

MIL-C-25427A**16 SEPTEMBER 1960****SUPERSEDING****MIL-C-25427(ASG)****12 AUGUST 1957****MILITARY SPECIFICATION****COUPLING ASSEMBLY, HYDRAULIC, SELF-SEALING,
QUICK DISCONNECT**

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for aircraft hydraulic self-sealing quick disconnect couplings, for use in types I and II hydraulic systems (-65° F to $+275^{\circ}$ F temperature range) as defined by Specification MIL-H-5440.

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

Class 600—600-pounds per square inch (PSI) rated pressure furnished only in $1\frac{1}{4}$ inch tube size.

Class 3000—3,000-PSI rated pressure furnished only in $\frac{1}{4}$ -, $\frac{3}{8}$ -, $\frac{1}{2}$ -, $\frac{5}{8}$ -, $\frac{3}{4}$ -, and 1-inch sizes.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS**MILITARY**

- MIL-E-5272 — Environmental Testing, Aeronautical and Associated Equipment, General Specification for.
- MIL-H-5440 — Hydraulic Systems: Design, Installation and Test of Aircraft, (General Specification for).
- MIL-F-5509 — Fittings; Fluid Connections.
- MIL-H-5606 — Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance.
- MIL-H-8775 — Hydraulic System Components, Aircraft, General Specification for.

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MIL-F-18280 — Fittings, Flareless, Fluid Connection.

STANDARDS**MILITARY**

MIL-STD-130 — Identification Marking of U. S. Military Property.

MS24333 — Coupling Assembly, Hydraulic, Self-Sealing, Quick Disconnect, Flared Fitting to Internal Thread Boss.

MS24334 — Coupling Assembly, Hydraulic, Self-Sealing, Flareless Fitting to Internal Thread Boss.

MS24335 — Flange, Bulkhead Mounting, Hydraulic, Self-Sealing Coupling.

MS28774 — Retainer, Packing Backup, Single Turn, Tetrafluoroethylene.

MS28775 — Packing, Preformed, Hydraulic, +275° F, ("O" Ring).

MS28782 — Retainer, Packing, Back-Up, Teflon.

MS28783 — Ring, Gasket, Back-Up, Teflon.

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AND10064 — Fittings, Installation of Flared Tube, Straight Threaded Connectors.

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

3. REQUIREMENTS

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

3.2 General specification. The requirements of Specification MIL-H-8775 apply as requirements of this specification, with the exceptions and additions specified herein. When the two specifications conflict, this specification shall govern.

3.3 Materials. The coupling shall be constructed of materials that will not change the composition of or be adversely affected by hydraulic fluid conforming to Specification MIL-H-5606. (See 4.5.2.)

3.4 Design and construction. The configuration, dimensions, and other details of design of the couplings shall conform to the applicable MS standard. Coupling nuts, or other coupling devices, shall be a part of the hose attaching coupling-half assembly. When coupled, the coupling shall be such that it will permit fluid flow in either direction in accordance with the rated flow and pressure drop as specified in table I. Flow shall not be blocked under surge conditions.

3.4.1 Temperature range. Couplings shall be designed to operate throughout the temperature range of -65°F to $+275^{\circ}\text{F}$. (See 4.6.1.)

3.4.2 Sealing and fluid loss. The couplings shall, when uncoupled, seal the ends of the disconnected lines at the point of disconnection and shall not permit external leakage during any phase of coupling or uncoupling. Fluid loss as specified in table II is not considered to be external leakage. Both halves of the coupling shall seal fluid under both low and high pressures when tested as specified in 4.6.8.

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TABLE I. Rated flow and pressure drop

Dash No.	Equivalent tube size	Rate flow GPM	Pressure drop PSI (max)
-4	1/4	1.2	8
-6	3/8	3.5	8
-8	1/2	6.0	8
-10	5/8	10.5	8
-12	3/4	16.0	8
-16	1	29.0	8
-20	1 1/4	45.0	8

3.4.3 *Seals.* Only Standard MS28775 O-ring packings, and Standards MS28774, MS-28782, and MS28783 Teflon backup rings shall be used.

