MIL-H-8775D
11 June 1976
SUPERSEDING
MIL-H-8775C
8 January 1964

MILITARY SPECIFICATION

HYDRAULIC SYSTEM COMPONENTS, AIRCRAFT AND MISSILES, 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 general requirements that are common to most hydraulic components (see 6.2), used in aeronautical hydraulic systems (see 6.1).

1.2 Classification - Aircraft hydraulic systems in which components covered by this specification are to be used shall be of the following types, as specified:

Type I	-65° to +160° F fluid temperature range
Type II	-65° to +275° F fluid temperature range

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

Federal

QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)

FSC 1650

Federal (Continued)

QQ-S-365	Silver Plating, Electrodeposited, General Requirements for
QQ-Z-325	Zinc Coating, Electrodeposited, Requirements for

Military

MIL-C-5015	Connectors, Electric "AN" Type
MIL-H-5440	Hydraulic Systems, Aircraft Types I and II, Design, Installation, and Data, Requirements for
MIL-C-5501	Cap and Plug, Protective, Dust and Moisture Seal
MIL-P-5510	Packing, Preformed, Straight Thread Tube Fitting Boss
MIL-G-5514	Gland Design, Packings, Hydraulic, General Requirements for
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-H-6083	Hydraulic Fluid, Petroleum Base, for Preservation and Operation
MIL-I-6866	Inspection, Penetrant Method of
MIL-I-6868	Inspection Process, Magnetic Particle
MIL-M-7969	Motor, Alternating Current, 400-Cycle, 115/200-Volt System, Aircraft, General Specification for
MIL-M-8609	Motors, Direct Current, 28-Volt System, Aircraft, General Specification for
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys

Military (Continued)

MIL-R-8791	Retainer, Packing, Hydraulic, and Pneumatic, Tetrafluoroethylene Resin
MIL-S-8879	Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification for
MIL-T-10727	Tin Plating, Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals
MIL-H-25475	Hydraulic Systems, Missile, Design, Installation Tests, and Data Requirements, General Requirements for
MIL-P-25732	Packing, Preformed, Petroleum Hydraulic Fluid Resistant, 275 Deg. F.
MIL-C-26074	Coating, Electroless Nickel, Requirements for
MIL-F-27656	Filter Unit, Fluid, Pressure MXU-408/M, Absolute 5 Micron, Hydraulic
MIL-C-38999	Connector, Electrical, Circular, Miniature, High Density Quick Disconnect
MIL-G-81322	Grease, Aircraft, General Purpose Wide Temperature Range
MIL-S-81733	Sealing and Coating Compound, Corrosion Inhibitive
MIL-F-81836	Filter and Disposable Element, Fluid Pressure, Hydraulic, 3 Micron Absolute
MIL-H-83282	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft
MIL-P-83461	Packings, Preformed, Petroleum Hydraulic Fluid Resistant, Improved Performance of 275 Degrees F., Sizes and Tolerances

Military (Continued)

MIL-C-83982	Compound, Sealing, Fluid Resistant

STANDARDS

Federal

FED-STD-791	Lubricant, Liquid Fuel and Related Products, Methods of Testing

Military

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-463	Definition and System of Units, Electromagnetic Interference Technology
MIL-STD-490	Specification Practices
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MIL-STD-785	Reliability Program for Systems and Equipment Development and Production
MIL-STD-810	Environmental Test Methods

Military (Continued)

MIL-STD-889	Dissimilar Metals
MIL-STD-961	Outline of Forms and Instructions for the Preparation of Military Standards and Association Documents
MS20659	Terminal, Lug, Crimp Style, Copper, Uninsulated, Ring Tongue, Type I, Class I
MS20995	Wire, Safety or Lock
MS21209	Insert, Screw Thread, Coarse and Fine, Screw Locking, Helical Coil, Cres
MS21343	Boss Spacing-Hydraulic Design, Standard for
MS21344	Fitting-Installation of Flared Tube, Straight Threaded Connectors, Design Standard for
MS27595	Retainer, Packing Backup, Continuous Ring, Tetrafluoroethylene
MS28772	Packing, "D" Ring, Shock Strut
MS28774	Retainer, Packing Backup, Single Turn Tetrafluoroethylene
MS28775	Packing, Preformed, Hydraulic, Plus 275 Deg. F. ("O" Ring)
MS28778	Packing, Preformed, Straight Thread Tube Fitting Boss
MS28782	Retainer, Packing, Back-Up, Teflon
MS28783	Ring, Gasket, Back-Up, Teflon
MS33514	Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal
MS33515	Fitting End, Standard Dimensions for Bulkhead Flareless Tube Connections

Military (Continued)

MS33540	Safety Wiring and Cotter Pinning, General Practices for
MS33547	Pin, Spring, Functional Limitiations of
MS33649	Boss, Fluid Connection - Internal Straight Thread
MS33656	Fitting End, Standard Dimensions for Flared Tube Connection and Gasket Seal
MS33657	Fitting End, Standard Dimensions for Bulkhead Flared Tube Connections

Air Force- Navy Aeronautical

AN814	Plug and Bleeder - Screw Thread
AN6227	Packing, "O" Ring Hydraulic
AN6230	Gasket, "O" Ring Hydraulic
AND10476	Washer - Limitations on Usage of Lock

PUBLICATIONS

Air Force - Navy Aeronautical Bulletin

MIL-147	Specifications and Standards of Non-Government Organizations Released for Flight Vehicle Construction

Military Bulletin

MIL-HDBK-5	Metallic Materials and Elements for Aerospace Vehicle Structures
MIL-HDBK-221	Fire Protection Design Handbook for U.S. Navy Aircraft Powered by Turbine Engines

(When requesting applicable documents, refer to both title and number. Copies of unclassified documents may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120. Requests for copies of classified documents should be addressed to the Naval Publications and Forms Center, via the cognizant Government representative.)

2.2 Other publications - The following document forms a part of this specification to the extent specified herein, unless otherwise indicated, the issue in effect on the date for bids or request for proposal shall apply.

American National Standards Institute

ANSI B46.1 1962	Surface Texture (Surface Roughness, Waviness and Lay)

(Copies of the above publication may be obtained from the American National Standards Institute, 10 East 46th Street, New York, New York 10017.)

Society of Automotive Engineers

ARP 603	Impulse Testing of Hydraulic Hose Assemblies, Tubing and Fittings
ARP 1383	Impulse Testing of Hydraulic Actuators, Valves, Pressure Containers and Similar Fluid System Components

(Copies of the above publication may be obtained from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.)

