MIL-H-83298A
10 March 1983
SUPERSEDING
MIL-H-83298(USAF)
17 March 1971

MILITARY SPECIFICATION

HOSE, TETRAFLUOROETHYLENE, HIGH TEMPERATURE, HIGH PRESSURE (3000 PSI), HYDRAULIC AND PNEUMATIC

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

1. SCOPE

1.1 This specification covers the requirements for tetrafluoroethylene hose for high-temperature, high pressure, hydraulic and pneumatic systems for aircraft and missiles (6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

FEDERAL

P-D-680	Dry Cleaning Solvent
TT-I-735	Isopropl Alcohol

MILITARY

MIL-P-775	Hoses, Rubber or Fabric (Including Tubing), and Fittings, Nozzles and Strainers, Packaging of
MIL-H-5606	Hydrualic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-F-8815	Filter and Filter Elements, Fluid Pressure, Hydraulic, Line, 15 Micron Absolute, Type II Systems
MIL-T-27602	Trichloroethylene, Oxygen Propellant Compatible (by Flushing Methods)
MIL-H-83282	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft
MIL-F-83296	Fitting, Hose, Tetrafluoroethylene, High Temperature, High Pressure, General Requirements for

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document shuld be addressed to: ASD/ENESS, Wright-Patterson AFB, OH 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

MILITARY

MIL-STD-130 Identification Marking of US Military Property
MIL-STD-143 Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-831 Test Reports, Preparation of

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific acquisition functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publication. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials

ASTM D412 Methods of Tension Testing of Vulcanized Rubber
ASTM D792 Tests for Specific Gravity and Density of Plastics
ASTM D1457 TFE - Fluorocarbon Resin Molding and Extrusion Materials

(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

Society of Automotive Engineers

AMS 3380 Hose, Polytetrafluoroethylene, TFE Fluorocarbon Resin, Wire Braid Reinforced
ARP 1153 Method for Determining Relative Specific Gravity Polytetrafluoroethylene Tubing

(Copies of SAE documents may be obtained from the Society of Automotive Engineers, Inc., 2 Pennsylvania Plaza, New York, NY 10001).

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. The hose furnished under this specification shall be a product which has been tested, has passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable Qualified Products List.

3.2 Components. The hose shall consist of a tetrafluoroethylene tube with corrosion-resistant steel reinforcement.

3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 Materials. Materials shall conform to applicable specifications and to the requirements specified herein. All materials that are not specifically described herein shall be of the highest quality and suitable for the purpose intended.

3.5 Design and construction. The hose shall be so designed and constructed that, when assembled with approved end fittings conforming to MIL-F-83296, the resulting assemblies will meet the requirements of this specification.

3.5.1 Tube. The tube shall be a seamless extrusion of virgin tetrafluoroethylene resin. Base resin shall conform to ASTM D1457, type III, except for the specific gravity (SG) requirements. Additives may be included in the compound from which the tube is extruded.

3.5.1.1 Reinforcement. The reinforcement shall be corrosion-resistant stainless steel wire, uniform in quality and size, and of sufficient strength to insure that the hose will meet the requirements specified herein.

3.5.1.2 Interlayers. Interlayers, if used, shall be resistant to or suitably protected from all fluids with which the hose may come in contact. They shall be capable of withstanding temperature and pressures listed in table I. Interlayers shall not extrude through the outer braid.

3.5.2 Hose end fittings. Hose end fitting required to test hose to the requirements of this specification shall conform to MIL-F-83296 and the applicable MS fitting specification.

3.5.3 Dimensions. The hose dimensions shall be as specified in table II.

3.5.3.1 Length. Unless otherwise specified, hose shall be furnished in the lengths as indicated in table II.

3.6 Performance. The hose shall be capable of meeting the following performance requirements within the physical requirements specified in table I.

3.6.1 Tube

3.6.1.1 Tube roll and tube proof pressure. The tube shall withstand the roll and proof pressure conditions of 4.5.2 without malfunction or leakage.

3.6.1.2 Elongation. The longitudinal and transverse elongation at 73.4°F ±3.6°F shall be minimum of 200 percent when tested in accordance with 4.5.3.1.

3.6.1.3 Tensile strength. The longitudinal tensile strength for all sizes of tube shall be 2200 psi minimum, and the transverse tensile strength (-10 size only) shall be 1800 psi minimum at 73.4°F ±3.6°F. The tensile strength test shall be conducted in accordance with 4.5.3.2.

3.6.1.4 Specific gravity. The specific gravity values and tests shall be in accordance with 4.5.3.3.

3.6.1.5 Conductivity of tube. Tube sizes -4 through -8 shall be capable of conducting a current equal to or greater than 6 microamperes. Tube size -10 shall be equal to or greater than 12 microamperes with a test potential of 1,000 volts dc, when tested in accordance with 4.5.3.4.

3.6.2 Hose. The hose, when assembled with end fittings conforming to MIL-F-83296, shall meet the following performance requirements.

TABLE I. Physical requirements of high pressure, high temperature hose.

Size dash No.	Operating pressure (Max psi)	Proof pressure (Min psi)	Burst pressure room temp (Min psi)	Burst pressure high temp (Min psi)	Min bend radius (inside of bend) (Inches)	1/ Temperature range	Cubical expansion (cc/in.)
-4	3000	6000	16,000	12,000	3	-65°F to +400°F	0.065
-6	3000	6000	14,000	10,500	5	-65°F to +400°F	0.085
-8	3000	6000	14,000	10,500	5-3/4	-65°F to +400°F	0.135
-10	3000	6000	12,000	9,000	6-1/2	-65°F to +400°F	0.220

NOTE: 1/ Pneumatic temperature range shall be -65°F to +160°F

TABLE II. Hose assembly, dimensions, and lengths.

Size	Hose Inside Diameter (Inches) Min.	Length (percent) 1/	Lengths Above 14 ft. (Min. %)	Tubing Wall Thickness (Inch) ±.005"	Over Braid Outside Diameter (Inches) Max.
-4	0.217	35	65	0.050	0.470
-6	0.310	35	65	0.050	0.575
-8	0.425	35	65	0.050	0.742
-10	0.552	45	55	0.050	0.882

1/ Not more than 5 percent of the full order can be of 3-foot lengths.

TABLE III. Length of tube and hose assemblies for test (in inches).

-4	16	20	18	14	6
-6	21	27	18	14	6
-8	24	30	18	14	6
-10	30	33	18	14	6

3.6.2.1 Proof pressure. The hose shall withstand the proof pressure listed in table I without malfunction or leakage when tested in accordance with 4.5.4.

3.6.2.2 Leakage. The hose assembly shall not leak nor rupture when subjected to 2 pressure cycles of 70 percent of the minimum room temperature burst pressure specified in table I when tested in accordance with 4.5.5.

