INCH-POUND
MIL-V-868(SH)
21 July 1989

MILITARY SPECIFICATION

VALVES, HYDRAULIC DIRECTIONAL CONTROL, GENERAL SPECIFICATION FOR

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for directional control valves for use in hydraulic systems. The valves are designed for standard or quiet operation and utilize quill-type or face seal mounting configurations.

1.2 Classification. Directional control valves shall be designated using the standard part numbers as identified in the applicable specification sheet.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

PPP-B-566 - Boxes, Folding, Paperboard.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-B-676 - Boxes, Setup.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 4810

MILITARY

MIL-P-116	- Preservation, Methods of.
MIL-V-868/1	- Valves, Hydraulic Directional Control, Four Way, 0 - 12 GPM.
MIL-V-868/2	- Valves, Hydraulic Directional Control, Four Way, 3 - 25 GPM.
MIL-V-868/3	- Valves, Hydraulic Directional Control, Four Way, 10 - 50 GPM.
MS3102	- Connector, Receptacle, Electric, Box Mounting, Solder Contacts, AN Type.
MIL-S-4040	- Solenoid, Electrical, General Specification for.
MIL-C-5015	- Connectors, Electrical, Circular Threaded, AN Type, General Specification for.
MIL-H-6083	- Hydraulic Fluid, Petroleum Based, for Preservation and Operation.
MIL-H-19457	- Hydraulic Fluid, Fire Resistant, Non-neurotoxic.
MIL-S-19500	- Semiconductor Devices, General Specification for.
MIL-S-19500/240	- Semiconductor Devices, Diode, Silicon, Rectifier Types 1N645, 1N647, 1N649, JAN and JANTX; 1N645-1, 1N647-1, 1N649-1, JAN, JANTX, JANTXV, and JANS.

STANDARDS

MILITARY

MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-202	- Test Methods for Electronic and Electrical Component Parts.
MIL-STD-454	- Standard General Requirements for Electronic Equipment.
MIL-STD-2193	- Hydraulic System Components, Ship; Metric.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

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

NATIONAL FLUID POWER ASSOCIATION (NFPA)

T2.6.1 - Method for Verifying the Fatigue and Static Pressure Rating for Pressure Containing Envelope of a Metal Fluid Power Component.

(Application for copies should be addressed to the National Fluid Power Association, Inc., 3333 N. Mayfair Road, Milwaukee, WI 53222.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.3.

3.3 General requirements. General requirements and materials shall be as specified herein and in accordance with MIL-STD-2193 (see 6.3).

3.4 Design and construction.

3.4.1 General requirements. Valves shall be in accordance with the general requirements specified in 3.4.1.1 through 3.4.1.12 (see 6.3, 6.9 and appendix).

3.4.1.1 Configuration. Valves furnished under this specification shall be of the mounting configuration as specified in the applicable specification sheet (see 3.1).

3.4.1.2 Type. The valve shall control fluid flow direction by means of a spool or poppet. The motion of the spool shall be linear or rotary. The spool shall consist of a slide and sleeve assembly or a single slide. The individual valve type shall be identified in the applicable specification sheet (see 3.1).

3.4.1.3 Flow pattern. Unless otherwise specified, the number of ways, positions, flow paths and center type for valves covered by this specification shall be as specified in the applicable specification sheet (see 3.1). For example, a four-way valve shall be defined as a valve with four ports; pressure (P), return (R) and two cylinder ports (CA and CB). A three-way valve shall be defined as a valve with three ports; pressure (P), return (R) and one cylinder port (CA).

3.4.1.4 Interflow. Unless otherwise specified, all valves shall be designed such that there is no interflow between the cylinder, supply and return ports when shifting from one position to another.

3.4.1.5 Manual operation. Unless otherwise designated, when the handle of a four-way valve is in the position nearest the valve body, fluid shall be directed from the "P" port to the "CA" port and from "CB" port to the "R" port. When in the opposite position, fluid shall be directed from the "P" port to the "CB" port

and from "CA" port to "R" port. For a three-way valve, when the handle is nearest the valve body, fluid shall be directed from the "P" port to "CA" port with "R" port blocked. When in the opposite position, fluid shall be directed from the "CA" port to "R" port with "P" blocked.

3.4.1.6 Operating handles and latches. Manually operated valves shall be provided with an operating handle. Unless otherwise designated by the valve part number description listed in the applicable specification sheet (see 3.1), the handle shall be provided with a latching mechanism to prevent the valve spool from changing position under high impact shock, vibration, or inadvertent bumping of the handle. The latching positions shall be as described in the applicable specification sheet (see 3.1). The design of the latching mechanism shall be such that the operating handle and latch can be operated simultaneously with one hand.

3.4.1.7 Solenoid operation. Solenoid shall be designated "LA" for single solenoid valves. When energized, the fluid shall be directed from the "P" port to the "CA" port. When de-energized, the fluid shall be directed from the "P" port to "CB" port. Solenoids shall be designated "LA" and "LB" for double solenoid valves. When "LA" is energized, fluid shall be directed from the "P" port to "CA" port. When "LB" is energized, fluid shall be directed from the "P" port to "CB" port. When both solenoids are de-energized, valve shall move to its center position.

3.4.1.8 Manual overrides. Unless otherwise specified (see 6.2), all solenoid operated valves shall be provided with manual overrides equipped with pin locks to allow local operation of the valve without energizing the solenoid. Once actuated, the pin lock shall be utilized to retain the valve in the override position until manually released. The manual override shall not be required to override an energized solenoid or hydraulic pilot. Unless otherwise specified, the overrides shall be protected from inadvertent operation.

