



<b>AEROSPACE STANDARD</b>	<b>AS1227™</b>	<b>REV. C</b>
	Issued 1972-11 Revised 2001-09 Reaffirmed 2025-04	
Superseding AS1227B		
Hose Assembly, Convoluted Polytetrafluoroethylene, Metallic Reinforced, Low Pressure, Up to 400 °F, Aircraft		

### RATIONALE

AS1227C has been reaffirmed to comply with the SAE Five-Year Review policy.

#### 1. SCOPE:

##### 1.1 Application:

This SAE Aerospace Standard (AS) defines the requirements for a convoluted polytetrafluoroethylene (PTFE) lined, metallic reinforced, hose assembly suitable for use in aerospace fluid systems at temperatures between -65 °F and 400 °F for Class 1 assembly, -65 °F and 275 °F for Class 2 assembly, and at operating pressures per Table 1.

The use of these hose assemblies in pneumatic storage systems is not recommended. In addition, installations in which the limits specified herein are exceeded, or in which the application is not covered specifically by this standard, shall be subject to the approval of the procuring activity.

##### 1.2 Classification:

###### 1.2.1 Hose assemblies furnished under this document shall be of the following classes:

- a. Class 1 - All corrosion resistant steel fittings, -65 to 400 °F
- b. Class 2 - Combination aluminum alloy nut, flange, nipple, elbow and corrosion resistant steel socket fittings, or all aluminum fittings, -65 to 275 °F

###### 1.2.2 Hose assemblies furnished under this document shall be of the following types:

- a. Type I - Conductive PTFE Innertube
- b. Type II - Non-Conductive PTFE Innertube

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## 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
- |          |  |
|----------|--|
| AMS 4069 | Aluminum Alloy, Drawn, Round Seamless Tubing Close Tolerance, 2.5Mg 0.25Cr (5052-0) Annealed   |
| AMS 4082 | Aluminum Alloy, Seamless Drawn Tubing, 1.0Mg 0.60Si 0.28Cu 0.20Cr (6061-T6) Solution and Precipitation Heat Treated  |
| AMS 4117 | Aluminum Alloy, Rolled or Cold Finished Bars, Rods, and Wire and Flash Welded Rings, 1.0Mg 0.60Si 0.28Cu 0.20Cr (6061; -T6, -T651) Solution and Precipitation Heat Treated |
| AMS 4121 | Aluminum Alloy, Bars, Rods, and Wire Rolled or Cold Finished, 4.5Cu 0.85Si 0.80Mn 0.50Mg (2024-T6) Solution and Precipitation Heat Treated                                 |
| AMS 4127 | Aluminum Alloy, Forgings and Rolled or Forged Rings, 1.0Mg 0.60Si 0.28Cu 0.20Cr (6061-T6) Solution and Precipitation Heat Treated  |
| AMS 4339 | Aluminum Alloy, Rolled or Cold Finished Bars and Rods 4.4Cu 1.5Mg 0.60Mn (2024-T851) Solution Heat Treated, Cold Worked, and Artificially Aged                             |
| AMS 5556 | Steel, Corrosion and Heat Resistant, Seamless or Welded Tubing, 18Cr 11Ni 0.70Cb (SAE 30347), Hydraulic, Solution Heat Treated   |
| AMS 5557 | Steel, Corrosion and Heat Resistant, Seamless or Welded Hydraulic Tubing 18.5Cr 10.5Ni 0.40Ti (SAE 30321), Solution Heat Treated   |
| AMS 5567 | Steel Corrosion Resistant, Seamless or Welded Tubing, 19Cr 10Ni (SAE 30304), Hydraulic, Annealed   |
| AMS 5570 | Steel, Corrosion and Heat Resistant, Seamless Tubing, 18Cr 11Ni 0.40Ti (SAE 30321), Solution Heat Treated  |
| AMS 5571 | Steel, Corrosion and Heat Resistant, Seamless Tubing, 18Cr 10.5 Ni 0.70(Cb+Ta) (SAE 30347), Solution Heat Treated  |
| AMS 5573 | Steel, Corrosion and Heat Resistant, Seamless Tubing, 17Cr 12.5Ni 2.5Mo (SAE 30316), Solution Heat Treated   |
| AMS 5575 | Steel, Corrosion and Heat Resistant, Welded Tubing, 18Cr 10.5Ni 0.70(Cb+Ta) (SAE 30347), Solution Heat Treated   |
| AMS 5636 | Steel, Corrosion Resistant, Bars and Wire, 18Cr 9.0Ni (SAE 30302), Solution Heat Treated and Cold Drawn, 100 ksi Tensile Strength  |
| AMS 5637 | Steel, Corrosion Resistant, Bars and Wire, 18Cr 9.0Ni (SAE 30302), Solution Heat Treated and Cold Drawn, 125 ksi Tensile Strength  |
| AMS 5639 | Steel, Corrosion Resistant, Bars, Wire, Forgings, Tubing and Rings, 19Cr 10Ni (SAE 30304), Solution Heat Treated   |