3.4.4 *Air inclusion.* Air inclusion, as determined by calculation of volume of air that may be displaced to the inside of the coupling during the coupling operation, shall not exceed the values specified in table II when tested as specified in 4.6.10.

TABLE II. Air inclusion and fluid loss

Dash No.	Equivalent tube size	Air inclusion cubic inches (max)	Average fluid loss per operating cycle cubic centimeter (max)
-4	1/4	0.05	0.50
-6	3/8	0.12	1.30
-8	1/2	0.20	2.20
-10	5/8	0.50	5.80
-12	3/4	0.70	8.20
-16	1	0.90	9.00
-20	1 1/4	1.20	11.80

3.4.5 *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 20G maximum loading. 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 coupling can remain

stable and permit fluid flow. Couplings shall be coupled with a single simple motion. (See 4.6.9.)

3.4.6 *Flange.* A removable bulkhead flange for fastening the coupling to a bulkhead shall be provided, as required by the MS standard, for use on the bulkhead mounting end of the coupling. The flange shall be in accordance with Standard MS24335. This flange shall withstand 1.5 times the maximum steel tubing wrench torque as specified by Standard AND10064 for a given tube size coupling when tested as specified in 4.6.13.

3.5 *Interchangeability.* Couplings shall be interchangeable as an assembly. It shall be impossible to interconnect different tube sizes.

3.6 *Performance.* The self-sealing couplings furnished under this specification shall perform satisfactorily when subjected to the tests specified in section 4 headed as follows:

- (a) Examination of product (See Specification MIL-H-8775).
- (b) Extreme temperature functioning (4.6.1).
- (c) Proof pressure (4.6.2)
- (d) Leakage (4.6.3)
- (e) Pressure drop (4.6.4)
- (f) Vacuum (4.6.5)
- (g) Surge flow (4.6.6)
- (h) Impulse and vibration (4.6.7)
- (i) Endurance (4.6.8)
- (j) Manual operation (4.6.9)
- (k) Air inclusion (4.6.10)
- (l) Impact (4.6.11)
- (m) Burst pressure (4.6.12)
- (n) Flange strength (4.6.13)

3.7 *Color.* The tube connection ends of the coupling shall be colored in accordance with

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Specification MIL-F-5509 and MIL-F-18280, as applicable. The uncoupling device shall be colored orange.

3.8 Identification of product. The coupling shall be marked for identification in accordance with Standard MIL-STD-130. In addition, each coupling shall be permanently marked with the MS and manufacturer's part numbers and the manufacturer's name or trademark as required on Standard MS24333 or MS24334. Each manufacturer shall identify all couplings by an identification letter. This letter will follow the MS number, but precede the size dash number; i.e., MS24333-x-size. The identification letter will be assigned when a manufacturer's first coupling is approved and will be used on all couplings manufactured by the same source.

3.9 Workmanship. Workmanship shall be of the quality necessary to produce couplings free from all defects which would affect proper functioning in service.

4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection responsibility. The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of tests. The sampling, inspection, and testing of couplings shall be in accordance with Specification MIL-H-8775 and as specified herein. The tests shall consist of qualification tests and acceptance tests (4.3 and 4.4, respectively).

4.3 Qualification tests.

4.3.1 The qualification tests shall consist of the following tests and shall be conducted in the following order. All tests, except Examination of product, are described under 4.6.

- (a) Examination of product (See Specification MIL-H-8775).
- (b) Extreme temperature functioning (4.6.1).
- (c) Proof pressure (4.6.2)
- (d) Leakage (4.6.3)
- (e) Pressure drop (4.6.4)
- (f) Vacuum (4.6.5)
- (g) Surge flow (4.6.6)
- (h) Impulse and vibration (4.6.7)
- (i) Endurance (4.6.8)
- (j) Manual operation (4.6.9)
- (k) Air inclusion (4.6.10)
- (l) Impact (4.6.11).
- (m) Proof pressure (repeat) (4.6.2)
- (n) Burst pressure (4.6.12)
- (o) Flange strength (4.6.13)

4.4 Acceptance tests. The acceptance tests shall consist of the following tests. All tests, except Examination of product, are described under 4.6.

