

INCH-POUND

MIL-DTL-8789E
6 April 2001
SUPERSEDING
MIL-F-8789D
9 May 1994

DETAIL SPECIFICATION

FITTING END, ATTACHABLE, HYDRAULIC, HIGH PRESSURE (3,000 PSI), GENERAL SPECIFICATION FOR

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 attachable end fittings for hose for use in hydraulic and pneumatic systems with operating pressures of 3,000 psi maximum.

2. APPLICABLE DOCUMENTS

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

2.2. Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center, Columbus, DSCC-VAI, 3990 East Broad Street, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4730

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS

DEPARTMENT OF DEFENSE

- MIL-H-5606 - Hydraulic Fluid, Petroleum Base, Aircraft, Missile and ordnance Hydrocarbon Base, Aircraft and Missile
- MIL-A-8625 - Anodic Coatings for Aluminum and Aluminum Alloys
- MIL-DTL-8788 - Hose, Rubber, Hydraulic, High Pressure (3,000 psi)
- MIL-DTL-8790 - Hose Assemblies, Rubber, Hydraulic, High Pressure (3,000 psi)
- MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

FEDERAL

- QQ-P-416 - Plating, Cadmium (Electrodeposited)

STANDARDS

DEPARTMENT OF DEFENSE

- MS28760 - Fitting End, Straight, Attachable, Hydraulic and Pneumatic, High Pressure Hose (3,000 psi), Flared Tube
- MS28761 - Fitting End, Straight, Attachable, Hydraulic, High Pressure Hose (3,000 psi), Flareless Tube
- MS28780 - Fitting End, 45° Elbow, Attachable, Hydraulic, High Pressure Hose (3,000 psi), Flared Tube
- MS28781 - Fitting End, 90° Elbow, Attachable, Hydraulic, High Pressure Hose (3,000 psi), Flared Tube

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4/D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B633 - Electrodeposited Coatings of Zinc on Iron and Steel (DoD adopted)
- ASTM D380 - Standard Test Methods for Rubber Hose (DoD adopted)

(Application for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

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AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- ASME B46.1 - Surface Texture (Surface Roughness, Waviness and Lay)
(DoD adopted)

(Applications for copies should be addressed to the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.)

AMERICAN WELDING SOCIETY INC. (AWS)

- ANSI/AWS C3.4 - Specification for Torch Brazing (DoD adopted)

(Application for copies should be addressed to the American Welding Society Inc., 550 N.W. Le Jeune Road, Miami, FL 33126.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

- ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Test Equipment,
General Requirements (DoD adopted)

(Application for copies should be addressed to the National Conference of Standards Laboratories, 1800 30th Street, Suite 305B, Boulder, CO 80301.)

SAE INTERNATIONAL

- AMS-QQ-A-225/6 - Aluminum Alloy Bar, Rod, and Wire, Rolled, Drawn or Cold
Finished, 2024 (DoD adopted)
- AMS-QQ-A-225/9 - Aluminum Alloy 7075, Bar, Rod, Wire and Special Shapes;
Rolled, Drawn or Cold Finished (DoD
adopted)
- AMS-STD-2219 - Fusion Welding for Aerospace Applications
- AMS4111 - Aluminum Alloy Forgings 7.7Zn-2.5Mg-1.5Cu-0.16Cr (7049-T73)
Solution and Precipitation Heat Treated (UNS A97049) R(1995)
(DoD adopted)
- AMS5050 - Steel Tubing, Seamless 0.15 Carbon, Maximum Annealed (DoD
adopted)
- AMS5053 - Steel Tubing, Welded 0.13 Carbon, Maximum Annealed (DoD
adopted)
- AMS-H-6088 - Heat Treatment of Aluminum Alloys (DoD adopted)
- AMS6322 - Steel Bars, Forgings and Rings 0.50Cr-0.55Ni-0.25Mo
(0.38-0.43C) (SAE 8740) (DoD adopted)
- AMS6325 - Steel, Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C)
(SAE 8740) Heat Treated, 105 ksi (724MPa) Tensile Strength
(DoD adopted)
- AMS6327 - Steel Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C)
(SAE 8740) Heat Treated, 125,00 psi (862MPa) Tensile Strength
(DoD adopted)
- AMS-S-6758 - Steel, Chrome-Molybdenum (4130) Bars and Reforging Stock
(Aircraft Quality) (DoD adopted)
- AMS-H-6875 - Heat Treatment of Steel Raw Materials