3.4.1.9 Hydraulic pilot operation. When pilot port (PPA) is pressurized, flow will be ported from supply port (P) to cylinder port (CA) and when pilot port (PPB) is pressurized, flow will be ported from supply port (P) to cylinder port (CB).

3.4.1.10 Life. Standard valves shall be designed for at least 150,000 hours (375,000 cycles) before replacement of the total valve is necessary. Fatigue rated valves shall meet the 10-million fatigue cycle requirement of 3.5.7. Valve parts shall be designed for the life of the valve with the following exceptions:

(a) Filters and screens. No more than four maintenance actions shall be required during the 50,000 cycle endurance test.
(b) Solenoids. The life requirement shall be in accordance with MIL-S-4040 for continuous duty rated solenoids.
(c) Seals. Seals shall be designed for at least 20,000 hours (50,000 cycles) of operation.

For two-position valves, a cycle is defined as starting at one position, moving the valve spool (slide) to the second position and then returning the valve spool to the original position. For a three-position valve, a cycle shall start with

the spool in the center position and shall consist of moving the valve spool to one fully offset position and then to the other fully offset position and back to the center position.

3.4.1.11 Maintainability. Unless otherwise specified in the applicable specification sheet (see 3.1), the mean time to repair (MTTR) of the valve shall not exceed 60 minutes. MTTR shall be limited to fault isolation and repair by parts replacement. The parts replacement shall be limited to seal replacement, actuator assembly (solenoids) replacement or subassemblies that can be replaced by using the standard tools that are listed in the Federal Supply catalog. (Copies of this catalog may be consulted in the office of the Defense Contract Administration Services Management Area (DCASMA).)

3.4.1.12 Nameplates and indicator plates. Unless otherwise specified (see 6.2), each valve shall be supplied with nameplates in accordance with MIL-STD-2193. Nameplates shall be of uniform size for each valve size range and shall contain the following information:

(a) Military part or identifying number (PIN)
(b) Manufacturer's part or model number
(c) Manufacturer's name or trademark
(d) Manufacturer's serial number

When specified, manually and solenoid operated valves shall be provided with indicator plates affixed adjacent to the manual lever or manual override. The indicator plate shall be inscribed with the operating function (such as open and close) or the valve schematic as specified. Double solenoid valves shall have two indicator plates, one for each solenoid.

3.4.2 Physical requirements.

3.4.2.1 Envelope. The valve envelope shall be such that the valve can be installed within the dimensions for the applicable size and type shown in the applicable specification sheet (see 3.1).

3.4.2.2 Mounting. Unless otherwise specified, valves shall be designed for subplate or manifold mounting and shall accept the interface configuration for the appropriate valve sizes listed in the applicable specification sheet (see 3.1). The seal interface configurations shall be as shown in the applicable specification sheet (see 3.1).

3.4.3 Electrical requirements. The electrical components associated with the solenoid operated pilot valves shall be in accordance with the following paragraphs of MIL-STD-454 in addition to the requirements specified herein:

(a) Materials
(b) Parts - electrical
(c) Encapsulation and embedment (potting)
(d) Structural welding
(e) Interchangeability

(f) Safety
(g) Soldering
(h) Electrical parts mounting
(i) Fungus - inert materials
(j) Wiring
(k) Schematic diagram

3.4.3.1 Connectors. Unless otherwise specified in the applicable specification sheet, the receptacle shall conform to MS3102, class R, shell size 16S with P contacts, and shall be mounted on each enclosure where cable entrance is required. Electrical connector's interface shall be in accordance with MIL-C-5015. Insert arrangement shall be 4P for "LA" and 4PX for "LB" (see figure 1).

3.4.3.2 Solenoids. Unless otherwise designated, solenoids shall be of the continuous duty type designed in accordance with MIL-S-4040 for either alternating current (ac) operation or direct current (dc) operation through a rectifier. The type of solenoid shall be as specified in the applicable specification sheet (see 3.1).

The electrical requirements for the solenoid shall be as follows (see 4.6.13):

(a) Supply voltage rating - 122 volts (V) ac maximum 87 Vac minimum.
(b) Drop-out voltage - 10 Vac minimum.
(c) Ambient temperature - 4 to 50 degrees Celsius (°C).
(d) Insulation resistance - 10,000 megohms at 500 Vdc between power input leads and case ground.
(e) Frequency range - 0 hertz (Hz) minimum; 400 Hz maximum.
(f) Dielectric strength or withstanding voltage - 1,500 (root mean square (rms) volts) plus rated voltage at 60 Hz for 60 seconds applied between input leads and case ground.
(g) Current - In rush: 250 milliamperes (mA) maximum; Holding: 140 mA maximum.
(h) The noise generated by the solenoid, when installed on the valve and actuated, shall not exceed the noise limits specified herein.

3.4.3.3 Electrical insulation. Electrical insulation for all solenoids shall be class H in accordance with requirement 11 of MIL-STD-454. Continuous duty solenoids shall be designed in accordance with the life requirement of MIL-S-4040 for continuous energized operation of 168 hours at an ambient temperature of 50°C (120 degrees Fahrenheit (°F)) and a supply voltage of 120 Vac maximum. The solenoid shall be readily replaceable without soldering.