3.6.2.3 Room temperature burst pressure. The hose assembly shall not leak nor rupture at any pressure below th minimum room temperature burst pressure specified in table I, when tested in accordance with 4.5.6.

3.6.2.4 Elongation and contraction. The hose assembly shall not change in length by more than ±0.20 inch in 10 inches of length when tested in accordance with 4.5.7.

3.6.2.5 Stress degradation. The average air effusion shall not exceed 2.0 cc/in/min when tested in accordance with 4.5.8.

3.6.2.6 Impulse. The hose assembly shall not burst, leak, nor show evidence of malfunctioning when subjected to a minimum of 250,000 impulse cycles when tested in accordance with 4.5.9.

3.6.2.7 Thermal shock. The hose assembly shall not leak nor rupture at any pressure below the minimum high temperature burst pressure specified in table I, when tested in accordance with 4.5.10.

3.6.2.8 Assembly flex. The hose assembly shall not leak nor show any evidence of malfunction when tested in accordance with 4.5.11.

3.6.2.9 Cubical expansion. The cubical expansion of the hose shall not exceed the limits specified in table I when tested in accordance with 4.5.12.

3.6.2.10 Pneumatic effusion. The hose assembly effusion rate shall not exceed the specified values when tested in accordance with 4.5.13.

3.6.2.11 Pneumatic surge. The tube of the hose asembly shall not collapse and there shall be no evidence of degradation when examining the sectioned hose and the down stream filter, when tested in accordance with 4.5.14.

3.6.2.12 Corrosion. The hose assembly shall function satisfactorily at the specified operating pressure after 172 hours of cycling when tested in accordance with 4.5.15.

3.7 Identification of product. The hose shall be marked for identification in accordance with MIL-STD-130. Metal or flexible plastic bands shall be placed on the hose at each end and at 10-foot intervals as applicable, and shall contain the following additional information: Hose specification number, size, operating pressure (3000 psi), and the manufacturer's Federal Supply Code Number.

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

4. 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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government 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.

4.1.1 Component and material inspection. The supplier is responsible for insuring that components and materials are manufactured, examined and tested in accordance with referenced specifications and standards.

4.2 Classification of inspections. The examining and testing of tetrafluoroethylene hose shall be classified as follows:

a. Qualification inspections (4.3)

b. Quality conformance inspections (4.4)

4.3 Qualification inspection (6.3)

4.3.1 Test samples. The test samples shall consist of 16 assemblies of each size and of the lengths specified in table III, made up as required from hose as specified herein and end fittings conforming to MIL-F-83296.

4.3.1.1 In addition to the samples specified in 4.3.1, two 14-inch and two 6-inch lengths of tubing (reinforcement removed) shall be used for tests as applicable herein.

4.3.2 Test conditions. All test conditions shall conform to the tolerance as specified herein.

4.3.2.1 Atmospheric conditions. Unless otherwise specified herein, all testing shall be performed at the atmospheric pressure within the range of 28 to 31 inches of mercury, a temperature between +60°F and +100°F, and a relative humidity of not more than 90 percent.

4.3.2.2 Tolerances. Unless otherwise specified, tolerances of the test conditions are as follows:

Test Conditions	Tolerances
Temperature	+10°F, -5°F
Pressure (gauge)	±5%

4.3.2.3 Accuracy of test apparatus. The accuracy of instruments and test equipment used to control and monitor the test parameter shall be verified as necessary to insure accuracy. All instruments and equipment used in conducting the tests specified herein shall:

a. Conform to laboratory standards whose calibration is traceable to the prime standards at the U.S. Bureau of Standards.

b. Have an accuracy of at least one-third the tolerance for the variable to be measured. In the event of conflict between this accuracy in any one of the test methods of this specification, the latter shall govern.

c. Be appropriate for measuring the test parameters.

4.3.2.4 Stabilization of test temperature. Unless otherwise specified, temperature stabilization will have been attained when the temperature within 6 inches of the assembly does not change more than +10°F, -5°F per hour.

4.3.2.5 Test fluids. Unless otherwise specified, the pressure test fluid shall be hydraulic fluids conforming to MIL-H-5606, MIL-H-83282, or water. When a high temperature test fluid is specified, the test fluid shall be MIL-H-8446 hydraulic fluid, MIL-H-7808 lubricating oil, or one of the following:

a. General Electric F-50, or equal

b. Dow Chemical F-60, or equal

c. Oronite Chemical 8200, or equal.

4.3.2.6 Oil aging. In all of the tests using oil-aged samples, the assembly shall be filled with a high temperature test fluid and soaked in an air oven at a temperature of 400°F for 7 days. All air shall be excluded from the bore of the assembly during the test.

4.3.2.7 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 for 7 days.

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 agency, the following shall be furnished to that activity:

a. Test report: Three copies of a test report in accordance with MIL-STD-831 which shall include a report of all tests and outline description of tests and conditions

b. Test samples: The samples which were tested, when requested by the procuring activity

c. Source list: List of sources of hose and sources' names and hose construction numbers.

d. Log sheets: 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.

4.3.4 Qualification tests schedule. Qualification inspections of each size hose and hose assembly shall consist of all the examinations and tests specified under 4.5. The test schedule shown in table IV shall be followed during qualification testing.

TABLE IV. Qualification test schedule.

	1/ Tube samples		Hose Assemblies (16)					
No.	1, 2	3, 4	5, 6	7, 8	9, 10	11, 12	13, 14	15 thru 20
Para.	4.5.1 4.5.2 4.5.3 4.5.3.1 4.5.3.2 4.5.3.3	4.5.1 4.5.2 4.5.3.4	4.5.1 4.5.2 4.5.4 4.5.7 4.5.11	4.5.1 4.5.2 4.5.4 4.5.12 4.5.13 4.5.6	4.5.1 4.5.2 4.5.4 4.5.5 4.5.10	4.5.1 4.5.2 4.5.4 4.5.8 4.5.14	4.5.1 4.5.2 4.5.4 4.5.15	4.5.1 4.5.2 4.5.4 4.5.9

1/ Reinforcement removed.

4.4. Quality conformance inspections. Quality conformance inspections shall consist of the following tests:

a. Individual tests (4.4.1)

b. Sampling tests (4.4.2)

c. Periodic control tests (4.4.3)

4.4.1 Individual tests. Each length of tube and hose assembly of each size shall be subjected to:

a. Examination of product (4.5.1.2)

b. Tube roll and tube proof pressure test (4.5.2)

c. Hose proof pressure (4.5.4)

4.4.2 Sampling tests

4.4.2.1 Lot. A sampling test lot shall consist of 1000 feet, or less, of one of each dash size hose manufactured at essentially the same time.

