

INCH-POUND

MIL-DTL-32330

10 August 2009

DETAIL SPECIFICATION

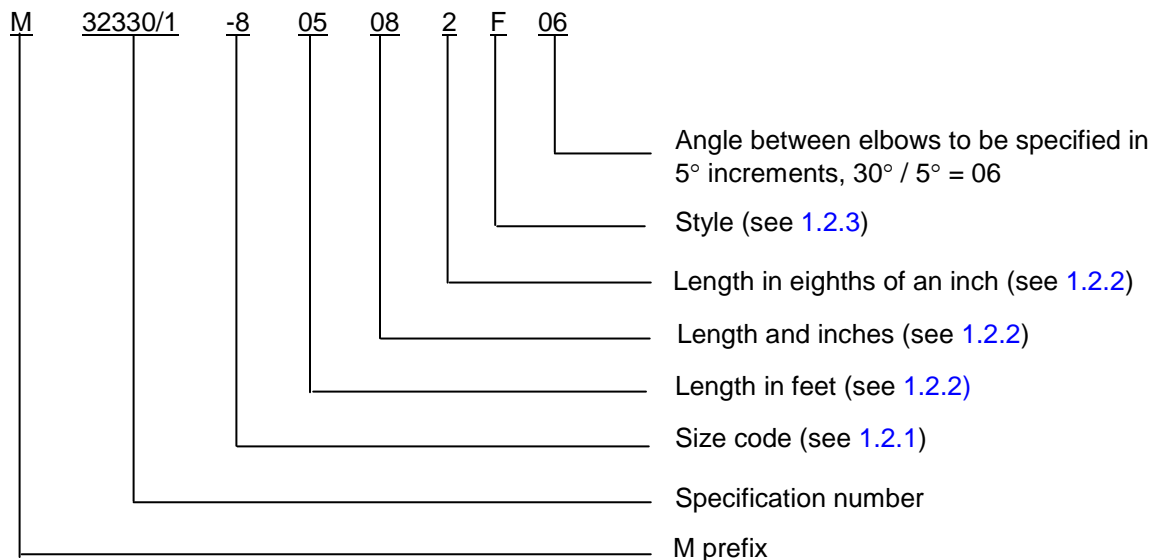
HOSE ASSEMBLY, CONDUCTIVE POLYTETRAFLUOROETHYLENE TUBE,
SMOOTH BORE, FLARED AND FLARELESS, TUBE TO HOSE,
WITH SWIVEL NUT

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

1. SCOPE

1.1 Scope. This specification covers the requirements for hose assembly, conductive polytetrafluoroethylene tube, smooth bore, flared and flareless, tube to hose, with swivel nut (see 6.1). Hose assemblies are manufactured with hose for high temperature applications (pneumatic -66°F to +160°F, hydraulic -65°F to +400°F), and a maximum operating pressure of 3000 psi, connectors are corrosion resistant steel.

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, a number for hose size, five numbers, two for length in feet, two for inches, and one for eighths of an inch, a letter for style, and two numbers for angle between elbows as follows:



Example: M32330/1-805082F06 indicates - Hose assembly for 1/2 inch hose ID, 5 feet 8 1/4 inches in length, style F (90° elbow to 90° elbow), and 30° between angular displacement between elbows.

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

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1.2.1 Hose dimensions. Hose inside and outside diameters are specified in table I.

TABLE I. Hose dimensions. 1/ 2/

Size dash no.	Hose ID Inches	Min. hose ID inches (mm)	Max. over braid OD inches (mm)
-4	1/4	.217 (5.51)	.470 (11.94)
-6	3/8	.310 (7.87)	.575 (14.61)
-8	1/2	.425 (10.80)	.742 (18.85)
-10	5/8	.552 (14.02)	.882 (22.40)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

1.2.2 Lengths of hose. Lengths of hose are represented by feet (00 through 99), inches (00 through 11) and fractions in 1/8 inch increments (0 thru 7).

1.2.3 Styles. Styles are specified in the individual specification sheets.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 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, 4, and 5 of this specification, whether or not they are listed.

2.2 Government documents.

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680	-	Degreasing Solvent
MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-PRF-7808	-	Lubricating Oil, Aircraft, Turbine Engine, Synthetic Base
MIL-PRF-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO code Number H-537
MIL-DTL-83296	-	Fitting, Corrosion Resistant Steel, High Temperature, High Pressure, General Requirements for
MIL-DTL-83298	-	Hose, Polytetrafluoroethylene, High Temperature, High Pressure (3000 PSI), Hydraulic and Pneumatic
MIL-PRF-87257	-	Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile
MIL-DTL-32330/1-	-	Hose Assembly, Conductive Polytetrafluoroethylene Tube, Flared, Tube to Hose with Swivel Nut
MIL-DTL-32330/2-	-	Hose Assembly, Conductive Polytetrafluoroethylene Tube, Flareless, Tube to Hose with Swivel Nut

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

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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.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

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

(Copies of these documents are available online at <http://www.iso.ch> or from the International Organization for Standardization American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.)

NCSL INTERNATIONAL

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

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

SAE INTERNATIONAL

SAE-AS603 - Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies
 SAE-AS611 - Hose Assembly and Tubing, Polytetrafluoroethylene, Cleaning Methods for
 SAE-AS2078 - Test Methods, Hose Assemblies, Polytetrafluoroethylene (PTFE)

(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. Unless otherwise noted herein or in the contract, in event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 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).