National Aerospace Standards Association, Inc.

NAS 1638	Cleanliness Requirements for Parts Used in Hydraulic Systems

(Application for copies should be addressed to the National Aerospace Standards Association, Inc., 1321 Fourteenth St., N.W., Washington, DC 20005.)

3. REQUIREMENTS

3.1 Contractor's general component specification - In those

cases where, by mutual agreement between the contractor and the procuring activity, it is determined that this specification cannot be readily applied to a particular hydraulic system, or the number of deviations necessary would make this specification impracticable, the contractor shall prepare a general component specification similar to this specification, in conformance to MIL-STD-490 and MIL-STD-961 and submit it to the procuring activity for approval. This document shall specify the performance, design, and testing requirements for all the components in the hydraulic system and also shall be the controlling document for components not otherwise covered by an applicable detail component specification.

3.2 Materials - Materials used in the manufacture of hydraulic components shall be of high quality, suitable for the purpose, and shall conform to applicable Government specifications. Materials conforming to contractor's specifications may be used, provided it can be clearly demonstrated that they are at least equivalent to Government specifications with respect to operating characteristics and that a savings in weight or cost can be accomplished. Contractor's specifications must be satisfactory to the Government and contain provisions for adequate tests. The use of contractor's specifications will not constitute waiver of Government inspection.

3.2.1 Metals - All metals shall be compatible with the fluid and intended temperature, functional, service, and storage conditions to which the components will be exposed. Metals shall be limited to those specified by the detail specification. The metals shall possess adequate corrosion-resistant characteristics or shall be suitably protected by the use of coatings equivalent to those listed in Table I to resist corrosion which may result from such conditions as dissimilar metal combinations, moisture, salt spray, and high temperature deterioration, as applicable. Where not indicated, class or type is at the option of the manufacturer, subject to approval by the procuring activity. Dissimilar metals are defined in MIL-STD-889. Unless otherwise specified herein, physical properties of all metals shall meet the minimum requirements of MIL-HDBK-5.

3.2.1.1 Copper and Aluminum alloys - All copper alloys except for bearing surfaces shall be suitably protected with a coating selected from Table I, except that cadmium and zinc plating shall not be used in applications subject to abrasion. Other metallic coatings, which shall have been demonstrated to be satisfactory to the Government, such as electrodeposited 85 percent tin and 15 percent cadmium alloy, may be used. All aluminum alloys shall be anodized in accordance with MIL-A-8625, type II coating, except that in the absence of abrasive conditions the anodize may be type I coating, where applicable, or may be a chemical film in accordance with MIL-C-5541.

TABLE I. METAL COATINGS

Coating	Specification
Cadmium plating	QQ-P-416, type II, class 2
Zinc plating	QQ-Z-325, type II, class 2
Chromium plating	QQ-C-320
Nickel plating	QQ-N-290
Silver plating	QQ-S-365
Tin plating	MIL-T-10727, type I
Electroless nickel	MIL-C-26074

3.2.1.2 Type I components - Except for internal surfaces in constant contact with hydraulic fluid, ferrous alloys shall have a chromium content of not less than 12 percent, or shall be suitably protected against corrosion as specified in 3.2.1, 3.2.1.1, and Table I. In addition, cadmium and zinc plating shall not be used for internal parts or on internal surfaces in contact with hydraulic fluid or exposed to its vapors. O-ring grooves for external seals shall not be considered as internal surfaces in constant contact with hydraulic fluid. Use of magnesium shall be subject to the approval of the procuring activity.

3.2.1.3 Type II components - Ferrous alloys shall have a chromium content of not less than 12 percent, or shall be internally and externally protected against corrosion as specified in 3.2.1, 3.2.1.1, and Table I. In addition, cadmium and zinc plating shall not be used for internal parts or on internal surfaces in contact with hydraulic fluid or exposed to its vapors. Magnesium shall not be used for type II components.

3.2.1.4 Residual magnetism - Parts made of material that is capable of retaining residual magnetism, but are not intended to function as magnets, shall be demagnetized sufficiently to prevent system or component malfunction, including malfunction due to accumulation of magnetic contaminants. Where a component or system is vulnerable to malfunction due to residual magnetism, the component detail specification shall specify the maximum allowable flux density.

3.2.1.5 Magnets - Permanent magnets and electromagnets shall be shielded where required to prevent system or component malfunction. The detail specification shall specify the maximum allowable flux density outside the shield.

3.2.2 Plastic parts - The use of plastic parts shall be subject to the approval of the procuring activity for the specific application involved.

3.2.3 Selection of materials, parts and processes - Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment, which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with MIL-STD-143 and MIL 147, except as provided in the following paragraph.

3.2.3.1 Standard parts - Standard parts (MS, AN or Specification sheet) shall be used wherever they are suitable for the purpose, and shall be identified on the drawing by their (MS, AN or Specification sheet) part numbers. Commercial utility parts, such as screws, bolts, nuts, and cotter pins may be used, provided they possess suitable properties and are replaceable by the standard parts (MS, AN or Specification sheet) without alteration, and provided the corresponding standard part numbers are referenced in the parts list and, if practicable, on the contractor's drawings. In the event there is no suitable corresponding standard part in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification and the detail specification.

3.3 Design and construction -

3.3.1 General - The configuration, dimensions, and other details of design of standard components shall conform to the applicable MS, AN or Specification sheet standards. Non-standard components shall conform to the applicable manufacturer's or procuring activity drawing as governed by MIL-H-5440 or MIL-H-25475.

3.3.2 Temperature range - Components shall be designed and so constructed as to insure satisfactory operation throughout the temperature range specified in the detail specification.

3.3.3 Threads - Straight threads shall conform to MIL-S-8879, Unified Fine Thread Series, classes UNJF-3A and UNJF-3B. Other type threads shall be subject to approval of the procuring activity. Pipe threads shall not be used except for permanently installed plugs.

3.3.4 Fluids - Components shall be designed to operate with MIL-H-5606 hydraulic fluid. When specified by the detail specification or approved by the procuring activity a fire resistant fluid such as MIL-H-83282 hydraulic fluid shall be used.