4.4.2.2 Tests. The lengths of hose shall be individually selected at random over each complete sampling lot and subjected to the tests below.

Tests	Samples
Examination of product (4.5.1.1)	All test lengths
Specific gravity (4.5.3.3)	Consisting of two 6-inch lengths of tube (reinforcement removed)
Elongation (4.5.3.1)	Consisting of two 6-inch lengths of tube (reinforcement removed)
Tensile strength (4.5.3.2)	Consisting of two 6-inch lengths of tube (reinforcement removed)
Elongation and constraction (4.5.7)	Consisting of two 14-inch assemblies
Room temperature burst pressure (4.5.6)	Consisting of two 14-inch assemblies

4.4.3 Periodic control tests

4.4.3.1 Lot. A periodic control test lot shall consist of hose of one dash size not exceeding a total length of 8000 feet.

4.4.3.2 Tests. The lengths of hose shall be individually selected at random over each complete periodic control test lot and subjected to the tests below.

Tests	Samples
Stress degradation test (4.5.8)	Consisting of 4 hose assembly for each test (8 total) of the lengths specified in table III.
Impulse test (unaged samples) (4.5.9)	Consisting of 4 hose assembly for each test (8 total) of the lengths specified in table III.
Conductivity test (of tube) (4.5.3.4)	Consisting of 4 lengths of tube as specified in table III.

4.4.4 Rejection and retest. Where one or more items selected from a lot fails to meet the specification, 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 agency (Government or industrial) and before it can be resubmitted for tests, full particulars concerning the cause of previous rejection and the action taken to correct the defects in the lot shall be furnished in writing by the contractor.

4.5 Inspection method

4.5.1 Examination of product

4.5.1.1 Physical. The tube and hose shall be examined to determine compliance with this specification with respect to the following:

a. Hose identification (3.6)

b. Tube dimensions (table II)

c. Hose dimensions (table II).

4.5.1.2 Visual. The tube shall be visually inspected for workmanship. Scratches and bumped extricate shall be cause for rejection. The hose shall be visually inspected for broken or missing reinforcing wires which shall be cause for rejection. Crossed over reinforcing wires shall not be cause for rejection.

4.5.2 Tube roll and tube proof pressure test

4.5.2.1 Tube roll. The tube (prior to reinforcing) shall be subjected to a tube roll test in accordance with AMS 3380, except the flattening gap and rounding gap shall be as specified in table V.

TABLE V. Tube roll and tube proof pressure.

Size	Proof Pressure (psi)	Flattening Gap (Max) in	Rounding Gap (Min) in
-4	380	0.281	0.250
-6	280	0.281	0.328
-8	220	0.328	0.469
-10	170	0.328	0.578

4.5.2.2 Tube proof pressure test. The tubing (prior to reinforcing) shall be subjected to the rated tube proof pressure specified in table V for 1 minute minimum. The test fluid may be air or water.

4.5.3 Tube tests

4.5.3.1 Elongation. Two 6-inch tubes shall be subjected to an elongation test in accordance with the ASTM D412-62T, except the separation speed shall be 2 inches per minute.

4.5.3.2 Tensile strength. Two 6-inch tubes shall be subjected to a tensile strength test in accordance with ASTM D412-62T, except that the separation speed shall be 2 inches per minute.

4.5.3.3 Specific gravity of tube

4.5.3.3.1 Apparent specific gravity. Apparent specific gravity shall be determined in accordance with ASTM D792, method A or ARP 1153, and shall not exceed 2.155 at 73.5° ±0.5°F. Two drops of wetting agent shall be added to the water.

4.5.3.3.2 Relative specific gravity. Relative specific gravity shall be determined in accordance with ARP 1153, and shall not exceed a value of 2.210 (for all sizes of tubes).

4.5.3.4 Conductivity test of tube

4.5.3.4.1 The inner surface of the two tubes shall be washed first with solvent conforming to P-D-680, and then with isopropyl alcohol conforming to TT-I-735 to remove surface contamination, and thoroughly dried at room temperature.

4.5.3.4.2 The test specimen shall then be arranged vertically as shown in figure 1. The relative humidity shall be kept below 70 percent and room temperature between 60°F and 90°F. One thousand volts dc shall be applied between the upper mercury or salt water solution electrodes and the lower (MS21900) fitting electrode. Salt water solution shall be 450 grams NaCl in 1 liter of chemically pure water.

4.5.3.4.3 The current shall be measured with an instrument with a sensitivity of at least 1 microampere (1×10^{-6} ampere).

4.5.4 Proof pressure test. The hose shall be subjected to the rated proof pressure specified in table I for 30 seconds minimum.

4.5.5 Leakage test. The assembly shall be pressurized to 70 percent of the rated minimum room temperature burst pressure shown in table I and held for 5 minutes minimum. The pressure shall then be reduced to zero psi, after which it shall be raised to 70 percent of the minimum burst pressure for a final 5-minute check.

4.5.6 Room temperature burst pressure test. The assembly shall be subjected to a pressure sufficient to burst the assembly with a rate of pressure rise equal to 20,000 ±5000 psi per minute. The assembly shall be observed throughout the test and the type of failure and the pressure at which failure occurred shall be recorded.

4.5.7 Elongation and contraction test. The unpressurized assembly shall be held in a straight position and a 10-inch gauge length marked off on the hose. The assembly shall be subjected to the rated operating pressure specified in table I. After 5 minutes, while still pressurized, the gauge length shall be remeasured and the change in length recorded.

