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MIL-DTL-25427B

15 May 2009

SUPERSEDING

MIL-C-25427A

16 Sept 1960

## DETAIL SPECIFICATION

COUPLING ASSEMBLY, HYDRAULIC, SELF SEALING,  
QUICK DISCONNECT, 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 detailed requirements for aircraft hydraulic self sealing quick disconnect coupling for use in types I and II hydraulic systems (-65 °F to +275 °F temperature range) as defined by SAE-AS5440.

1.2 Classification. Hydraulic self-sealing, quick disconnect couplings may be one of the following classes, as specified (see 6.2):

Class 1000- 1000 pounds per square inch (psi) rated pressure furnished in 1.25 to 1.5 inch tube sizes (return lines).

Class 3000- 3000 psi rated pressure furnished in 0.25 through 1 inch tube sizes (1.25 and 1.5 inch tube sizes are for return lines only).

Class 5000- 5000 psi rated pressure furnished in 0.25 to 1 inch tube sizes (1.25 and 1.5 inch tube sizes are for return lines only).

1.2.1 Part or identifying number (PIN). The part or identifying number to be used for couplings acquired to this specification is identified in the applicable specification sheet.

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| Comments, suggestions, or questions on this document should be addressed to the Naval Air Systems Command, Attention: Code 4L8000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to <a href="mailto:michael.sikora@navy.mil">michael.sikora@navy.mil</a> . Since contact information can change, you may want to verify the currency of this address information using the ASSIST online database at <a href="http://assist.daps.dla.mil">http://assist.daps.dla.mil</a> . |
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## 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 of 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 handbook 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.

## SPECIFICATIONS

## DEPARTMENT OF DEFENSE SPECIFICATIONS

|               |   |
|---------------|---|
| MIL-PRF-5606  | - Hydraulic Fluid, Petroleum Base; Aircraft, Missile, And Ordnance (Inactive for New Design)                            |
| MIL-A-8625    | - Anodic Coatings for Aluminum and Aluminum Alloys  |
| MIL-DTL-25579 | - Hose Assembly, Polytetrafluoroethylene, High temperature, Medium pressure   |
| MIL-P-25732   | - Packing, Preformed, Petroleum Hydraulic Fluid Resistant, Limited Service at 275 °F (135 °C) (Inactive for New Design) |
| MIL-PRF-83282 | - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537                           |
| MIL-H-85800   | - Hose Assemblies, Polytetrafluoroethylene, Aramid Fiber Reinforced 5000 and 8000 psi, General Specification for        |
| MIL-PRF-87257 | - Hydraulic Fluid, Fire Resistant, Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile                    |

## DEPARTMENT OF DEFENSE STANDARDS

|             |   |
|-------------|---|
| MIL-STD-129 | - Marking For Shipment And Storage  |
| MIL-STD-130 | - Identification Marking Of US Military Property  |
| MIL-STD-810 | - Environmental Engineering Considerations and Laboratory Tests                             |
| MS21344     | - Fittings - Installation of Flared Tube, Straight Threaded Connectors, Design Standard For |

## DEPARTMENT OF DEFENSE HANDBOOK

|              |                               |
|--------------|-------------------------------|
| MIL-HDBK-831 | - Preparation of Test Reports |
|--------------|-------------------------------|

(See supplement 1 for applicable specification sheets.)

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(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.)

2.2.2 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.

## SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) INTERNATIONAL

|                    |  |
|--------------------|--|
| SAE-AMS2700        | - Passivation of Corrosion Resistant Steels (DoD Adopted)  |
| SAE-AMS4965        | - Titanium Alloy, Bars, Wire, Forgings and Rings, 6Al-4V Solution Heat Treated and Aged (DoD Adopted)  |
| SAE-AMS5047        | - Steel, Sheet and Strip, .08-0.13C, Aluminum Killed (SAE1010) Deep Forming Grade (DoD Adopted)  |
| SAE-AMS5085        | - Steel, Strip, and Plate, 0.47-0.55C (SAE1050) Annealed (DoD Adopted)   |
| SAE-AMS5529        | - Steel, Corrosion Resistant, Sheet and Strip 17CR-7.1NI-1.1Al Solution Heat Treated and Cold Rolled, Precipitation Hardenable 0.0015 to 0.050 Inch (0.038 to 1.27MM) Normal Thickness (DoD Adopted) |
| SAE-AMS5643        | - Steel, Corrosion Resistant, Bars, Wire, Forgings, Tubing and Rings, 16Cr-4Ni, 0.30Cb-4 Cu, Solution Heat Treated Precipitation Hardenable (DoD Adopted)  |
| SAE-AMS5659        | - Steel, Corrosion Resistant, Bars, Wire, Forgings, Rings, and Extrusions 15CR - 4.5NI - 0.30CB - 3.5CU Consumable Electrode Melted Solution Heat Treated, Precipitation Hardenable (DoD Adopted)    |
| SAE-AMS5678        | - Steel, Corrosion Resistant, Wire, 17Cr-7.1 Ni-1.1 Al, Cold Drawn, Precipitation Hardenable (DoD Adopted)   |
| SAE-AMS-P-83461    | - Packing, Preformed, Petroleum Hydraulic Fluid Resistant, Improved Performance at 275 °F (135 °C) (DoD Adopted)   |
| SAE-AMS-QQ-A-225/6 | -Aluminum Alloy, 2024, Bar, Rod, and Wire; Rolled, Drawn, Or Cold Finished (DoD Adopted)   |
| SAE-AMS-QQ-A-225/9 | -Aluminum Alloy 7075, Bar, Rod, Wire, and Special Shapes; Rolled, Drawn or Cold Finished (DoD Adopted)   |
| SAE-AMS-QQ-P-416   | - Plating, Cadmium (Electrodeposited) (DoD Adopted)  |
| SAE-AS603          | - Hose, Hydraulic, Tubing and Fitting Assemblies, Impulse Testing of   |
| SAE-AS1339         | - Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced 3000 psi, 400°F, Lightweight, Hydraulic and Pneumatic (DoD Adopted)  |
| SAE-AS8775         | - Hydraulic System Components, Aircraft and Missiles, General Specification for (DoD Adopted)  |
| SAE-AS8791         | - Hydraulic and Pneumatic Retainers (Back-up Rings), Polytetrafluoroethylene (PTFE) (Resin) (DoD Adopted)  |

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(Copies of these documents are available online at <http://www.sae.org> or from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-D3951 - Commercial Packaging

(Copies of these documents are available online at <http://www.astm.org> or from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI-B46.1 - Surface Texture (Surface Roughness, Waviness, and Lay)

(Copies of this document are available online at <http://www.ansi.org> or from ANSI, 25 West 43<sup>rd</sup> Street, New York, NY 10036-8002.)

## AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ-Z1.4 - Sampling Procedures and Tables For Inspection By Attributes

(Copies of this document are available online at <http://www.asq.org> or from the American Society for Quality, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet or MS sheet. In the event of any conflict between the requirements of this specification and the specification sheet or MS sheet, the latter shall govern.

3.2 Qualification. The couplings 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 (4.5 and 6.4).

3.3 General specification. The requirements of SAE-AS8775 apply if it is necessary and if the requirements are not specified in this specification.

3.4 Materials and finish. The materials shall be as specified in table I. The selected materials shall be corrosion resistant metal or protected from corrosion and shall be compatible

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with hydraulic fluids conforming to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257. The finish requirements of the coupling shall be as specified in table I.

3.4.1 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.

TABLE I. Materials and finishes.

| Material                                     | Material Code | Material specification                               | Finish  | Note                  |
|--|---------------|--|---|-----------------------|
| Aluminum alloy 2014/2024                     | D             | SAE-AMS-QQ-A-225/6 temper T351                       | Anodized per MIL-A-8625, type II, class 1 Dichromate sealed or Class 2, Nickel acetate seal | For 1000 psi only     |
| Aluminum alloy 7075                          | W             | SAE-AMS-QQ-A-225/9 Temper T73                        | Anodized per MIL-A-8625, type II, class 2 dyed brown  | For 3000 psi          |
| Stainless steel 300 series 15-5 PH or 17-4PH | S             | SAE-AMS5529, SAE-AMS5643, SAE-AMS5678 or SAE-AMS5659 | Passivate per SAE-AMS2700   | For 3000 and 5000 psi |
| Carbon steel                                 | C             | SAE-AMS5085, or SAE-AMS5047                          | 1/ Cadmium plated per SAE-AMS-QQ-P-416, type II, class 2                                    |                       |
| Titanium                                     | T             | SAE-AMS4965  | None  |                       |

1/ This document references cadmium plating. See 6.5 for information using cadmium.

