieved, 125 ksi (862 MPa) Tensile Strength
AMS5639	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 19Cr - 10Ni, Solution Heat Treated
AMS5643	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 16Cr - 4.0Ni - 0.30Cb (Nb) - 4.0Cu, Solution Heat Treated, Precipitation Hardenable
AMS5644	Steel, Bars and Forgings, Corrosion Resistant, 17Cr - 7Ni - 1Al
AMS5645	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings, 18Cr - 10Ni - 0.40Ti (321) Solution Heat Treated
AMS5646	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 18Cr - 11Ni - 0.60Cb (Nb) (347) Solution Heat Treated
AMS5647	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 19Cr - 9.5Ni, Solution Heat Treated
AMS5659	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Rings, and Extrusions, 15Cr - 4.5Ni - 0.30Cb (Nb) - 3.5Cu
AMS5743	Steel, Corrosion and Heat-Resistant, Bars and Forgings, 15.5Cr - 4.5Ni - 2.9Mo - 0.10N, Solution Heat Treated, Sub-Zero Cooled, Equalized, and Over-Tempered
AMS2700	Passivation of Corrosion Resistant Steels
AMS-QQ-S-763	Steel, Corrosion Resistant, Bars, Wire, Shapes, and Forgings
AS150	Hose Assembly, Type Classification of, Basic Performance and Fire Resistance
ARP603	Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies
AS611	Hose Assembly and Tubing, Polytetrafluoroethylene, Cleaning Methods for

ARP908 Torque Requirements, Installation and Qualification Test, Hose and Tube Fitting

AS1055 Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components

AS1072 Sleeve, Hose Assembly, Fire Protection

AS1073 Sleeve Hose Assembly, Heat Shrinkable

AIR1228 Standard Impulse Machine Equipment and Operation

AS1241 Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft

ARP1835 Preparation for Delivery, General Requirements for Hose Assemblies

AS2078 Test Methods, Hose Assemblies, Polytetrafluoroethylene (PTFE)

AS4265 Impulse Testing of Hydraulic Tubing and Fittings, S-N Curve

AS4375 Fitting End, Flareless, Design Standard

AS4395 Fitting End, Flared, Tube ConnectionDesign Standard

AS4488 Tubular Assemblies, Fusion Welded, Inspection Processes and Acceptance Standards For

AS4658 Fitting End, External Thread, Short Flareless, Design Standard

AS5272 Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting, Procurement Specification

AS7003 Nadcap Program Requirements

AS7112 National Aerospace and Defense Contractors Accreditation Program Requirements for Fluid System Components

AS8879 Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter

AS33514 Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal

AS85421 Fittings, Tube, Fluid Systems, Separable, Beam Seal, 3000/4000 psi, General Specification For

AS85421/1 Fitting End, Standard Dimensions for Dynamic Beam Seal, Male

2.1.2 ASTM Publications

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

ASTM A262 Detecting Susceptibility to Intergranular Attack on Stainless Steel

ASTM B348 Specification for Titanium and Titanium Alloy Bars and Billets, Grade 2

2.1.3 U.S. Government Publications

Copies of these documents are available online at http://quicksearch.dla.mil.

MIL-PRF-680 Dry Cleaning Solvent

MIL-PRF-5606 Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordinance

MIL-HDBK-831 Preparation of Test Reports

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

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

2.1.4 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

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

NAS 1760 Fitting End, Flareless Acorn, Standard Dimensions for

2.1.5 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B46.1 Surface Texture

ASME Y14.100/ASME Y14.24/ASME Y14.35M Engineering Drawings

2.1.6 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel 724-772-1616, www.pri-network.org.

PD2001 Qualified Product Management Council Procedures for Qualified Products Group

PD2101 Aerospace Quality Assurance, Product Standard, Qualification Procedures, Fluid Systems

2.1.7 Hose Assembly Parts Standards

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org. The hose assembly parts standards applicable to this procurement standard include:

AS4624 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless Titanium Fittings, Including Jump Size, Straight to Straight

AS4625 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless Titanium Fittings, Including Jump Size, Straight to 45°

AS4626 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless Titanium Fittings, Including Jump Size, Straight to 90°

AS4627 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless Titanium Fittings, Including Jump Size, 45° to 45°

AS4628 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless Titanium Fittings, Including Jump Size, 45° to 90°

AS4629 Hose Assembly, Polytetrafluoroethylene, Para Aramid Reinforced, Heavy-Duty, 275 °F, 3000 psi Flareless, Titanium Fittings, Including Jump Size, 90° to 90°

3. TECHNICAL REQUIREMENTS

3.1 Qualification

Hose assemblies supplied in accordance with this document shall be representative of products which have been subjected to and which have successfully passed the qualification tests specified in this standard.