## 2.1.1 (Continued):

AMS 5643	Steel, Corrosion Resistant, Bars, Wire, Forging, Tubing and Rings, 16Cr 4.0Ni 0.30(Cb+Ta) 4.0Cu (SAE 17-4PH), Solution Heat Treated, Precipitation Hardenable
AMS 5644	Steel Bars and Forgings, Corrosion Resistant, 17Cr 7.0Ni 1.0Al (SAE 17-4PH)
AMS 5645	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings, 18Cr 10Ni 0.40Ti (SAE 30321), Solution Heat Treated
AMS 5646	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings, 18Cr 11Ni 0.60Cb (SAE 30347), Solution Heat Treated
AMS 5647	Steel, Corrosion Resistant, Bars, Wire, Forgings, Tubing and Rings, 19Cr 9.5Ni (SAE 304L), Solution Heat Treated
AMS 5648	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings, 17Cr 12Ni 2.5Mo (SAE 30316), Solution Heat Treated
AMS 5653	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings, 17Cr 12Ni 2.5Mo (SAE 30316L), Solution Heat Treated
AMS 5656	Steel, Corrosion Resistant, Bars, Wire, Forgings, Extrusions, and Rings 9.0Mn 20Cr 6.5Ni 0.27N (SAE 21-6-9) Solution Heat Treated
AMS 5659	Steel, Corrosion Resistant, Bars, Wire, Forgings, Rings, and Extrusions 15Cr 4.5Ni 0.30Cb 3.5Cu (SAE 15-5PH), Consumable Electrode Melted, Solution Heat Treated, Precipitation Hardenable
AMS 5689	Steel, Corrosion and Heat Resistant, Wire 18Cr 10.5Ni 0.40Ti (SAE 30321), Solution Heat Treated
AMS 5690	Steel, Corrosion and Heat Resistant, Wire 17Cr 12Ni 2.5Mo (SAE 30316), Solution Heat Treated
AMS 5697	Steel, Corrosion Resistant, Wire 19Cr 9.5Ni (SAE 30304), Solution Heat Treated
AMS-QQ-P-35	Passivation Treatments for Corrosion Resistant Steel
AS150	Hose Assembly, Type Classifications of, Basic Performance and Fire Resistance
AS611	Hose Assembly and Tubing, Polytetrafluoroethylene, Cleaning Methods
ARP908	Hose Fitting - Installation and Qualification Test Torque Requirements
AS1055	Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings and Similar System Components
AS1708	Fitting End, Internal Flared, Design Standard
ARP1835	Preparation for Delivery, General Requirements for Hose Assemblies
AS2078	Test Methods, Hose Assemblies, Polytetrafluoroethylene (PTFE)
AS4375	Fitting End, External Thread, Flareless Design Standard
AS4395	End Fitting - Flared Tubing Connections, Design Standard
AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP)
AS7112	National Aerospace and Defense Contractors Accreditation Program requirements for Fluid System Components
AS8879	Screw Threads - UNJ Profile, Inch
AS33514	Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal

2.1.2 ASTM Publications: Available from ASTM, 100 Barr Harbor, West Conshohocken, PA 19428-2959.

ASTM A 262 Standard Recommended Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steel  
ASTM A 313 Standard Specification for Stainless Steel Spring Wire  
ASTM A 580 Specification for Stainless and Heat Resisting Steel Wire  
ASTM D 471 Standard Test Methods for Rubber Property - Effects of Liquid

2.1.3 NAS Standards: Available from Aerospace Industries Association, 1250 Eye Street NW, Washington, DC 20005.

NAS 847 Caps and Plugs, Protective, Dust and Moisture Seal  
NAS 1760 Fitting End, Flareless Acorn, Standard Dimensions for