3.5 Design and construction. The configuration, dimension, and the detail design and construction of the coupling shall conform to the applicable specification sheets or MS sheets. The objective of the design is obtaining smallest size and lightest weight possible commensurate with meeting the performance requirements specified herein. When the two halves coupled, the coupling assembly shall permit fluid flow in intended direction in accordance with the rated flow and pressure drop specified in tables II. Flow shall not be blocked under surge conditions.

3.5.1 Temperature range. Coupling shall be designed for operation with type II hydraulic fluid having the temperature range from -65 °F to +275 °F.

3.5.2 Sealing and fluid loss. When uncoupled, the couplings shall seal at the point of disconnection at the end of the disconnected lines and shall not permit external leakage during any phase of coupling or uncoupling. Fluid loss (spillage) as specified in tables III is not

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considered external leakage. Both coupling halves shall seal fluid under low and high operating pressures.

3.5.3 Seals. SAE-AMS-P-83461 packing, MIL-P-25732 packing, and SAE-AS8791 PTFE retainer shall be used which are compatible with MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257 hydraulic fluids.

3.5.4 Operation. The coupling shall be so designed that it can be coupled and uncoupled with one hand without the use of tools. Coupling and uncoupling operations shall be possible with 60 psi static pressure applied to both halves of the coupling. Inadvertent uncoupling shall not occur under normal vibration environment of powered flight, dynamic loading of aircraft within flight and maneuvering envelopes, and during shocks associated catapult launch/arrested landing. It shall be possible to determine by visual inspection that the coupling is completely coupled and locked. In addition, couplings shall provide a touch indication for determining whether the coupling is locked or unlocked. Couplings shall not have any partially coupled unlocked positions in which the couplings can remain stable and permit fluid flow. Couplings shall be coupled with a single simple motion.

TABLE II. Coupling assembly rated flow, surge flow, and pressure drop for all pressure classes.

| Dash No. | Tube OD | Rated flow Gal/min | Surge flow Gal/min | Pressure drop psi (max) |
|----------|---------|--------------------|--------------------|-------------------------|
| -04      | 0.250   | 1.2                | 6                  | 8                       |
| -06      | 0.375   | 3.5                | 17.5               | 8                       |
| -08      | 0.500   | 6.0                | 30                 | 8                       |
| -10      | 0.625   | 10.5               | 52.5               | 8                       |
| -12      | 0.750   | 16                 | 80                 | 8                       |
| -16      | 1.000   | 29                 | 87                 | 8                       |
| -20      | 1.250   | 45                 | 90                 | 4                       |
| -24      | 1.500   | 60                 | 120                | 4                       |

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TABLE III. Air inclusion and fluid loss for all pressure classes.

| Dash No. | Tube OD | Air inclusion<br>cm <sup>3</sup> (in) <sup>3</sup> max |             | Average fluid<br>Loss per operating cycle<br>(spillage) cm <sup>3</sup> (in) <sup>3</sup> max |             |
|----------|---------|--|-------------|---|-------------|
|          |         | 3000 psi   | 5000 psi    | 3000 psi  | 5000 psi    |
| -04      | 0.250   | 0.05   | 0.10 (.006) | 0.50 (.031)   | 0.05 (.003) |
| -06      | 0.375   | 0.12   | 0.20 (.012) | 1.30 (.079)   | 0.10 (.006) |
| -08      | 0.500   | 0.20   | 0.40 (.025) | 2.20 (.134)   | 0.20 (.012) |
| -10      | 0.625   | 0.50   | 0.60 (.037) | 5.80 (.354)   | 0.30 (.018) |
| -12      | 0.750   | 0.70   | 1.00 (.061) | 8.20 (.500)   | 0.50 (.031) |
| -16      | 1.000   | 0.90   | 1.75 (.107) | 9.00 (.549)   | 1.00 (.061) |
| -20      | 1.250   | 1.20   | 2.00 (.122) | 11.80 (.720)  | 1.20 (.073) |
| -24      | 1.500   | 1.20   | 2.50 (.153) | 11.80 (.720)  | 1.50 (.092) |

3.6 Interchangeability of bulkhead halve coupling. Bulkhead halve couplings (mounted on aircraft) shall be interchangeable as an assembly or individual coupling halves for same tube size and pressure class. It shall be designed not to interconnect coupling assembly or coupling halves of different tube sizes. Couplings of different pressure classes shall not be capable of cross coupling. This requirement does not apply to hose end couplings which shall be interchangeable regardless of pressure classes.

3.7 Performance. The self sealing coupling furnished under this specification shall perform satisfactorily when conducting to the following performance requirements.

3.7.1 Envelope dimensions, weight, materials. Each coupling half shall conform to the applicable specified envelope dimensions, weight, materials, and finishes specified in the applicable specification sheet.

3.7.2 Manual operation. Coupling halves shall be tested in accordance with the requirements specified in 4.8.2 with no evidence of coupling forces, leakage or spillage beyond the specified limits specified in table IV and table III respectively. Both coupling halves shall be installed in the systems capable of accommodating fluid displacement without pressure rise.

3.7.3 Immersion. The self sealing coupling contains nonmetallic parts and therefore shall be compatible with hydraulic fluid and show no leakage, damage or malfunction when tested as specified in 4.8.3.

3.7.4 Air inclusion. The air inclusion for all coupling halves shall be within specified limits conforming to table III at 30 inches of hydraulic fluid static pressure (15 psi).

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TABLE IV. Coupling pressure, torque, and force requirements for manual operation.

| Dash No. | Static Pressure<br>psi | Push-pull<br>Axial force lb | Torque rotation<br>lb-in |
|----------|------------------------|-----------------------------|--------------------------|
| -04      | 60                     | 30                          | 15                       |
| -06      | 60                     | 35                          | 20                       |
| -08      | 60                     | 40                          | 25                       |
| -10      | 60                     | 45                          | 30                       |
| -12      | 50                     | 50                          | 40                       |
| -16      | 30                     | 60                          | 50                       |
| -20      | 20                     | 60                          | 60                       |
| -24      | 15                     | 60                          | 70                       |

3.7.5 Leakage. Coupling halves shall meet the leakage requirements when tested as specified in 4.8.5 at 30 inches of static head of hydraulic fluid and operating pressure.

3.7.6 Pressure drop. Each coupling shall indicate a pressure drop within the limits specified in table II. The fluid temperature shall be  $100\text{ }^{\circ}\text{F} \pm 10\text{ }^{\circ}\text{F}$  and test set-up shall be as shown on figure 2.

3.7.7 Vacuum. Each coupling half shall meet leakage requirements with no evidence of malfunction or degradation when hydraulic pressure equivalent to 10 inches of Hg (5 psi) is applied and lines are closed for five minutes.

3.7.8 Extreme temperature functioning. Each coupling half shall not malfunction during or after it is subjected to extreme temperature functioning tests low at  $-65\text{ }^{\circ}\text{F}$  and high at  $+275\text{ }^{\circ}\text{F}$  (see 4.8.8).

3.7.9 Rapid warm up. The coupling shall be assembled and disassembled five times smoothly without malfunction and shall pass the rapid warm up test specified in 4.8.9.

3.7.10 Proof pressure. Each coupling half shall meet operational and leakage requirements after being subjected to proof pressure of 150 percent of operating pressure for a period of one minute as specified in 4.8.10.

3.7.11 Surge flow. Coupling halves shall meet leakage, operational, and pressure drop requirements after being subjected to surge flow (five times the rated flow) in each direction as specified in table II (see 4.8.11).

3.7.12 Impulse and vibration (1000 and 3000 psi only). The coupling and coupling halves shall be designed to meet the impulse and vibration test requirements specified in 4.8.12.



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3.7.13 Impulse (5000 psi only). Coupling halves designed for 5000 psi shall withstand an impulse test conforming to SAE-AS603 without malfunction. Operating pressures, rate of pressure rise, and impulse shall conform to table IX and figure 3 (see 4.8.13).

3.7.14 Vibration (5000 psi only). Each coupling half for 5000 psi shall be designed to meet the vibration test requirements specified in 4.8.14 without malfunction or degradation.