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ARP603	-	Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies (DoD adopted)
ARP891	-	Determination of Aluminum Alloy Tempers through Electrical Conductivity Measurement (Eddy Current) (DoD adopted)
ARP908	-	Torque Requirements Installation and Qualification Test, Hose and Tube Fittings (DoD adopted)
AS4395	-	Fitting End-Flared Tube Connection, Design Standard (DoD Adopted)
AS8879	-	Screw Threads - UNJ Profile, Inch
AS33514	-	Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal (DoD adopted)
J1966	-	Lubricating Oil, Aircraft Piston Engine (Nondispersant Mineral Oil) (DoD adopted)

(Application for copies should be addressed to the SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, (except for related associated specifications, specification sheets or MS standards) 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 sheets (MSs). In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The fittings furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) before contract award (see 4.4 and 6.3).

3.3 Materials. Materials used shall be as specified herein. However, materials not specified herein shall be of a quality that will enable the fitting end to meet the requirements specified herein.

3.3.1 Heat treatment.

3.3.1.1 Aluminum Alloy. Aluminum alloy fittings and nuts shall be supplied in the final temper as shown in table 1. When fitting material is purchased in other than the final temper, the heat treatment shall be in accordance with AMS-H-6088.

3.3.1.2 Steel. Corrosion-resistant steel fittings and nuts shall have a hardness of Rockwell B80 minimum. When required, steel shall be heat treated in accordance with SAE-AMS-H-6875.

3.3.1.1.1 Electrical conductivity and hardness. Aluminum alloy fittings and nuts shall meet the electrical conductivity and hardness requirements of ARP891 or equivalent.

3.3.2 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 the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

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3.3.3 Hazardous substances. The use of hazardous substances, toxic chemicals, or Ozone Depleting Chemicals (ODCs) shall be avoided, whenever feasible.

TABLE I. Material.

Type of part	Material	Specification
Nipples, nuts, and elbows ^{1/}	Steel	AMS-S-6758 AMS6322 AMS6325 AMS6327
Socket, Bodies	Aluminum alloy	AMS-QQ-A-225/6 Temper T6 or T851 AMS-QQ-A-225/9 Temper T73 AMS4111 Temper T73

^{1/} The elbow may be fabricated from an alternate material using steel tubing as specified in AMS5050 or AMS5053.

3.4 Design and construction. The design and construction of the attachable end fitting shall conform to MS28760, MS28761, MS28780, and MS28781 and this specification, as applicable. The end fitting shall be suitable for use with hose qualified to MIL-DTL-8788 to form flexible assemblies, which meet all the requirements of MIL-DTL-8790.

3.4.1 Fittings. Fitting ends shall be fabricated of materials listed in table I and as specified in the applicable specification sheets.

3.4.2 Finish. Aluminum parts shall be anodized in accordance with MIL-A-8625, Type II, Class 2. Carbon steel parts shall be cadmium plated in accordance with QQ-P-416, type and class optional.

3.4.3 Surface roughness. Surface roughness of machined parts shall not exceed 125 micro inches arithmetical average (AA), except for the sealing of fittings which shall not have annular tool marks in excess of 100 micro inches AA. The AA values shall be interpreted in accordance with ASME B46.1.

3.4.4 Dimensions. Dimensions and tolerances shall be as shown on the applicable specification sheet. Dimensional requirements are applicable after heat treatment and protective finish.

3.4.5 Threads. All threads shall be in accordance with AS8879, except root radius is not required on incomplete threads. External threads on aluminum alloy shall be produced by machining, single point method or grinding.

3.5 Examination of product. The fitting shall conform to the material (see 3.3), finish (see 3.4.2), identification markings (see 3.9) and workmanship (see 3.10) specified herein and in the applicable specification sheets, when examined as specified in 4.7.1.

3.6 Performance. The fittings shall meet the following performance requirements. When necessary for testing, the fittings shall be assembled with hose qualified to MIL-DTL-8788.

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3.6.1 Bulge resistance. The ball gage, used to determine the inner tube diameter at the bulge, shall fall through the section under its own weight through the section of the end-fitting insert in the hose, when tested as specified in 4.7.2.