2.1.4 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-5606 Hydraulic Fluid, Petroleum Base; Aircraft; Missile and Ordnance  
MIL-PRF-7808 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base  
MIL-A-8625 Anodic Coatings for Aluminum and Aluminum Alloys  
MIL-PRF-83282 Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft  
MIL-PRF-87257 Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile  
MIL-STD-100 Engineering Drawings  
MIL-STD-130 Identification Marking of U.S. Military Property  
MIL-HDBK-831 Preparation of Test Reports

2.1.5 ASME Publications: Available from ASME, 345 East 47th Street, New York, NY 10017-2330.

ASME B46.1 Surface Texture

2.1.6 PRI Publications: Available from Performance Review Institute, 161 Thornhill Road, Warrendale, PA 15086-7527.

PD2001 Qualified Product Management Council Procedures for Qualified Products Group  
PD2101 Aerospace Quality Assurance, Product Standard, Qualification Procedures, Fluid Systems

2.1.7 Order of Precedence: In the event of a conflict between the text of this specification and the reference cited herein, the text of this specification shall take precedence.

### 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 PRI Qualified Products List (QPL).

#### 3.2 Material:

The hose assemblies shall be uniform in quality and free from defects in material as is consistent with good manufacturing practice, and shall conform to the applicable specifications and requirements specified in this standard. All materials not specifically described herein shall be of the highest quality and suitable for the purposes intended.

3.2.1 **Metals:** Metals used in the hose shall be corrosion-resistant steel, and fittings shall be aluminum alloy or corrosion-resistant steel, suitably treated to resist corrosion when in storage or during normal service use. Metals used in the hose and fittings shall be as listed below:

##### a. Bars and Forgings:

Corrosion resistant steel, austenitic, annealed or as rolled

- |     |          |      |
|-----|----------|------|
| (1) | AMS 5639 | 304  |
| (2) | AMS 5647 | 304L |

Heat stabilized corrosion resistant steel, austenitic, annealed or as rolled

- |     |          |        |
|-----|----------|--------|
| (3) | AMS 5645 | 321    |
| (4) | AMS 5646 | 347    |
| (5) | AMS 5648 | 316    |
| (6) | AMS 5653 | 316L   |
| (7) | AMS 5656 | 21-6-9 |

## 3.2.1 (Continued):

Precipitation hardening corrosion resistant steel - resolution heat treated and artificially aged condition

- |      |          |        |
|------|----------|--------|
| (8)  | AMS 5659 | 15-5PH |
| (9)  | AMS 5643 | 17-4PH |
| (10) | AMS 5644 | 17-7PH |

Aluminum Alloy

- |      |          |                |
|------|----------|----------------|
| (11) | AMS 4121 | 2014-T6        |
| (12) | AMS 4339 | 2024-T851      |
| (13) | AMS 4117 | 6061-T6, -T651 |
| (14) | AMS 4127 | 6061-T6        |

## b. Tubing:

Aluminum Alloy

- |     |          |                   |
|-----|----------|-------------------|
| (1) | AMS 4069 | Seamless, 5052-0  |
| (2) | AMS 4082 | Seamless, 6061-T6 |

Corrosion resistant steel, austenitic, seamless or welded, annealed

- |     |          |                       |
|-----|----------|-----------------------|
| (3) | AMS 5567 | Type 1 or Type 2, 304 |
|-----|----------|-----------------------|

Heat stabilized corrosion resistant steel, austenitic, seamless or welded

- |     |          |                       |
|-----|----------|-----------------------|
| (4) | AMS 5557 | Type 1 or Type 2, 321 |
| (5) | AMS 5556 | Type 1 or Type 2, 347 |
| (6) | AMS 5570 | Seamless, 321         |
| (7) | AMS 5571 | Seamless, 347         |
| (8) | AMS 5573 | Seamless, 316         |
| (9) | AMS 5575 | Welded, 347           |

## c. Wire:

Corrosion resistant steel, austenitic, cold drawn

- |     |                   |                               |
|-----|-------------------|-------------------------------|
| (1) | ASTM A 580/ A 313 | Comp. 304 (AMS 5697)          |
| (2) | ASTM A 580/ A 313 | Comp. 316 (AMS 5690)          |
| (3) | ASTM A 580/ A 313 | Comp. 321 (AMS 5689)          |
| (4) | AMS 5636          | 302, 100 ksi Tensile Strength |
| (5) | AMS 5637          | 302, 125 ksi Tensile Strength |

### 3.3 Design and Construction:

The hose assembly shall consist of a convoluted PTFE inner tube, which may be covered with convoluted woven glass cloth and/or other suitable materials, corrosion-resistant steel-wire reinforcement, and aluminum, corrosion-resistant steel, or a combination of aluminum and stainless steel end fittings as required to meet the construction and performance requirements of this document, and as required for its intended use.