3.7.15 Shock. Coupling halves shall meet a transit drop (shock test) and a catapult launch and arrested landing test specified in 4.8.15 with the exception that the height for the transit drop shock test shall be 10 feet.

3.7.16 Burst pressure test. Coupling halves shall withstand 250 percent of operating pressure at 275 °F temperature when tested as specified in 4.8.16 burst pressure test without fluid loss or rupture.

3.7.17 Flange strength. The bulkhead half of the coupling that is mounted on aircraft shall withstand a torque equal to 1.5 times the maximum steel tubing wrench torque conforming to MS21344 applied to the wrench flats of the union without damage to the mounting flange (see 4.8.17).

3.7.18 Endurance. Each coupling half shall meet 200 endurance cycles without malfunction or degradation with 15 psig pressure applied to each half (see 4.8.18).

3.8 Identification of product. Unless otherwise specified in the contract, the coupling shall be marked for identification in accordance with MIL-STD-130. It shall include part identification number (PIN), manufacturer's name, trademark or CAGE code. The detail PIN arrangement is shown in the applicable MS sheet and specification sheet.

3.9 Workmanship. Machined surfaces shall be free from burrs, longitudinal or spiral tool marks. Unless a finer finish is specified on applicable drawings, sealing surfaces shall be smooth, except that annular tool marks up to 63 micro inches ( $\mu$ -in) arithmetical average ( $R_a$ ), as defined by ANSI B46.1 shall be acceptable. All other machined surfaces shall not exceed 125  $\mu$ -in  $R_a$ . Un-machined surfaces, such as forging surfaces and bar stock flats shall be free from blisters, fins, folds, seams, laps, cracks, segregations, spongy areas and except for forging parting lines shall not exceed 250  $\mu$ -in  $R_a$ . Surface defects may be explored by suitable etching. However if these defects can be removed so that they do not appear on re-etching and the required section thickness can be maintained, they shall not be cause for rejection (see 4.8.1).

#### 4. VERIFICATION

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

- a. Qualification inspection (see 4.5).
- b. Conformance inspection (see 4.6).

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4.2 Inspection lot. A lot shall consist of all parts of a given part number made from the same material, same manufacturing processes, manufactured during the same period of production, and presented for inspection at essentially the same time.

4.2.1 Sampling for inspection. Sample from each lot of couplings for inspection shall be randomly selected per ANSI/ASQ Z1.4, 1% AQL, Level II and shall pass the qualification inspections specified in table V.

4.3 Maintaining record of inspection. The contractor shall maintain a record of inspections performed on each lot and shall be available to the acquiring activity upon request.

4.4 Inspection conditions.

4.4.1 Temperatures. Unless otherwise specified, the inspection shall be conducted at room temperature 70 °F to 90 °F and a fluid temperature of 70 °F to 110 °F measured within 12 inches of the test sample. The actual temperature of the fluid during the inspection shall be recorded.

4.4.2 Test fluid. Hydraulic fluids used in all tests shall conform to MIL-PRF-5606, MIL-PRF-83282, or MIL-PRF-87257.

4.5 Qualification inspection. Qualification inspection shall consist of all examinations and tests specified in table V. Qualification tests shall be performed at a laboratory acceptable to the Government. The test samples shall be products produced with consistent equipment and procedures used in production. The test methods are described in 4.8.

4.5.1 Test samples. Test samples submitted for qualification shall be as specified by the qualifying activity. When the tests are conducted at a location other than the government testing facilities, the contractor shall get approval from the qualifying activity prior to testing.

4.6 Conformance inspection. Conformance inspection shall be conducted as specified in table VI and test methods are described in 4.8. Results of this inspection shall be submitted to the qualifying activity.

4.6.1 Inspection of product for delivery. Products for delivery shall be inspected to ensure they pass the conformance inspection specified in table VI. Marking shall be in accordance with 3.8.

4.6.2 Periodic inspection. If there is no production for 3 years, periodic inspection shall be performed and shall consist of those tests listed in table VII. Where the results of these inspections show noncompliance with the applicable requirements (see 4.6.3), delivery of products which have previously passed the qualification inspection requirements shall be withheld pending corrective action taken to the satisfaction of the qualifying activity. Periodic inspection samples shall be representative of products which are qualified and listed on the qualified product list.

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4.6.3 Noncompliance. If a sample fails to pass inspection, the manufacturer shall immediately notify the qualifying activity and the cognizant inspection activity of such failure and corrective action shall be taken. Full particulars concerning action taken to correct the defects shall be submitted to the qualifying activity and the inspection activity. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After the corrective action has been taken, inspection shall be repeated with additional sample units. Inspections may be continued; however, final acceptance and shipment shall be withheld until final inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure shall be furnished to the cognizance inspection activity and the qualifying activity.

TABLE V. Qualification inspections.

| Inspection                                     | Requirement paragraphs | Test paragraphs |
|--|------------------------|-----------------|
| Examination of product                         | 3.6, 3.8 and 3.9       | 4.8.1           |
| Manual operation                               | 3.7.2                  | 4.8.2           |
| Immersion                                      | 3.7.3                  | 4.8.3           |
| Air inclusion                                  | 3.7.4                  | 4.8.4           |
| Leakage  | 3.7.5                  | 4.8.5           |
| Pressure drop                                  | 3.7.6                  | 4.8.6           |
| Vacuum   | 3.7.7                  | 4.8.7           |
| Extreme temperature functioning                | 3.7.8                  | 4.8.8           |
| Rapid warm up                                  | 3.7.9                  | 4.8.9           |
| Proof pressure                                 | 3.7.10                 | 4.8.10          |
| Surge flow                                     | 3.7.11                 | 4.8.11          |
| Impulse and vibration (1000 and 3000 psi only) | 3.7.12                 | 4.8.12          |
| Impulse (5000 psi only)                        | 3.7.13                 | 4.8.13          |
| Vibration (5000 psi only)                      | 3.7.14                 | 4.8.14          |
| Shock  | 3.7.15                 | 4.8.15          |
| Burst pressure                                 | 3.7.16                 | 4.8.16          |
| Flange strength                                | 3.7.17                 | 4.8.17          |
| Endurance                                      | 3.7.18                 | 4.8.18          |

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TABLE VI. Conformance inspections.

| Inspection       | Requirement paragraphs | Test paragraphs |
|------------------|------------------------|-----------------|
| Examination      | 3.6, 3.8, and 3.9      | 4.8.1           |
| Manual operation | 3.7.2                  | 4.8.2           |
| Leakage          | 3.7.5                  | 4.8.5           |
| Proof pressure   | 3.7.10                 | 4.8.10          |

TABLE VII. Periodic inspections.

| Inspection       | Requirement paragraphs | Test paragraphs |
|------------------|------------------------|-----------------|
| Manual operation | 3.7.2                  | 4.8.2           |
| Leakage          | 3.7.5                  | 4.8.5           |
| Proof pressure   | 3.7.10                 | 4.8.10          |
| Burst pressure   | 3.7.16                 | 4.8.16          |

4.7 Inspection of packaging. Except when commercial packaging is specified, the sampling and inspection of the preservation and interior package marking shall be as specified in a contract. Unless otherwise specified, the sampling and inspection of packing and marking for shipment and storage shall be in accordance with the requirements of MIL-STD-129.

#### 4.8 Methods of inspection.

4.8.1 Examination of product. The coupling shall be visually inspected for verification of good workmanship and correct markings. Physical measurements shall be taken and a record of all dimensions noted on applicable assembly drawings for verification of correct configuration, envelope, mounting requirements, interface dimensions and applicable dimensional tolerances. Dry weight shall be recorded. Finish, material, and workmanship shall be visually inspected for conformance to the specification requirements (see 3.6, 3.8, and 3.9).

4.8.2 Manual operation. The coupling shall be tested to determine conformance to 3.7.2. The coupling shall be coupled and uncoupled without the use of tools with a pressure of 60 psi (see table IV) applied to both halves. The bulkhead half (aircraft halve coupling) shall be securely mounted in a fixed position for this test. One hand shall be used to couple the coupling. This test shall be repeated five times without malfunction, and the fluid loss (spillage) plus leakage shall not exceed the values specified in table III. Couplings shall be inspected during this test to ensure compliance with 3.5 and while coupled and unlocked positions the coupling remains stable and permit fluid flow.