- (a) Examination of product (See Specification MIL-H-8775)
- (b) Proof pressure (4.6.2)
- (c) Leakage at low pressure (4.6.3.1)

4.5 Test conditions.

4.5.1 Temperatures. Except where otherwise specified, the tests of this specification shall be conducted at a room temperature of 70° to 90°F and with a fluid temperature

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of 70° to 110°F, as measured within 12 inches of the test sample. The actual temperature of the fluid during the tests shall be recorded in the test reports.

4.5.2 Immersion. All couplings shall be immersed continuously in hydraulic fluid for a period of 72 hours at a fluid temperature of 275° ± 5°F, prior to conducting the qualification tests (see 4.3) specified herein. All internal parts of the coupling shall be in contact with the fluid during this immersion. After the 72 hours' soak period, the coupling shall be subjected to the next test immediately or remain in the fluid at normal room temperatures until such test.

4.6 Test methods.

4.6.1 Extreme temperature functioning. The couplings shall withstand the following tests without malfunctioning or leakage in excess of the values specified herein. (See 3.4.1.)

4.6.1.1 High temperature. After immersion (4.5.2), but before being uncoupled, the coupling shall be connected to a 30-inch static head of hydraulic fluid and subjected to a temperature of 275° ± 5° 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 time, the coupling shall be cooled to 140° ± 5°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° ± 5°F and shall be subjected to the leakage at low pressure test (4.6.3.1) and then subjected to the leakage at high pressure test (4.6.3.2).

4.6.1.2 Low temperature. After completion of the high temperature tests (4.6.1.1), the couplings shall be connected to a 30-inch static head of hydraulic fluid, and subjected to a temperature not warmer than -65°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 the leakage at low pressure test (4.6.3.1) and then subjected to the leakage at high pressure test (4.6.3.2). It will be satisfactory for the temperature to rise to -40°F during this process.

4.6.1.3 Rapid warmup. The coupled coupling while connected to a 30-inch static head of hydraulic fluid shall be allowed to warm up rapidly from -65° to +40°F 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. During the coupling and uncoupling process, the coupling shall be observed for sticking and malfunction.

4.6.2 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 30 seconds. There shall be no leakage greater than specified herein nor any permanent distortion or other malfunctioning of the coupling. The coupling shall couple and uncouple normally and seal hydraulic fluid as required after having been subjected to this test. This test shall be repeated after all other tests required herein have been accomplished but just prior to the burst pressure test (4.6.12). This test shall be conducted at 275° ± 5°F for qualification tests and at room temperature for acceptance tests (4.3 and 4.4, respectively).

4.6.3 Leakage.

4.6.3.1 Leakage at low pressure. The connected coupling and the disconnected halves shall be subjected to an internal pressure equal to a head of 80 inches of hydraulic fluid for 12 minutes. All external surfaces

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shall be dry at the beginning of this test. There shall be no evidence of any external leakage from the connected coupling. A waiting period of 2 minutes shall be allowed for the 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.

4.6.3.2 Leakage at high pressure. Both the connected coupling and the disconnected halves shall be subjected to a hydraulic static pressure equal to the applicable rated pressure for 15 minutes. All external surfaces shall be dry at the beginning of this test. There shall be no evidence of any external leakage from the connected coupling. Leakage from the disconnected halves shall not exceed a trace. Fluid loss as specified in table II is not considered to be external leakage.

4.6.4 Pressure drop. Pressure drop through the connected coupling shall be measured at a flow equal to the rated flow capacity prescribed in table I. The hydraulic fluid flow shall be accurately maintained. A manometer connected across the coupling, as shown in figure 1, shall be used for accurate measurement of the pressure drop. The temperature of the fluid shall be maintained at $100^{\circ} \pm 5^{\circ}\text{F}$. The pressure drop in each direction shall not exceed the value specified in table I. The pressure drop of the coupling shall be considered as the difference in pressure drop through the coupling and the pressure drop through the same length of rigid tube, and standard straight fittings, if used, of corresponding diameter.