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3.3 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.

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

3.3.2 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.

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

3.4 Design and construction. The hose assembly 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 working pressure shown in [table II](#) and a minimum hydrostatic burst pressure shown in [table II](#).

TABLE II. Performance requirements of hose assemblies. 1/

Size dash no.	Maximum operating pressure		Proof pressure		Min. burst pressure at room temp		Min. burst pressure at high temp	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa
-4	3,000	20.7	6,000	41.4	16,000	110.3	12,000	82.7
-6	3,000	20.7	6,000	41.4	14,000	96.5	10,500	72.4
-8	3,000	20.7	6,000	41.4	14,000	96.5	10,500	72.4
-10	3,000	20.7	6,000	41.4	12,000	82.7	9,000	62.1

TABLE II. Performance requirements of hose assemblies - Continued. 1/

Size dash no.	Min. bend radius (inside of bend) inch (mm)	Volume expansion (cc/in.)	Pneumatic temperature range	Hydraulic temperature range °F (°C)
-4	3.00 (76)	.065	-65°F to +160 °F -54°C to +71°C	-65°F to +400°F -54°C to +204°C
-6	5.00 (127)	.085		
-8	5.75 (146)	.135		
-10	6.50 (165)	.220		

1/ Metric equivalents are given for information only.

3.4.1 Hose assembly construction. The hose assemblies in this specification and associated slash sheets shall consist of hose made in accordance with MIL-DTL-83298 and fittings shall be made in accordance with MIL-DTL-83296.

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3.4.2 Dimensions and configuration.

3.4.2.1 Hose dimensions. Hose dimensions shall be in accordance with MIL-DTL-83298. Typical hose configurations are shown on [figure 1](#).

3.4.2.2 Length. The hose assembly shall be furnished in lengths specified by the procuring activity. The hose shall be measured as shown on the applicable detail specification sheet. Tolerances shall be in accordance with 3.4.2.2.1.

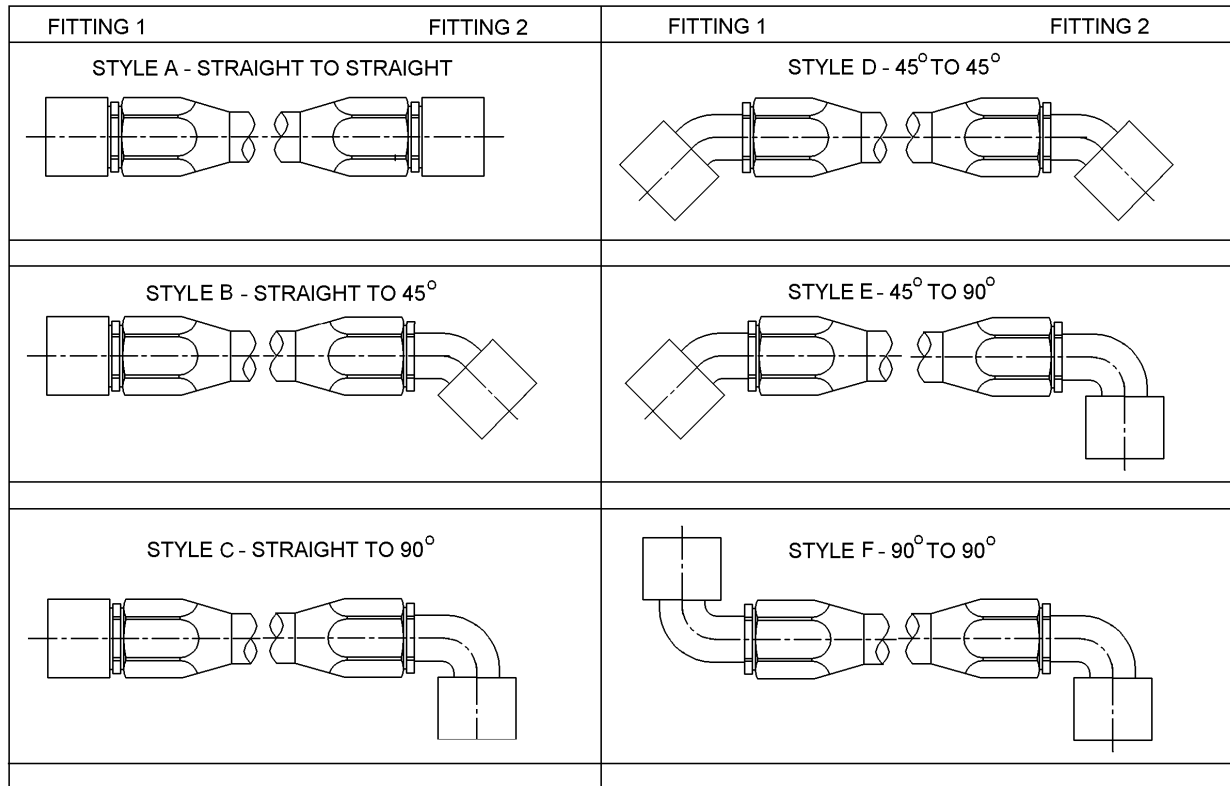


FIGURE 1. Typical hose assembly configurations.