4.5.8 Stress degradation test

4.5.8.1 The assembly shall be filled with a high temperature test fluid as specified in 4.3.2.5.

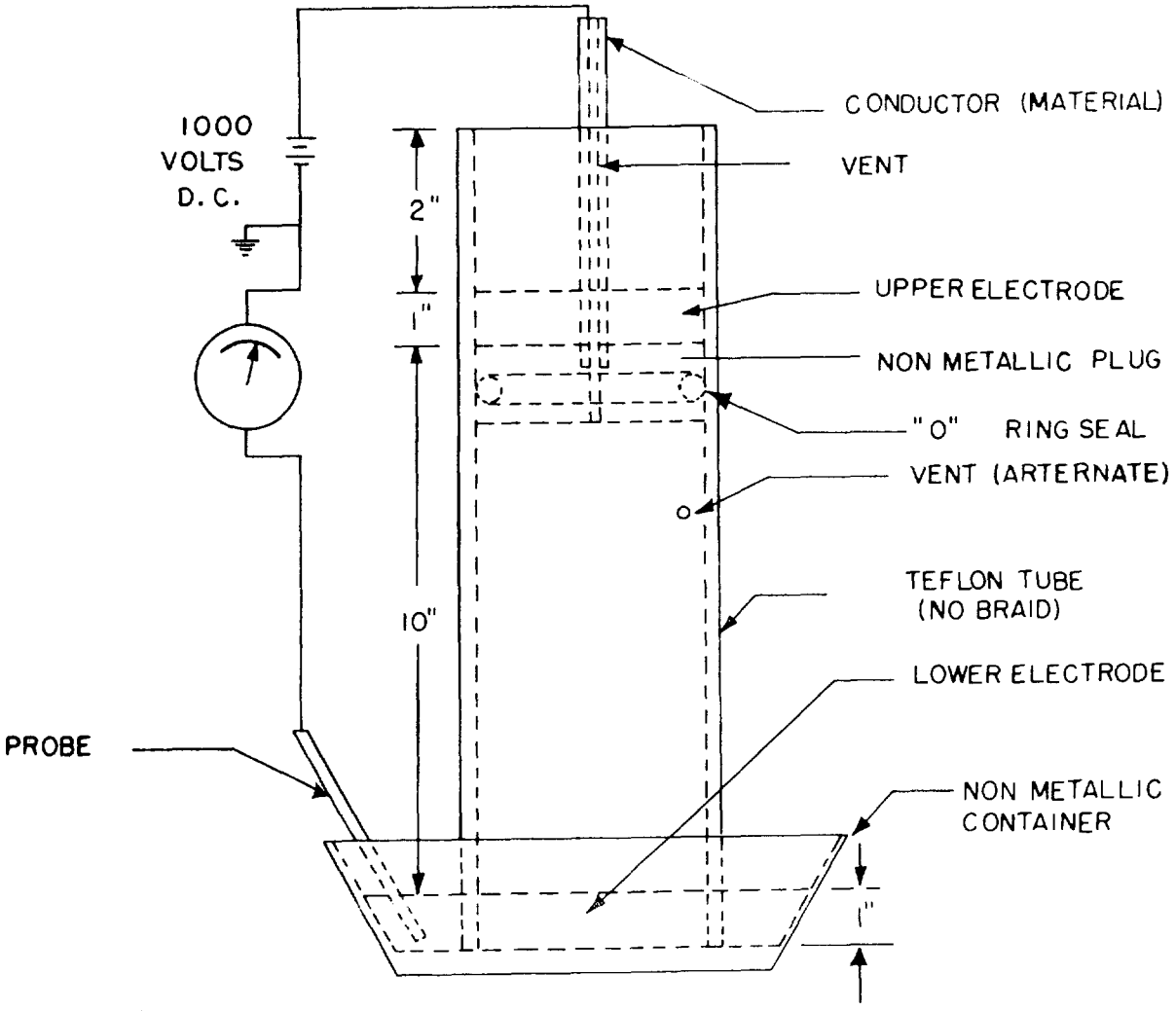


FIGURE 1. Electrostatic conductivity test diagram.

4.5.8.2 The assembly shall then be placed in an oven which shall be maintained at the maximum temperature specified in table I. Precautions shall be taken to assure that the assembly does not come in contact with parts of the oven that are at a higher temperature. A pressure equal to the rated operating pressure specified in table I shall be applied to the assembly.

4.5.8.3 After a minimum of 20 hours at the maximum temperature specified in table I, the pressure shall be gradually released and the assembly shall be removed from the oven, drained, and cooled to room temperature.

4.5.8.4 The assembly shall then be filled with fluid conforming to MIL-H-5606. A pressure equal to the rated operating pressure specified in table I shall be applied and held for a minimum of 2 hours at room temperature.

4.5.8.5 The procedures specified in 4.5.8.1, 4.5.8.2, 4.5.8.3, and 4.5.8.4 shall be repeated for a total of three times.

4.5.8.6 After the final 2-hour pressurization period, the assembly shall be drained and flushed with trichloroethylene conforming to MIL-T-27602, and then placed in an oven for 1 hour. The temperature of the oven shall be maintained at 160°F ±10°F.

4.5.8.7 The assembly shall be removed from the oven, cooled to room temperature, and then subjected to an air-underwater test. To conduct this test, the assembly shall be installed in an apparatus constructed similar to that shown in figure 2.

4.5.8.8 The apparatus with the assembly installed shall be immersed in water containing no wetting agent. A pressure equivalent to the rated operating pressure specified in table I shall be applied for 15 minutes to allow any entrapped air in the assembly to escape.

4.5.8.9 The pressure shall be held an additional 5-minute period during which time the effused gas shall be collected from the assembly, including the juncture of the hose to the fitting, but not including the "B" nut. After the 5-minute period of pressurization, the average rate of effusion through the assembly shall be computed into cc/in./min.

4.5.9 Impulse test. The impulse test shall be as follows:

a. Two assemblies shall be oil-aged, two shall be air-aged, and two shall be unaged. The assemblies shall then be subjected at room temperature to the rated proof pressure specified in table I for a minimum of 5 minutes.

b. The assemblies shall be installed in an impulse tester and bent in a U-shape with a bend radius as specified in table I.

c. Electronic measuring devices shall be used to determine and control the impulse pressures in the inlet manifold to the magnitude shown by the graph in figure 3. The impulse shall occur at 70 ±10 cycles per minute (cpm). The test fluid shall be one of the high temperature test fluids specified in 4.3.2.5. The test shall be run in such a manner that the assemblies shall be temperature cycled from room temperature to the maximum ambient temperature specified in table I, a minimum of 2 times with a minimum of 80 percent of the impulses cycled at the maximum temperature.