4.6.5 Vacuum. A vacuum shall be applied to the coupled coupling equivalent to 10 inches Hg gage. When the correct pressure has been attained, the lines shall be closed for a period of 5 minutes, during which time there shall be no change in pressure.

4.6.6 Surge flow. The coupling shall be sub-

jected to flow at five times the rated flow for 5-seconds' minimum duration in each direction. This surge flow pattern shall be repeated 100 times. There shall be no evidence of flow blocking or internal damage, and the disconnected halves shall pass the leakage tests (4.6.3) at the completion of the surge flow sequence.

4.6.7 Impulse and vibration. The couplings shall withstand the following tests without evidence of failure.

4.6.7.1 Resonance. 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 $-0, -10$ percent of that specified for Vibration tests, Procedure XII, (figure 1), of Specification MIL-E-5272. All resonant frequencies shall be noted.

4.6.7.2 Fatigue.

4.6.7.2.1 The connected couplings shall be vibrated for 25 hours in a test setup similar to that shown in figure 2 at the resonant frequency for the direction perpendicular to the axis of the coupling.

4.6.7.2.2 The connected couplings shall be vibrated an additional 25 hours in a test setup similar to that of figure 2, except that the direction of the applied amplitude shall parallel that of the coupling axis. The frequency of the vibration shall be at resonance for the direction parallel to the coupling axis. If a resonant frequency does not exist for a given direction of applied amplitude, the coupling shall be vibrated at 55 cycles per second and a double amplitude of 0.060 inch.

4.6.7.2.3 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 $225^{\circ} \pm 5^{\circ}\text{F}$.