3.3.5 Orifices - Orifices larger than 0.012 inch but smaller than 0.070 inch in diameter shall be protected by adjacent strainer elements having screen openings 0.008 to 0.012 inch in diameter. Orifices smaller than the above range may be protected by adjacent elements having openings smaller than the orifices with the approval of the procuring activity. Orifices and strainer elements shall be strong enough to absorb system design flow and pressure up to and including blocked flow without rupture.

3.3.6 Packing -

3.3.6.1 General - Components shall be so designed that, in assembly of parts, sufficient clearance exists to permit assembly of the components without damage to O-rings or backup rings where they pass threaded parts or sharp corners. MIL-G-5514 and MS21344 shall be used for type I system packing installation and as a guide for type II system packing installation.

3.3.6.2 Type I system components - All packings and gaskets shall be in accordance with MS28778, AN6227, AN6230, MS28772, or MS28775. Backup rings shall be in accordance with MS28774, MS28782, MS28783, or MS27595. Packing shall conform to MIL-P-25732 (excluding boss applications). Packings used in bosses shall conform to MIL-P-5510.

3.3.6.3 Type II system components - Packings conforming to MIL-P-25732 shall be used within the performance constraints reflected by qualification requirements and tests of MIL-P-25732. Non-Standard packing or MIL-P-83461 packing may be used subject to approval of procuring activity. The major performance constraints of MIL-P-25732 are summarized below.

3.3.6.3.1 Maximum fluid temperature of 225°F - If the maximum fluid temperature does not exceed 225°F, the standard seal is suitable for the normal life reflected by Endurance Test "B" of MIL-P-25732.

3.3.6.3.2 Maximum fluid temperature between 225°F and 275°F - If maximum fluid temperature is between 225°F and 275°F, the life expectancy of the standard seal shall be reduced proportionally from the normal life reflected by Endurance Test "B" of MIL-P-25732 to the reduced life reflected by Endurance Test "A" of MIL-P-25732. (The total accumulated time of exposure to 275°F during qualification tests is approximately 80 hours.) The reduced life expectancy shall be clearly defined in all appropriate publications. Packings used in bosses shall be subject to the approval of the procuring activity.

3.3.6.4 Back-up rings - Back-up rings shall conform to MIL-R-8791.

3.3.7 Safetying - All threaded parts shall be securely locked or safetied by safety wiring, self-locking nuts, or other approved methods. Safety wire shall be applied in accordance with MS33540 and shall conform to MS20995. Star washers and jam nuts shall not be used as locking devices. Use of lock washers shall be governed by limitations set for in AND10476.

3.3.7.1 Safetying internal parts of fluid chambers - Permanently deformed safetying devices, such as safety wire or cotter pins, that are subject to breaking off shall not be used internally in fluid chambers.

3.3.7.2 Threaded Inserts - All threaded holes in non ferrous parts to be used for mounting screws or bolts shall incorporate self-locking inserts conforming to MS21209.

3.3.8 Retainer rings - Retainer rings or snap rings shall not be used unless specifically authorized by the procuring activity for each application. Where such applications are authorized, the following requirements are applicable.

3.3.8.1 Displacement - Displacement of the ring or fragmentation thereof, and associated hardware (e.g. washers, lockwire, etc.) shall not cause, or contribute to, loss of fluid from the component or system, or cause malfunction of any component in the aircraft.

3.3.8.2 Load limitation - Hydraulic, structural, mechanical, or any other form of loads, or combinations thereof, including vibration, shock loads, expansion or contraction due to thermal changes, etc. shall not be exerted on the ring that may cause axial displacement and/or failure of the ring.

3.3.8.3 Installation clearances and tolerances - Retainer rings or snap rings shall not be used where buildup of clearances and manufacturing tolerances will allow destructive end play in the assembly that may cause, or contribute to, failure of packings or gaskets, brinelling, or fatigue failure of parts.

3.3.8.4 Installation and removal - The retainer rings or snap rings shall be capable of being installed and removed with standard pin-type pliers or other standard tools developed for use with the rings.

3.3.9 Spring pins - The use of spring pins is undesirable and they shall not be used in any applications that conflict with the intent of MS33547, unless specifically approved by the procuring activity.

3.3.10 Reverse Installation - All components shall be designed such that reverse or incorrect installation in the aircraft or sub-assembly cannot be made. Internal parts which are subject to malfunction or failure due to reversed or rotated assembly shall be designed to render improper assembly impossible.

3.3.11 Structural strength - The components shall have sufficient strength to withstand all loads or combinations of loads resulting from hydraulic pressure, vibration, temperature variations, actuation or operations, and torque loads for connection of tube fittings in accordance with MS21344. Standard type II components shall be designed to withstand 275° F proof pressure and burst pressure tests, 4.5.3.1 and 4.5.3.2, respectively, after loss of strength of the material caused by aging at 275° F for 1,000 hours. Nonstandard type II components shall be designed to withstand 275° F proof pressure and burst pressure tests as specified in 4.5.3.1 and 4.5.3.2, respectively, after loss of strength of the material caused by aging at 275° F for a time period as designated in the detail specification.

3.3.12 Ruggedness - Where a manually operated control lever, etc. is intergral in a component, the lever, mechanism, and stops shall be capable of withstanding a limit torque of 75R pound-inches for radii greater than 0.8 inches. In the case of components which incorporate stops but do not have an integral control means, the stops shall be capable of withstanding a limit torque of 1,800 pound-inches.

3.3.13 Rated flow capacity - The rated flow capacity shall be as specified in the applicable detail drawing or specification.

3.3.14 Pressure drop at rated flow - The component shall be so designed as to offer the minimum restriction to flow consistent with the other requirements of this specification. Pressure drop at rated flow shall not exceed the values specified in the applicable detail drawing or specification.

3.3.15 Bleeding - The configuration of components shall provide scavenging of entrapped air and foreign matter such as water or excess lubricant. Auxiliary bleed ports shall be provided when necessary.

3.3.16 Function-adjustment screws - Function-adjustment screws, if used, shall be so designed and constructed as to maintain adjustment under all the required conditions of vibration, shock, temperature, and operation. Friction-type locking devices shall be kept to a minimum and shall be subject to the approval of the procuring activity. If friction type is used, the adjustment screws shall maintain their setting after adjusting through the full range 15 times, or as specified in the detail specification, and then vibration tested. It shall be possible to adjust and lock the adjustable screws with a standard wrench or screwdriver. Where practicable, it shall be possible to adjust under full system pressure with negligible loss of fluid. The adjustment screws shall be sealed, where practicable. If the component is subject to multiple settings, the seal shall be marked with the setting. The means of adjustment shall either be internal or protected from tampering by a cover or similar device.