3.4.3.4 Rectifiers. A rectifier shall be provided for each solenoid designed for direct current operation. The rectifier shall be built into the solenoid package and shall be silicon in accordance with MIL-S-19500 and MIL-S-19500/240. Rectifier circuits shall be of the full wave bridge type and designed for continuously energized operation from a normal 115-volt, 60-Hz single phase supply. The device shall operate satisfactorily within the voltage and frequency ranges specified in 3.4.3.2 and shall be removable for replacement.

3.4.4 Hydraulic requirements.

3.4.4.1 Hydraulic fluid. The valves shall meet the fluid compatibility requirements of the hydraulic fluid listed in the applicable specification sheet (see 3.1).

3.4.4.2 Operating pressure. Unless otherwise specified in the applicable specification sheet (see 3.1), the valves shall be designed to operate with supply pressure ranging from 90 to 210 bars (1300 to 3000 pounds per square inch (lb/in^2) gauge) and return pressure from 0 to 24 bars (0 to 350 lb/in^2 gauge) with surges to 40 bars (580 lb/in^2 gauge). With the 40-bar return pressure surges, the valve spool shall not shift position to degrade the functional setting of the valve.

3.4.4.3 Proof pressure. Valves shall be designed and constructed to withstand specified hydrostatic test pressure without incurring any permanent damage or deformation. Unless otherwise specified in the applicable specification sheet (see 3.1), the hydrostatic test pressure shall be:

(a) Supply and cylinder ports - 310 bars (4500 lb/in^2 gauge)
(b) Return port - 60 bars (900 lb/in^2 gauge)

3.4.4.4 Temperature. The valves shall operate within a fluid temperature range of 70°C (160°F) maximum to 15°C (60°F) minimum under normal conditions. The valves shall operate with fluid temperatures as low as 5°C (41°F), but valves controlled by solenoid operated pilot stage shall not be required to meet the rates of operation specified in 3.4.6.4.

3.4.4.5 Fluid contamination. Valves shall operate (shift) satisfactorily when subjected to the contamination sensitivity test (see 3.5.6).

3.4.4.6 Pilot stage filtration. For pilot stages requiring additional protection, either a throw-away or cleanable type screen or filter shall be built into the valve assembly. The screen or filter shall be serviceable without disassembling the valve or dismounting the valve from its subplate. The screen or filter element shall not be equipped with a bypass and shall not collapse at less than 230 bars differential (3300 lb/in^2 differential). The location of the screen or filter element shall be marked.

3.4.5 Performance.

3.4.5.1 External leakage. There shall be no evidence of external leakage, other than slight wetting insufficient to form a drop, throughout all environmental and operational ranges. Unless otherwise specified, external leakage shall not exceed one drop every 25 cycles where spool shaft extensions or operators penetrate the valve (see 4.5).

3.4.5.2 Internal leakage. Internal leakage shall not exceed the limits listed in the applicable specification sheet (see 3.1).

3.4.5.3 Flow requirements. Valves shall meet the flow rates specified in the applicable specification sheet (see 3.1). The valves shall perform in accordance with the requirements specified herein when mounted in any orientation or attitude.

3.4.5.4 Differential pressure at rated flow. The requirements for a differential pressure across a given size and grade valve shall be as specified in the applicable specification sheet (see 3.1) at the rated flow.

3.4.6 Operation.

3.4.6.1 Manual operation. Manual valves shall be designed for quick operation using only one hand. Unless otherwise specified in the specification sheets (see 3.1), the force required to operate the valve shall not exceed 67 newtons (15 pounds) when applied to the end of the operating handle throughout the operating range specified in 3.4.4.2. The force required to operate a manual override shall not exceed 90 newtons (20 pound-force). The manual override shall not be required to override an energized solenoid or pilot.

3.4.6.2 Hydraulic actuation. Unless otherwise specified in the specification sheets (see 3.1), hydraulically operated valves shall not start to shift for differential pressures less than 25 bars (360 lb/in^2) and shall be completely shifted at differential pressures exceeding 69 bars (1000 lb/in^2) for the operating range specified in 3.4.4.2. Differential pressure shall be the difference between the supply pressure and the return pressure.

3.4.6.3 Mechanical actuation. Unless otherwise specified in the applicable specification sheet (see 3.1), the force required to operate the valve shall not exceed 310 newtons (70 pounds) when applied to the valve stem to offset the valve from one position to another for the operating range specified in 3.4.4.2.

3.4.6.4 Solenoid actuation. Valves controlled by a solenoid operated pilot stage shall shift the main stage to its full offset position within 250 to 500 milliseconds of energizing the pilot stage solenoid. The valve main stage shall return to neutral within 250 to 500 milliseconds after de-energizing the solenoid. This rate shall be met at ambient temperature and pressure when tested under the conditions specified in the applicable specification sheet (see 3.1).

3.5 Operational environments.

3.5.1 Ambient conditions. Unless otherwise specified in the applicable specification sheet (see 3.1), the valves shall operate throughout the ambient temperature of 5 to 70°C (40 to 160°F). The ambient pressure range shall be 0.8 to 1.2 bars absolute (11.8 to 17.7 lb/in^2 absolute).

3.5.2 Shock. Valves shall perform in accordance with requirements specified herein after being subjected to the shock test specified in MIL-STD-2193.

3.5.3 Vibration. Valves shall operate to the vibration requirements specified in MIL-STD-2193.

3.5.4 Salt fog. Valves shall withstand, without degradation, the salt fog test as specified in MIL-STD-2193.

3.5.5 Noise. Valves shall meet the structureborne noise level specified in the applicable specification sheet (see 3.1) when tested in accordance with MIL-STD-2193.