4.8.3 Immersion. Test couplings shall be immersed continuously in hydraulic fluid for a period of 72 hours at a fluid temperature of 275 °F  $\pm$  5 °F prior to conducting the qualification

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inspection (see 4.5) specified herein. All internal parts of the coupling shall be in contact with the fluid during immersion. After the 72-hour soak period, the coupling shall be subjected to the next test immediately or remain in the fluid at normal room temperature until such test is available.

4.8.4 Air inclusion. The coupling shall be subjected to an air inclusion test to determine compliance with 3.7.4. This test shall be performed during the manual operation test specified in 4.8.2.

4.8.5 Leakage.

4.8.5.1 Leakage at low pressure. The connected coupling and the disconnected halves shall be subjected to an internal pressure equal to a 30-inch static pressure of hydraulic fluid for 12 minutes. All external surfaces shall be dry at the beginning of this test. There shall be no evidence of external leakage from the connected coupling. A waiting period of 2 minutes shall be allowed for leakage rate to become constant from the disconnected halves. Following this waiting period, leakage shall be measured for the next 10 minutes and shall not exceed one drop. For conformance tests, the connected coupling and the disconnected halves shall be subjected to internal pressure equal to 30 inches of hydraulic fluid for 30 seconds. All external surfaces shall be dry at the beginning of this test. There shall be no evidence of leakage (zero) from either the coupled coupling or disconnected halves.

4.8.5.2 Leakage at high pressure. Both the connected coupling and the disconnected halves shall be subjected to a hydraulic static pressure equal to the applicable operating pressure for 15 minutes. All external surfaces shall be dry at the beginning of this test. There shall be no evidence of external leakage from the connected coupling. Leakage from the disconnected halves shall not exceed a trace (insufficient to form a drop) in 10 minutes. Fluid loss as specified in table III is not considered to be external leakage.

4.8.6 Pressure drop. Pressure drop through the connected coupling shall be measured at a flow equal to the rated flow specified in table II. The hydraulic fluid flow shall be accurately maintained. A manometer or other equally accurate method of differential pressure measurement (differential pressure gauge) shall be connected across the coupling as shown in figure 2. The temperature of the fluid shall be maintained at  $100\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$ . The pressure drop in the coupling shall not exceed the value specified in table II.

4.8.7 Vacuum. A vacuum shall be applied to the coupling assembly equivalent to 10 inches of Hg (5 psi). When the correct pressure has been attained, the lines shall close for a period of 5 minutes, during which time there shall be no change in pressure. Temperature shall be maintained constant within  $\pm 2\text{ }^{\circ}\text{F}$  both fluid and ambient during this test.

4.8.8 Extreme temperature functioning. The couplings shall be tested with the following tests without malfunctioning or leakage in excess of the values specified in 4.8.5.

4.8.8.1 High temperature. After immersion in hydraulic fluid but before uncoupled, the coupling shall be connected to a 30-inch static pressure of hydraulic fluid and subjected to a

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temperature of  $275^{\circ}\text{F} \pm 5^{\circ}\text{F}$  for a period of 6 hours. There shall be no measurable leakage from the connected coupling during the 6 hour period. At the end of this period, the coupling shall be cooled to  $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$  and at least five cycles of coupling and uncoupling shall be completed. There shall be no binding during any cycle of disconnection and connection. The temperature of the uncoupled halves shall be raised to  $225^{\circ}\text{F} \pm 5^{\circ}\text{F}$  and shall be subjected to a leakage at low pressure test (see 4.8.5.1) and then subjected to a leakage at high pressure test specified in 4.8.5.2.

4.8.8.2 Low temperature. After completion of the high temperature tests (see 4.8.8.1), the couplings shall be connected to a 30-inch static pressure of hydraulic fluid and subjected to a temperature of  $-65^{\circ}\text{F}$  for a period of 4 hours after stabilization. There shall be no measurable leakage from the connected coupling during this period. At the end of this period, at least five cycles of coupling and uncoupling shall be completed. There shall be no binding during any cycle of disconnection and connection. The uncoupled halves shall be subjected to leakage at low pressure test (see 4.8.5.1) and then subjected to leakage at high pressure test (see 4.8.5.2). This requirement shall be satisfactory for the temperature rising to  $-40^{\circ}\text{F}$  during this test.

4.8.9 Rapid warm up. The coupled coupling while connected to a 30 inch static head of hydraulic fluid, shall be allowed to warm up rapidly from  $-65^{\circ}\text{F}$  to  $+40^{\circ}\text{F}$  within a 5 minute period and shall be coupled and uncoupled at least five times during this period without waiting for the fluid, coupling, and ambient air temperature to stabilize. The test temperature shall be measured at coupling outer surface. During the coupling and uncoupling process, the coupling shall be observed for any malfunction.

4.8.10 Proof pressure. The coupled coupling and the uncoupled halves shall be subjected to a proof pressure of 150 percent of the rated pressure for a period of one (1) minute at room temperature. There shall be no leakage greater than to form a drop or any permanent distortion or other malfunctioning of the coupling. The coupling shall couple and uncouple normally and seal the test fluid without leakage after subjected to proof pressure test. This test shall be repeated at  $275^{\circ}\text{F} \pm 5^{\circ}\text{F}$  for five (5) minutes for qualification inspection and repeated at room temperature for 1 minute for conformance inspection specified in table VI.

4.8.11 Surge flow. The coupling shall be subjected to a flow at five times the rated flow for 5 seconds minimum in each direction. This surge flow pattern shall be repeated 100 times. There shall be no evidence of flow blockage or internal damage and the disconnected halves shall pass the leakage test (see 4.8.5).

4.8.12 Impulse and vibration (1000 and 3000 psi). The couplings shall withstand the following tests without evidence of failure.

4.8.12.1 Resonance search. The connected fluid-filled coupling shall be tested for resonance in a direction parallel and a direction perpendicular to the axis of the coupling. The frequency and double amplitude shall be slowly varied to within  $+0$  and  $-10$  percent of that specified for vibration tests as shown on figure 2. All resonant frequencies shall be noted.

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4.8.12.2 Fatigue.

(a) The connected couplings shall be vibrated for 25 hours in a test setup similar to that shown in figure 3 at the highest resonant frequency for the direction perpendicular to the axis of the coupling. If a resonant frequency does not exist for a direction perpendicular to the axis of the coupling, the coupling shall be vibrated at 55 cycles per second and a double amplitude of 0.060 inch.

(b) The connected couplings shall be vibrated an additional 25 hours in a test setup similar to that of figure 3, except that the direction of the applied amplitude shall be parallel to that of the coupling axis. The frequency of the vibration shall be at the highest resonance for the direction parallel to the coupling axis. If a resonant frequency does not exist for a direction parallel to the axis of the coupling, the coupling shall be vibrated at 55 cycles per second and a double amplitude of 0.060 inch.

(c) The first 25 percent of each of the above tests shall be conducted at a temperature of  $275^{\circ} \pm 5^{\circ}\text{F}$ . The remaining 75 percent shall be at  $225^{\circ} \pm 5^{\circ}\text{F}$ .

(d) Throughout each of these fatigue tests the coupling shall be subjected to pressure impulses having a frequency of  $30 \pm 5$  cycles per minute. The impulse test machine shall produce dynamic pressure impulses in the coupling of the magnitude indicated by the graph shown on figure 5. An oscilloscope photograph of the nature of the impulse shall be recorded.

(e) At the conclusion of the fatigue tests, the coupling shall successfully pass the leakage at high pressure and leakage at low pressure tests (see 4.8.5.1 and 4.8.5.2, respectively).

4.8.13 Impulse (5000 psi coupling). The mated coupling and disconnected coupling halves installed with caps and plugs shall be subjected to impulse test in accordance with the general requirements of SAE-AS603. Test conditions shall conform to table IX and test setup conforming to figure 3 and hose band radii conforming to table VIII. The impulse test machine shall produce dynamic pressure impulses, in the coupling, of the magnitude indicated by the graph shown on figure 5. An oscilloscope photograph of the nature of the impulse shall be included in the test report.