- 3.3.1 Inner Tube: The inner tube shall be of a convoluted construction of virgin PTFE resin designed to promote easy bending. It shall be free from pitting or projections on the inner surface. Additives may be included in the compound from which the tube is fabricated.
- 3.3.2 Reinforcement: The reinforcement shall consist of corrosion-resistant steel wires. The wires shall be so arranged over the inner tube as to provide sufficient strength to ensure conformance to the requirements specified herein. Broken reinforcing wires shall be cause for rejection. Crossed-over reinforcing wires shall not be cause for rejection of the hose assembly.
- 3.3.3 Interlayers: Interlayers, if used, shall be of a suitable material and shall be resistant to all fluids with which the hose may come in contact during normal service. They shall be capable of withstanding temperatures of -65 to 400 °F and shall not extrude through the outer braid during testing or in service.
- 3.3.4 Fittings: All fittings shall be permanently attached and proven to meet the requirements herein. Standard hose assemblies should have flared fittings according to AS1708 (preferred) to mate with AS4395 or flareless fittings according to NAS1760 to mate with AS4375 or AS33514. Fitting hex portions shall fit standard wrench openings.
- 3.3.4.1 Straight Fittings: Fittings shall be of one piece construction. Weld or braze joints must not be located in the fluid paths, except welded and redrawn tubing per AMS 5556, AMS 5557, or AMS 5567 may be used.
- 3.3.4.2 Other Fittings: Other fittings, including elbow fittings, shall be of one piece construction to the maximum extent possible. When one piece construction is not used, the joints shall be welded using either butt-weld or lap-weld design or brazed using lap-braze design. For double elbow assemblies, the elbows may be treated as non-standard.
- 3.3.4.3 End Fitting Collars (Sockets): All end fitting collars (sockets), crimped or swaged, fabricated from Type 304 stainless steel are required to be capable of passing an embrittlement test as specified in ASTM A 262, Practice E, prior to assembly to the nipple by the crimping or swaging operation. Sockets fabricated from stabilized austenitic steel (304L, 316, 316L, 321, or 347), or aluminum, are acceptable without being subjected to the embrittlement test.

## 3.3.4.4 Fitting Finish:

3.3.4.4.1 Aluminum Parts: Unless otherwise specified, aluminum parts shall be finished in accordance with MIL-A-8625, Type II, color optional. The color fastness requirement of MIL-A-8625 does not apply.

3.3.4.4.2 Corrosion-Resistant Steel Parts: Unless otherwise specified, corrosion-resistant steel parts shall be passivated in accordance with AMS-QQ-P-35.

## 3.4 Hose, Dimensional and Physical Requirements:

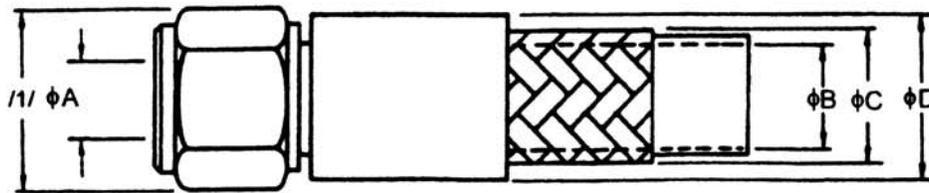
3.4.1 Physical Requirements: Hose assemblies shall meet the physical and weight requirements per Table 1.

TABLE 1 - Physical Requirements of Hose Assemblies and Weight of Hose

Hose Size	Hose Weight Max <sup>1</sup> lb/in	Operating Pressure Max psi	Proof Pressure Max psi	Burst Pressure		Bend Radius At Inside of Bend Min in
				Room Temperature Min psi	High Temperature Min psi	
04	0.008	300	600	1200	900	0.50
06	0.010	300	600	1200	900	0.75
08	0.015	250	500	1000	750	1.00
10	0.020	250	500	1000	750	1.50
12	0.027	200	400	800	600	2.00
16	0.033	200	400	800	600	3.00
20	0.050	150	300	600	450	4.00
24	0.060	150	300	600	450	5.00
32	0.090	150	300	600	450	6.00
40	0.110	75	150	300	225	9.00
48	0.145	50	100	200	150	12.00
64Z	0.200	50	100	200	150	20.00

<sup>1</sup> Hose weight shall be determined on a minimum length of 12 in.