3.5.6 Contamination sensitivity. Unless otherwise specified (see 3.1 and 6.2), valves shall meet the requirements of this specification when subjected to a contamination sensitivity test in accordance with MIL-STD-2193 (see 4.6.18) with the following modifications:

(a) The valve shall be installed in such manner to permit flow to at least one cylinder port (CA or CB) when actuated.
(b) The system shall be cleaned to the specified level with the test valve isolated from the system and its bypass valve open.
(c) With the system cleaned to the specified level and with the filter on line, the valve is actuated at 6 cycles/minute for 60 minutes. At the completion of the run-in period, the valve performance level is measured as specified in 4.6.18. The filter is then bypassed and the first contaminant sample is injected. The valve shall remain in the continuous flow position without cycling for 30 minutes. The valve performance level is measured, then the filter is replaced on line and the system operated in the cleaning mode for 30 minutes. The sequence is repeated until all contaminant samples have been injected.

3.5.7 Fatigue. When specified in the applicable specification sheet (see 3.1), the valve shall be fatigue tested to 90 percent assurance and 90 percent confident levels in accordance with NFPA T2.6.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

(a) First article inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of the tests specified in table I. Tests in Group 1 shall be completed prior to starting the tests in Group 2 and the tests in Group 2 shall be conducted before starting Group 3 tests. The salt fog and maintainability tests of Group 4 may be conducted anytime. One valve of each specific part number shall be tested. When a number of similar valves are being acquired, the first article inspections are subject to approval by extension when technically justified (see 6.3 and 6.4.1.1).

TABLE I. First article inspection.

Tests	Requirement	Test
Group 1		
Examination	3.4.1 & 3.4.2	4.6.1
Proof pressure	3.4.4.3	4.6.2
Run-in/external leakage	3.4.5.1	4.6.3
Internal leakage	3.4.5.2	4.6.4
Differential pressure at rated flow	3.4.5.4	4.6.5
Manual actuation (as applicable)	3.4.6.1	4.6.8
Hydraulic actuation (as applicable)	3.4.6.2	4.6.10
Mechanical actuation (as applicable)	3.4.6.3	4.6.11
Solenoid test	3.4.3.2	4.6.13.1
Solenoid actuation (as applicable)	3.4.6.4	4.6.9
Noise (for grades other than B)	3.5.5	4.6.6
High and low temperature	3.4.4.4	4.6.14
Group 2		
Endurance	3.4.1.10	4.6.15
H.I. shock	3.5.2	4.6.16
Vibration	3.5.3	4.6.17
Fatigue	3.5.7	4.6.21
Group 3		
Rerun internal leakage	3.4.5.2	4.6.4
Rerun pressure drop at rated flow	3.4.5.4	4.6.5
Rerun noise	3.5.5	4.6.19
Rerun manual, hydraulic, mechanical or solenoid actuation as applicable	(See above)	(See above)

TABLE I. First article inspection - Continued.

Tests	Requirement	Test
Group 4		
Contamination sensitivity	3.5.6	4.6.18
Salt fog	3.5.4	4.6.20
Maintainability demonstration	3.4.1.11	4.6.12

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the tests specified in table II. These inspections shall be conducted on all valves except for noise test sampling procedure (see 4.6.7). In the event a valve fails to conform to the requirements of this specification for any test, the manufacturer shall correct the cause of failure and repeat the test in total until the valve passes the test. The manufacturer shall also correct this deficiency in all valves produced under the contract or order.

TABLE II. Quality conformance inspection.

Tests	Requirement	Test
Examination	3.4.1 & 3.4.2	4.6.1
Proof pressure	3.4.4.3	4.6.2
Run-in/external leakage	3.4.5.1	4.6.3
Internal leakage	3.4.5.2	4.6.4
Manual actuation	3.4.6.1	4.6.8
Hydraulic actuation	3.4.6.2	4.6.10
Mechanical actuation	3.4.6.3	4.6.11
Solenoid tests	3.4.3.2	4.6.13.2
Solenoid actuation	3.4.6.4	4.6.9
Noise (for grades other than B)	3.5.5	4.6.7

4.5 Test conditions.

4.5.1 Test fluid and fluid temperature. The test fluid and the required fluid temperature shall be as specified in the applicable specification sheet (see 3.1). (See 6.7 for fluid viscosity at various temperatures.)

4.5.2 Fluid contamination. Unless otherwise specified, the test fluid shall not exceed the following particle count:

Particulate size (micrometer)	Maximum number of particles per 100 milliliters
greater than 15	12,000
greater than 25	2,000
greater than 50	360

No particles over 500 micrometers, except fibers, shall be permitted. Fibers shall be defined as particles with a length at least 10 times the diameter.

4.5.3 Test pressure. Unless otherwise specified in the applicable specification sheet (see 3.1) or specific test paragraph, the supply pressure shall not be less than 200 bars (2900 lb/in^2 gauge) or more than 215 bars (3100 lb/in^2 gauge). The return pressure shall be atmospheric unless otherwise specified.

4.5.4 Test assembly. A valve shall be tested as a complete assembly, including solenoids, handles, and manual overrides. The valve assembly shall be mounted on a single subplate for the H.I. shock, vibration, and noise (non-Grade B valves only) tests. The quality conformance inspection on valves, acquired with manifolds or subplates, may be conducted on the complete assembly.