4.8.14 Vibration (5000 psi). The connected coupling shall be vibration tested in accordance with MIL-STD-810, test method 514.6, test procedure I for jet aircraft with an exception of the following specified herein. The couplings shall be pressurized to 15 psig and shall be mounted in a similar resonant-free test fixture as shown on figure 3. Figure 4 indicates vibration exposure experienced on the product mounted on jet aircraft. Tolerances of the vibration characteristics shall be as follow:

|              |            |
|--------------|------------|
| Amplitude    | $\pm 10\%$ |
| Frequency    | $\pm 2\%$  |
| Acceleration | $\pm 10\%$ |

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4.8.14.1 Sinusoidal vibration. The tests shall be performed at ambient temperature of 70 °F to 90 °F, along two axes, one axis parallel to the direction of flow and the other axis perpendicular to the direction of flow. The vibration input accelerometer shall be mounted on the fixture close to the mounting point of the coupling to the fixture. A second accelerometer shall be mounted directly on the test item for monitoring resonant frequencies. Sinusoidal excitation shall consist of three tests, resonance search (see 4.8.14.1.1), resonance dwell (see 4.8.14.1.2), and cycling (see 4.8.14.1.3).

4.8.14.1.1 Resonance search. Resonant frequencies of the coupling shall be determined along each axis by slowly sweeping through the frequency range of 15 Hertz (Hz) to 2000 Hz logarithmically (see figure 6). The applied vibration shall be at reduced levels (0.5g) but with sufficient amplitude to excite the test item. A resonant frequency shall be considered to be any natural frequency with an amplification factor of 2.0 or greater of the output response relative to the input level. The resonant frequencies shall be recorded.



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TABLE VIII. Hose length and bend radii for impulse test for all pressure classes.

| Hose dash number                                   | Hose OD | Hose length | Bend radii |
|--|---------|-------------|------------|
| <b>Class 1000, MIL-DTL-25579 hose for 1000 psi</b> |         |             |            |
| -04  | 0.250   | 14          | 2.00       |
| -06  | 0.375   | 18          | 4.00       |
| -08  | 0.500   | 21          | 4.63       |
| -10  | 0.625   | 23.5        | 5.50       |
| -12  | 0.750   | 27.5        | 6.50       |
| -16  | 1.000   | 18          | 7.38       |
| -20  | 1.250   | 18          | 11         |
| -24  | 1.500   | 18          | 14         |
| <b>Class 3000 SAE-AS1339 hose for 3000 psi</b>     |         |             |            |
| -04  | 0.250   | 12          | 1.50       |
| -06  | 0.375   | 15          | 2.50       |
| -08  | 0.500   | 18          | 2.88       |
| -10  | 0.625   | 21          | 3.25       |
| -12  | 0.750   | 18          | 4.00       |
| -16  | 1.000   | 23          | 5.00       |
| <b>Class 5000 MIL-H-85800 (AS) for 5000 psi</b>    |         |             |            |
| -04  | 0.250   | 12          | 1.50       |
| -06  | 0.375   | 15          | 2.50       |
| -08  | 0.500   | 18          | 2.88       |
| -10  | 0.625   | 21          | 3.25       |
| -12  | 0.750   | 25          | 4.00       |
| -16  | 1.000   | 31          | 5.00       |

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TABLE IX. Impulse requirements for all pressure classes.

| Sequence | Test description   |     | Class 1000                      | Class 3000 | Class 5000  |
|----------|--|-----|---------------------------------|------------|-------------|
| 1        | Operating pressure                                       |     | 1000                            | 3000       | 5000        |
| 2        | Peak pressure<br>145% of operating pressure<br>$\pm 5\%$ |     | 1500                            | 4500       | 7500        |
| 3        | Temperature  |     | 25% at 275 °F and 75% at 225 °F |            |             |
| 4        | Cycle rate (cpm)   |     | $30 \pm 5$                      |            | $70 \pm 10$ |
| 5        | Rate of<br>pressure<br>rise<br>(psi/sec)                 | min | 10,000                          | 45,000     | 75,000      |
|          |  | max | 100,000                         | 300,000    | 200,000     |
| 6        | Number of cycles   |     | 100,000                         | 200,000    | 200,000     |

4.8.14.1.2 Resonance dwell. The coupling shall be vibrated along each axis at the four most severe resonant frequencies based on the results of the resonant search. Dwell time shall be thirty (30) minutes at each test condition. The source dwells may be performed simultaneously. If a change in the resonant frequency occurs during the test, its time of occurrence shall be recorded and immediately the frequency shall be adjusted to maintain the least resonance condition. The final resonant frequency shall be recorded.

4.8.14.1.3 Cycling. The couplings shall be vibrated along each axis for three (3) hours. The cycling time shall be 3 hours minus the total resonance dwell time. The frequency shall be swept over the range 15 Hz to 2000 Hz logarithmically. Sweep time for the 15 Hz to 2000 Hz cycle shall be twenty (20) minutes.

4.8.14.2 Test item inspection for all pressure classes. During the sinusoidal and random vibration tests, the test items shall be continuously monitored for sign of leakage and inadvertent uncoupling. Following the vibration test, the coupling assembly and disconnected coupling halves shall be examined for sign of excessive wear or damage. The test coupling shall be subjected to the manual operation test specified in 4.8.2, leakage test specified in 4.8.5 and the pressure drop test specified in 4.8.6.

4.8.15 Shock. The coupling shall withstand the following shock tests conforming to MIL-STD-810, Method 516 and shall meet the requirements specified in 3.7.15.

4.8.15.1 Transit drop test. The ground support coupling half shall be connected to a static pressure of 60 psi and shall be subjected to 26 drops from a height of 10 feet (average

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height of fuselage of military aircraft). This drop test shall conform, with exception to the height stated in this specification, to MIL-STD-810, Method 516, procedure IV.

4.8.15.2 Catapult launch and arrested landing. The connected coupling shall be subjected to a hydraulic static pressure equal to the applicable operating pressure and withstand a shock test conforming to MIL-STD-810, Method 516, Procedure VIII.

4.8.16 Burst pressure. The connected coupling and the disconnected coupling half shall be subjected to a burst pressure equal to 250 percent of operating pressure for a minimum of 2 minutes. The rate of applying pressure shall not exceed 25,000 psi per minute. There shall be no rupture under the specified pressure and leakage shall not exceed twice the values of 4.8.5.2 leakage at high pressure. This test shall be conducted at  $275^{\circ}\text{F} \pm 5^{\circ}\text{F}$ .

4.8.17 Flange strength. If applicable, the bulkhead half of the coupling (coupling half mounted on aircraft) shall be mounted by means of its flange to a bulkhead. A union of equal size of test coupling shall be installed in the boss. A torque equal to 1.5 times the maximum steel tubing wrench torque conforming to MS21344 (for a given tube size) shall be applied 15 times to the wrench flats of the union without damage to the mounting flange.

4.8.18 Endurance. The couplings shall be subjected to 200 coupling and uncoupling operations. During each operation, the 15 psi gauge pressure shall be applied to each half of the coupling. The coupling shall be observed for indication of malfunction and the fluid leakage for this test shall be measured. The coupling shall withstand this test without malfunction or excessive wear. The fluid loss shall not exceed the values specified in table III. There shall be no external leakage.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.3). When packaging of the 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.

5.2 Commercial packaging. Commercial packaging if used shall be in accordance with ASTM-D3951.

## 6. NOTES

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

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6.1 Intended use. The self sealing couplings covered by this specification are intended for use in aircraft hydraulic systems as covered by SAE-AS5440 and are used in installations where frequent uncoupling of a hydraulic line is required. Couplings covered by this specification will not be used for ground test stand connections, when separate ground test stand connections are provided in the aircraft. A coupling provides a convenient means of uncoupling the line without necessitating drainage of the system and without resulting in any undue leakage of fluid. Unless otherwise specified by the procuring activity, self sealing couplings should not be used with any hydraulic fluid other than that conforming to MIL-PRF-5606, MIL-PRF-83282, and MIL-PRF-87257.

6.2 Military application. This specification contains the requirements of high pressure couplings designed to operate with unique ground servicing carts to support military aircraft hydraulic filling systems. These couplings are not used commercially (reported by Industry).

6.3 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Part or identification number (PIN)
- c. Material code (see table I)
- d. Pressure classes (see 1.2)
- e. Packaging and packing requirements (see 5.1)

6.4 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-25427 whether or not such products have actually been so listed by that date. The attention of the 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 Commander, Naval Air Systems Command, 48110 Shaw Road, Bldg 2187, Code 4.3.5.2, Patuxent River, MD 20670. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <http://assist.daps.dla.mil>.