3.1.1 Manufacturer Qualification

A manufacturer producing a product in conformance to this procurement specification shall be accredited in accordance with the requirements of PD2101, AS7003 and AS7112, and shall be listed in a Performance Review Institute (PRI) Qualified Manufacturers List (QML).

3.1.2 Product Qualification

All products shall conform to the requirements of this procurement specification and shall be approved in accordance with the requirements of PD2001, and PD2101, for listing in a Performance Review Institute (PRI) Qualified Parts List (QPL).

3.2 Materials

The hose assembly materials shall be uniform in quality, free from defects, consistent with good manufacturing practice, and shall conform to applicable specifications and the requirements specified herein.

3.2.1 Metals

Metals used in the hose and fittings shall be corrosion-resistant and shall conform to the following specifications:

3.2.1.1 Bars and Forgings

(1)	AMS-QQ-S-763	Class 302 - Condition A or Condition B (AMS5636 and AMS5637)
(2)	AMS-QQ-S-763	Class 304 - Condition A or Condition B (AMS5639)
(3)	AMS-QQ-S-763	Class 304L - Condition A (AMS5647)
(4)	AMS-QQ-S-763	Class 321 - Condition A (AMS5645)
(5)	AMS-QQ-S-763	Class 347 - Condition A (AMS5646)
(6)	AMS4928	6Al-4V Titanium - Annealed
(7)	AMS4965	6Al-4V Titanium - Solution Treated
(8)	AMS5643	17-4 PH Solution Heat Treated
(9)	AMS5644	17-7 PH Solution Heat Treated

(10) AMS5659 15-5 PH Solution Heat Treated

(11) AMS5743 AM 355 - Solution Heat Treated

(12) ASTM B348 Grade 2 - Titanium Alloy

3.2.1.2 Tubing

(1) AMS4945 Titanium 3Al-2.5V Texture Controlled

(2) AMS5556 Type 1 or Type 2 Stainless Steel Tubing, 347

(3) AMS5557 Type 1 or Type 2 Stainless Steel Tubing, 321

(4) AMS5567 Type 1 or Type 2 Stainless Steel Tubing, 304

(5) AMS5570 Seamless Stainless Steel Tubing, 321

(6) AMS5571 Seamless Stainless Steel Tubing, 347

(7) AMS5575 Welded Stainless Steel Tubing, 347

(8) AMS5576 Welded Stainless Steel Tubing, 321

3.2.2 Reinforcement

Para-aramid textile treated and applied to the hose with an outer polyester braid or polybenzimidazol/para-aramid blend braid cover to meet all the requirements herein.

3.3 Design and Construction

The hose assembly shall consist of a seamless PTFE inner tube, treated para-aramid reinforcement, polyester or polybenzimidazol/para-aramid blend outer braid cover and corrosion-resistant steel and/or titanium end fittings, as required, to meet the construction and performance requirements of this document.

3.3.1 Inner Tube

The inner tube shall be of a seamless construction of virgin PTFE resin of uniform gage. It shall have a smooth bore and shall be free from pitting or projections on the inner surface. Additives may be included in the compound from which the tube is extruded.

3.3.2 Reinforcement

The reinforcement shall consist of a treated para-aramid braid and/or wraps with braided polyester or polybenzimidazol/para-aramid blend braid cover. The reinforcement shall be arranged over the inner tube to provide sufficient strength and protection for ensuring conformance with the requirements specified herein. Broken reinforcing cords shall be cause for rejection. The outer braid shall provide 100% coverage to protect the para-aramid reinforcement from exposure to ultraviolet light. A continuous lay line interrupted with AS4623 and hose manufacturer's name and trademark shall be marked in contrasting color along length of hose.