4.6 Test methods. Test methods shall be in accordance with 4.6.1 through 4.6.21 (see 6.3).

4.6.1 Examination. Each valve shall be subjected to a visual and dimensional examination to determine conformance with the requirements of this specification, applicable specification sheet, and manufacturer's valve assembly drawings.

4.6.2 Proof test. Each valve shall be hydrostatically tested in accordance with the requirements specified in 3.4.4.3. The pressure shall be applied to the "P" port with the cylinder ports blocked and the return port "R" connected to the reservoir or open to atmosphere. The supply pressure shall be held for 2 minutes minimum in each valve position. NOTE: The test pressure shall be relieved to system pressure or lower prior to shifting the valve. The test is repeated with the specified pressure on the return port "R" with pressure port "P" connected to the reservoir or open to atmosphere. No external leakage, permanent damage or deformation of the component shall be allowed.

4.6.3 Run-in. Each valve shall be cycled at least 25 cycles at test pressure specified in 4.5.3. For quality conformance, each production valve shall be cycled at least 25 cycles by its normal control method of actuation. During this test the general function of the valve shall be observed. External leakage shall not exceed the requirement of 3.4.5.1. Internal flow paths of valves and proper port markings shall also be confirmed.

4.6.4 Leakage test. Each valve assembly shall be tested for internal leakage under the conditions specified in 4.5.1 through 4.5.3 following the last cycle of the run-in exercise specified in 4.6.3. The first article and quality

conformance leakage test shall be conducted in accordance with MIL-STD-2193. Leakage shall not exceed the maximum rate listed in applicable specification sheet (see 3.1).

4.6.5 Rated flow. The differential pressure shall be measured in the valve positions for which rated flow is required. A flow meter or other accurate means of measuring flow and pressure drop shall be utilized. The valves shall meet the flow and pressure drop requirements in the applicable specification sheet (see 3.1). The test fluid and temperature for this test shall be in accordance with 4.5.1.

4.6.6 First article noise tests. Non-grade B valves shall meet the structureborne noise requirements of 3.5.5 when tested under the conditions specified in the applicable specification sheet (see 3.1) and 4.6.6.1 or 4.6.6.2, as applicable. The maximum allowable one third octave band structureborne noise level for these test conditions shall not exceed limits specified in the applicable specification sheet (see 3.1). If data taken in these tests indicate higher noise levels than specified for certain test conditions, additional tests shall be run in that area to insure that the noise levels of the applicable specification sheet are not exceeded.

4.6.6.1 Non-metering valves and valves without stroke limiting adjustments. Measure the structureborne noise levels in each one third octave band for each flow position for the test condition specified in the specification sheet. Also while monitoring the broadband vibration level (10 Hz to 20 kilohertz (KHz)), measure the peak reading of the transient noise produced when shifting the valve from one operating position to another. Unless otherwise specified in the applicable specification sheet (see 3.1), only the noise produced in the 10 Hz to 10 KHz range shall be evaluated to determine if the valve conforms to the requirement of this specification. For valves shifted by solenoid, the shift time shall be within the requirements listed in 3.4.6.4. Manual valves shall be shifted in less than 1 second. Valves which have blocked center or flow to return in neutral shall not require testing in the neutral position.

4.6.6.2 Metering valves and valves with stroke limiting adjustments. With the valve positioned in increments of 5, 10, 25, 50, 75, and 100 percent from neutral or spring offset position as applicable, measure the structureborne noise levels for the valve in each one third octave band and flow position for test condition specified in the applicable specification sheet (see 3.1). For valves with differential pressure adjustments, the peak transient noise produced when shifting from each position to every other position with the valve adjusted for the maximum rated flow shall be measured while monitoring the broadband vibration level (10 Hz to 20 KHz). Unless otherwise specified in the applicable specification sheet (see 3.1), only the noise produced in the 10 Hz to 10 KHz range shall be evaluated to determine if the valve conforms to the requirement of this specification. For valves shifted by solenoid, the shift time shall be within the requirements listed in 3.4.6.4. Manual valves shall be shifted in less than 1 second.

4.6.7 Quality conformance noise tests. Unless otherwise specified (see 6.2), all production valves, except noise grade B valves, shall meet the requirement of 3.5.5 (see 4.6.6) using the following designated sampling procedure:

(a) The first three valves of each part number shall be tested. Where different part number valves use the same spool or slide and sleeve assembly under identical specification flow test conditions, they may be grouped together and treated as a single part number.
(b) If all three valves tested passed the noise test, then every fifth valve shall be noise tested.
(c) If one of the valves tested failed the noise test and requires rework other than seal replacement, then the next five valves shall be tested. All five valves shall pass the noise test to implement the sampling plan specified in (b).

If any of the five valves tested fail, the process shall be repeated until the requirement specified is met.

4.6.8 Manual actuation. Each valve shall be actuated using manual control or manual override, as applicable. The valve, when manually actuated, shall operate smoothly without any binding or roughness, and the force required to operate the valve shall be checked and shall not exceed the limits specified in 3.4.6.1.

4.6.9 Solenoid actuation. Solenoid operated valves shall be tested under the conditions listed in 3.4.6.4 and shall meet the requirements specified herein.

4.6.10 Hydraulic actuation. The differential pressure required to shift hydraulically operated valves shall be within the limits specified in 3.4.6.2 when tested with any return pressures up to 24 bars (350 lb/in^2 gauge). For quality conformance, the test may be conducted with return pressure at atmospheric.