6.4.1 Retention of qualification. To retain qualification, the contractor must forward a DD Form 1718 at 2-year intervals to the preparing activity. The preparing activity must establish the initial reporting date. The DD Form 1718 should include:

- a. A summary of the results of the tests performed for inspection of product for delivery, indicating as a minimum, the number that have passed, the number that have failed, and the lot which they failed. The results of tests of all reworked lots must be identified and accounted for.
- b. A summary of the results of tests performed for periodic inspection, including the number and mode of failures. The summary must include results of all periodic inspection tests performed and completed during the 2-year period.

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c. In the event that no production occurred during the reporting period, a report must be submitted certifying that the company still has the capabilities and facilities necessary to reproduce the item.

d. 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 the qualified products for testing in accordance with the qualification inspection requirements and the reason for no production.

e. If the summary of the test results indicate non-conformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken removing the failure product from the qualified products list.

6.5 Cadmium plating. Further information for using cadmium is available at EPA web site <http://www.epa.gov/epaoswer/hazwaste/minimize/chemlist>. Also contact local authority for specific information using hazardous materials in the local area.

6.6 Cleaning and drying. Couplings and coupling halves should be thoroughly cleaned and dry before packaging for delivery.

6.7 Marking. Unless specified in the contract, shipping container should be marked in accordance with MIL-STD-129 and should include bar code markings. Marking for commercial packages and, interior and exterior packs should be in accordance with ASTM-D3951. The complete military or contractor's type or part number as applicable including CAGE code should be marked on all units.

6.8 Packaging inspection. Unless otherwise specified in the contract, the package should be inspected in accordance with 4.7.

6.9 Subject term (key word) listing.

Aircraft systems  
Connector  
Delivery fluid  
Ground support equipment

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

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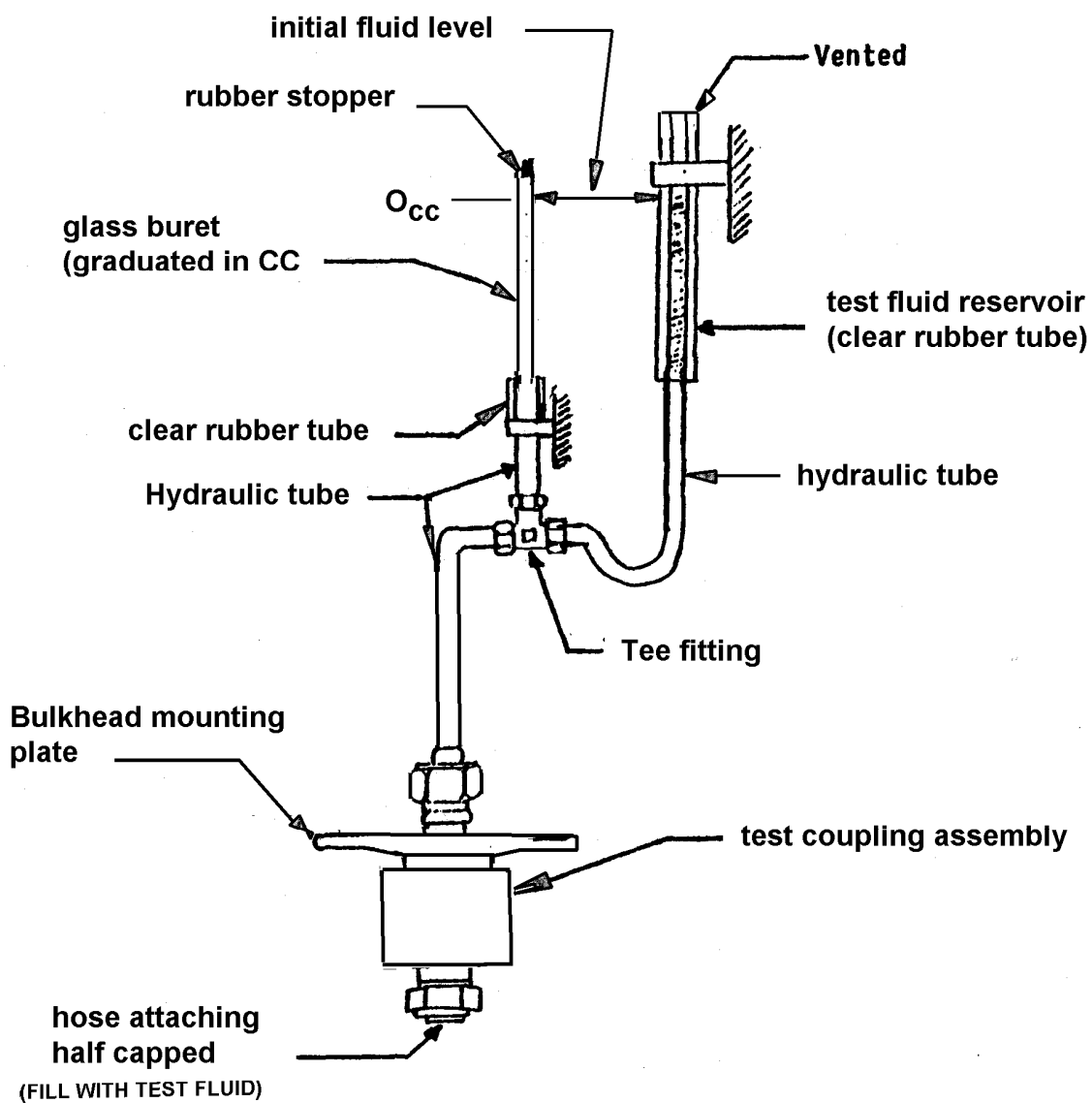
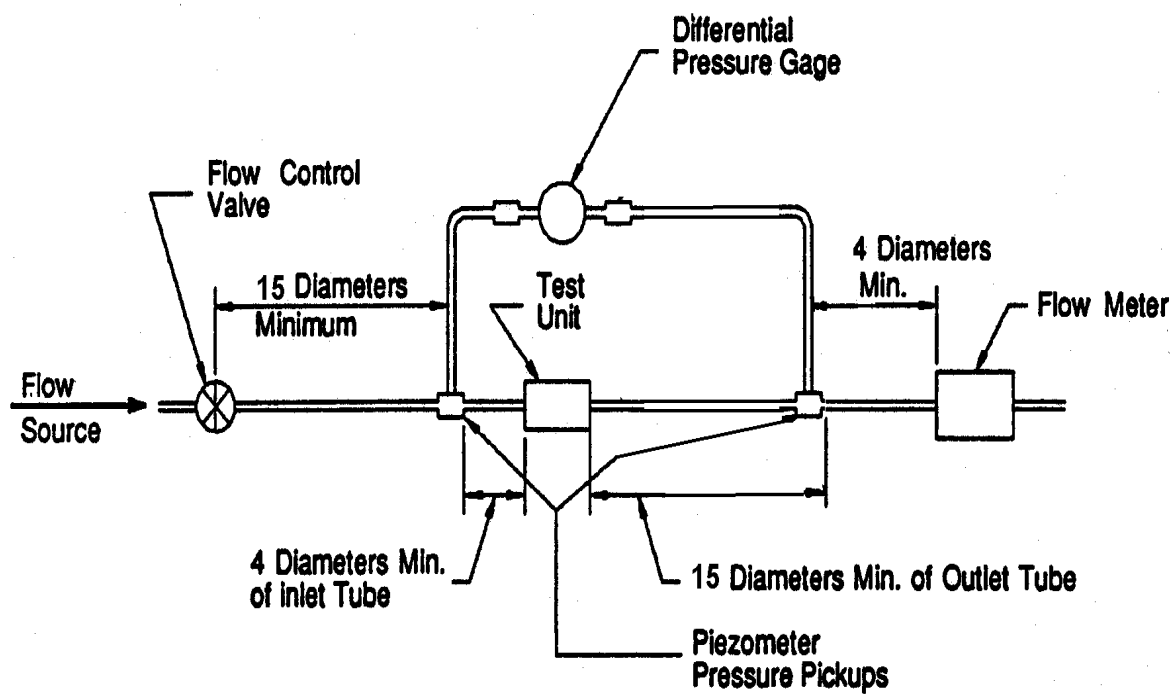


FIGURE 1. Air inclusion test setup.

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FIGURE 2. Pressure drop test setup.