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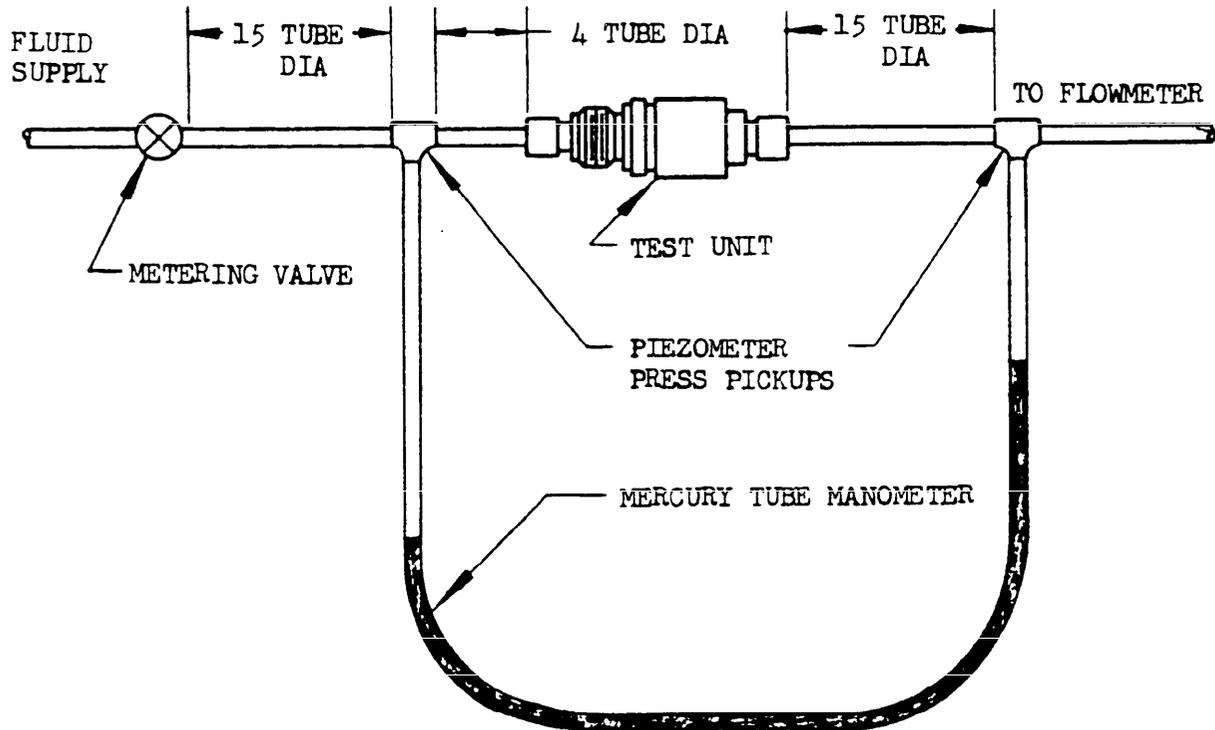
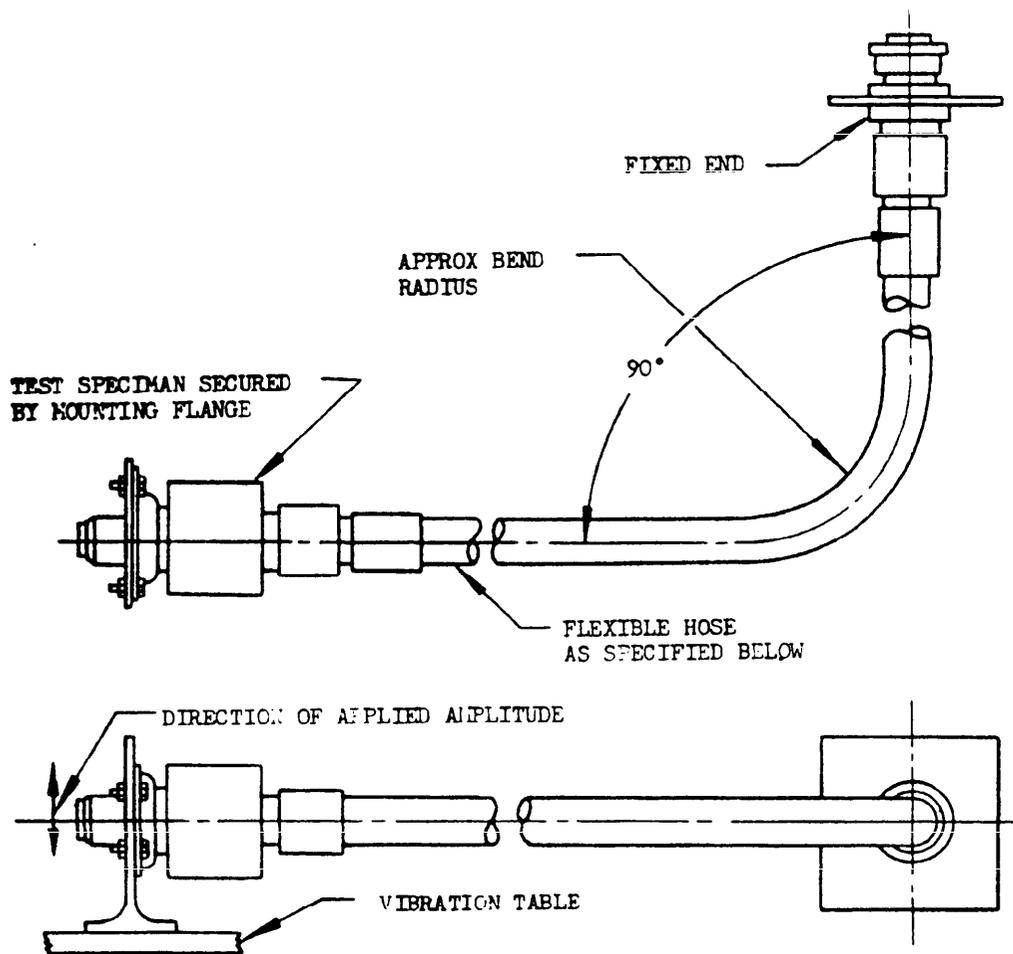