3.3.3 Fittings

All fittings shall be permanently attached and proven to meet the requirements herein. Standard hose assemblies shall have flared fittings to mate with AS4395, flareless fittings according to NAS 1760 to mate with AS33514 or AS4375, or short flareless fittings according to mate with AS4658 or beam seal fittings to mate with male end fittings per AS85421. Anti-torque hexes shall be provided and shall fit standard wrench openings. All internal surfaces of fitting nuts shall be dry filmed with dry film per AS5272. Dry film on external surfaces is optional.

3.3.3.1 Straight Fittings

Straight fittings shall be of one piece construction. Welded joints must not be located in the fluid paths, except welded and redrawn tubing, in accordance with AMS5567 or AMS5576 or AMS5557 may be used.

3.3.3.2 Other Fittings

Other fittings including elbow fittings shall be of one piece construction to the maximum extent possible. However, those made with other than one piece construction shall use welded and redrawn tubing in accordance with AMS5576 or AMS5567 or AMS5557 and shall employ a butt-weld joint method per AS4488. If welding is used, a stabilized grade of stainless steel shall be used. Titanium tubes shall be in accordance with AMS4945 and employ a butt-weld joint method per AS4488 or equivalent.

3.3.3.3 End Fitting Collars (Sockets)

All end fitting collars (sockets), crimped or swaged, and fabricated from Type 304 stainless steel are required to be capable of passing an embrittlement test as specified in ASTM A262 Practice E, prior to assembly to the nipple and crimp or swaging operation. Sockets fabricated from stabilized austenitic steel (304L, 321, or 347) and titanium are acceptable without being subjected to the embrittlement test. Titanium collars are per ASTM B348 - Grade 2.

3.3.3.4 Finish

3.3.3.4.1 Corrosion Resistant Steel Parts

Unless otherwise specified, corrosion resistant steel parts shall be passivated in accordance with AMS2700.

3.3.3.4.2 Titanium Alloy Parts

Titanium alloy parts shall be fluoride phosphate coated per AMS2486 unless otherwise specified.

3.4 Dimensions

The hose assembly dimensions, except for length, shall be as specified in Figure 1 and Table 1.

3.4.1 Hose Weight

Hose consisting of inner tube, reinforcement, and outer layers as outlined in 3.3.1 and 3.3.2 shall not exceed the maximum hose weights specified in Table 2.

3.5 Performance

The inner tube and hose assembly shall meet the following performance requirements:

3.5.1 Inner Tube

3.5.1.1 Tube Roll

The tube shall not leak, split, burst, or show any evidence of malfunction, when rolled to the flattening and rounding gaps of AS2078 (3,000 psi or higher) values. The test method is specified in 4.6.2.1.

3.5.1.2 PTFE Tube Proof Pressure

The tube, without reinforcement, shall not leak, burst, or show any evidence of malfunction when tested to AS2078 (3,000 psi and higher) proof pressure values. Test method is specified in 4.6.2.1.

3.5.1.3 Tensile Strength

The longitudinal tensile strength for all sizes of tubes shall be 2,200 psi minimum. The transverse tensile strength for sizes -10 and larger shall be 1,800 psi minimum. For sizes -08 and smaller, the transverse tensile strength need not be tested. The test method is specified in 4.6.2.2.

3.5.1.4 Elongation

Elongation shall be a minimum of 200%. Test method is specified in 4.6.2.3.

3.5.1.5 Specific Gravity

The specific gravity values of the hose inner tube shall not exceed 2.155 apparent and 2.190 relative. The test method is specified in 4.6.2.4.

3.5.2 Hose Assembly

The hose, complete with reinforcing braids and assembled with end fittings, shall meet the following performance requirements:

3.5.2.1 Proof Pressure

The hose assembly shall withstand the proof pressure listed in Table 2 without malfunction or leakage. The test method is specified in 4.6.3.

3.5.2.2 Elongation and Contraction

The hose assembly shall not change in length by more than ±2% in 10 inches of hose length, when subjected to the maximum operating pressure in Table 2 for a minimum of 5 minutes. The test method is specified in 4.6.4.