3.4.2 Dimensions: The hose assembly dimensions, except for length, shall be as specified in Figure 1 and Table 2.



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

FIGURE 1 - Hose and Fitting Dimensions

TABLE 2 - Hose and Fitting Dimensions as Shown in Figure 1 (in)

Hose Size	Rigid Tube OD (Ref)	Fitting ID Min A <sup>2</sup>	Hose ID Min B	Hose Wire Braid OD		Fitting OD Max D	Spherical Ball Size for Determining Min Hose Assy. ID <sup>1)</sup> In	
				Min	Max		Straight Fittings	Elbow Fittings
04	0.250	0.132	0.270	0.413	0.477	0.55	0.119	0.112
06	0.375	0.256	0.355	0.523	0.587	0.65	0.230	0.218
08	0.500	0.345	0.510	0.723	0.787	0.86	0.310	0.293
10	0.625	0.430	0.600	0.818	0.882	0.95	0.387	0.366
12	0.750	0.635	0.765	1.028	1.092	1.28	0.572	0.540
16	1.000	0.835	0.980	1.238	1.302	1.47	0.752	0.710
20	1.250	1.085	1.220	1.494	1.558	1.70	0.976	0.922
24	1.500	1.310	1.480	1.758	1.822	2.00	1.179	1.114
32	2.000	1.825	1.937	2.293	2.357	2.56	1.642	1.551
40	2.500	2.278	2.437	2.843	2.907	3.00	2.050	1.936
48	3.000	2.771	2.937	3.398	3.462	3.70	2.494	2.355
64	4.000	3.700	3.937	4.423	4.487	4.70	3.330	3.145

<sup>1)</sup> Hose assembly conformance to minimum specified inside diameter shall be verified by passing the designated or larger spherical ball through the hose assembly.

3.4.3 Hose Weight: Hose consisting of inner tube, reinforcement and interlayers as outlined in 3.3.1 through 3.3.3 shall not exceed the maximum weight specified in Table 1.

3.5 Hose Assembly, Test and Performance Requirements:

The hose assembly shall meet the following performance requirements:

- 3.5.1 Proof Pressure: The hose assembly shall withstand the proof pressure listed in Table 1 without malfunction or leakage. The hose assembly shall be tested in accordance with 4.6.2.
- 3.5.2 Elongation and Contraction: The hose assembly shall not change in length by more than +0.3 in or -0.1 in in 10 in of hose length when subjected to the operating pressure listed in Table 1 for a minimum of 5 min. The hose assembly shall be tested in accordance with 4.6.3.
- 3.5.3 Leakage: The hose assembly shall not leak (no external wetting) when subjected to two pressure cycles of 70% of the minimum room temperature burst pressure. The hose assembly shall be tested in accordance with 4.6.4.
- 3.5.4 Room Temperature Burst Pressure: The hose assembly shall not leak nor burst at any pressure below the room temperature burst pressure specified in Table 1. The hose assembly shall be tested in accordance with 4.6.5.
- 3.5.5 High Temperature Burst Pressure: The hose assembly shall not leak nor burst at any pressure below the high temperature burst pressure specified in Table 1. The hose assembly shall be tested in accordance with 4.6.6.
- 3.5.6 Oil Resistance: The hose assembly shall show no evidence of leakage when tested with oil conforming to MIL-PRF-7808 ( or other oils specified by the procuring activity) and with test fluid conforming to ASTM Reference Fuel B (70% Isooctane, 30% toluene) as defined in ASTM D 471. The hose assembly shall be tested in accordance with 4.6.7.
- 3.5.7 Flexibility and Vacuum: A ball of the applicable diameter listed in Table 3 shall roll through the hose assembly from fitting to fitting after the hose assembly has been maintained for 4 h at the maximum operating temperature and the applicable vacuum listed in Table 3. Following this, the hose assembly shall show no evidence of leakage nor permanent damage after being tested to the applicable proof pressure specified in Table 1. The hose assembly shall be tested in accordance with 4.6.8.
- 3.5.8 Pressure Surge: The hose assembly shall show no evidence of leakage from the hose or end fitting when subjected to 50,000 pressure cycles. The hose assembly shall be tested in accordance with 4.6.9.
- 3.5.9 Specific Gravity: The specific gravity values of the hose inner tube shall not exceed 2.155 apparent and 2.210 relative when tested in accordance with AS2078.