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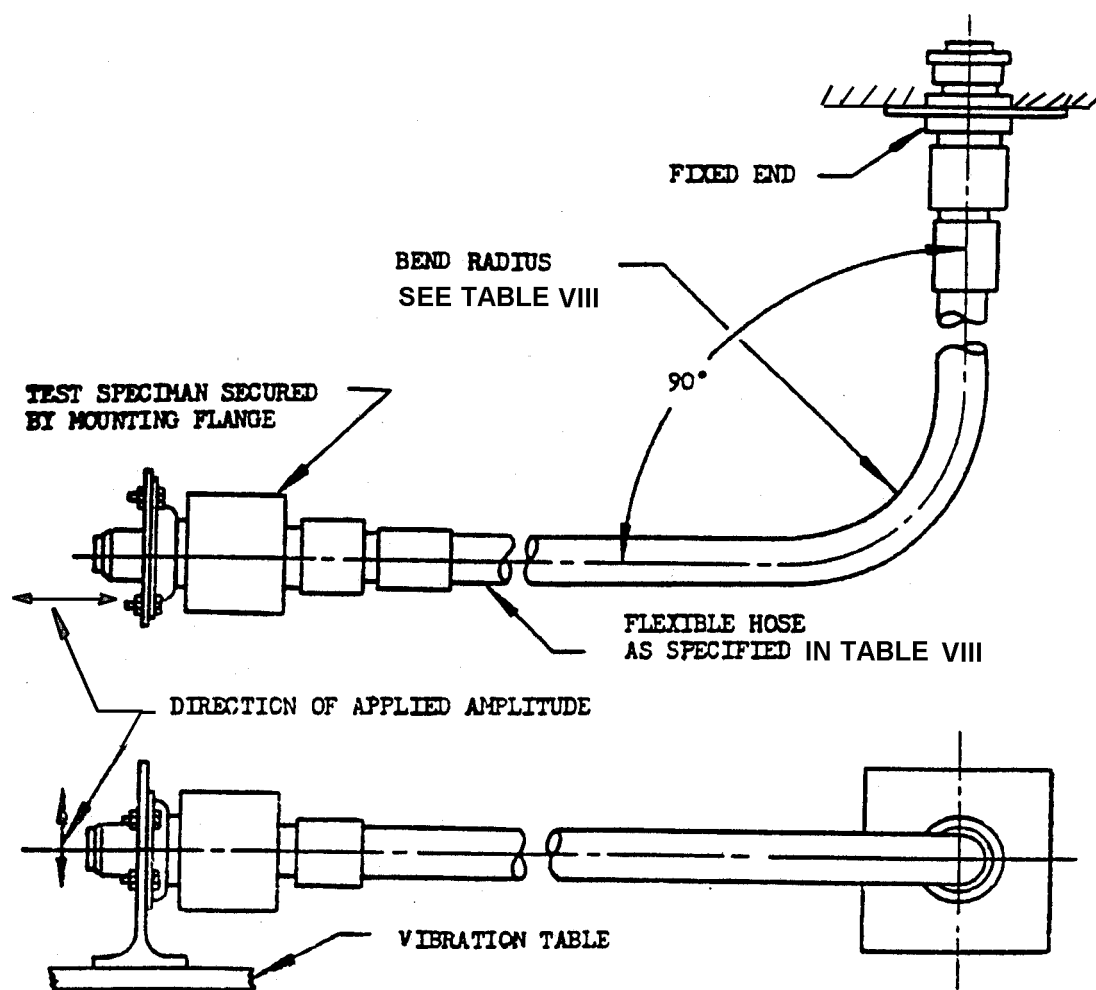
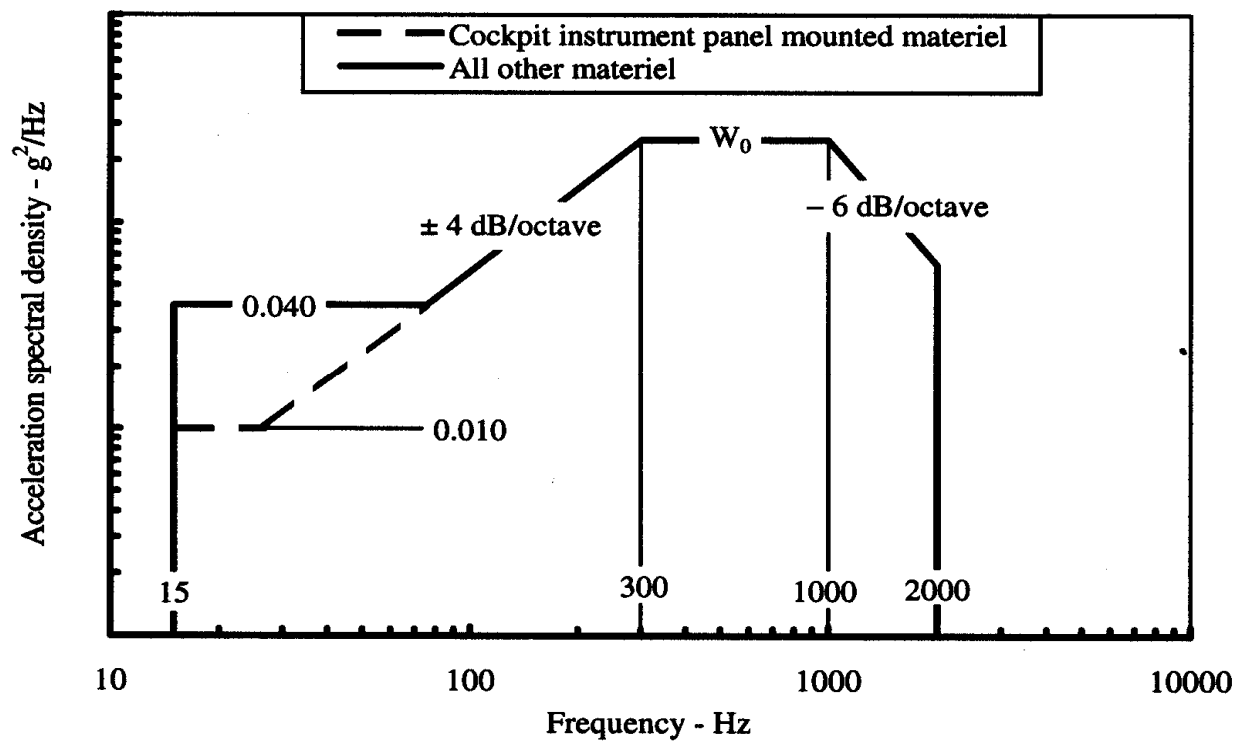


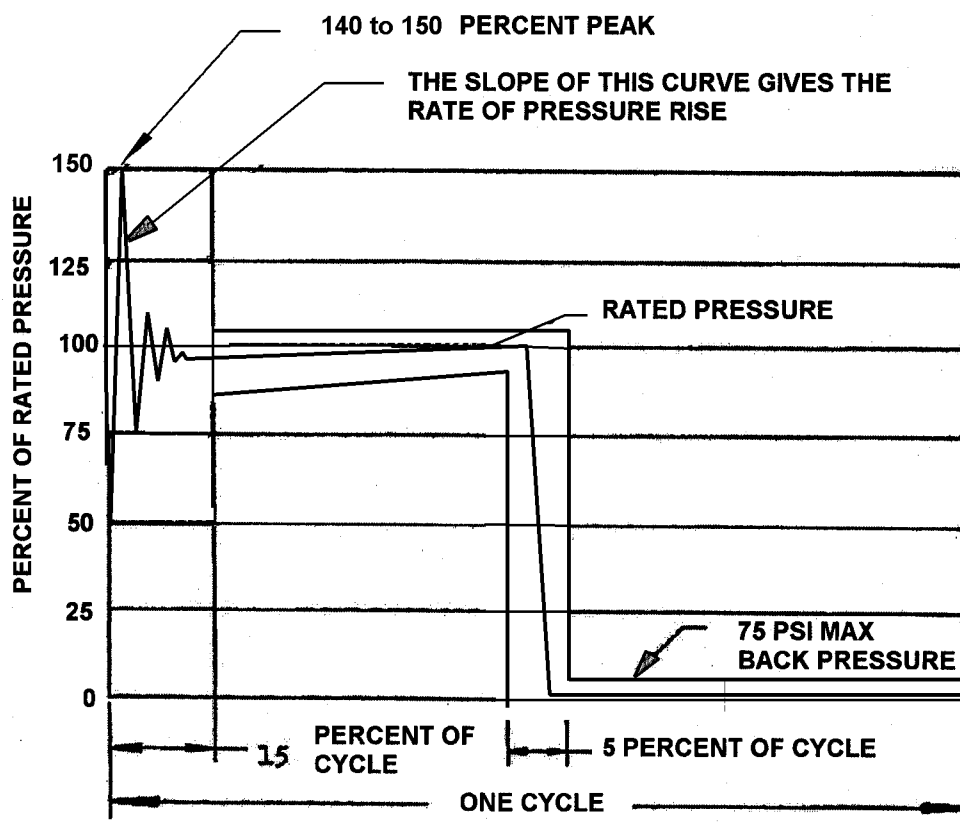
FIGURE 3. Impulse and vibration tests setup.