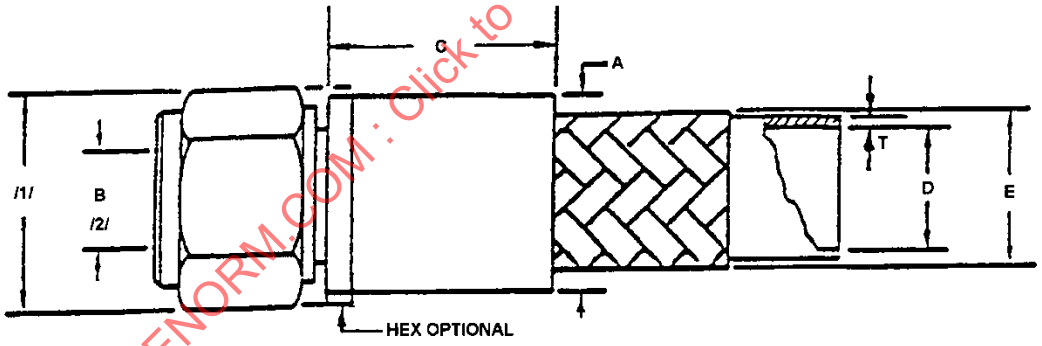

Figure 1 - Hose and fitting dimensions

Table 1 - Hose and fitting dimensions as shown in Figure 1 (inch)

Hose Size	Rigid Tube OD (ref)	/1/ Fitting OD A Max	/2/ Fitting ID B Min	Socket Length C Max	Hose ID D Min	Hose OD E Min	Hose OD E Max	Unbraided PTFE Wall Thickness T Min
04	0.250	0.690	0.120	1.25	0.212	0.480	0.540	0.035
06	0.375	0.800	0.205	1.45	0.298	0.600	0.660	0.035
08	0.500	0.970	0.314	1.78	0.391	0.765	0.825	0.045
10	0.625	1.150	0.380	2.25	0.485	0.860	0.930	0.045
12	0.750	1.380	0.510	2.50	0.602	1.130	1.210	0.045
16	1.000	1.660	0.760	3.00	0.852	1.427	1.507	0.050
20	1.250	2.320	0.925	3.55	1.101	1.700	1.780	0.050

/1/ Cross corners of nut and socket hex may exceed "A" dimension.

/2/ Minimum specified inside diameter shall be verified by passing a spherical ball through the hose assembly. The minimum ID shall not be less than 90% of the value(s) shown for a straight fitting nor less than 85% of the value(s) shown for an elbow fitting.

Table 2 - Physical requirements of hose assemblies and weight of hose

Hose Size	Hose Weight Max /1/ lb/in	Operating Pressure psi	Proof Pressure psi	Burst Pressure Room Temperature Min psi	Burst Pressure High Temperature Min psi	Bend Radius at Inside of Bend Min in	Volumetric Expansion Max cm^3/in	Maximum Operating Temperature °F
04	0.010	3,000	6,000	16,000	12,000	1.50	0.089	275
06	0.014	3,000	6,000	14,000	10,500	2.50	0.132	275
08	0.020	3,000	6,000	14,000	10,500	2.88	0.187	275
10	0.023	3,000	6,000	12,000	9,000	3.25	0.383	275
12	0.032	3,000	6,000	12,000	9,000	4.00	0.493	275
16	0.055	3,000	6,000	12,000	9,000	7.50	1.000	225
20	0.075	3,000	6,000	12,000	9,000	12.00	1.150	225

/1/ Hose weight shall be determined on a minimum length of 12 inches.

3.5.2.3 Volumetric Expansion

The volumetric expansion of the hose assemblies shall not exceed the limits specified in Table 2. The test method is specified in 4.6.5.

3.5.2.4 Leakage

The hose assembly shall not leak (no external wetting) when subjected to two pressure cycles of 70% of minimum room temperature burst pressure. The test method is specified in 4.6.6. For -16 and -20 sizes only 66% of minimum room temperature burst is required.

3.5.2.5 Burst Pressure

3.5.2.5.1 Room Temperature Burst Pressure

The hose assembly shall not leak nor burst at any pressure below the room temperature burst value specified in Table 2. The test method is specified in 4.6.7.1.