3.6.2 Proof pressure. The hose assembly shall not leak or fail during or at the completion of the test, when tested as specified in 4.7.3, with the applicable proof pressure specified in table II. There shall be no visual evidence of damage or permanent deformation.

TABLE II. Performance characteristics.

Hose size no.	Proof pressure, min (psi)	Burst pressure, min (psi)	Operating pressure (psi)	Bend radius inside, min (inch)	Assembly length of test samples (inch) 1/
4	8,000	16,000	3,000	3.00	16
5	7,000	14,000	3,000	3.38	18
6	7,000	14,000	3,000	5.00	21
8	7,000	14,000	3,000	5.75	24
10	6,000	12,000	3,000	6.50	30
12	6,000	12,000	3,000	7.75	33
16	5,000	10,000	3,000	9.63	24

1/ Represents length of assembly per MIL-DTL-8790. A minimum free length of 12 inches shall remain between fittings.

3.6.3 Leakage. The hose assembly shall not show any evidence of leakage during or at the completion of the test, when tested as specified in 4.7.4.

3.6.4 Burst resistance. There shall be no leakage at the end fittings or in the hose, when tested as specified in 4.7.5, below and including the minimum burst pressure specified in table II. The fittings shall not loosen or disconnect from the hose. The hose shall not burst or develop a permanent blister.

3.6.5 Impulse. The hose assembly shall not show any evidence of leakage, burst, or fitting loosening or blow-off, when tested as specified in 4.7.6.

3.6.6 Low temperature flexibility. The hose assembly shall not leak or fail during or at the completion of the test, when tested as specified in 4.7.7. There shall be no visual evidence of damage or permanent deformation.

3.6.7 Over-tightening torque. The fitting assembly shall not show any evidence of material failure, deformation of the assembly or difficulty in turning the swivel nut on the nipple by hand, when tested as specified in 4.7.8.

3.7 Brazing. Unless otherwise specified, fittings requiring brazing shall be copper hydrogen brazed in accordance with ANSI/AWS C3.4.

3.8 Welding. Fittings requiring welding shall be welded in accordance with AMS-STD-2219.

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3.9 Identification of product. Each end fitting assembly shall be identified with a durable permanently attached tag. This tag shall show the Part or Identifying Number (PIN), CAGE code, and manufacturer's name or trademark.

3.10 Workmanship. All parts of the end fitting shall be uniform in quality and free from irregularities, defects, or foreign matter.

4. VERIFICATION

4.1 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 used. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI/NCSL Z540-1 or equivalent.

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

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspection (see 4.5).
 1. Sampling tests (see 4.5.2).
 2. Periodic Tests (see 4.5.3).

4.3 Inspection conditions. Unless otherwise specified, all required inspections shall be performed in accordance with the test conditions specified in 4.6.

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

4.4.1 Samples for qualification. Qualification samples shall be representative of the products proposed to be furnished to this specification. Samples shall consist of sufficient end fittings to permit the fabrication of 10 hose assemblies of each size and of the lengths specified in table II. The samples shall be a hose, conforming to MIL-DTL-8788, assembled with end fittings of the same size. Fittings shall be qualified with hose from a minimum of two specific current qualified hose manufacturer(s).

4.4.2 Qualification inspection routine. Samples shall be subjected to qualification testing in accordance with table III in the sequence specified in table IV.

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TABLE III. Inspection requirements.

Requirement	Requirement paragraph	Test method paragraph	Qualification inspection	Conformance inspection		
				Sampling tests (Lot acceptance)	Periodic control tests	
					1	2
Examination of product	3.5	4.7.1	X	X		
Bulge resistance	3.6.1	4.7.2	X			
Proof pressure	3.6.2	4.7.3	X		X	
Leakage	3.6.3	4.7.4	X		X	
Burst resistance	3.6.4	4.7.5	X		X	
Impulse 1/	3.6.5	4.7.6	X			
Low Temperature	3.6.6	4.7.7	X			
Over-tightening torque	3.6.7	4.7.8	X			X

1/ Aging not required for periodic inspection

TABLE IV. Qualification inspection sequence.