3.4.2.2.1 Tolerances for length. Tolerances for the length "L" of hose assemblies shall be a specified below:

- a. L under 24 inches (610 mm): $\pm .125$ (3.18 mm)
- b. L from 24 to 36 inches (610 to 910 mm): $\pm .250$ (6.35 mm)
- c. L from 36 to 50 inches (910 to 1270 mm): $\pm .500$ (12.70 mm)
- d. L over 50 inches (1270 mm): ± 1 percent

3.4.2.3 End fittings. The end fittings shall be made in accordance with MIL-DTL-83296. The end fittings shall be retained on the assembly without slipping or leaking when coupled to the hose and tested as specified herein.

3.4.2.3 Lubricants. Lubricants may be used in the assembly of hose components.

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3.5 Performance.

3.5.1 Proof pressure. The hose shall withstand the proof pressure listed in [table II](#) without malfunction or leakage when tested in accordance with [4.8.2](#).

3.5.2 Leakage. There shall be no leakage through the wall of the hose or around the fittings when the hose assembly is subjected to testing in accordance with [4.8.3](#).

3.5.3 Burst pressure (see [4.8.4](#)).

3.5.3.1 Room temperature burst pressure. The hose assembly shall not leak or rupture at any pressure below the minimum room temperature burst pressure specified in [table II](#), when tested in accordance with [4.8.4.1](#).

3.5.3.2 High temperature burst pressure. When tested in accordance with [4.8.4.2](#), the hose assembly shall not leak, rupture, or blow off the hose at any pressure below the minimum high temperature burst pressure specified in [table II](#).

3.5.4 Hose conductivity. When subjected to testing in accordance with [4.8.5](#) using a test potential of 1,000 V dc, hose assembly sizes 4 through 8 shall conduct a direct current of not less than 6 μ A.

3.5.5 Elongation and contraction. The hose assembly shall not change in length by more than \pm .20 inch (5.08 mm) in 10 inches (254 mm) of length when tested in accordance with [4.8.6](#).

3.5.6 Stress degradation. The average air effusion shall not exceed 2.0 cc/in/min when tested in accordance with [4.8.7](#).

3.5.7 Impulse. The hose assembly shall not burst, leak, or show evidence of malfunctioning when subjected to a minimum of 250,000 impulse cycles when tested in accordance with [4.8.8](#).

3.4.8 Thermal shock. The hose assembly shall not leak or rupture at any pressure below the minimum high temperature burst pressure specified in [table II](#), when tested in accordance with [4.8.9](#).

3.5.9 Flexibility. The hose assembly shall not leak or show any evidence of malfunction when tested in accordance with [4.8.10](#).

3.5.10 Pneumatic surge. When tested in accordance with [4.8.11](#), the hose assembly shall no signs of leakage when proof pressure tested or show any evidence of malfunction when examined internally and externally.

3.5.11 Pneumatic leakage test. When tested in accordance with [4.8.12](#), the hose assembly shall show no evidence of leaks.

3.5.12 Corrosion. The hose assembly shall function satisfactorily at the specified operating pressure after 172 hours of cycling when tested in accordance with [4.8.13](#).

3.5.13 Tensile strength. The hose assembly when tested in accordance with [4.8.14](#) shall withstand a tensile pull of 1,000 pounds (453.59 kg).

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3.6 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. Date of hose assembly manufacture expressed in month and year.
- b. The rated working pressure in PSI (3000 psi).
- c. Hose assembly manufacturer's commercial and government entity (CAGE).
- d. Hose manufacturer's CAGE if different from hose assembly manufacturer.
- e. PIN (see 1.2).

3.7. Cleaning. All hose assemblies shall be cleaned in accordance with SAE-AS611, class 0. The interior surface of the hose assemblies shall be free from oil, grease, dirt, moisture, cleaning solvents and foreign materials when examined in accordance with 4.8.1. The ends of each hose assembly length shall be capped or plugged, with caps or plugs in accordance with NAS 847 to prevent entrance of moisture and foreign matter. The caps or plugs shall be securely attached and shall withstand normal strains, jarring and vibrations encountered during shipping, storage, and handling.

3.8 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 III. Workmanship shall be such as to enable the hose and hose assemblies to meet the applicable performance requirements of this specification.

TABLE III. Workmanship defects.

Defect	Inspection	Reference
Dimensions affecting interchangeability not within tolerance	Standard inspection equipment (SIE)	3.4.1
Hose inside diameter at fitting junction out of tolerance	SIE (hose assembly only)	3.4.2
Ridge on tube - Severe	SIE	N/A
Bunching of tube - Severe	SIE	N/A
Loose tube	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	N/A
Misbranding	Visual	3.6
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
Missing protective caps or plugs	Visual	3.7
Internal contaminants	SIE	3.7

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4. VERIFICATION

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

- a. Qualification inspection (see [4.4](#)).
- b. Conformance inspection (see [4.5](#)).

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

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions in specified in [4.3.1](#), [4.3.2](#), [4.3.3](#), [4.3.4](#), and [4.3.5](#).