3.3.17 Fluid connections - Permanent fitting shall be used subject to limitations specified in MIL-H-5440.

3.3.17.1 Bosses - All internally threaded bosses for connecting fittings and AN814 plugs shall conform to MS33649. Spacing of ports for connecting fittings shall conform to MS21343. Bosses shall be made deep enough or shall incorporate fitting stops to prevent damage to internal mechanism or restriction of fluid flow when universal fittings are screwed into the bosses to excessive depths.

3.3.17.2 External tube connections - External male threaded tube connections shall conform to MS33656 and MS33657 or MS33514 and MS33515. Male threaded flared fitting ends on 3,000 pounds per square inch (psi) components shall be steel in sizes below 1/2-inch tube sizes. These may be aluminum alloy or steel for the tube sizes 1/2 inch and above. Caution should be used in the use of aluminum alloy where repeated assembly could damage the fitting which is an integral part of the component and thus render it unserviceable.

3.3.17.3 Fluid connection marking - All ports for the tube connections shall be clearly and permanently marked to indicate the connections to be made using nomenclature in accordance with MIL-STD-130. Where applicable, the directions of flow shall be indicated. The use of abbreviations should be avoided, but if used shall be the general industry accepted abbreviations as applicable for the marking. Use of a single letter for marking such as "P" for pressure and "C" for cylinder is not acceptable. Decalcomanias shall not be considered as a permanent marking.

3.3.18 Plugs - All plugs, except permanently installed plugs that will not have to be removed during the life of the component shall conform to AN814 for types I and II systems. Where considered more advantageous a plug with a seal conforming to MS28775 may be used.

3.3.19 Alignment - All plungers, poppets, balls, pistons, etc. shall be accurately guided to prevent misalignment or chattering on their seats.

3.3.20 Electrically operated components -

3.3.20.1 Voltage range - Electrically operated components shall be designed to operate in aircraft and missile electrical systems having characteristics as specified in MIL-STD-704. The components shall be designed to operate under simultaneous extremes of temperature, fluid pressure, and voltage for their classes as specified in Table II. The effect of factors such as: over and undervoltage, distortion (ripple), surge and emergency mode operation shall be considered in determining the most detrimental voltage as defined in MIL-STD-704.

Table II. Temperature, Pressure, and Voltage

Class	Temperature	System pressure	Voltage delivered by aircraft or missile electrical system (See MIL-STD-704)
A, B, C, D	(min) (4-hour soak)	(max.), min)	Lowest voltage delivered
A, B, C, D	Room (70°F to 90°F)	(max.), (min)	Lowest voltage delivered
A, B, C, D	Room (70°F to 90°F)	1.5 times	Lower limit of steady state range
A	(max) plus temp. rise	(max.), (min)	Lowest voltage delivered
B	(max) plus temp. rise	(max.), (min)	Lower limit of steady state range
C	(max) plus temp. rise	(max.), (min)	Upper limit of steady state range
D	(max)	(max.), (min)	Lower limit of steady state range

3.3.20.1.1 The class of the component shall be A, B, C, or D and as specified in the detail specification.

3.3.20.1.2 Class A and B components - Class A and B components are normally energized continuous-duty type. These components shall be capable of operation at the voltage specified in Table II after being energized at the upper limits of the steady state voltage range specified in MIL-STD-704, while

exposed to the maximum ambient temperature and altitude conditions specified in the detail specification until coil temperature stabilization is reached. If any form of temperature control of the coils is to be used in the actual system it shall be employed in the test setup.

3.3.20.1.3 Class C components - Class C components are normally energized continuous-duty type. These components shall be capable of recycling at the voltage specified in Table II and at the temperature, and altitude specified in the detail specification, after being energized at the same voltage while exposed to the maximum ambient temperature and altitude conditions specified in the detail specification until coil temperature stabilization is reached. If any form of temperature control of the coil is to be used in the actual system, it shall be employed in the test setup.

3.3.20.1.4 Class D components - Class D components are normally deenergized intermittent-duty type, and shall be tested at the voltage specified in Table II while at the maximum temperature and altitude conditions specified in the detail specification after temperature stabilization is reached while in the deenergized condition. The time of energization and time between cycles shall be as specified in the detail specification.

3.3.20.2 Solenoid operated components - The solenoids shall be of compact design and of sufficiently rugged construction to withstand the mechanical shocks and stresses incident to their use in aircraft and performance requirements specified in 3.3.20.2.7. Solenoids shall be designed for continuous or intermittent duty and shall be provided with single-coil windings. Solenoids shall be totally enclosed, in order to prevent moisture from coming in contact with the electrical windings. The coil shall be firmly fixed in the frame to prevent ultimate failure of leads caused by vibration. Potting compounds used in the electrical components shall be subject to approval by the procuring agency. Solenoids shall operate within the time specified in the detail specification.

3.3.20.2.1 Coils - Coils shall be evenly wound and insulated to meet the performance requirements specified (see 3.3.20.2.7). Coils shall be completely insulated from the frame or other component parts. Coils shall be suitably taped, impregnated, and secured to the frame as required to prevent damage under humidity, salt fog, vibration, and other test conditions specified for the component (see section 4).

3.3.20.2.2 Terminals - Solenoid coils shall be terminated with an electrical connector conforming to MIL-C-5015 or MIL-C-38999. Terminals shall be constructed of corrosion-resistant material or suitably plated material and equipped with washer, lockwasher and screw or nut for use with cable terminals conforming to MS20659.

3.3.20.2.3 Dielectric strength - All solenoids shall exhibit a leakage current of less than one milliampere when subjected to a 60 Hertz alternating test voltage between terminals and case for one minute at the following root mean square amplitudes:

a. 1500 volts at room temperature and pressure
b. 1000 volts at maximum operating temperature and altitude.

3.3.20.2.4 Temperature rise - When tested at maximum temperature and altitude conditions, the temperature attained at equilibrium calculated by the rise of resistance method shall not exceed the continuous rating of the electrical insulation or other materials used in construction of the solenoids (see 4.5.7).

3.3.20.2.5 Endurance - The solenoid valve shall withstand the endurance test specified in the detail specification for the component (see 4.5.8 and 4.6.1).

3.3.20.2.6 Attitude - The solenoid valve shall conform to all requirements of this specification while mounted in any position.