TABLE 3 - Values for Vacuum Test

Hose Size	Negative Pressure in Hg	Ball Size in
04	28	0.125
06	28	0.250
08	28	0.344
10	28	0.406
12	28	0.625
16	28	0.812
20	20	1.062
24	12	1.281
32	5	1.812
40	5	2.250
48	5	2.750
64	3	3.688

3.5.10 Electrical Conductivity (Type I only): Hose assembly sizes up to -08 shall conduct a direct current equal to or greater than 6  $\mu$ A and sizes -10 and above a direct current equal to or greater than 12  $\mu$ A with a test potential of 1000 V DC when tested in accordance with 4.6.10.

3.5.11 Repetitive Assembly Torque: The fitting shall withstand repetitive assembly torque values specified in ARP908 when tested in accordance with 4.6.11.

### 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 Tolerance:

Tolerances on hose assembly lengths shall be as follows:

- a. 0.250/-0.125 in for lengths under 18 in
- b. 0.500/-0.250 in for lengths from 18 to 36 in exclusive
- c. +1.000/-0.500 in for lengths from 36 to 50 in exclusive
- d. +2%/-1% for lengths of 50 in and over

### 3.8 Part Numbering of Interchangeable Parts:

All parts complying with this standard and having the same manufacturer's or standard part number shall be functionally and dimensionally interchangeable. The item identification and part number requirement of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

### 3.9 Identification of Product:

The assembly and its component parts shall be permanently 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 one element of all end fittings.
- 3.9.2 Assembly: A permanent marking shall be applied on a fitting or on a permanent band or bands securely attached on the hose. Marking bands shall be so designed as to remain tight on the hose to prevent relative movement and resultant chafing. The band shall be no wider than 1 in 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:
- Assembly manufacturer's name or trademark
  - CAGE code and complete hose assembly part number
  - Operating pressure in PSI (as applicable)
  - Operating temperature "400 °F" or 275 °F (as applicable)
  - Pressure test symbol "PT"
  - Assembly Specification "AS1227"
  - Date of hose assembly manufacture expressed in terms of month and year
  - Hose manufacturer's CAGE code number (required only when hose manufacturer is different than hose assembly manufacturer)
  - 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 to good quality. All surfaces shall be free from burrs and sharp edges. 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 Tolerances: 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, moisture, cleaning solvents and other foreign materials, both internally and externally. Unless otherwise specified, hose assemblies shall be cleaned per 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 Inspections:

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

- a. Quality conformance inspections (see 4.3)
- b. Qualification inspections (see 4.4)

##### 4.3 Quality Conformance Inspections:

Quality conformance inspections shall consist of the following tests:

- a. Individual tests ( see 4.3.1)
- b. Sampling tests (see 4.3.2)
- c. Periodic control tests ( see 4.3.3)

##### 4.3.1 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 4.6.2)

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

##### 4.3.2 Sampling Test: The following tests shall be performed in the order indicated on one hose assembly with straight fittings at each end selected at random from each inspection lot. The inspection lot shall consist of approximately, but not more than, 500 hose assemblies, all of one size manufactured under essentially the same conditions, but not necessarily during one continuous run.

- a. Elongation and Contraction test (see 3.5.2)
- b. Leakage tests (see 3.5.3)
- c. Room temperature burst pressure test (see 3.5.4)

- 4.3.3 Periodic Control Tests: The following tests shall be performed as indicated on four hose assemblies with straight fittings at each end selected at random from each inspection lot. The inspection lot shall consist of approximately, but not more than, 5000 hose assemblies, all of one size, manufactured under essentially the same conditions but not necessarily during one continuous run.
- High temperature burst pressure test (see 3.5.5) - (2) assemblies
  - Oil resistance test, omitting 4.6.7.4 and 4.6.7.5 (see 3.5.6) - (2) assemblies
  - Electrical conductivity test (see 3.5.10) - One 14 in length of hose with one end fitting
- 4.3.4 Rejection and Retest: When one item selected from a production run fails to meet the specification, no items still on hand or later produced shall be accepted until the extent and cause of failure are determined and corrective action, as necessary, taken.
- 4.3.4.1 Individual Test May Continue: For operational reasons, the individual tests may be continued pending the investigation of a sampling or periodic control test failure. Final acceptance of items on hand or produced later shall not be made until it is determined that items meet the requirements on which the rejection was based.
- 4.4 Qualification Inspections:
- 4.4.1 Qualification Testing: The qualification of hose assemblies shall consist of all the tests described in this specification. Unless otherwise specified by the purchaser, qualification samples shall consist of the number of samples and lengths specified in Table 4 for each method of fitting attachment. The procedure shall be as specified in Table 5. The end fitting design for the samples shall have flared fittings to mate with AS4395, or flareless fittings in accordance with NAS1760 to mate with AS4375 or AS33514.