4.6.11 Mechanical actuation. Each mechanically operated valve shall operate within the limits specified in 3.4.6.3 when tested with return pressure of atmospheric and 40 bars (580 lb/in^2 gauge). For quality conformance, the test shall be conducted with return pressure at atmospheric.

4.6.12 Maintainability demonstration test. The maintainability requirements specified in 3.4.1.11 shall be demonstrated. The demonstration shall include MTTR and ease of disassembly/assembly. Failure to comply with any or all of the specified requirements shall result in rejection.

4.6.13 Solenoid tests.

4.6.13.1 First article tests. The following tests of MIL-S-4040 shall be conducted as first article tests:

(a) Group 1 tests (all)
(b) Group 2 tests

(1) Vibration
(2) Hi-impact shock
(3) Life (solenoid may be installed in a valve or test block with mass no greater than mass of valve which will utilize the solenoid)

(c) Group 3 tests

(1) High temperature (altitude requirement not applicable)
(2) Low temperature

NOTE: The vibration and shock tests specified herein may be substituted for the MIL-S-4040 tests and the number of samples may be reduced to three.

4.6.13.2 Quality conformance tests.

4.6.13.2.1 Insulation resistance. Solenoids shall be tested in accordance with method 302 of MIL-STD-202 to insure that the requirements of 3.4.3.2(d) are met. The following details shall apply:

(a) Test condition B - test potential - 500 volts ± 10 percent
(b) Point of measurement - Between coil input leads and case

4.6.13.2.2 Dielectrical strength. The dielectric strength or withstanding voltage of solenoids shall be tested in accordance with method 301 of MIL-STD-202 to insure that the requirements of 3.4.3.2(f) are met. The following details shall apply:

(a) Magnitude of test voltage equals 1500 rms (volts) plus rated voltage at 60 Hz.
(b) Nature of potential - Ac rectified.
(c) Duration of test voltage - 5 to 15 seconds (quality conformance); 60 seconds (first article).
(d) Point of application of test voltage - between the coil input leads and case.

Satisfactory performance shall be such that no damage, arcing, breakdown, or leaking current in excess of 0.5 milliampere is present (see 6.6 regarding restrictions on re-test of solenoids).

4.6.13.2.3 Voltage, current and frequency. Each solenoid used shall be tested to insure that the electrical features specified in 3.4.3.2(a), (b), (e) and (g) are met. The solenoid shall be assembled to the valve which is under operating pressure (see 4.5.3) and temperature (see 4.5.1) at time of electrical tests.

4.6.13.3 Solenoid continuous duty test. Solenoids shall be tested for continuous energized duty cycle under normal valve operating loads under the requirements of 3.4.3.3. Following the test, insulation resistance and dielectric withstanding voltage shall be tested as specified in 4.6.13.1 and 4.6.13.2. Satisfactory performance is demonstrated if the solenoid remains mechanically and electrically operative as specified herein. This test shall not be required if the solenoid has previously passed the qualification tests of MIL-S-4040.

4.6.14 High and low temperature. Unless otherwise specified in the applicable specification sheet (see 3.1), each valve shall be tested for operation at extreme fluid temperatures as follows:

(a) High temperature operation - With the test system bled and charged to a supply pressure of 3000 lb/in^2 gauge, the entire set-up shall be maintained at 65 ± 5°C, for not less than 3 hours. After this time, the valve shall be cycled by solenoid or manual actuation at least five times to ensure that no binding of moving parts occur. Solenoid valves shall also be actuated by manual override to ensure proper manual operation. There shall be no evidence of external leakage. Any binding or delayed valve response shall constitute a failure of this test.

(b) Low temperature operation - The above test shall be repeated with the entire set-up maintained at 5°C maximum. There shall be no binding of moving parts or evidence of external leakage. The pilot operated solenoid values shall not be required to meet the rate of operation specified in 3.4.6.4.

4.6.15 Endurance. Unless otherwise specified, valves shall be endurance tested to meet the 50,000 cycle replaceable parts requirement of 3.4.1.10. The valve shall be cycled under pressure (see 4.5.3) by its normal means of operation. Unless otherwise designated, the three-position valve shall be cycled from one extreme position to the other. The cycling rate for three-position valves shall not exceed 12 cycles per minute to permit pressure to reach its maximum value and hold for a minimum of 2 seconds. For two-position valves, the cycling rate shall not exceed 19 cycles per minute. Replacement of any operating parts with the exception of filters or screens shall constitute a failure of the test.

4.6.16 High shock test. The valve shall be subjected to the grade A, class I shock test in accordance with 3.5.2. The valve shall be considered to have failed the shock test if it does not meet the requirements of any group 3 test of table I or shows any signs of external or internal damage. Release of locking handles on equipped valves shall also be considered a failure.

4.6.17 Vibration. The valve shall be vibration tested up to and including 50 Hz in accordance with 3.5.3. The valve shall be considered to have failed the vibration test if it does not meet the requirements of any group 3 test of table I or shows any signs of external or internal damage. Release of locking handles on equipped valves shall also be considered a failure.

4.6.18 Contamination sensitivity. Valves shall be tested in accordance with 3.5.6 with the test fluid and temperature specified in 4.5.1 and pressure specified in 4.5.3. The valve performance level shall be measured as follows:

(a) For all manually and mechanically operated valves, the force to move the spool shall be measured at the intervals specified in 3.5.6. For a valve with an operating handle, the force shall be measured at the end of the handle. Should the spool stick or the force exceed the limits specified in 3.4.6.1 or 3.4.6.3, the valve shall be considered to have failed this test.