FIGURE 1. Setup for pressure drop test

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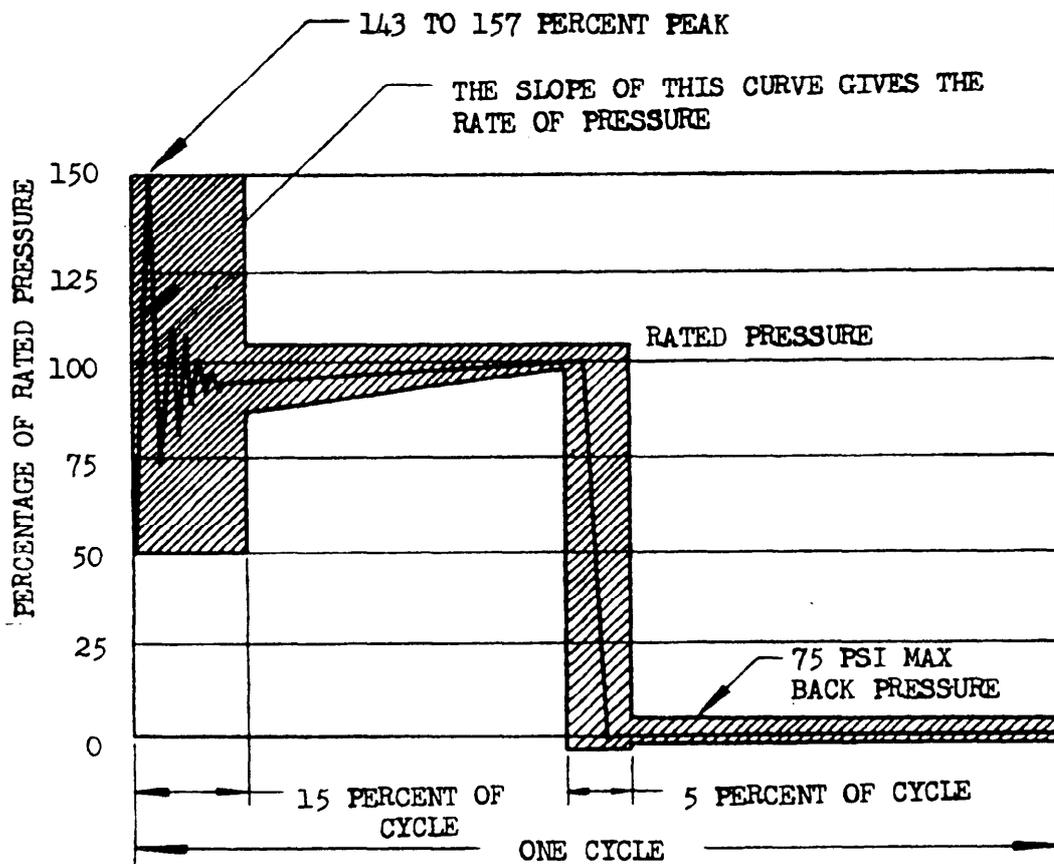
HOSE LENGTHS AND BEND RADII

COUPLING SIZE	EQUIVALENT TUBE SIZE	TEFLON-LINED DOUBLE-BRAIDED HOSE ASSEMBLY LENGTHS FOR IMPULSE AND VIBRATION TEST	BEND RADII INCHES
-4	1/4	16	3.5
-6	3/8	21	5.0
-8	1/2	24	5.75
-10	5/8	30	6.50
-12 (a)	3/4	33	7.75
-16	1	33	9.625
-20	1-1/4	24	5.0

(a) USE REDUCER FITTING

FIGURE 2. Setup for impulse and vibration test

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THE CURVE SHOWN ABOVE IS THE APPROXIMATE PRESSURE TIME CYCLE DETERMINED TO BE OF PROPER SEVERITY FOR IMPULSE TESTING OF HYDRAULIC COUPLINGS. ALTHOUGH IT IS MANDATORY ONLY THAT PRESSURE PEAK RISES TO 143 TO 157 PERCENT OF THE RATED PRESSURE AT SOME POINT PRIOR TO LEVELING OFF AT RATED PRESSURE, IT IS CONSIDERED HIGHLY DESIRABLE THAT THE PRESSURE TIME CURVE BE CONFINED TO THE SHADED AREA INDICATED. ONE VERY DESIRABLE BENEFIT TO BE GAINED IN THIS MANNER IS THAT RESULTS OF TESTS PERFORMED ON DIFFERENT TEST MACHINES WILL BE MORE NEARLY COMPARABLE.