4.3.1 Test conditions. Unless otherwise specified, all testing shall be conducted at atmospheric pressure within the range of 28 to 31 inches of mercury (71.1 to 78.4 centimeters of mercury), a temperature between 60°F and 100°F (15.6°C to 37.8°C), and a relative humidity of not more than 90%. Tolerances of the test conditions shall be as follows:

- a. Temperature: +10°F, -5°F (+5.6°C, -2.8°C)
- b. Pressure gage: ±5%

4.3.2 Stabilization of test temperatures. Unless otherwise specified, the test temperature in the chamber shall be stabilized before conducting the test.

4.3.3 Test fluids. Unless otherwise specified, the pressure test fluid shall be hydraulic oil in accordance with MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257, or water (proof test, burst test, and leakage tests only). When a high temperature test fluid is specified, the test fluid shall be lubricating oil in accordance with MIL-PRF-7808.

4.3.4 Oil aging. In all of 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 (204.4°C) for 7 days. All air shall be excluded from the bore of the assembly during the test.

4.3.5 Air aging. In all of the tests using air-aged samples, the hose assemblies shall be kept in air at a temperature of 400°F (204.4°C) for 7 days.

4.4 Qualification inspection (see [6.3](#)). Qualification inspection shall be performed at a laboratory acceptable to the qualifying activity on sample units produced with equipment and procedures used in production.

4.4.1 Samples for qualification. Samples for qualification shall be representative of the products proposed to be furnished to this specification. Test samples, consisting of 24 assemblies for each dash number size and for each length specified in [table IV](#), shall be examined and tested by the qualifying activity in accordance with this specification. Hose assemblies shall be qualified with hose and fittings from a minimum of two specific QPL manufacturers. Test results shall be submitted to the acquiring activity. All assemblies shall be identified with the manufacturer's name and the specification PIN.

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TABLE IV. Hose assembly lengths for testing. 1/

Hose size dash no.	Hose assemblies (24) <u>2/</u>									
	Category 1		Category 2		Category 3		Category 4		Category 5	
	Length inch (mm)	Qty.	Length inch (mm)	Qty.	Length inch (mm)	Qty.	Length inch (mm)	Qty.	Length inch (mm)	Qty.
-4	16 (406)	6	20 (508)	4	18 (457)	6	14 (356)	6	6 (152)	2
-6	21 (533)	6	27 (686)	4	18 (457)	6	14 (356)	6	6 (152)	2
-8	24 (610)	6	30 (762)	4	18(457)	6	14 (356)	6	6 (152)	2
-10	30 (762)	6	33 (762)	4	18 (457)	6	14 (356)	6	6 (152)	2

1/ Metric equivalents are given for information only.

2/ Hose assemblies vary in length among sizes. Category numbers shall be used to decide appropriate length of hose for testing.

4.4.2 Qualification inspection routine. All hose assemblies shall be subjected to qualification testing in table V and in the sequence specified in [table VI](#).

TABLE V. Qualification inspection requirements.

Inspection	Requirement paragraph	Test method paragraph
Dimensional and visual inspection	3.4.2 , 3.6 , 3.7 , and 3.8	4.8.1
Proof pressure	3.5.1	4.8.2
Leakage	3.5.2	4.8.3
Room temperature burst pressure	3.5.3.1	4.8.4.1
High temperature burst pressure	3.5.3.2	4.8.4.2
Hose conductivity	3.5.4	4.8.5
Elongation and contraction	3.5.5	4.8.6
Stress degradation	3.5.6	4.8.7
Impulse	3.5.7	4.8.8
Thermal shock	3.5.8	4.8.9
Flexibility	3.5.9	4.8.10
Pneumatic surge	3.5.10	4.8.11
Pneumatic leakage	3.5.11	4.8.12
Corrosion	3.5.12	4.8.13
Tensile strength	3.5.13	4.8.14

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TABLE VI. Qualification test sequence.

Sample number	Hose assemblies (see table IV)		Test sequence paragraph			
	Category	Qty.				
1 and 2	4	2	4.8.1	4.8.2	4.8.6	4.8.10
3 and 4	1	2	4.8.1	4.8.12	4.8.2	4.8.11
5 and 6 ^{1/}	3	2	4.8.1	4.8.2	4.8.3	4.8.4.1
7 and 8 ^{1/}	3	2	4.8.1	4.8.2	4.8.3	4.8.4.2
9 and 10	2	2	4.8.1	4.8.2	4.8.13	—
11 and 12	1	2	4.8.1	4.8.2	4.8.7	4.8.12
13 and 14	5	2	4.8.1	4.8.2	4.8.3	4.8.9
15 and 16	4	2	4.8.1	4.8.2	4.8.14	—
17thru 22 ^{1/}	1	2	4.8.1	4.8.2	4.8.8	—
	2	2				
	3	2				
23 and 24	4	2	4.8.5	—	—	—

^{1/} These samples shall have a 90° elbow fitting on one end of the assembly.

4.4.3 Acceptance of qualification test data. For identical requirements and test procedures, using an identical hose and fittings, qualification test data specified in MIL-DTL-83296 and MIL-DTL-83298 may be accepted as qualification test data for this specification providing that documented approval has been obtained from the qualifying activity. Unless otherwise approved by the qualifying activity, qualification test data from one manufacturer shall not be accepted for another.

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

4.4.5 Retention of qualification. To retain qualification, the contractor shall submit a report at 12-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. Each report shall contain a summary of the results obtained from both the sampling tests and the periodic control tests performed during the 12-month interval. The number of lots and quantities of fitting that have passed and failed shall be included. All reworked sampling lots shall be accounted for and identified.