3.3.20.2.7 Performance - The solenoid shall be capable of operating the component under the following environmental conditions or natural combinations thereof:

(a) Atmospheric pressure range: Equivalent to the range from sea level to the maximum altitude specified in the detail specification.

(b) Temperature limits: Same as specified for fluid and ambient limits for the component. Test as specified in 4.5.6.5.

(c) Humidity: Conditions encountered when tested as specified in 4.5.10.

(d) Sand and dust: Conditions encountered when tested as specified in 4.5.12.

(e) Vibration, shock and acceleration: Conditions encountered when tested as specified in 4.5.9.

(f) Fungus resistance: (See 4.5.11.)

(g) Salt fog: (See 4.5.13.)

3.3.20.2.7.1 Drop out voltage - Solenoid operated components shall be de-energized below the drop out voltage. The drop out voltage shall be greater than 10% of the nominal operating voltage and less than the minimum activation voltage specified in the detail specification.

3.3.20.3 Electric motor operated components - The characteristics of electric motors for operating hydraulic components shall conform generally to MIL-M-8609 for dc operated units, MIL-M-7969 for ac operated units, and to the detail specification, including the oilproof and explosion proof requirements.

3.3.20.4 Clutches or brakes - On assemblies using clutches or brakes to limit overtravel, the design shall be such as to prevent overtravel sufficient to cause malfunctioning of the component, even with oil on the clutch or brake surfaces. Positive mechanical stops shall be incorporated to insure accurate positioning.

3.3.20.5 Explosion proof - Detail specifications for electrically operated components that have a potential source of ignition shall specify the applicable explosion proof test in accordance with MIL-STD-810. Surface temperature of electrically operated components shall be below auto ignition temperature of the environment as defined in MIL-HDBK-221.

3.3.20.6 Electromagnetic interference - Detail specifications for electrically operated components that cause electromagnetic interference shall specify interference testing in accordance with MIL-STD-461, MIL-STD-462 and MIL-STD-463.

3.3.21 Actuation above system pressure - Components shall be so designed as to be capable of actuation or deactuation under pressure equal to thermal relief or system relief valve maximum setting of the circuit in which they are installed, without encountering any seizing, excessive force input or greater electrical voltage than the specified maximum turn-on voltage nor greater than maximum rated current. The turn-on voltage shall not exceed 80 percent of the nominal voltage. The maximum current rating (continuous and intermittent) based on the worst case environment and the maximum turn-on voltage, shall be provided in the component specification.

3.3.22 Reliability - Each component shall be designed and constructed to meet a specified quantitative reliability requirement in terms of mean time between failures (MTBF) or its equivalent. The detail specification for critical (see MIL-STD-785) components shall include specific test plans to demonstrate that the necessary reliability requirement, including confidence factors, is satisfied.

3.3.23 Cleanliness - Internal cleanliness of hydraulic components shall be equal to or better than class 8, table I of NAS1638 (see 4.5.20).

3.4 Interchangeability - All parts having the same part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's or procuring activity part numbers shall be governed by the drawing number requirements of MIL-STD-100. Subassemblies composed of selected mating components must be interchangeable as assembled units, and shall be so indicated on the applicable drawings. The individual components of such assembled units need not be interchangeable.

3.5 Lubricants - The hydraulic fluid selected in paragraph 3.3.4 shall be used to lubricate seals during installation and assembly of hydraulic components. A light coating of grease conforming to MIL-G-81322 or hydraulic fluid conforming to MIL-H-6083 may also be used (for MIL-H-5606 systems). If other lubrication is necessary, the means of lubrication and the lubricant used must be approved by the procuring activity. Lubrication shall be so accomplished that no disassembly for relubrication is necessary during endurance testing or normal service life. Copious use of MIL-G-81322 grease shall be avoided.

3.6 Weight - Weight shall be maintained as low as possible, consistent with the requirements of this specification. The weight of the assembled component shall be specified in the manufacturer's assembly drawings.

3.7 Finish -

3.7.1 Surface roughness - Surface roughness finishes, where required, shall be established, and shall be specified on the manufacturer's assembly drawings as specified in ANSI B46.1 - 1962. The determination of surface finishes shall be made with a profilometer, comparator brush analyzer, or other suitable comparison equipment with an accuracy of ±15 percent at the level being measured. If surface defects are unacceptable, it shall be specifically designated that all imperfections will be within stated limits or that prescribed special inspection procedures will be followed. At least where a surface of 16 microinch roughness height rating (RHR) or finer is designated, the essential process description for its generation shall be in addition to surface measurements that constitute part of the requirements for compliance. When necessary, waviness and lay shall be specified.

3.7.2 Coatings - Upon request of the procuring activity, the contractor shall supply test data or perform specific tests which are considered necessary to determine that the materials and plated coatings employed in the component are suitable for the intended service.

3.8 Physical defect inspection - All magnetizable highly stressed parts shall be subjected to magnetic inspection in accordance with MIL-I-6868. Aluminim or aluminum-alloy parts which have been treated with MIL-C-5541 material shall be inspected after treatment by a process conforming to MIL-I-6866. Where such inspection is necessary, it shall be called for on the manufacturer's drawings. Cracks or other injurious defects disclosed by the inspection shall be cause for rejection. Where MIL-C-5541 material is used for touchup on parts which have been anodized, the above inspection process will not be required.

3.9 Special tools - The design shall be such that special or unusual tools will not be required for normal maintenance and inspection of the component.

3.10 Identification of product - The components shall be marked for identification in accordance with MIL-STD-130.

3.10.1 Nameplate - Each component shall be identified by means of a durable nameplate conforming to MIL-STD-130. The nameplate shall be securely attached to each component by use of screws, rivets, welding, or other approved method. A faying surface sealant conforming to MIL-C-83982 or MIL-S-81733 shall be used under mechanically fastened nameplates to prevent corrosion. Nameplates which are attached by use of adhesives will require prior approval of the procuring activity. Nameplates shall not be impression stamped after installation.

3.11 Workmanship - Workmanship shall be high grade throughout to insure proper operation and service life.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of tests - The classification of tests, qualification, first article or quality conformance, shall be as specified in the detail specification. Test methods are described in 4.5, 4.6 and 4.7.

4.3 Qualification or first article test conditions - The following test conditions apply to qualification or first article testing, unless otherwise modified by, or added to, in the detail specification.