3.5.2.5.2 High Temperature Burst Pressure

The hose assembly shall not leak nor burst at any pressure below the high temperature burst value specified in Table 2. The test method is specified in 4.6.7.2.

3.5.2.6 Thermal Shock

The hose assemblies shall not leak nor show any evidence of malfunction when subjected to the Table 2 proof and high temperature burst pressure, after being thermally shocked by rapidly increasing hose temperature from -65 to 275 °F. The test method is specified in 4.6.8. Temperature shall be -65 to 225 °F for -16 size and larger.

3.5.2.7 Torsion - Impulse

The hose assemblies shall be capable of withstanding 250,000 impulse cycles including torsion for the last 50,000 cycles and one million rapid rate impulse cycles when tested in accordance with 4.6.9. Any hose or fitting leakage, hose burst, fitting blowout, or any other evidence of malfunction during the test shall constitute failure.

3.5.2.8 Assembly Flexibility

The hose assembly shall not leak nor show any evidence of malfunction when subjected to the Table 2 proof pressure after 400,000 flexure cycles. The test method is specified in 4.6.10.

3.5.2.9 Stress Degradation (Air Leakage)

The air leakage rate from the hose and two end fittings (not including “B” nuts) when held at the Table 2 operating pressure after completion of the stress degradation test shall not exceed 2.0 cc/in/min. The test method is specified in 4.6.11.

3.5.2.10 Repetitive Assembly Torque

The beam seal fitting shall withstand the repetitive torque values specified in AS85421, and flared and flareless fittings per ARP908, without failure or leakage. There shall be no leakage, galling, or other malfunction of the fitting nut and interface connection during the specified pressure test. The test method is specified in 4.6.12.

3.5.2.11 Electrical Conductivity

Hose assembly shall conduct a direct current equal to 900 µA minimum to 10,000 µA maximum with a test potential of 1,000 V DC. The test method is specified in 4.6.13.

3.5.2.12 Push/Pull Test

The hose assembly shall not leak nor show any evidence of malfunction when subjected to the push/pull test specified in 4.6.14.

3.6 Screw Threads

Coupling nut threads shall be in accordance with AS8879 (ISO 3161). Thread tolerance increase of 10% during assembly or testing shall not be cause for rejection of the hose assembly.

3.7 Length

Tolerances on hose assembly lengths shall be as follows:

a. ±0.125 for lengths under 18 inches

b. ±0.250 inch for lengths from 18 to 36 inches exclusive

c. ±0.500 inch for lengths from 36 to 50 inches exclusive

d. ±1% for lengths of 50 inches and over

3.8 Part Numbering and Interchangeable Parts

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirement of ASME Y14.100, ASME Y14.24, ASME Y14.35M, and ASME Y14.34M shall govern the manufacturer's part numbers and changes thereto.

3.9 Identification of Product

Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The following special marking shall be added.

3.9.1 Fittings

The manufacturer's name or trademark shall be permanently marked on all end fittings.

3.9.2 Assembly

A permanent marking on the fitting or a permanent stainless steel band or bands on hose shall be used. If band is used on hose, it shall be covered with translucent shrink sleeve per AS1073 code "A" and extend beyond the edge of the band by approximately 0.125 inch. Shrink sleeve should also be used as a chafe guard under any band applied to the hose. A permanent metallic band may be used on the collar or over a firesleeve. The band shall be no wider than 1 inch and shall not impair the flexibility or the performance of the hose. Unless otherwise specified, the marking on the fitting or band shall include the following information:

a. Assembly manufacturer's name or trademark, and assembly specification number AS4623

b. CAGE code and manufacturer's assembly part number

c. Operating pressure 3,000 psi (maximum)

d. Operating temperature 275 °F or 225 °F (as applicable per Table 2)

e. Pressure test symbol "PT"

f. Date of hose assembly manufacture expressed in terms of month and year

g. Hose manufacturer's CAGE code number (required only when hose manufacturer is different than the hose assembly manufacturer)

h. Fire resistance type per AS1055, type and class or AS150 and type (when applicable)

3.10 Workmanship

The hose assembly, including all parts, shall be constructed and finished in a thoroughly workmanlike manner. All surfaces shall be free from burrs. All sealing surfaces shall be smooth, except that annular tool marks up to 100 µin Ra maximum per ASME B46.1 will be acceptable.