4.4.5.1 Nonconformance of qualification. If the summary of test results indicates nonconformance with the requirements specified herein but, the corrective measures acceptable to the qualifying activity has not been taken, action may be taken to remove the failed product from the QPL.

4.4.5.2 Periodic qualification report. Failure to submit the report within 30 days after the end of each 12-month period may result in loss of qualification for the period. In addition to the periodic submission of inspection data, the manufacturer shall immediately notify the qualifying activity at any time during the 12-month period that the inspection data indicates failure of the qualified product to meet the requirements specified herein. If there has been no production during the reporting period, a report shall be submitted certifying that the manufacturer still has the capabilities and the facilities necessary to produce the qualified product. If there has been no production during two consecutive report periods, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified product for testing in accordance with the qualification inspection requirements.

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4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of individual inspections in table VII.

TABLE VII. Individual inspections.

Inspection	Requirement paragraph	Test method paragraph
Dimensional and visual inspection	3.4.2, 3.6, 3.7, and 3.8	4.8.1
Cleaning effectiveness	3.7	4.8.15
Proof pressure	3.5.1	4.8.2

4.5.2 Individual inspections. All hose assemblies from a production lot (see 4.5.2.1) shall be subjected to the individual inspections specified in table VII. Any item failing to meet the requirements of the individual tests shall immediately be removed from the lot.

4.5.2.1 Production lot. A production lot shall consist of all hose assemblies of the same part number which have been manufactured under the same conditions and on the same continuous run.

4.5.2.2 Sampling inspection. Hose assemblies, randomly selected to form an inspection sample (see 4.5.3.2), shall be subjected to the sampling tests specified in table VIII.

TABLE VIII. Sampling inspection.

Inspection or test	Requirement paragraph	Test method paragraph
Elongation and contraction	3.5.5	4.8.6
Leakage	3.5.2	4.8.3
Room temperature burst pressure	3.5.3.1	4.8.4.1

4.5.2.3 Inspection sample. Eight hose assemblies shall be tested for each 3000 assemblies produced (large lot). At the option of the manufacturer, one hose assembly may be tested for each 375 assemblies produced (small lot option). An inspection sample shall consist of hose assemblies randomly selected without regard to quality. If there has been some production for any given size, but not enough to trigger sampling tests within three years for that size, sampling tests will be performed at the rate of one assembly for every 375 built unless written approval to not perform the testing is obtained from the qualifying activity.

4.5.2.4 Disposition of sampling inspection samples. Samples that have been subjected to sampling inspection are considered damaged and shall not be delivered as part of a contract or purchase order.

4.5.2.5 Nonconformance of sampling tests. If one or more defects are found in the inspection sample, both the qualifying and inspection activities shall be immediately notified and the production lot shall be rejected and not be supplied to this specification. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. The corrective measures shall be performed on the materials or processes, or both, as warranted, and on all products considered subjected to the same failure. Once the corrective action has been completed, either the specific sampling test in which the original sample failed or all sampling tests may be required

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to be repeated on additional samples, at the option of the qualifying activity. However, final acceptance shall be withheld until testing has shown that the corrective action was successful. In the event of a failure after re-inspection, information concerning the failure and the corrective action taken shall be furnished to both the qualifying and inspection activities.

4.5.3 Periodic control tests. For each size manufactured under essentially the same conditions, periodic control testing shall be performed on either eight samples from every 10,000 hose assemblies produced or two samples from every 2,500 hose assemblies. If there has been some production but the number of hose assemblies produced has not reached 2,500 for a specific size within three years, the manufacturer shall perform periodic control tests on two hose assemblies of that size unless documented approval has been obtained from the qualifying activity.

4.5.3.1 Periodic control test plan. Testing shall be as specified in table IX. Half of the samples shall be subjected to the stress degradation test followed by the hose conductivity test. The remaining half of the samples shall be subjected to the impulse test.

TABLE IX. Periodic control tests.

Inspection	Requirement paragraph	Test method paragraph
Hose assembly conductivity	3.5.4	4.8.5
Impulse	3.5.7	4.8.8
Stress degradation	3.5.6	4.8.7

4.5.3.2 Nonconformance of periodic control tests. If a sample fails a periodic control test, both the qualifying and inspection activities shall be immediately notified of such failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. The corrective measures shall be performed on the materials or processes, or both, as warranted, and on all products considered subjected to the same failure. Once the corrective action has been completed, either the specific periodic control test in which the original sample failed or all periodic control tests may be required to be repeated on additional samples, at the option of the qualifying activity. Furthermore, the sampling tests may be re-instituted in addition to the periodic control tests if deemed applicable by the qualifying activity. However, final acceptance shall be withheld until testing has shown that the corrective action was successful. In the event of a failure after re-inspection, information concerning the failure and corrective action taken shall be furnished to both the qualifying and inspection activities.

4.5.4 Disposition of sample units. Samples that have been subjected to any sampling or periodic control tests are considered damaged and shall not be delivered as part of a contract or purchase order.

4.6 Additional QPL test and reporting requirements.

4.6.1 Retention of qualification. To retain qualification, the contractor 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.

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- 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 Loss of product qualification.

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

4.7.3 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 qualified product list (QPL) product. Subsequently, the qualifying activity shall 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.