4.3.1 Adverse tolerance conditions: - The component shall be capable of functioning when assembled with adverse tolerance parts without any degradation in component performance or life. The manufacturer shall verify compliance with this requirement by mathematical analysis.

4.3.2 Test fluid - The fluid selected in paragraph 3.3.4 shall be used as a test fluid. For quality conformance testing MIL-H-6083 fluid may be used in lieu of MIL-H-5606 fluid.

4.3.3 Temperature conditions - Unless otherwise specified, the ambient and outlet fluid temperatures shall be within the range indicated in each individual test. For the components with appreciable heat generating characteristics such as relief valve, solenoid-operated units, etc., the outlet fluid temperature shall be as specified, and the inlet fluid and ambient temperature may be decreased to compensate for this heat generation. However, in no case shall the inlet fluid temperature or ambient temperature be decreased by more than 25°F. For zero flow condition tests, the ambient temperature shall be as specified. The ambient inlet and outlet fluid temperature shall be stated in the test report. Fluid temperature shall be measured as near as practicable to the component ports. During all soaking periods, the system shall be bled of air and shall be maintained full of fluid. Unless otherwise specified, the following tolerances shall be applied respectively to the following basic temperatures referred to throughout the tests specified in Section 4:

275° ± 5°F	100° ± 5°F
225° ± 5°F	-65° $^{+0°}_{-5°}$ F
160° $^{+5°}_{-0°}$ F	

4.3.4 Filtration - For qualification testing, the test fluid shall be continuously filtered through a filter element with a micron rating equivalent to the micron rating of the filter element used in the aircraft or missile system.

4.3.5 Qualification of similar units - In the case of a series of devices which are intended to serve the same general function in a hydraulic system, qualification of one device of the series may, at the discretion of the activity responsible for qualification, be applied to any other devices of the series if all the internal working parts are identical in every detail with the corresponding internal working parts of the qualified device, and provided it meets the proof, burst pressure, and such operational requirements as may be designated by the activity responsible for qualification. For example, qualification of this type would apply to all devices which differ from pre-

viously qualified devices only insofar as port size, port location, external body dimensions, and external body configuration are concerned. This qualification of similar devices is not automatic upon qualification of one device in a series; it is the discretion of the activity responsible for qualification.

4.3.6 Applicable tests - All tests described herein shall be conducted on each test component in the order specified in the detail specification.

4.4 Quality conformance tests - Unless otherwise specified in the detail specification, the quality conformance tests for a type I or a type II component shall consist of:

(a)	Examination of product	(4.5.1)
(b)	Proof pressure	(4.5.3.1)
(c)	Leakage tests	(4.5.4)
(d)	Pressure drop	(4.5.5)

4.4.1 Quality conformance test conditions - Unless otherwise specified in the detail specification, the following test conditions shall apply.

4.4.1.1 Quality conformance test temperature - Unless otherwise specified, fluid and ambient temperatures shall be between 70° and 120° F.

4.4.1.2 Quality conformance test filtration - Unless otherwise specified, the test fluid shall be continuously filtered through filters equivalent to MIL-F-27656 (USAF) or MIL-F-81836 (AS) for Navy applications.

4.5 Test methods - Type I components -

4.5.1 Examination of product - Each component shall be carefully examined to determine conformance to the requirements of this specification for design, weight, workmanship, marking, conformance to applicable AN or MS standard, government and manufacturer's drawings, specifications and standards for any visible defects.

4.5.2 Immersion -

4.5.2.1 Nonmetallic parts - Components containing nonmetallic parts other than plastic parts or MS or AN standard seals in glands conforming to MIL-G-5514 shall be immersed in hydraulic fluid for a period of 7 days at a temperature of 158° ± 2°F prior to conducting the qualification tests specified herein or in the detail specification. All internal parts shall be in contact with

the fluid during this period. If this test is necessary as a result of the use of nonstandard packing installations, or if the packings pass over holes, ports, step diameters, threads, etc., and if the inside diameter, outside diameter, or sides of the seal are unrestrained during any part of their normal operation, the packing used in the test samples shall be fabricated of the approved AN packing compound listed in QPL-5516 having the highest swell, and the fluid shall be the hydraulic fluid listed in QPL-5606 with 26-28% swell of standard synthetic rubber. (The Government will designate the applicable high-swell packing compound and fluid upon request to the activity responsible for qualification.) After the above immersion, the equipment shall remain in the high-swell fluid at normal room temperature until ready for test. It shall not be exposed to air for any appreciable length of time during the tests.

4.5.3 Pressure tests -

4.5.3.1 Proof pressure - A proof pressure, as specified in MIL-H-5440, MIL-H-25475 or the detail specification, shall be applied at the temperature specified in the detail specification for at least two successive times and held 2 minutes for each pressure application. The rate of pressure rise shall not exceed 25,000 psi per minute. The equipment shall be operated in its normal function between applications of the test pressure. There shall be no evidence of external leakage, other than a slight wetting at seals insufficient to form a drop, excessive distortion, or permanent set. Components which require varying test pressures in different elements may have these pressures applied either separately or simultaneously as specified in the detail specification. Components that are subject to pressure in the reverse direction such as check valves, shut off valves or accumulators shall be pressurized in both directions, either separately or simultaneously as specified in the detail specification.

4.5.3.2 Burst pressure - A burst pressure, as specified in MIL-H-5440, MIL-H-25475 or the detail specification, shall be applied at the temperature specified in the detail specification to the component at a maximum pressure rise rate of 25,000 psi per minute. The component shall not rupture under this pressure nor shall leakage exceed that permitted in external leakage test specified herein. The pressure may be increased above that specified in order to secure data on actual rupture pressure. This should be the last test performed because of its destructive nature. Components that require different test pressures in different elements shall have these pressures applied either separately or simultaneously, whichever is the most critical. Components that are subject to pressure in the reverse direction such as check valves, shut off valves or accumulators shall be pressurized in both directions, either separately or simultaneously as specified in the detail specification.

4.5.4 Leakage tests -

4.5.4.1 External leakage - During the course of all the tests listed in this specification, external leakage, other than a slight wetting insufficient to form a drop through static seals, shall be cause for rejection. Where external, dynamic seals are utilized, permissible leakage past such seals shall be no greater than that specified in the detail specification.