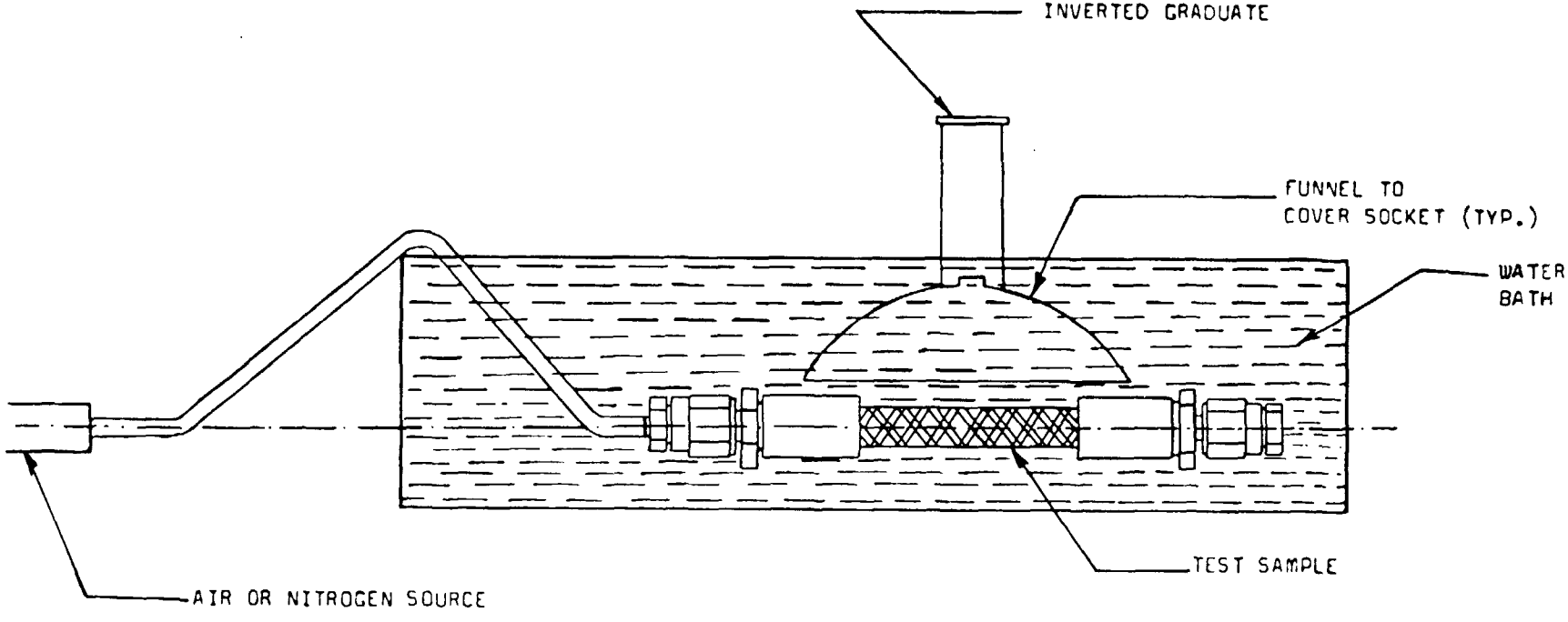


FIGURE 2. Test set-up for pneumatic effusion tests and stress degradation tests.

4.5.10 Thermal shock test. The thermal shock test shall be as follows:

a. One assembly shall be air-aged and one assembly shall be unaged. The assemblies shall then be subjected to the rated proof pressure specified in table I for a minimum of 5 minutes.

b. The assembly shall then be mounted, empty, in a test setup (typical setup shown in figure 4) and the ambient temperature reduced to the minimum temperature specified in table I for a minimum of 2 hours. At the end of this period, while still at this temperature, high temperature test fluid at the maximum temperature specified in table I shall be suddenly introduced at a minimum presure of 50 psi. Immediately after the hot oil has filled the assembly, the pressure shall be raised to the rated proof pressure specified in table I for a minimum of 5 minutes. Not more than 15 seconds shall elapse between the introduction of the high temperature oil at 50 psi and the raising of the pressure to proof pressure.

c. The assembly shall then be filled with one of the high temperature test fluids at a pressure of 75 ±25 psi and soaked, with fluid and ambient temperature maintained at the maximum temperature specified in table I for 1 hour. At the end of this period the assembly shall be pressurized to the rated proof pressure specified in table I for a minimum of 5 minutes. The pressure shall then be released, and while still maintaining this temperature, the pressure shall be increased at a rate of pressure rise equal to 20,000 ±5,000 psi per minute until failure is obtained. The assembly shall be under continuous observation during the preceding test, and the pressure at which the failure occurred and the type of failure shall be recorded.

4.5.11 Assembly flex test. The assembly shall be mounted in the assembly flex test setup shown in figure 5, and subjected to the following test sequence. The uncapped assembly shall be filled with oil conforming to one of the high temperature test fluids specified in 4.3.2.5. Temperature indicated is both fluid and ambient. Flexing shall occur at a rate of 70 ±10 cpm during portions c, d, and e.

a. The assembly shall be soaked with no pressure or flexing and at -67° ±2°F for minimum of 1 hour.

b. With no flexing, the assembly shall be pressurized to the rated proof pressure specified in table I while still maintaining this temperature for a minimum of 5 minutes (first cycle only).

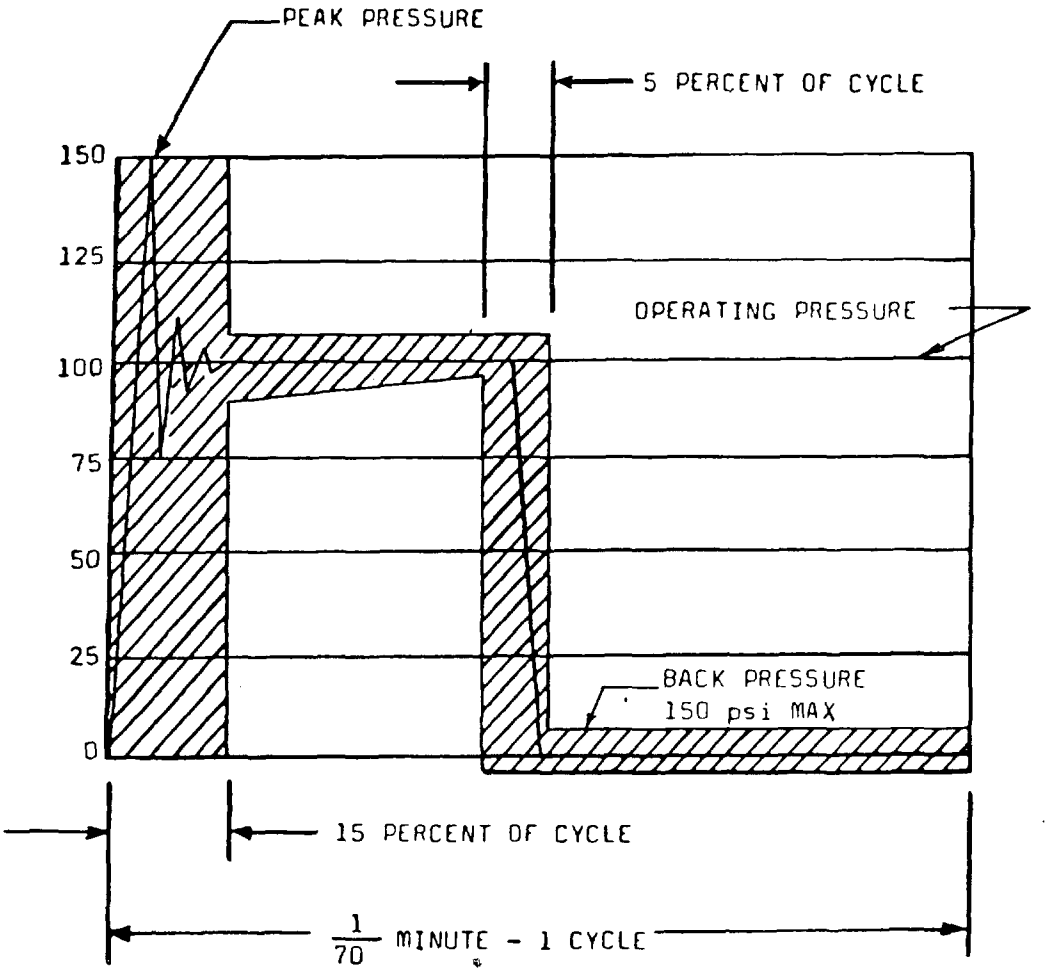
c. Flexing shall begin while the assembly is pressurized to the rated operating pressure and maintained at -67° ±2°F for a minimum of 4,000 cycles.