4.7.4 No production during reporting period (12 months). 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.

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 dimensions, design and construction (3.4.2), marking (3.6), cleaning (3.7), and workmanship (3.8).

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

4.8.2 Proof pressure test (see 3.5.1). The hose assembly shall be tested as specified in SAE-AS2078. When subjected to the rated proof pressure specified in [table II](#) the hose assembly shall meet the requirements of [3.5.1](#).

4.8.3 Leakage (see 3.5.2). Prior to testing, the exterior of the samples shall be cleaned free of oil and of any residues. Samples shall be subjected to testing in accordance with SAE AS2078. Test fluid shall be water or fluid in accordance with MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257. A white paper towel, wrapped tightly around the entire length of the sample, shall be used to check for leakage. Conformance shall be as specified in [3.5.2](#).

4.8.4 Burst tests (see 3.5.3).

4.8.4.1 Room temperature burst pressure test (see 3.5.3.1). A hose assembly shall be subjected to the room temperature burst pressure test in accordance with SAE-AS2078 and shall meet the requirements of [3.5.3.1](#). The assembly shall be observed throughout the test and the type of failure and the pressure at which failure occurred shall be recorded.

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4.8.4.2 High temperature burst pressure test (see 3.5.3.2). Hose assemblies when subjected to high temperature burst pressure testing shall meet the requirements of 3.5.3.2. The assembly shall be filled with one of the high temperature test fluids specified in 4.3.3 and tested as specified in SAE-AS2078.

4.8.5 Hose conductivity (see 3.5.4). The test sample shall be a 14 inch (35.6) length of hose with a fitting attached at only one end. Testing shall be in accordance with the conductivity test for hose assembly in accordance with SAE-AS2078. Conformance shall be as specified in 3.5.4.

4.8.6 Elongation and contraction test (see 3.5.5). The unpressurized assembly shall be tested as specified in SAE-AS2078 and shall meet the requirements of 3.5.5. After 5 minutes, while still pressurized, the gauge length shall be remeasured and the change in length recorded.

4.8.7 Stress degradation test (see 3.5.6). The assembly shall be tested as specified in SAE-AS2078 and shall meet the requirements of 3.5.6. When necessary, the assembly shall be drained and flushed with fluid conforming to MIL-PRF-680.

4.8.8 Impulse test (see 3.5.7). 6 hose assemblies shall be impulse tested in accordance with SAE-AS2078 and shall meet the requirements of 3.5.7. The following details shall apply:

- a. Prior to impulsing, two assemblies shall be oil-aged, two shall be air-aged, and two shall be unaged.
- b. The assemblies shall then be subjected at room temperature to the rated proof pressure specified in [table II](#) for a minimum of 5 minutes.
- c. The assemblies shall be tested as specified in SAE-AS2078.
- d. Electronic measuring devices shall be used to determine and control the impulse pressures in the inlet manifold to the magnitude as specified in SAE-AS603.
- e. The impulse shall occur at 70 ± 10 cycles per minute (cpm).
- f. The rate of pressure rise shall not be less than 100,000 psi/sec or more than 200,000 psi/sec.
- g. The test fluid shall be one of the high temperature test fluids specified in 4.3.3.

4.8.9 Thermal shock test (see 3.5.8). Two hose assemblies shall be thermal shock tested in accordance with SAE-AS2078 and shall meet the requirements of 3.5.8. The following details shall apply:

- a. One hose assembly shall be air-aged and one assembly shall be unaged.
- b. The assemblies shall then be subjected to the rated proof pressure specified in [table II](#) for a minimum of 5 minutes.
- c. High temperature test fluid shall be as specified in 4.4.3.

4.8.10 Flexibility test (see 3.5.9). A hose assembly shall be tested in accordance with SAE-AS2078 and shall meet the requirements of 3.5.9. The following details shall apply:

- a. The distance between fitting ends shall be as specified in table X.
- b. The uncapped assembly shall be filled with oil conforming to one of the high temperature test fluids specified in 4.3.3.

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TABLE X. Flexibility dimension. ^{1/}

Size dash no.	Distance between fitting ends inches (mm)
-4	6.50 (165)
-6	10.63 (270)
-8	12.25 (311)
-10	14.00 (356)

^{1/} Metric equivalents are given for information only.

4.8.11 Pneumatic surge test (see [3.5.10](#)). A hose assembly shall be tested in accordance with SAE-AS2078 and shall meet the requirements of [3.5.10](#). The hose assembly shall be subjected at room temperature, to the rated operating pressure specified in [table II](#). At the end of this period, the hose shall be proof pressure tested and then sectioned for inspection.

4.8.12 Pneumatic leakage test (see [3.5.11](#)). A hose assembly shall be pneumatic leakage tested in accordance with SAE-AS2078 and shall meet the requirements of [3.5.11](#).

4.8.13 Corrosion test (see [3.5.12](#)). A hose assembly when subjected to the corrosion test shall meet the requirements of [3.5.12](#). The following details shall apply:

- The hose assembly shall be mounted in a vertical position and immersed in a 2.5% solution of sodium chloride for 5 minutes.
- The assembly shall then be air dried at 140°F (60°C) for 25 minutes.
- This cycling shall be continued for 172 hours with the assembly pressurized to the rated operating pressure specified in [table II](#).