4.5.4.2 Internal leakage -

4.5.4.2.1 Qualification or first article tests - These tests shall be performed with the component held in the position most conducive to leakage. The component shall be tested for leakage by applying 5 psi, 50 percent of working pressure, working pressure and pressure equal to thermal relief valve setting or proof pressure for a period of 30 minutes each, unless otherwise specified in the detail specification. The leakage measurements period shall begin 2 minutes after the application of the required pressure. The component shall be actuated between pressure applications. The rates of leakage shall not exceed those specified in the detail specification. During the first 2 minutes of each test, the leakage shall rapidly decrease from the flow condition to the rate in the fully seated condition.

4.5.4.2.2 Quality conformance tests - These tests shall be performed with the component held in the position most conducive to leakage. Pressure of 5 psi and working pressure shall be held for a period of 5 minutes each, unless otherwise specified in the detail specification. In each case, the leakage measurement shall consist of the last 3 minutes of the 5-minute period. The rate of leakage shall not exceed that specified in the detail specification for the qualification or first article test.

4.5.5 Pressure drop - Pressure drop characteristics for a flow range of 0 to 150 percent of rated flow or as specified in the detail specification shall be determined for the component. The piezometer or manometer across the component may be used for accurate measurement where the pressure drop range is low enough to permit its use. The pressure drop observed at rated flow shall not exceed the value permitted by the applicable detail specification.

4.5.6 Extreme temperature functioning tests -

4.5.6.1 Low temperature - The component shall be connected to a static head of 1 to 3 feet of the test fluid or rated working pressure, whichever

is the more critical condition. This arrangement shall be maintained at a temperature not warmer than -65° F for 3 hours after the temperature has stabilized at -65° F. After this period the component shall be actuated at least two times. Variation of actuating forces or regulation, as applicable shall not exceed that permitted by the detail specification. The quality conformance tests for leakage shall be performed after each actuation and the requirements of the detail specification satsified.

4.5.6.2 Intermediate temperature - Immediately following the low temperature test (4.5.6.1), the test arrangement shall be warmed rapidly to a temperature of 160° F. While the temperature is being raised, the component shall be actuated at maximum increments of 36° F to determine satisfactory operation throughout the temperature range. These check tests shall be made without waiting for temperature of the entire component to stabilize. For complex components, the 36° F increment may be increased in the detail specification to allow for time to perform functional tests.

4.5.6.3 High temperature - In the case of AN or MS standard components, the temperature shall be maintained at 160° F, or in the case of nonstandard components, the temperature shall be maintained at the highest value which the component is expected to encounter for a length of time sufficient to allow all parts of the component to attain the temperature. In no case shall the temperature at which this test is conducted be less than 160° F. The component shall then be actuated at least two times. In the case of pressure actuation or regulation, the variation from room temperature actuation or regulation shall not exceed that permitted by the detail specification. The quality conformance test for leakage (4.5.4) shall be performed after each actuation and the requirements of the detail specification satisfied.

4.5.6.4 Differential temperature - For components utilizing fluid from the two systems, the component shall be operated with the fluid temperature maintained at a differential temperature of 160° F between systems or as specified in the detail specification (as the maximum differential possible for the system). The component shall be actuated at least two times. Variation of actuating forces or regulation, as applicable shall not exceed that permitted by the detail specification for the differential temperature condition.

4.5.6.5 Temperature limits - The solenoids shall be subjected to high temperature and low temperature test procedure of MIL-STD-810.

4.5.7 Temperature rise - dc components shall be tested at 29V, and ac components shall be tested at 122 V or 212V for single phase or

or 3 phase, respectively, at the frequency as specified in the detail specification. The dc test source shall be used to measure coil resistance prior to and immediately after operation at 122V or 212V ac. The dc resistance measurements shall be used to determine temperature rise.

4.5.8 Endurance -

4.5.8.1 General - The component shall be subjected to cyclic operation and to other fatigue tests, such as hydraulic impulse, in accordance with the requirements of the detail specification which shall indicate number of cycles, schedule of cycling, cycle rate, stroke, rate of flow, loads, temperature, impulse peaks, etc. When applicable, leakage shall be checked at 25, 50, 75 and 100 percent of the number of cycles required. At the conclusion of the endurance test, the component shall operate satisfactorily and shall be disassembled and carefully inspected. There shall be no evidence excessive wear in any part of the component.

4.5.8.2 Aircraft applications - The number of cycles selected shall be based on the duty cycle over the anticipated life of the aircraft or the component, whichever is greater, multiplied by an appropriate safety factor. In either case, the cycles shall be not less than the values specified in Table III.

TABLE III. ENDURANCE TEST

Type and Usage of Component	Cycles
AN or MS standard	(See detail specification)
Nonstandard - Emergency	5,000
- Infrequent (less than 10 cycles per flight)	20,000
- Frequent (more than 10 cycles per flight)	50,000
- Flight control, steering, antiskid, etc.	(See detail specification)

4.5.8.3 Missile applications - The number of cycles selected shall be four times the estimated number of cycles to which the component may be subjected during the life of the missile, including periodic missile exercise and confidence check cycles, except that a minimum of 2,000 cycles shall be conducted on all components.

4.5.8.4 Impulse -

4.5.8.4.1 Actuators, valves, pressure containers and similar components - These components shall be subjected to an impulse test in accordance with SAE ARP 1383 and as specified in the detail specification. Where the SAE ARP and the detail specification conflict, the detail specification shall take precedence.

4.5.8.4.2 Hose assemblies, tubing, fittings, quick disconnect couplings, filters and other transmission line components - These components shall be subjected to an impulse test in accordance with SAE ARP 603 and as specified in the detail specification. Where the SAE ARP and the detail specification conflict, the detail specification shall take precedence.

4.5.9 Vibration, shock and acceleration - Components shall be subjected to vibration, shock and acceleration test procedure of MIL-STD-810 (methods 514, 516 & 513 respectively) when specified in the detail specification.

4.5.10 Humidity - Moisture resistance shall be established by the humidity test procedure of MIL-STD-810. At the conclusion of this test, the component shall operate normally through 25 cycles at rated voltage. The solenoids shall be subjected to dielectric strength test specified in 4.5.19.

4.5.11 Fungus - Components which include materials that are not classified as fungus - inert by MIL-STD-454, Requirement 4, shall be subjected to the fungus test of MIL-STD-810, Method 508.

4.5.12 Sand and dust - The components shall be subjected to the dust test procedure of MIL-STD-810. This test may be omitted if all moving parts of the component are exposed only to internal fluid.