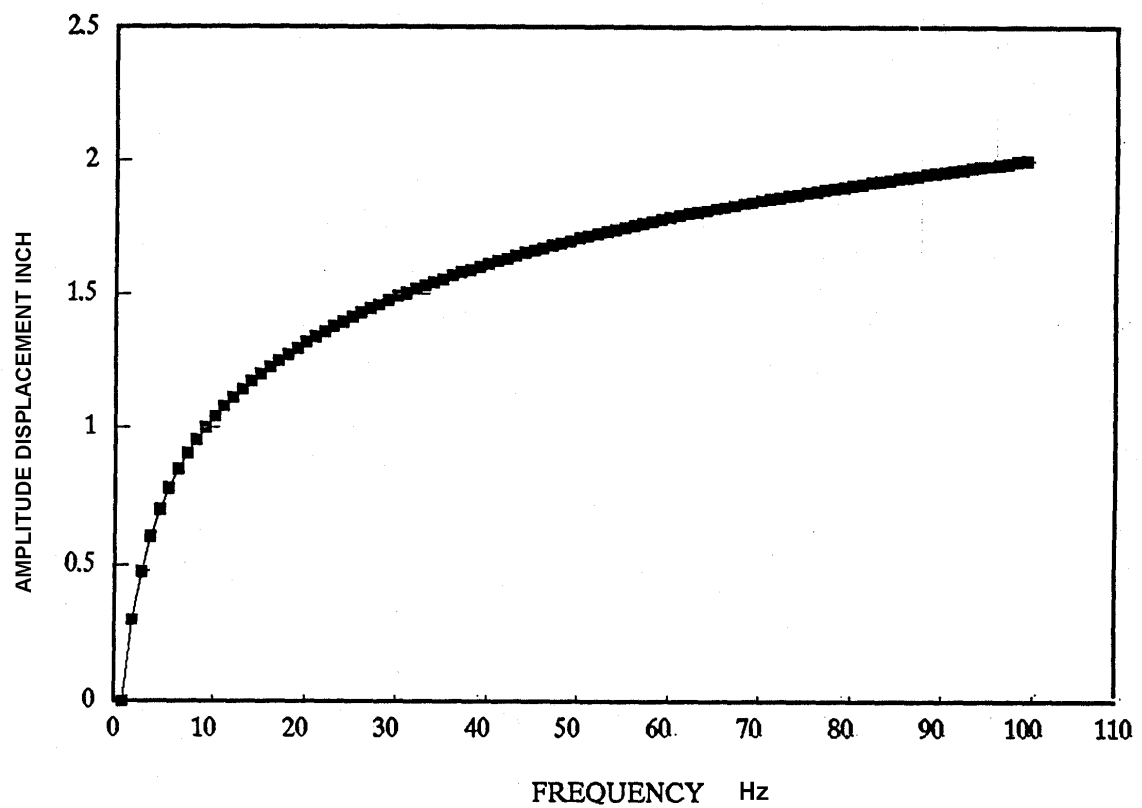
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FIGURE 4. Vibration exposure on coupling mounted on jet aircraft (5000 psi).

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FIGURE 5. Pressure impulse per cycle.

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FIGURE 6. Logarithmic frequency of vibration.

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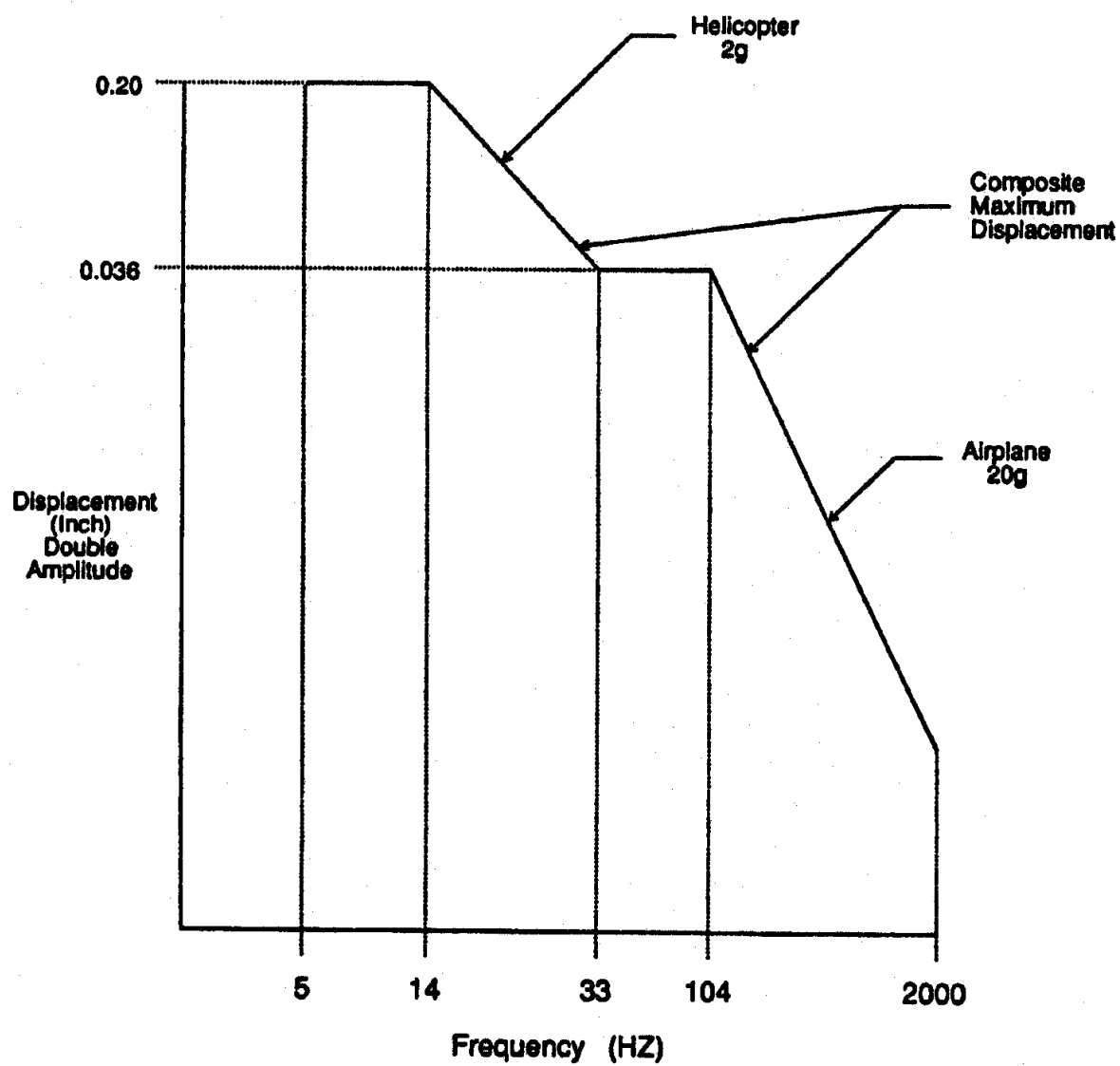


FIGURE 7. Vibration test for 3000 psi coupling.

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## CONCLUDING MATERIAL

Custodians:

Army - AV

Navy - AS

Air Force - 99

Preparing activity:

Navy-AS

(Project 4730-2008-120)

Review activities:

Army – AT, MI

Navy - MC, SA, SH

Air Force - 11, 71

DLA - CC

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>.