Required qualification test	Required test paragraph	Sample number										
		1	2	3	4	5	6	7	8	9	10	
Examination of product	4.7.1	X	X	X	X	X	X	X	X	X	X	X
Bulge resistance	4.7.2	X	X	X	X							
Proof pressure	4.7.3	X	X	X	X	X	X	X	X	X	X	X
Leakage	4.7.4					X	X					
Burst resistance	4.7.5					X	X					
Impulse	4.7.6	X	X	X	X							
Low temperature flexibility	4.7.7								X	X		
Over-tightening torque	4.7.8										X	X
Proof Pressure	4.7.3								X	X		

4.4.3 Acceptance of qualification data. For identical requirements and test procedures, using an identical fitting, qualification test data from MIL-DTL-8788 hose and from MIL-DTL-8790 hose assemblies may be accepted as qualification test data for MIL-DTL-8789 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 fittings that have passed and failed shall be included. All reworked sampling lots shall be accounted for and identified.

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 failing product from the QPL.

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Failure to submit the report within 30 days after the end of each 12-month period may result in loss of qualification for the product. 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 of this specification. If there has been no production during the reporting period, a report shall be submitted certifying that the manufacturer still has the capabilities and facilities necessary to produce the qualified product. If there has been no production during two consecutive reporting periods, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified product to testing in accordance with qualification inspection requirements.

4.5 Quality conformance inspection

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of sampling tests.

4.5.2. Sampling tests. Fittings, randomly selected from a production lot (see 4.5.2.1) to form an inspection sample (see 4.5.2.2), shall be subjected to the sampling tests specified in table III.

4.5.2.1. Production lot. A production lot shall consist of end fittings manufactured on the same production line(s) by means of the same production technique, materials, controls, and design during the same production run.

4.5.2.2 Inspection sample. The inspection sample shall be product selected at random from the production lot without regard to quality. The sample size shall be as specified in table V.

TABLE V. Sampling inspection lot size.

Production lot size	Accept on zero sample size
1 to 8	All
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1,200	27
1,201 to 3,200	35
3,201 to 10,000	38
10,001 to 35,000	46

4.5.2.3 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 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.

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4.5.3. Periodic control tests. Required periodic control tests at the fitting level that were already performed at the bulk hose or assembly level may be eliminated if documented approval has been obtained from the qualifying activity.

4.5.3.1 Periodic tests (1). Periodic tests (1) as specified in table III shall be performed on three assemblies (six fittings) for each size at least once per year regardless of the total number of fittings produced. At least three of the six fittings, used for testing, shall be flared fittings with the greatest bend angle. If no flared fittings were produced, flareless fittings shall be used. The six fittings selected shall be as representative as possible of those produced during the period in terms of fitting material and joint configuration. If there has been no production for a particular size, during the past year, periodic testing (1) is not required for that size.

4.5.3.2 Periodic tests (2). Periodic tests (2) as specified in table III shall be performed on two fittings at least once per year regardless of the total number of fittings produced. The fittings shall be of any bend angle and joint configuration. The two fittings selected shall be as representative as possible of those produced during the period, in terms of material used for the threaded parts. The size of the two fittings shall be determined based on the fitting size that is most likely to fail if there was a defect. If there has been no production during the past year, periodic testing (2) is not required.

4.5.3.3 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 failure after re-inspection, information concerning the failure and the corrective action taken shall be furnished to both the qualifying and inspection activities.

4.5.3.4 Disposition of test specimens. Test specimens, which have been subjected to periodic control tests, are considered damaged and shall not be delivered on a contract or purchase order.

4.5.3.5 Acceptance of conformance inspection data. For identical requirements and test procedures, using an identical fitting, conformance inspection data from MIL-DTL-8788 or MIL-DTL-8790 may be accepted as conformance inspection data for MIL-DTL-8789 providing that documented approval has been obtained from the qualifying activity.

4.6 Test conditions.

4.6.1 Preparation of specimens. Test samples shall be assembled with samples of hose of applicable size conforming to MIL-DTL-8788. Assembly lengths shall be as shown in table II.

4.6.2 Test fluids. Unless otherwise specified, the test fluid shall be lubricating oil conforming to grade 50 of SAE J1966 or hydraulic fluid conforming to MIL-H-5606, MIL-PRF-83282 or water.

4.6.3 Aging of samples. When specified, specimens shall be either air aged (see 4.6.3.1) or oil aged (see 4.6.3.2) prior to testing.