4.5.13 Salt fog - The components shall be subjected to salt fog test procedures of MIL-STD-810 unless it is established by the procuring activity that this test is not required.

4.5.14 Icing - The component shall be subjected to an icing test if its design is such that accumulation of ice on external surfaces or inside of vent holes may cause malfunction. When required, this test shall be performed as specified in the detail specification.

4.5.15 Explosion proof - Components with a potential source of ignition shall be subjected to an explosion proof test in accordance with the explosive atmosphere test procedure of MIL-STD-810.

4.5.16 Electromagnetic interference - Components that cause electromagnetic interference shall be subjected to a electromagnetic interference test in accordance with MIL-STD-461, MIL-STD-462 and MIL-STD-463.

4.5.17 Actuation above system pressure - Components shall be tested for actuation, under a pressure equal to thermal relief valve maximum setting of the circuit in which they are installed. This test shall be conducted as specified in the detail specification.

4.5.18 Reliability - Tests shall be conducted to demonstrate compliance with reliability requirements, including MTBF, or equivalent, as specified in the detail specification.

4.5.19 Dielectric strength - If the dielectric test follows the humidity test or the salt fog test, the solenoids shall be baked for 6 hours at a maximum ambient temperature as specified in the detail specification prior to being subjected to the dielectric test. All solenoids shall be subjected to a 60 Hertz alternating test voltage between terminals and case for one minute at the following root mean square amplitudes:

(a) 1500 volts at room temperature and pressure
(b) 1000 volts at maximum operating temperature and altitude.

Leakage current shall not exceed one milliampere during these tests.

4.5.19.1 Subsequent dielectric tests on assembled hydraulic component or dielectric test after environmental test on the solenoid shall be performed at 75 percent of the above voltages for 1 minute. Flashover or leakage current greater than one milliampere shall constitute a failure. There shall be no distinction between test voltage on prototype and production units.

4.5.20 Drop out voltage test - Solenoid operated components shall be tested for drop out voltage by applying nominal activation voltage and slowly reducing the applied voltage to 10% of the nominal activation voltage. The solenoid shall drop out between 10% of the nominal activation voltage and the minimum activation voltage specified in the detail specification.

4.5.21 Component cleanliness - The component shall be tested for interal cleanliness by subjecting a representative sample of the fluid contained in the component to a particle count using FED-STD-791, method 3009. The

component shall be actuated (if possible) during the sampling. The cleanliness level shall be equal to or better than Class 8, Table I of NAS 1638. If this procedure is not practical, the detail specification shall include a component cleanliness test.

4.6 Test methods - Type II components - The test methods described for type I components shall also apply to type II components with the following exceptions:

4.5.2 shall be conducted at 275° F for 72 hours.

4.5.3.1, 4.5.3.2, 4.5.6.3 shall be conducted at 275° F instead of 160° F.

4.5.6.4 shall be conducted at maximum temperature differential.

4.6.1 Endurance - The endurance tests of type II components shall be governed by the following general test cycle, as well as the test methods for type I components specified in 4.5.8. The following tests shall be performed in the sequence indicated:

General test cycle - type II components:

(a) Fill the component with hydraulic fluid to 90 percent of the total fluid volume of the unit. Cap the ports and place the component in a heating chamber in which the ambient temperature is maintained at 275° F. Hold the component at the ambient temperature of 275° F for a period of 72 hours.

(b) Conduct the test specified in 4.5.3.1 at 275° F.

(c) Conduct the test specified in 4.5.6.1 at -65° F for a minimum of 10 cycles. Test specimen to remain at -65° F for at least 4 hours prior to conducting test. Increase in temperature during the test owing to operation is permitted.

(d) Immediately following the test specified in 4.5.6.2 at 160° F, warm test arrangement rapidly to 275° F and actuate component at increments of approximately 36° F to determine satisfactory operation.

(e) Conduct the test specified in 4.5.6.3 at 275° F for a minimum of 10 cycles.

(f) Conduct 25 percent of the cycles of the test specified in 4.5.8 at 275° F, with the consequent length of exposure at 275° F, unless either condition is modified as a result of 4.6.1.1.

(g) Soak component at 275° F for 2 hours. Pressure is to be maintained during the first hour and reduced to approximately zero psi for the second hour.

(h) Repeat the low temperature test specified in 4.5.6.1 at -65° F and the high temperature test specified in 4.5.6.3, at 275° F.

(i) Conduct 75 percent of the cycles of the test specified in 4.5.8 at 225° F unless modified as the result of 4.6.1.1.

4.6.1.1 For the type II system components, the contractor shall determine the percentage of the cycles a component is to operate at elevated temperatures and the cumulative elevated temperature exposure of the component during its life or the life of the aircraft, whichever is greater. The extent of elevated temperature endurance cycling of a component shall be based on the above determination.

4.7 Packaging, packing, and marking - Preparatior for delivery shall be inspected for conformance to Section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing - Preservation, packaging, and packing requirements shall be as specified in the detail specification or by the procuring activity. Hydraulic components shall be sealed with closures conforming to MIL-C-5501. For Navy aircraft only metal closures conforming to MIL-C-5501 as required by NAVAIR 01-1A-17 shall be used.

5.2 Marking of shipment - In addition to any special marking required by the contract or order, or the detail specification, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.2.1 Reinspection marking - Reinspection marking shall be as specified by the procuring activity.

6. NOTES

6.1 Intended use - Aircraft and missile hydraulic components are intended for use in aircraft hydraulic systems conforming to MIL-H-5440 and MIL-H-25475.

6.2 Definitions - For the purpose of this specification, the term "component" is used to mean a valve, actuating cylinder, or similar device of a hydraulic system.

6.2.1 A standard component is one which is assigned an MS, AN or specification sheet part number.

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

Preparing activity:
Navy - AS

(Project No. 1650-0317)

Reviewer activities:
Army - MI
Air Force - 71

☆U.S. GOVERNMENT PRINTING OFFICE: 1976-603-766/4741

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

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

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE NAVY
Commanding Officer
Naval Air Engineering Center
Systems Engineering Standardization Department
(SESD), Code 93
Lakehurst, NJ 08733

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 12503 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE NAVY

Commanding Officer
Naval Air Engineering Center
Systems Engineering Standardization Department
(SESD). Code 93
Lakehurst, NJ 08733

ATTN: TJM (9322)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

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

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

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

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.