3.10.1 Dimensions and Tolerance

All pertinent dimensions and tolerances, where interchangeability, operation, or performance of the hose assembly may be affected, shall be specified on all drawings.

3.10.2 Cleaning

All hose assemblies shall be free from oil, grease, dirt, or other foreign materials both internally and externally. Unless otherwise specified, hose assemblies shall be cleaned to Class 0 of AS611, using approved alkaline cleaners only. Do not use chlorinated solvents.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the procuring activity. The procuring activity reserves the right to perform any of the inspections set forth in the specification, where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of Inspection

The examining and testing of hose assemblies shall be classified as:

a. Qualification inspections (4.3)

b. Quality conformance inspections (4.4)

4.3 Qualification Inspections

4.3.1 Qualification Test Samples

Test samples shall consist of the number of samples and lengths specified in Table 3. All specimens for each hose size are required for qualification each of the methods of end fitting attachment and for each, method of end fitting construction, bent tube or forged. Simultaneous qualification of two (flared, flareless, short flareless, or beam seal) of four types of end fittings may be accomplished by having different fittings on each end of the hoses. If a supplier qualifies one or more ends and at a later date desires to qualify others, two hose assemblies of each size and type to be qualified shall be subjected to the tests specified in 4.5.2.2.

The six test specimens required for the impulse test (4.6.9) shall have straight end fittings on one end and 90 degree elbow fittings on the other. All remaining test samples shall have straight-to-straight end fittings.

Table 3 - Length of hose assemblies in inches for test

Hose Assembly Size	Six Assemblies for Each Impulse Test	Two Assemblies for Each Flex Test	Assemblies for Other
04	10.5	14.00	18
06	15.0	18.50	18
08	17.5	21.00	18
10	20.5	24.00	18
12	24.5	28.00	18
16	38.0 (25.0 - 90 degrees) /1/	41.00	18
20	55.0 (34.5 - 90 degrees) /1/	58.50	18

/1/ When assemblies are tested at 90 degrees in place of 180 degrees.

4.3.2 Qualification Test Sequence

Test sequence and procedure shall be as specified in Table 4 and if applicable 4.5.2.2.

Table 4 - Qualification test schedule

Sample No.	PTFE Tube 1 /1/	Hose Assys 2, 3	Hose Assys 4, 5	Hose Assys 6, 7	Hose Assys 8, 9	Hose Assys 10 through 15 /2/	Hose Assy 16	Hose Assy 17 /3/
4.6.1.1 Examination of Product	o							o
4.6.2.1 Tube Roll	o							
4.6.2.1 Proof Pressure	o							
4.6.2.2 Tensile Strength	o							
4.6.2.3 Elongation	o							
4.6.2.4 Specific Gravity	o							
4.6.3 Proof Pressure	o							
4.6.1.2 Examination of Product		o	o	o	o	o	o	
4.6.3 Proof Pressure		o	o	o	o	o	o	
4.6.4 Elongation and Contraction		o						
4.6.5 Volumetric Expansion			o					
4.6.6 Leakage				o				
4.5.2.3 Oil Aging			o					
4.6.7.1 Room Temperature Burst Pressure			o (1ea)					
4.6.7.2 High Temperature Burst Pressure			o (1ea)					
4.6.8 Thermal Shock				o				
4.6.9 Torsion-Impulse						o		
4.6.10 Assembly Flexibility		o						
4.6.11 Stress Degradation					o			
4.6.12 Repetitive Assembly Torque		o						
4.6.13 Electrical Conductivity								o
4.6.14 Push/pull							o	

/1/ Production lot records may be used to verify conformance to 4.6.1 and 4.6.2 when the tube being used is an established production item.

/2/ These samples shall have a 90 degree elbow fitting on one end of the hose and a straight-type fitting on the other end of the hose. If approval is being sought for both the bent-tube and the forged elbow configuration, then one-half of the samples (three) shall use one type of configured elbow, while the other half of the samples use the other type.

/3/ Fitting required on one end only.