(b) For valves that are hydraulically operated, the pilot pressure to shift the spool shall be measured at the intervals specified in 3.5.6. Should the spool stick or the pressure exceed the requirements of 3.4.6.2, the valve shall be considered to have failed this test.

(c) For solenoid operated valves, a measurement of pressure (port CA or CB), flow, position, or other means (see 6.2) versus time shall be obtained. The measurement shall be sufficient to analyze the opening transient response in detail. Should the valve stick or the response time exceed the limits specified in 3.4.6.4, the valve shall be considered to have failed this test.

4.6.19 Noise retest requirements. At the conclusion of Group 1 and 2 tests, each first article valve shall be noise tested in accordance with the applicable testing procedure of 4.6.6. If the valve's noise level has increased above the allowable levels, the manufacturer shall disassemble the valve to determine why the noise level increased. The correction shall be made and the noise test repeated until the allowable noise levels are obtained.

4.6.20 Salt fog. The salt fog test shall be conducted in accordance with 3.5.4. The salt concentration for the water shall be 5 plus or minus 1 percent. The valve shall be set up in its normal operating mode. The duration of the test shall be 48 hours with a period of 24 hours wet and 24 hours drying. After completion of testing and cleaning, the base metal of the component shall not be visible through the coating or finish, nor shall there be any evidence of corrosion, peeling, chipping or blistering. The solenoid shall also be examined and the voltage, insulation test of table I shall be performed. The valve shall be considered to have failed this test if it does not meet any of these requirements.

4.6.21 Fatigue. When specified, the fatigue test shall be conducted in accordance with 3.5.7. Any evidence of structural failure or external leakage in excess of the values specified in 3.4.5.1 shall constitute a failure of the test.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.8.)

5.1 General requirements.

5.1.1 Cleaning and drying. Cleaning and drying of valves shall be in accordance with MIL-P-116. Unless otherwise specified (see 6.2), any of the processes or procedures specified in MIL-P-116 can be used provided there is no degradation of the valve seals, nonmetallic materials, or electrical components (solenoids). Care shall be taken after cleaning to ensure that the valve is not contaminated prior to or during preservation and packing.

5.1.2 Preservation fluid. Unless otherwise specified (see 6.2), the preservative fluid shall be in accordance with MIL-H-6083. For applications where petroleum based preservative fluid in accordance with MIL-H-6083 is not desirable, then the alternate fluid shall be either of the following:

Phosphate ester systems: Use fluid in accordance with MIL-H-19457 and completely fill valve.

Water glycol system: Use water glycol with a rust inhibitor as specified (see 6.2). Flush valves with water glycol prior to installation.

The cleanliness of the preservative fluid shall meet the following requirements:

(a) Particle count:

Particulate size (micrometer)	Maximum number of particles per 100 milliliters
greater than 15	14,000
greater than 25	2,500
greater than 50	400

No particles over 500 micrometers, except fibers are permitted. Fibers shall be defined as particles with a length at least 10 times the diameter.

(b) Water count shall be not more than 0.03 percent by volume.

5.2 Preservation and packing. Preservation and packing shall be level A or C (see 5.2.1 or 5.2.2) as specified (see 6.2).

5.2.1 Level A. Immediately after the cleaning and drying cycle (see 5.1.1), valves shall be filled with preservative fluid (see 5.1.2) and drained to ensure complete coverage of the areas within the valve. Care shall be exercised to prevent contamination of the valve by sealing it in a heat-sealed plastic bag of commercial quality and compatible with the preservative fluid. Unless otherwise specified (see 6.2), the valves shall be packed in waterproof or weather-resistant paperboard folding, set-up, fiberboard, or cleated-plywood boxes conforming to PPP-B-566, PPP-B-676, PPP-B-636, or PPP-B-601 respectively.

5.2.2 Level C. Immediately after the cleaning and drying cycle (see 5.1.1), preservation and packing of equipment and accessories shall be accomplished to afford protection against contamination, corrosion, and physical damage during shipment from the supply source to the first receiving activity for immediate use. The contractor's normal retail or wholesale preservation and packing methods may be utilized when such methods meet the requirements of this level.

5.3 Marking. In addition to any special marking required, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129, and include the following:

(a) Specification sheet part number.
(b) Month and year of manufacture.

5.3.1 Special marking. Preserved assemblies shall be tagged, and the individual unit container and exterior shipping container marked or labeled with the following:

"The interior of this item has been cleaned and examined and was coated (or filled) with (list type of preservative, fluid brand name or Military specification number as applicable) on (this date)."