d. With the pressure reduced to zero psi, flexing shall continue for 1,000 cycles at the minimum temperature.

e. Increase the temperature to the maximum temperature specified in table I and flex for 1,000 cycles with the pressure at zero psi. The pressure shall then be increased to the rated operating pressure specified in table I while still maintaining this temperature. Flexing shall continue until an accumulated total of 80,000 cycles is reached.

f. Steps a, c, d, and e shall be repeated for a total of 5 test sequences; i.e., 400,000 flexing cycles.

THE SLOPE OF THIS CURVE GIVES THE RATE OF PRESSURE RISE. RISE TO BE 175,000 psi PER SECOND MINIMUM



THE CURVE SHOWN ABOVE IS THE APPROXIMATE PRESSURE-TIME CYCLE DETERMINED TO BE OF PROPER SEVERITY FOR IMPULSE TESTING OF HYDRAULIC HOSE. THE PRESSURE-TIME CURVE SHALL BE CONFINED TO THE SHADED AREA INDICATED. RATE OF RISE IS DEFINED AS THE SLOPE OF THE PRESSURE-TIME CURVE. FOR PURPOSES OF DEFINITION, THE SLOPE SHALL BE DETERMINED BY USE OF A STRAIGHT LINE BETWEEN 10 PERCENT AND 90 PERCENT OF PEAK PRESSURE. RATE OF RISE WILL BE CALCULATED AS FOLLOWS:

$$\text{RATE OF RISE (PSI/SEC)} = \frac{.9P - .1P}{T_2 - T_1}$$

WHERE: P = PEAK PRESSURE IN PSI
T_1 = TIME AT 10% P (SEC)
T_2 = TIME AT 90% P (SEC)

FIGURE 3. Dynamic pressure impulses.

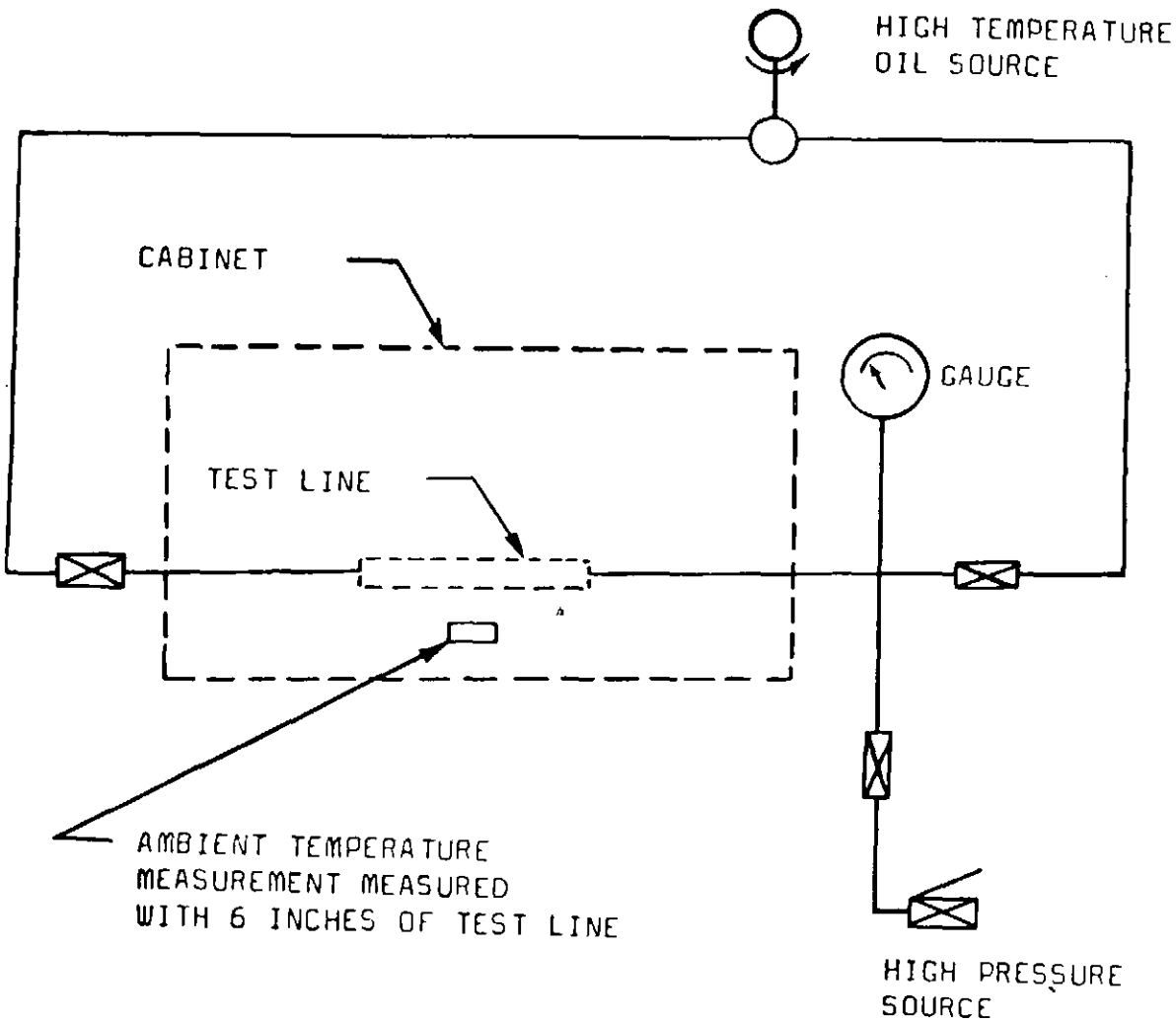
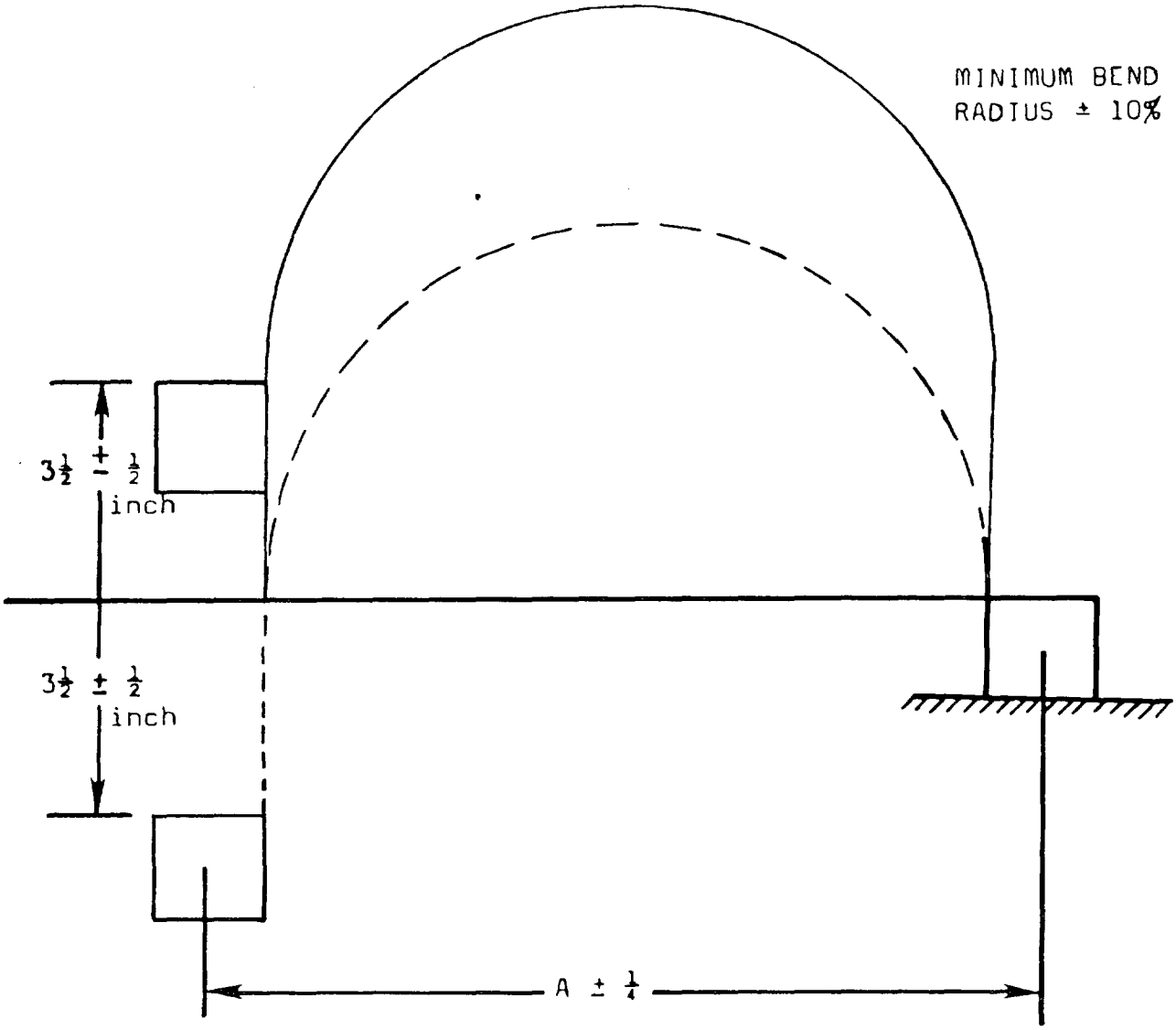