All specimens for each hose size are required for qualifying each of the methods of end fitting attachment, for each method of end fitting construction, bent tube or forged, and for each fitting material class. Simultaneous qualification of flared and flareless fittings may be accomplished by having a fitting on one hose end flared and a flareless fitting on the other end.

If a supplier qualifies one type end fitting sealing design as defined herein and desires to qualify another sealing design, two hose assemblies of each size to be qualified shall be subjected to the tests specified in 4.5.1.1.

TABLE 4 - Length of Hose Assemblies for Test

Hose Size	Assembly No. 1 - 4	Assembly No. 5 - 6 <sup>1</sup>	Assembly No. 7 - 10 <sup>2</sup>
	in	in	in
04	15	15	15
06	15	15	15
08	15	15	15
10	15	15	15
12	18	18	18
16	18	18	18
20	18	20	20
24	18	25	25
32	18	30	30
40	18	38	38
48	18	45	45
64	18	60	60

<sup>1</sup> Assembly length for flexure and vacuum test

<sup>2</sup> Assembly length required for pressure surge test

In addition to the ten hose assemblies listed, one additional sample of each size in length as shown in Figure 3 shall be required for Type I conductivity test (4.6.10) and several PTFE chips for Specific Gravity test (3.5.9)

TABLE 5 - Qualification Test Sequence and Number of Test Specimens in Sample

RELEVANT TEST		TEST SPECIMEN No.														
Para.	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4.6.1	Examination of Product	X	X	X	X	X	X	X	X	X	X	X		X	X	X
4.6.2	Proof Pressure	X	X	X	X	X	X	X	X	X	X			X	X	X
4.6.3	Elongation and Contraction	X														
4.6.4	Leakage	X	X													
4.6.7	Oil Resistance			X		X										
4.6.8	Flexibility and Vacuum					X	X									
4.6.9	Pressure Surge							X	X	X	X					
4.6.10	Electrical Conductivity (Type I)											X				
4.6.11	Repetitive Assembly Torque	X	X													
4.6.5	Burst at Room Temperature			X	X											
4.6.6	Burst at High Temperature	X	X													
3.5.9	Specific Gravity Test												X <sup>1</sup>			
6.1.1	Fire Resistance (when required)													X	X	X

Key: X means one test

<sup>1</sup> Test to be performed on PTFE Inner Liner

4.4.2 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 made available if requested by the procuring activity:

- a. Test Report: The test report shall be in accordance with MIL-HDBK-831 which shall include a report of all tests and outline description of the tests and conditions.
- b. Test Samples: Test samples when requested by the procuring activity. Samples subjected to qualification testing shall not be shipped as part of contract or order.
- c. Drawings: Three sets of assembly and subassembly drawings. The assembly drawings shall have a cut-away section showing all details in their normal assembly position and shall define all details and subassemblies.
- d. Sources: List of sources of hose or hose components, including source's name and product identification for inner tube, hose and fitting if other than assembly supplier.

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

4.4.3 Qualification Test Sequence: Test sequence and procedure shall be in as specified in Table 5 and, if applicable, 4.5.1.1.

4.5 Test Conditions:

4.5.1 Fitting Ends: Qualification tests shall be conducted on assemblies using straight type swivel ends with dimensions shown in Figure 1 and in Table 1, except for the impulse test samples requiring 90° elbow fitting at one end. Satisfactory completion of qualification tests on these hose assemblies shall also constitute qualification approval on hose assemblies using other fittings that have an identical attachment method and design.

4.5.1.1 Additional Fitting End Designs: If qualification approval is required for other type end fittings mating design, two additional hose assemblies with the type fittings and of the size to be qualified shall be subjected to the following tests in the sequence indicated:

- a. Examination of product (see 4.6.1)
- b. Proof pressure test (see 4.6.2)
- c. Leakage test (see 4.6.4)
- d. Repetitive assembly torque test (see 4.6.11)
- e. Room temperature burst pressure test (see 4.6.5)

#### 4.5.2 Preparation of Sample:

4.5.2.1 Oil Aging: In all the tests using oil aged samples, the hose assemblies shall be filled with a high temperature test fluid and soaked in an air oven at a temperature of 400 °F or 275 °F, as applicable, for seven days. All air shall be excluded from the bore of the assembly during the test. No pressure shall be applied to the assembly during the aging period.