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4.6.3.1 Air aging. Air aged samples shall be kept in air at a temperature of $158 \pm 2^\circ\text{F}$ for a minimum of 168 continuous hours.

4.6.3.2 Oil aging. Samples shall be completely immersed in fluid conforming to either MIL-H-5606 or MIL-PRF-83282 at a temperature of $158 \pm 2^\circ\text{F}$ for a minimum of 168 continuous hours. Air shall not be trapped in the bore of the tube during this aging period. The volume of fluid used shall be sufficient to completely fill and cover the samples. Both the samples and the fluid shall be placed in a non-pressurized closed type container or in a reflux type condenser to prevent distillation of the volatile matter in the fluid. For qualification tests, a new batch of oil shall be used for each group of test samples. For quality conformance tests, a new batch of oil shall be used for each 10 or fewer tests.

4.7 Test Methods

4.7.1 Examination of product. The end fitting shall be visually examined for material (see 3.3), finish (see 3.4.2), identification markings (see 3.9), and workmanship (see 3.10). Requirements shall be as specified in 3.5.

4.7.2 Bulge resistance test. The four samples prepared for the impulse test (see 4.7.6) shall be checked for bulging of the inner tube and reduction of fitting nipple inner diameter caused by the attachment of end fittings. Measurements shall be taken on assemblies using a ball-end type gage. The diameter of the ball shall not be less than 0.002 but no greater than 0.001 inch smaller than the bulge diameter specified in table VI. The weight of the ball, in ounces, shall be no more than the hose size tested. Without using force or lubrication, the ball shall be placed inside the end of the assembly at the bulge gage inspection point shown in figure 1. Conformance shall be as specified in 3.6.1.

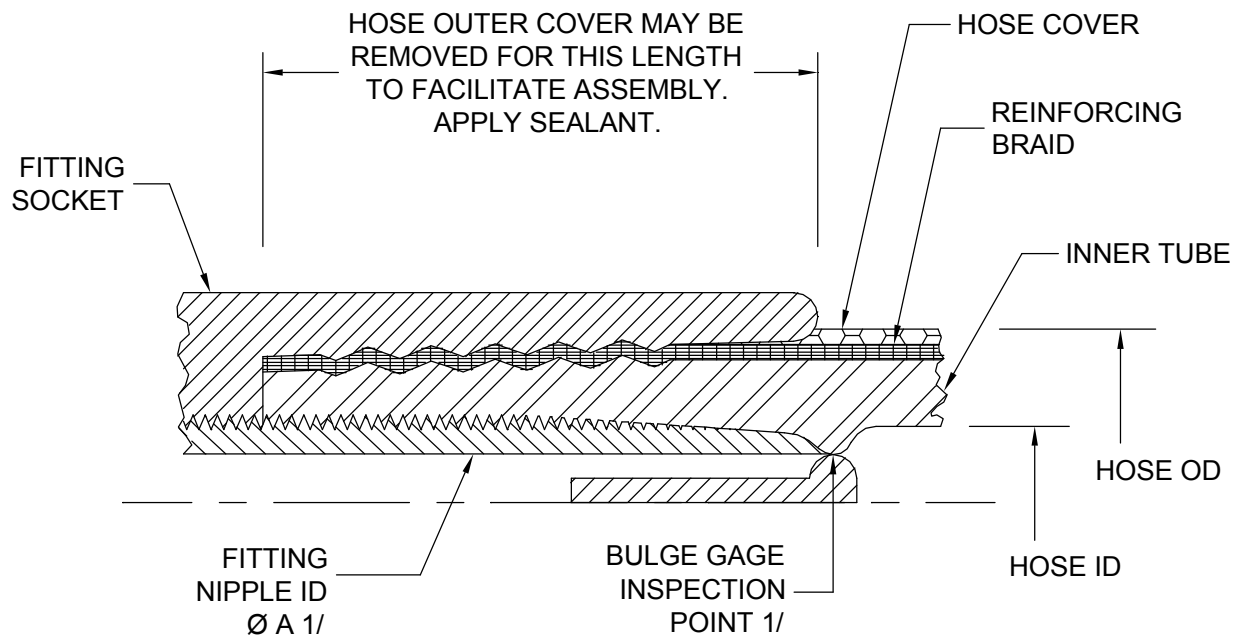


FIGURE 1. Minimum diameter of hose inner tube at the bulge.