FIGURE 4. Typical setup for thermal shock test.



HOSE SIZE	A INCHES
-4	6-1/2
-6	10-5/8
-8	12-1/4
-10	14

FIGURE 5. Assembly flex test setup.

g. After completion of step f and with no flexing, the assembly shall be pressurized to the rated proof pressure and maximum temperature specified in table I for a minimum of 5 minutes (last cycle only).

4.5.12 Cubical expansion test. The assembly shall be installed in the test set-up shown in figure 6. The assembly shall be filled with distilled water to the zero level on the burette. With the outlet valve closed, pressurize assembly to the rated operating pressure specified in table I. Close inlet valve. Open outlet valve and record change of fluid level in burette. Convert fluid volume change into cc/in.

4.5.13 Pneumatic effusion test. The assembly shall be subjected to the rated operating pressure specified in table I for 1 hour at room temperature. Air effusion shall be collected using the water displacement method and an air collecting device similar to that shown in figure 4. The total amount of effusion through the hose and two fittings shall be collected over the last 1/2 hour of testing and shall not exceed 8.0 cc/ft/30 minutes for any size tested.

4.5.14 Pneumatic surge test. The assembly shall be installed in the test apparatus shown in figure 7. The assembly shall be subjected at room temperature, to the rated operating pressure specified in table I for 25 minutes at room temperature. After this period of pressurization, the exhaust valve shall be opened within 50 milliseconds to permit rapid discharge of the compresssed gas. After 5 minutes, the valve shall be closed and the pressure recycled. This sequence of 25 minutes at operating pressure and 5 minutes at zero pressure shall be repeated a total of 16 times. At the end of this period, the hose shall be sectioned.

4.5.15 Corrosion test. The assembly shall be mounted in a vertical position and immersed in a 2 1/2 percent solution of sodium chloride for 5 minutes. The assembly shall then be air dried at 140°F for 25 minutes. This cycling shall be continued for 172 hours with the assembly pressurized to the rated operating pressure specified in table I.

4.5.16 Pressurization, packaging, marking. Preparation for delivery shall be examined for conformance with section 5.

5. PACKAGING

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (6.2), in accordance with MIL-P-775.

5.2 Packing. Packing shall be level A, B, or C, as specified (6.2), in accordance with MIL-P-775.

5.3 Marking. In addition to any special marking required by the contract, shipments shall be marked in accordance with MIL-P-775.