4.5.2.2 Air Aging: Air aged samples shall be kept in air at a temperature of 400 °F or 275 °F, as applicable, for seven days.

4.5.2.3 Unaged Samples: Unaged assemblies shall be as manufactured.

4.5.3 Test Fluids: Unless otherwise specified, test fluids shall be hydraulic fluid conforming to MIL-H-5606, MIL-PRF-87257, MIL-PRF-83282, or water. Where high temperature test fluid is specified, the test fluid shall be MIL-PRF-83282 hydraulic fluid, MIL-PRF-7808 lubricating oil, or equivalent, unless otherwise specified by the procuring activity.

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

4.5.5 Pressure Measurements: Unless otherwise specified, all pressures shall have a tolerance of +20 psi, -0 psi.

#### 4.6 Inspection Methods:

4.6.1 Examination of Product: All hose assemblies shall be visually inspected to determine conformance to this document with respect to material, size and workmanship. Broken reinforcing wires or any evidence of malfunction shall be cause for rejection. Crossed over reinforcing wires shall not be cause for rejection.

4.6.2 Proof Pressure: All hose assemblies shall be subjected to the proof pressure test in accordance with AS2078. See 3.5.1

4.6.3 Elongation and Contraction: One hose assembly of each size shall be subjected to the elongation and contraction test in accordance with AS2078. See 3.5.2.

4.6.4 Leakage Test: Two hose assemblies of each size shall be leakage tested in accordance with AS2078. See 3.5.3.

4.6.5 Room Temperature Burst Pressure Test: Two hose assemblies of each size shall be subjected to the room temperature burst test in accordance with AS2078. The assemblies shall be observed throughout the test and the type of failure and the pressure when failure occurred shall be recorded. See 3.5.4.

- 4.6.6 High Temperature Burst Pressure Test: Two hose assemblies of each size shall be subjected to the high temperature burst test in accordance with AS2078 except the maximum ambient and fluid temperature shall be 400 °F for Class 1 assemblies, and 275 °F for Class 2 assemblies. The assemblies shall be monitored throughout the test and the type of failure and the pressure when failure occurred shall be recorded. See 3.5.5.
- 4.6.7 Oil Resistance Test:
- 4.6.7.1 Two hose assemblies of each size shall be filled with oil conforming to MIL-PRF-7808 or another oil approved by the procuring activity and placed in an oven which shall be maintained at 400 °F for Class 1 assemblies, and at 275 °F for Class 2 assemblies. Care shall be taken to insure against the assembly coming in contact with parts of the oven which are at a higher temperature. The same test fluid shall be used throughout this test, unless otherwise specified. The assembly shall have a pressure applied equal to the rated operating pressure as specified in Table 1.
- 4.6.7.2 At the end of a minimum of 16 h, the assembly shall be removed from the oven, drained and refilled with test fluid conforming to ASTM Reference Fuel B (70% Isooctane, 30% Toluene) as defined in ASTM D 471. A pressure shall then be applied equal to the rated operating pressure and maintained for a minimum of 2 h at room temperature.
- 4.6.7.3 The test as specified in 4.6.7.1 and 4.6.7.2 shall be repeated for a total of 3 times.
- 4.6.7.4 At the completion of the above tests, the test assemblies shall be filled with oil and placed in a cold chamber for 4 h while maintained at  $-67\text{ °F} \pm 2\text{ °F}$ . After the 4 h cold soak, the assemblies shall be subjected to a pressure equal to the operating pressure specified in Table 1. The pressure shall be held for a minimum of 5 min and then released. This shall be repeated for a total of 10 times with a minimum of 5 min between each pressure application.
- 4.6.7.5 The assemblies shall again be placed in a cold chamber where the temperature is  $-67\text{ °F} \pm 2\text{ °F}$  for 24 h. At the end of this time, oil at a temperature of 400 °F for Class 1 assemblies, and 275 °F for Class 2 assemblies, shall be circulated through the assemblies. Within 15 s after introduction of the hot oil, the pressure shall be increased to the rated proof pressure and held for a minimum of 2 min.
- 4.6.7.6 Any leakage of the test fluid from the assemblies during the preceding tests shall be evidence of failure.
- 4.6.7.7 At the conclusion of the above tests, one of the test assemblies shall be subjected to the room temperature burst test of 4.6.5. The other assembly shall be subjected to the flexibility and vacuum test of 4.6.8.