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TABLE VI. Hose inner tube diameter at the bulge.

Fitting size size	A Diameter, min (inch) <u>1/</u>
4	.146
5	.177
6	.271
8	.365
10	.455
12	.568
16	.778

1/ Diameter A, indicates both the minimum permissible inner tube diameter at the bulge, and the minimum nipple ID of the fitting, when the fitting is assembled with the hose.

4.7.3 Proof pressure test. Each hose assembly shall be tested as specified in ASTM D380 when subjected to the applicable proof pressure listed in table II. Test fluid shall be water or fluid conforming to MIL-H-5606 or MIL-PRF-83282. Conformance shall be as specified in 3.6.2.

4.7.4 Leakage test. Two unaged samples shall be tested as specified in ASTM D380. The samples shall be a minimum of 12 inches in length. Test fluid shall be water or hydraulic fluid conforming to MIL-H-5606 or MIL-PRF-83282. Samples shall be subjected to 70% of the minimum burst value shown in table III and held for 5 minutes. After 5 minutes, the pressure shall be released and reduced to zero. Then the pressure shall be raised again to 70% of the minimum burst pressure and held for another 5 minutes. The adjacent outer cover shall be carefully inspected during this period for any wicking or leakage of the test fluid. Conformance shall be as specified in 3.6.3. After completion of the leakage test on these samples, they shall be subjected to the burst resistance test specified in 4.7.5.

4.7.5 Burst resistance test. Two unaged hose assembly samples shall be subjected to the burst pressure specified in table II within 24 hours after assembly of the end fittings to the hose. The assemblies shall be a minimum of 12 inches in length. Test fluid shall be water or hydraulic fluid conforming to MIL-H 5606 or MIL-PRF-83282. The rate of pressure rise shall be 25,000 +0/-10,000 psi per minute. Pressure shall be applied until failure occurs. During this test, the hose assembly shall be fastened at one end to the source of pressure, the hose shall be extended straight, and the free end shall not be restrained or fastened in any way. The actual pressure at which the samples burst or otherwise fail shall be recorded. Conformance shall be as specified in 3.6.4.

4.7.6 Impulse test. Four samples of the length specified in table II shall be subjected to the proof pressure test (see 4.7.3), prior to impulsing. Two of the four samples shall be air aged and the other two shall be oil aged. The samples shall be tested in accordance with ARP603, table II, and table VII. Only size 16 shall be tested without surge peaks and in a straight position with one end free. Test fluid shall conform to MIL-H-5606 or MIL-PRF-83282, except that up to 25% of the total volume may be fluid conforming to SAE J1966, grade 50. The fluid temperature, measured in the manifold, shall be held at $120 \pm 20^\circ$ F. Conformance shall be as specified in 3.6.5.

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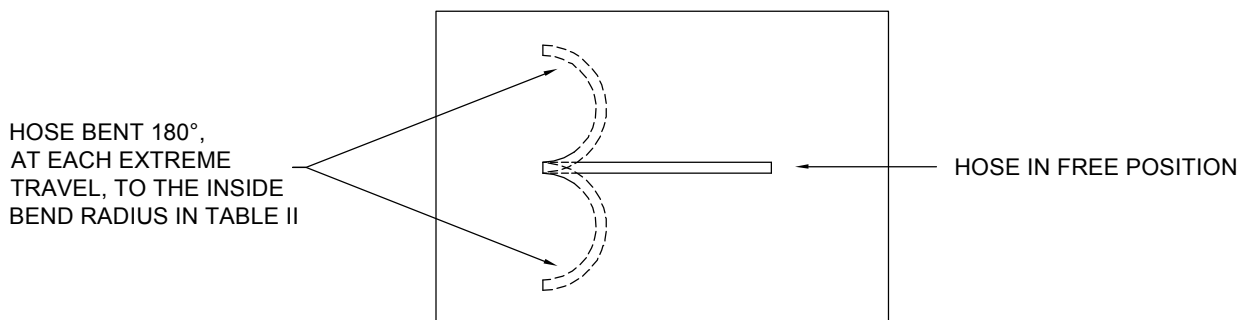
TABLE VII. Impulse cycles.