FIGURE 3. Graph of pressure impulse cycle

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4.6.7.2.4 Throughout each of these fatigue tests the coupling shall be subjected to pressure impulses having a frequency of 30 ± 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 3. An oscilloscope photograph of the nature of the impulse shall be included in the test report.

4.6.7.2.5 At the conclusion of the fatigue tests, the coupling shall successfully pass the leakage at high pressure and leakage at low pressure tests (4.6.3.1 and 4.6.3.2, respectively).

4.6.8 *Endurance.* After the impulse and vibration test (4.6.7), the couplings shall be subjected to 200 coupling and uncoupling operations. During each operation, 15 PSI shall be applied to each half of the coupling. The coupling shall be observed for any indication of malfunction, and the fluid loss plus leakage for this test shall be measured. The coupling shall withstand this test without malfunction or excessive wear. The fluid loss plus leakage shall not exceed the values of table II.

4.6.9 *Manual operation.* The coupling shall be tested to determine conformance to 3.4.5. The coupling shall be coupled and uncoupled without the use of tools with a pressure of 60 PSI applied to both halves. The bulkhead half 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 plus leakage shall not exceed the values of table II.

4.6.9.1 Couplings shall be checked to insure that the design allows no partially coupled unlocked positions in which the coupling can remain stable and permit fluid flow. The bulkhead half should be securely mounted in a fixed position for this test.

4.6.10 *Air inclusion.* The coupling shall be

subjected to an air inclusion test to determine compliance with 3.4.4. This test may be performed during the manual operation test specified in 4.6.9.

4.6.11 *Impact.* The coupling shall be subjected to 12 impact shocks of 20G, each shock impulse having a time duration of 10 ± 1 milliseconds. The intensity shall be within ± 10 percent. The maximum G shall be reached in approximately 5 milliseconds. The shocks shall be applied in the following directions:

- (a) Parallel to axis—three shocks in each direction.
- (b) Perpendicular to axis — three shocks in each direction.

Inadvertent uncoupling shall not occur as a result of this test.

4.6.12 *Burst pressure.* The connected coupling and the disconnected halves shall be subjected to a burst pressure equal to 250 percent of rated 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 nor other failure under the specified pressure, and leakage shall not exceed twice the values of table II. This test shall be conducted at $275^\circ \pm 5^\circ$ F.

4.6.13 *Flange strength.* The bulkhead half of the coupling shall be mounted by means of its flange to a bulkhead. A union of appropriate size shall be installed in the boss. A torque equal to 1.5 times the maximum steel tubing wrench torque of Standard AND10064 (for a given tube size) shall be applied 15 times to the wrench flats of the union without damage to the mounting flange. (See 3.4.6.)

4.6.14 *Preservation, packaging, packing, and marking.* Preparation for delivery shall be inspected for conformance to section 5.

MIL-C-25427A**5. PREPARATION FOR DELIVERY**

5.1 General specification. The provisions contained in section 5 of Specification MIL-H-8775 are applicable to this specification.

5.2 Marking of shipments. The MS Part No., class, and the manufacturer's Part No. shall also be included in marking of shipments information.

6. NOTES

6.1 Intended use. The self-sealing couplings covered by this specification are intended for use in aircraft hydraulic systems as covered by Specification MIL-H-5440 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 Specification MIL-H-5606.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) MS Part No.
- (c) Selection of applicable levels of preservation, packaging, and packing.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Bureau of Naval Weapons, Navy Department, Washington 25, D.C., and information pertaining to qualification of products may be obtained from that activity.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodians:

Army—Transportation Corps
Navy—Bureau of Naval Weapons
Air Force—ARDC

Preparing activity:

Navy—Bureau of Naval Weapons

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

SPECIFICATION

ORGANIZATION (of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

 DIRECT GOVERNMENT CONTRACT SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

 YES NO IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity)

DATE