4.3.3 Test Report, Test Samples, and Data for the Procuring Activity

When the tests are conducted at a location other than the laboratory of the procuring activity, the following shall be furnished to that activity:

a. Test Report: The test report shall include a report of all tests and outline description of the tests and conditions, according to MIL-HDBK-831.

b. Test Samples: Test samples when requested by the procuring activity and subjected to qualification testing, shall not be shipped as part of contract order.

c. Drawings: Three sets of assembly and subassembly shall have a cut-away section showing all details in their normal assembly position and shall identify all details and subassemblies.

d. Sources: A list of sources of hose or hose components, including source's name and product identification for inner tube, hose, and assembly shall be supplied.

NOTE: Log sheets and recorded test data shall remain on file at the source test facility and are not to be sent to the qualifying activity unless specifically requested.

4.3.4 Qualification Inspection Methods

Qualification inspection methods shall consist of all the examinations and tests specified under 4.6.

4.4 Quality Conformance Inspections

Quality conformance inspections shall consist of the following tests:

a. Individual tests (see 4.4.1) (100% inspection)

b. Sampling tests (see 4.4.2)

c. Periodic control tests (see 4.4.3)

4.4.1 Individual Tests

Each hose assembly shall be subjected to the following tests:

a. Examination of product (see 4.6.1)

b. Proof pressure test (see 4.6.3)

NOTE: Production samples that are proof pressure tested with water should be air dried prior to capping (see cleaning requirements in 3.10.2).

4.4.2 Sampling Tests

The following inspections and tests shall be performed on hose assemblies with straight fittings on each end, selected at random from each inspection lot. Initially, an inspection lot shall be hose made from each of the first four reinforcement setups for the construction of each dash size. After successfully testing four consecutive reinforcement setups (lots), an inspection lot shall consist of no more than 9,000 hose assemblies, all of one hose size, manufactured under essentially the same conditions.

Table 5

	No. of Samples Per Test Initial Lots	No. of Samples Per Test Per 9000 Assemblies
Room temperature burst	1	3
Specific gravity	Tubing Only	Tubing Only
Impulse per 4.6.9(b) less torsion (unaged)	1	3
Stress degradation	1	3

4.4.3 Periodic Control Tests

The following inspections and tests shall be performed as indicated on four hose assemblies manufactured from bulk hose lengths selected at random from each inspection lot. The inspection lot shall consist of not more than 20 000 feet of hose, all of one dash number size, and manufactured under essentially the same conditions.

Table 6

	No. of Samples Per Test
Elongation and contraction	4
Leakage	Use same samples for all tests
Conductivity	Use same samples for all tests

4.4.4 Rejection and Retest

Where one or more items selected from a lot fails to meet the specifications, all items in the lot shall be rejected.

4.4.4.1 Resubmitted Lots

Once a lot (or part of a lot) has been rejected by a procuring activity (government or industry), and before it can be resubmitted for tests, full particulars concerning the cause of rejection, and the action taken to correct the defects in the lot, shall be furnished in writing by the contractor.

4.4.5 Inspection Procedures

All inspection plans shall be single sample plans with an accept number of zero.

4.4.6 Destructive Test Sample

Prior to testing, a letter "D" shall be permanently marked on each end fitting of those assemblies used for destructive tests (4.4.2 and 4.4.3).

4.5 Test Conditions

4.5.1 Fitting Ends

Qualification tests shall be conducted on assemblies using straight type swivel ends except for impulse test samples requiring a 90 degree elbow fitting on one end. Satisfactory completion of qualification tests shall also constitute qualification approval for hose assemblies having other fittings that have an identical attachment method and design, and meet the requirements of this document.