Size dash no.	Minimum impulse cycles	Minimum average impulse cycles ^{1/}	Maximum impulse cycles that can be used to compute average ^{2/}
4	100,000	—	—
5	100,000	—	—
6	100,000	—	—
8	75,000	100,000	150,000
10	50,000	75,000	100,000
12	35,000	50,000	70,000
16	45,000	55,000	75,000

^{1/} The average of the test assemblies shall not be below the values listed in this column.

^{2/} When test assemblies impulse cycles are averaged, the maximum cycles that may be used to compute the average shall not exceed the figures given in this column.

4.7.7 Low temperature flexibility test. Testing shall consist of two samples of the lengths specified in table II. One sample shall be unaged, while the other shall be oil aged prior to testing. Samples shall be filled with fluid conforming to MIL-H-5606 or MIL-PRF-83282 and then exposed for 24 hours in a chamber at a temperature of $-65 \pm 2^\circ\text{F}$. Size 16 hose may be exposed to a temperature of $-40^\circ \pm 2^\circ\text{F}$. After the 24 hour exposure and while still at the specified temperature, the samples shall be flexed through 180° at each extreme travel, considered as one cycle, to the applicable inside bend radius specified in table II. Each sample shall be subjected to one cycle only, the duration of which shall be no greater than four seconds. After the flexing cycle (see figure 2), samples shall be removed from the cold chamber and subjected to the proof pressure test (see 4.7.3). Conformance shall be as specified in 3.6.6.

FIGURE 2. Flexibility test set up.

4.7.8 Over-tightening torque test. The flared and flareless type fittings shall be installed on mating adapter ends (AS4395 or AS33514) and tested in accordance with ARP908. Conformance shall be as specified in 3.6.7.

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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. The fittings covered by this specification are military unique fittings that mate with hose, conforming to MIL-DTL-8788, to form hose assemblies, conforming to MIL-DTL-8790. The military unique hose assemblies are intended to be used in high pressure hydraulic systems requiring interoperability and compatibility with associated components and equipment. The hose assemblies are required to withstand an operating pressure of 3,000 psi. The interoperability and compatibility has been assured through strict adherence to the military detail specification requirements. Manufacturers of these items and users place great reliance on the detailed technical requirements to ensure the products meet the interoperability and compatibility requirements while encountering rapid ambient temperature fluctuations.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification, including any amendments.
- b. Applicable part number (see MS specification sheets of 2.2).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2. and 2.3).
- d. Packaging requirements (see 5.1).

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-8789 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements. Manufacturers are urged to arrange to have the products they propose to offer to the Federal Government tested for qualification so that they may be eligible for contract awards or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Defense Supply Center, Columbus, DSCC-VQP, 3990 East Broad Street, Columbus, OH 43216-5000.

6.4 Subject term (key word) listing.

Adapter
Hose

MIL-DTL-8789E

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Air Force - 99

Army - AV

Navy - AS

DLA - CC

Preparing activity:

DLA-CC

Project 4730-0744

Review activities:

Air Force - 71

Army - AT, MI

Navy - SA

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of 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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-8789E	2. DOCUMENT DATE (YYYYMMDD) 20010406
3. DOCUMENT TITLE FITTING END, ATTACHABLE, HYDRAULIC, HIGH PRESSURE (3,000 PSI), GENERAL SPECIFICATION FOR		
4. NATURE OF CHANGE (<i>Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.</i>)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (<i>Last, First, Middle Initial</i>)	b. ORGANIZATION	
c. ADDRESS (<i>Include Zip Code</i>)	d. TELEPHONE (<i>Include Area Code</i>) (1) Commercial: (2) DSN: (<i>If Applicable</i>)	7. DATE SUBMITTED (YYYYMMDD)
8. PREPARING ACTIVITY DLA-CC		
a. NAME COMMANDER DEFENSE SUPPLY CENTER COLUMBUS	b. TELEPHONE NUMBER (<i>Include Area Code</i>) (1) Commercial (2) DSN (614) 692-0538 850-0538 Fax: (614) 692-6939	
c. ADDRESS (<i>Include Zip Code</i>) CODE DSCC-VAI 3990 EAST BROAD STREET COLUMBUS, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office DLSC-LM 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888	