4.8.14 Tensile strength (see [3.5.13](#)). Hose assemblies when subjected to the tensile strength assembly test shall meet the requirements of [3.5.13](#). The following details shall apply:

- The hose assembly shall be placed in a straight position and pressurized to 3,000 psig (206.84 bar) using a suitable liquid.
- 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.
- Any failure below 1,000 pounds (453.59 kg) pull shall be cause for rejection (see [3.5.13](#)).

4.8.15 Cleaning effectiveness. Cleaning effectiveness shall be in accordance with SAE-AS611 class 0 (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 [3.7](#) 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 0 and preserved and packaged with the remainder of the lot.

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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.

6. NOTES

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

6.1 Intended use. These hose assemblies are military unique because they are intended for use in military aircraft and missile systems that use high pressure (3,000 psi) and high temperature (-65°F to +160°F) pneumatic and (-65°F to 400°F) hydraulic systems. Medium pressure pneumatic storage system applications are not recommended. These hose assemblies are capable of withstanding the severe environment encountered in military applications. Installations in which the limits specified herein are exceeded, or in which the application is not covered specifically by this specification will be subject to the approval of the acquiring activity.

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 3.6).
- c. Level of preservation, packaging, and marking required (see section 5.1).

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 contract, qualified for inclusion in Qualified Products List QPL No. 32330 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. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <http://assist.daps.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.

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

6.6 Subject term (key word) listing.

Medium pressure
Hydraulic
Pneumatic

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APPENDIX A

ASSEMBLY AND DISASSEMBLY OF FITTINGS ONTO A HOSE AND TUBE.

A.1 SCOPE

A.1.1 Scope. This appendix provides the assembly and disassembly of fittings onto a hose. This appendix is not a mandatory part of this specification. The information contained herein is for guidance only.

A.2 APPLICABLE DOCUMENTS

DEPARTMENT OF DEFENSE SPECIFICATIONS

MS27639 - Disassembly Tool

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

SAE INTERNATIONAL

SAE-AS4395 - Fitting End, Flared, Tube Connection, Design Standard

(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.)

A.3 Assembly procedure (hose). The hose and fitting assembly procedure shall be as follows:

- a. The hose shall be wrapped two full turns with a gummed fabric tape where the hose will be cut. Then the hose shall be cut squarely through the tape with a power driven, circular "knife-edge" blade. For ease of cutting, the hose may be bent slightly. The knife-edge blade shall be kept sharp to avoid excessive welding of the reinforcement wire ends which could result in poor flaring and thereby cause a source of leaks. Clean hose after cutting and assure no sharp cutting edges. Inspect hose internally for any residue and clean in accordance with SAE-AS611.
- b. The gummed fabric tape shall be unwrapped one full turn and shall be rewrapped and rolled over the exposed end of the hose. The above step shall be repeated for each hose cut length.
- c. Sockets shall be installed on the hose (see [figure A-1](#)). The hose shall be inserted into the skirt-end of the socket by applying a twisting, pushing motion. After assembling both sockets, the tape shall be removed.
- d. There shall be approximately .065 inch (1.65 mm) clearance at the end of the hose between the tube and the reinforcement to permit installation of the sleeve. If it is necessary to flare the reinforcement, the sleeve may be used by placing the edge of the sleeve between the tube and reinforcement and oscillating it around the circumference of the hose. The reinforcement wires shall not be over-flared.
- e. The tube shall be expanded into the sleeve by inserting the hose on the preassembly tool in accordance with MS27639. A steady force and a slight rotation of the hose shall be executed until the sleeve bottoms on the shoulder of the tool. The hose shall be removed from the preassembly tool and a check made to insure that the tube is still bottomed against the shoulder inside the sleeve.

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APPENDIX A

- f. The socket shall be held firmly in a vise and the preassembly tool inserted into the end of the hose (The hose shall be pulled into the socket by hand as far as possible). Using a nonferrous hammer, the preassembly tool shall be tapped to force the sleeve into the socket. The threaded end of the socket shall bottom against the shoulder on the preassembly tool. Then the preassembly tool shall be removed. Reinforcement wires shall not extend into the threaded portion of the socket.
- g. The nipple shall be installed onto the hose. A steady force and a slight rotation of the nipple shall be executed until the threads of the nipple and socket engage. Then the nipple shall be turned by hand to assure no cross threading.
- h. With the proper size wrench, the fitting shall be tightened until a $.031 + .015$ to $-.008$ inch ($0.79 + 0.38$ to -0.20 mm) gap is obtained (see [figure A-2](#)).
- i. Clean each hose assembly internally .
- j. Inspect each hose assembly for bulged inner tube, obstructions, and cleanliness.
- k. Proof test each hose assembly.

A.4 Assembly procedure (tube). The tube and fitting assembly procedure shall be as follows:

- a. The sleeve shall be squarely inserted on tube and the tube and sleeve shall be squarely inserted into the nipple. The sleeve shall be started by hand and positioned by pushing firmly against a flat surface until the tube bottoms against the shoulder inside the sleeve. Care should be exercised to insure that the tube OD shall not be scratched or cut.
- b. A steady force and a slight rotation of the nipple shall be executed until the threads of the nipple and socket engage. Then the nipple shall be turned by hand to assure no cross threading.
- c. With the proper size wrench, the fitting shall be tightened sufficiently to prevent leakage.