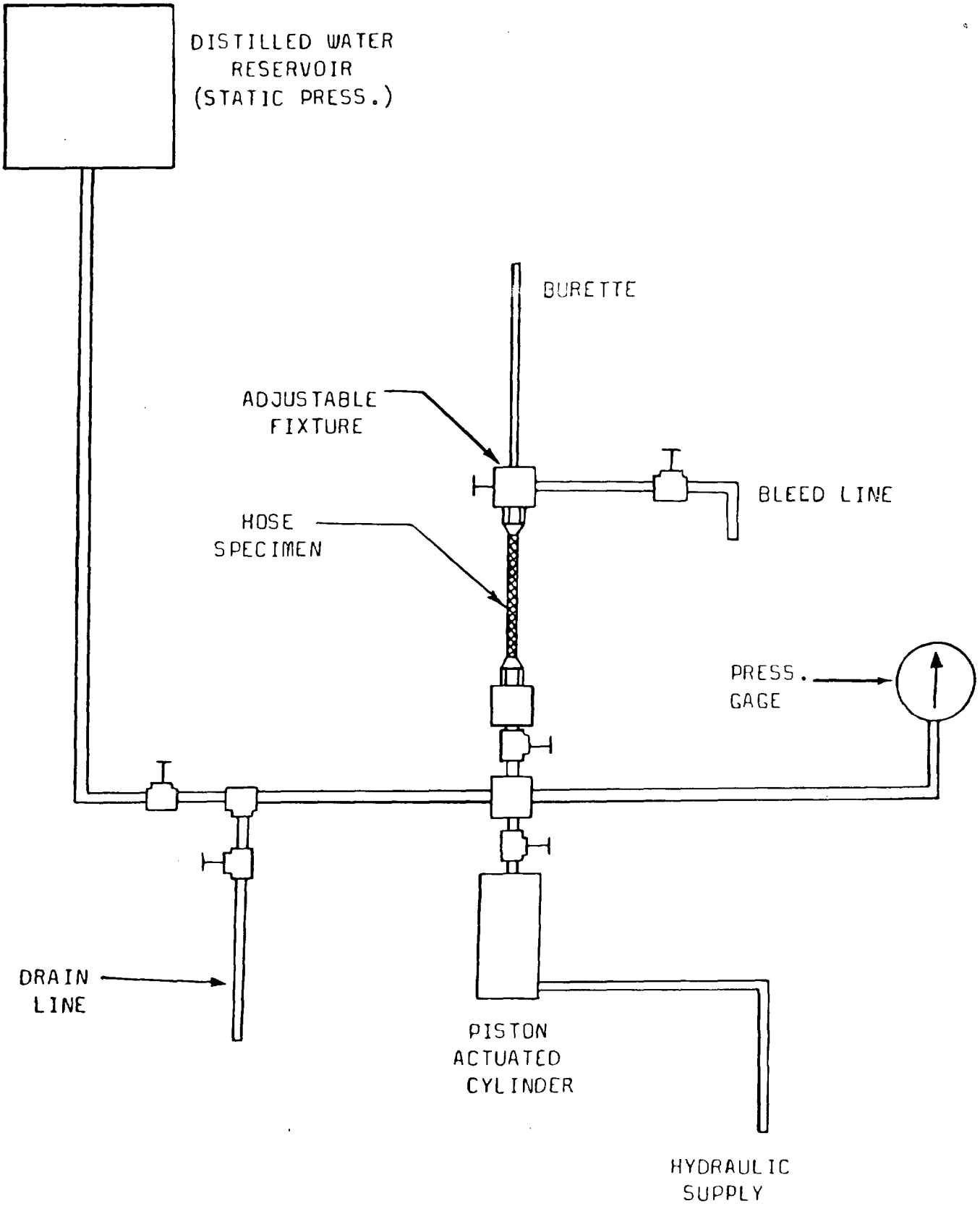


FIGURE 6. Cubical expansion test set-up.

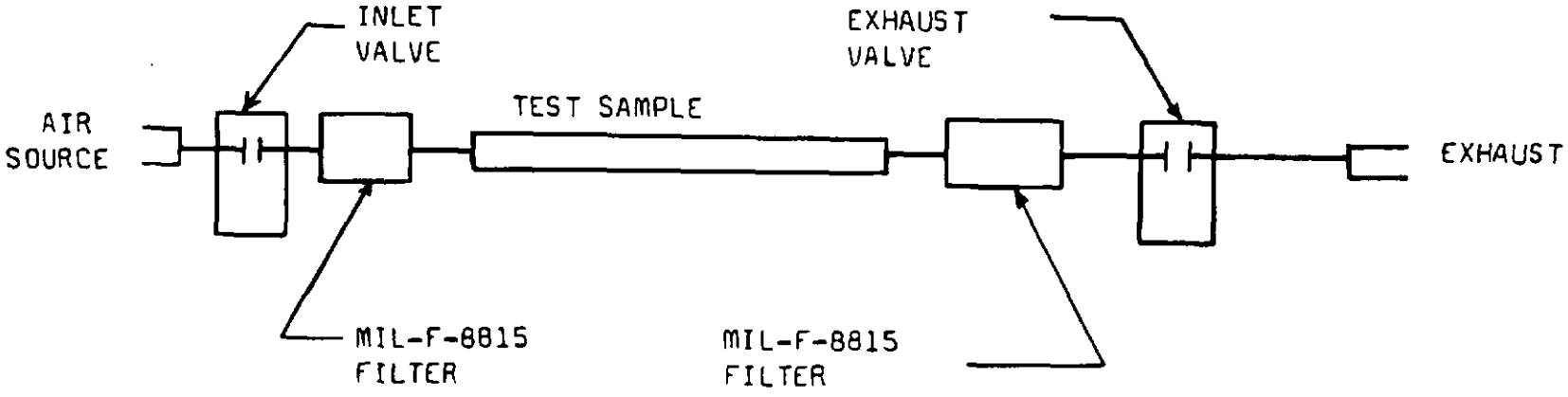


FIGURE 7. Test set-up for pneumatic surge test.

6. NOTES

6.1 Intended use. The hose is intended for use in aircraft and missile high pressure (3,000 psi), and high temperature (-65°F to +400°F) hydraulic systems. The hose is suitable for use in high pressure (3,000 psi) pneumatic storage system application system application (continuous static pressure) are not recommended. Installations in which the limits specified herein are exceeded or in which application is not covered specifically by this specification will be subject to the approval of the procuring activity.

6.2 Ordering data

6.2.1 Acquisition requirements. Procurement documents should specify the following:

a. Title, number, and date of this specification

b. Size and length of hose to be furnished

c. Level or preservation and packaging, and level of packing required (5.1)

d. Samples subjected to destructive testing are not to be considered or shipped as part of the contract or order.

6.2.2 Data requirements. (See 4.3.3)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been listed by that date. The attention of suppliers is called to this requirement, 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. The activity responsible for the Qualified Products List is the Commander Aeronautical Systems Division, Air Force Systems Command, Attn: ENESS, Wright-Patterson Air Force Base, Ohio, 45433, and information pertaining to qualification of products may be obtained from that activity.

Custodian:
Army - AV
Navy - AS
Air Force - 11

Reviewer:
Air Force - 99
DLA - CS

Preparing activity:
Air Force - 11

Project No. 4720-0497

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE AIR FORCE

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 73236 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE AIR FORCE

ASD/ENESS
Wright-Patterson AFB, OH 45433

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.