4.5.2 Preparation of Samples

4.5.2.1 Unless otherwise specified, the length of sample assemblies shall be in accordance with Table 3.

4.5.2.2 If test samples use either one or two of the three types of standard fittings (flared, flareless, or beam seal), and qualification approval is desired for the other type(s), two additional hose assemblies with the other type(s) of fitting end and size to be qualified shall be subjected to the following tests in the sequence indicated:

a. Examination of product (see 4.6.1): Samples 1, 2

b. Proof pressure test (see 4.6.3): Samples 1, 2

c. Leakage test (see 4.6.6): Samples 1, 2

d. Repetitive assembly torque test (see 4.6.12): Samples 1, 2

e. Room temperature burst pressure test (see 4.6.7.1): Samples 1, 2

f. Impulse/torsional test (unaged) (see 4.6.9): Samples 1, 2

4.5.2.3 Oil Aging

In all the tests using oil-aged samples, the hose assemblies shall be fully preconditioned in AS1241 Type IV fire resistant fluid or the system hydraulic fluid, as applicable. Preconditioning shall be done in two phases:

a. The hose assemblies shall be filled with AS1241 hydraulic fluid or system hydraulic fluid, as applicable, and then shall be pressurized to operating pressure. While maintaining the pressure at room temperature, the hose assembly shall be immersed in AS1241 or system fluid, as applicable, for 8 to 10 minutes and then allowed to air dry for the remainder of 1 hour. This sequence of immersion and air drying shall be repeated for a total of not less than 50 times.

b. After completing item (a), the hose shall be filled with AS1241 hydraulic fluid or system fluid, as applicable (excluding all air), and the hose shall then be pressurized to operating pressure and aged at 275 °F in air for 168 hours. Sizes -16 and -20 shall be aged at 225 °F.

4.5.2.4 Air Aging

Air aged samples shall be kept in air at a temperature of 275 °F for 7 days. Sizes -16 and -20 shall be aged at 225 °F.

4.5.2.5 Unaged Samples

Unaged assemblies shall be as manufactured.

4.5.3 Test Fluids

Unless otherwise specified, the pressure test fluid shall be hydraulic oil conforming to MIL-PRF-5606, MIL-PRF-87257, or water. Where a high temperature test fluid is required, the test fluid shall be MIL-PRF-83282 hydraulic fluid.

4.5.4 Pressure Measurement

Unless otherwise specified, all pressures shall have a tolerance of -0%, +5%.

4.5.5 Temperature Measurements

Unless otherwise specified, temperature measurements shall be taken within 6 inches of hose assemblies under test. Unless otherwise specified, all temperatures shall have a tolerance of +15 °F, -5 °F.

4.5.6 End Connections

Except as otherwise noted, each hose end shall be connected to a male fitting end in accordance with 3.3.3 and shall have an installation torque range as specified in ARP908 or male end fitting per AS85421/1 with installation torques per AS85421.

4.6 Inspection Methods

4.6.1 Examination of Product

4.6.1.1 Inner Tube (PTFE)

Each length of tubing shall be examined to determine conformance to this document with respect to material, size, workmanship, and dimensions.

4.6.1.2 Hose Assembly

All hose assemblies shall be visually inspected to determine conformance to this document with respect to material, size and workmanship.

4.6.2 Tube Tests

4.6.2.1 Tube Roll and Proof Pressure Test

Each length of tubing shall be subjected to a tube roll and proof pressure test in accordance with AS2078. The flattening gap, rounding gap, and proof pressure shall be as specified for 3,000 psi and higher. The test media shall be air or water.

4.6.2.2 Tensile Strength

The tube shall be subjected to tensile strength tests in accordance with AS2078.

4.6.2.3 Elongation

The tube shall be subjected to the elongation in accordance with AS2078.

4.6.2.4 Specific Gravity of the Tube

4.6.2.4.1 Apparent Specific Gravity

Apparent specific gravity shall be determined in accordance with AS2078. When test samples are prepared from braided hose, the braid impression must be removed prior to testing.

4.6.2.4.2 Relative Specific Gravity

Relative specific gravity shall be determined in accordance with AS2078.

4.6.3 Proof Pressure Test

All hose assemblies shall be pressure tested to the values specified in Table 2 in accordance with AS2078. The test fluid may be either water or hydraulic oil conforming to MIL-PRF-5606 or MIL-PRF-87257 for tests conducted at room temperature. All assemblies used for the tests described in this document shall have this proof pressure test applied to them. Any evidence of leakage from the hose or fittings, or any evidence of malfunction shall constitute failure. Proof pressure of hose assemblies having firesleeves shall be performed before sleeving, when possible, using water as the test medium. Proof pressure shall be held for a minimum of 2 minutes, during which time the firesleeves, if installed, shall be pulled back from the end fittings.