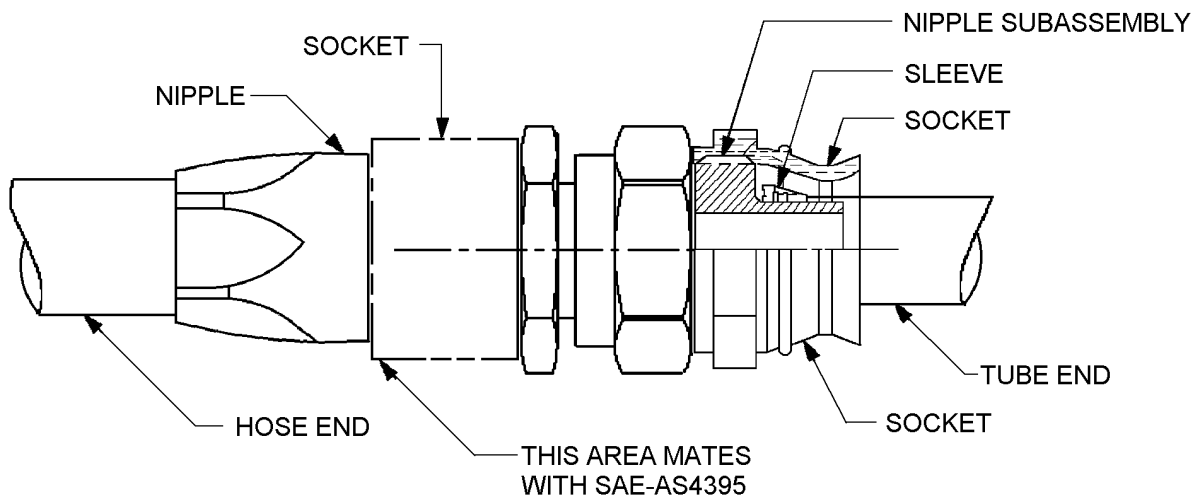
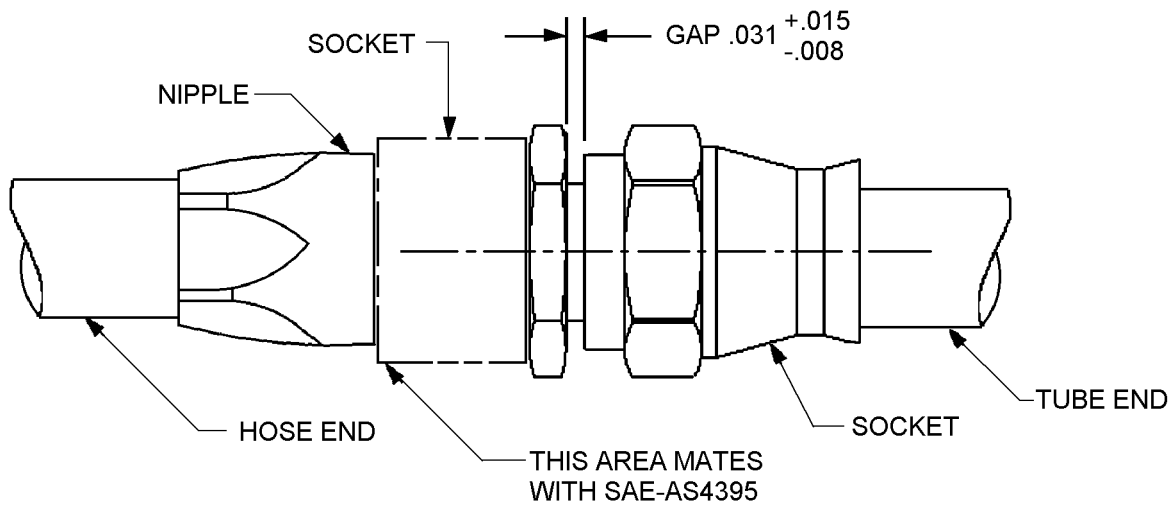


FIGURE A-1. Nipple sleeve and socket.

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APPENDIX AFIGURE A-2. Gap measurement.

A.5 Disassembly procedure. The hose and fitting disassembly procedure shall be as follows:

- a. With the proper size wrench, the nipple shall be loosened and removed from the socket and hose (see [figure A-1](#)).
- b. The hose shall be cut approximately 1 inch (254 mm) from the socket skirt. If a new hose assembly is to be made from the salvaged length of hose the instructions shall be followed as specified in [A.3](#).
- c. The socket shall be held firmly in a vise. Needle nose pliers shall be used to remove the tube from the sleeve and hose reinforcement. The tube shall be removed by folding longitudinally and pulling it out of the skirt end of the socket.
- d. With the socket still in a vise, the disassembly tool (MS27639) shall be inserted so that the shoulder on the tool engages the shoulder in the sleeve. A nonferrous hammer shall be used to tap the tool until the sleeve separates from the socket and hose reinforcement. The reinforcement shall then be pulled out of the socket.
- e. The fitting components shall be cleaned with air pressure to remove dirt and other foreign matter before reuse.

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CONCLUDING MATERIAL

Custodians:

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

Preparing activity:

DLA - CC

(Project 4720-2008-011)

Review activities:

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

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