6. NOTES

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

6.1 Intended use. The valves covered by this specification are intended for use in shipboard hydraulic systems utilizing petroleum base hydraulic fluids. With proper selection of preservative fluid (see 5.1.2), the valves can be used in other hydraulic systems utilizing other hydraulic fluids compatible with MIL-R-83248 seals.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number and date of this specification.
(b) Title, number and date of the applicable specification sheet.
(c) Applicable specification sheet part number.
(d) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
(e) When first article inspection is required (see 3.2).
(f) If pin locks and guards are required (see 3.4.1.8).
(g) Nameplate and indicator plate data required (see 3.4.1.12).
(h) Test circuit for contamination sensitivity test if other than specified (see 3.5.6).
(i) Quality conformance noise test, if other than specified (see 4.6.7).
(j) Contamination sensitivity test measurement (see 4.6.18(c)).
(k) Level of preservation, packing, and marking required (see 5.1, 5.2, and 5.3).
(l) Preservation fluid if other than specified (see 5.1.2).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.3	UDI-T-23191	Certification data for level I material	-----
3.4.1 & appendix	DI-DRPR-80651	Engineering drawings	-----
4.3	DI-T-5315	First article qualification test plan	-----
4.3	DI-T-4902	First article inspection report	-----
4.6	DI-T-5329	Inspection and test reports	Contractor format

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first ___ production items, a standard production item from the contractor's current inventory (see 3.2), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4.1 First article and drawing approval. For items which will be used on U.S. Navy ships, first article and drawing approval by the Hydraulic Control System and Component Standardization branch of the Naval Sea Systems Command (NAVSEA 56W16) is required. Acquisition activities will not be required to obtain and submit first article test reports and drawings to NAVSEA when the offeror provides evidence that the item being offered has been approved by NAVSEA and the offeror attests that such approval is still valid and has not been rescinded. Any changes to the revision of a drawing approved by NAVSEA will require resubmittal for NAVSEA review and approval of the change and any applicable first article test requirements resulting from the change. Unless otherwise specified in the contract, drawings and first article test reports may be submitted to NAVSEA by either the acquisition activity or the offeror. When an offeror wishes to obtain first article approval on similar items, he may submit a first article test report for NAVSEA approval in which the number of tests are minimized in order to eliminate duplicate testing of identical and similar items. Offerors wishing to obtain first article approval on a whole family of similar valves are encouraged

to submit a test plan for approval in advance of testing. If a test plan has been approved in advance of testing, first article test reports should cite the test plan as the basis for approval by extension. Whenever approval based on extension from a previous test is requested, the test report from which extension is sought must be identified. The test report from which extension is requested need not be submitted with the request for extension but must be provided when requested by the approving activity.

6.4.1.1 Extension of first article tests. In general, NAVSEA will consider approval of the following extensions of tests between similar valves.

(a) Proof pressure. Extension will be considered when pressures, area subject to pressure, fasteners and parts used to contain the pressure are equivalent.
(b) Leakage. Extension will be considered when the parts subject to leakage are the same as used in the tested assembly.
(c) Differential pressure at rated flow. Extension will be considered when the valves use the same spool and sleeve assembly.
(d) Actuation. The various types of actuation tests can be considered for extension when the actuators are basically identical and the valve spool is of the same diameter as in the tested assembly.
(e) Noise. Extension of noise tests from tested assemblies will be considered when the slide and sleeve assembly is the same as in a tested assembly and the test conditions for fluid, temperature and flow rate are identical.
(f) High and low temperature. Extension requirements will be subject to review but it is expected that extension will be considered when the method of actuation and the spool/sleeve configuration is similar and the spool diameter is identical to the tested item.
(g) Endurance. While this is subject to specific review it is expected that extension may be possible from testing a solenoid operated valve of each size.
(h) High shock. It is expected that extension from the test of a valve of each type actuation and size will be considered.
(i) Vibration. It is expected that extension from the test of one solenoid operated valve and one manually operated valve of each size will be considered.
(j) Contamination sensitivity. Extension from testing one solenoid operated and one hydraulically operated valve for each size spool will be considered.
(k) Fatigue. The similarity between the tested valve and items to be extended on the basis of similarity will be carefully reviewed. Items with similar bodies will be considered for extension.
(l) Solenoid continuous duty test. The solenoid continuous duty test for a solenoid will be considered for extension to any valve assembly on which the solenoid is used.

6.4.2 Disposition of first article samples. Unless otherwise prohibited by the contract, the offeror may deliver first article items which meet or have been refurbished to meet the specification requirements for new items except that pressure containing items (bodies, end caps, fasteners, seals, etc.) which have been subjected to a fatigue test must not be used. Items subjected to fatigue testing must be marked as not suitable for use.

6.4.3 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 Part or identifying number (PIN). The PIN to be used in acquiring the directional control valve to this specification should be in accordance with the applicable specification sheet (see 3.1).

6.6 Material safety precautions. The application of the dielectric strength test of 4.6.13.2.2 is degrading and is not to be applied to delivered valves. If a dielectric strength test is to be applied at valve overhaul, the applied voltage should be in accordance with the original manufacturer's recommendations but not less than 500 volts.

6.7 Fluid viscosity - fluid temperature data. The test conditions specified in the specification sheets are stated in terms of fluid viscosity since the viscosities of the fluids specified for testing can vary by 10 percent or more at 40°C. The manufacturer may determine test temperature based on viscosity test of the fluid being used. However, in order to facilitate testing and minimizing the necessity for determination of test temperature based on actual fluid viscosity, the Government will accept test data for viscosity requirement identified below without data showing actual fluid viscosity. The manufacturer must periodically verify that the actual viscosity is within the applicable specification requirements for the fluid being used.

	Acceptable fluid temperature range	
Viscosity requirement	MIL-H-17672 (2135 TH)	MIL-L-17331 (2190-TEP)
50 Centistokes (Maximum)	Above 48°C (118°F)	Above 52°C (125°F)
75 Centistokes (Maximum)	Above 38°C (100°F)	Above 43°C (110°F)
75 to 97 Centistokes	35 to 38°C (95 to 100°F)	40 to 43°C (104 to 110°F)

6.8 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

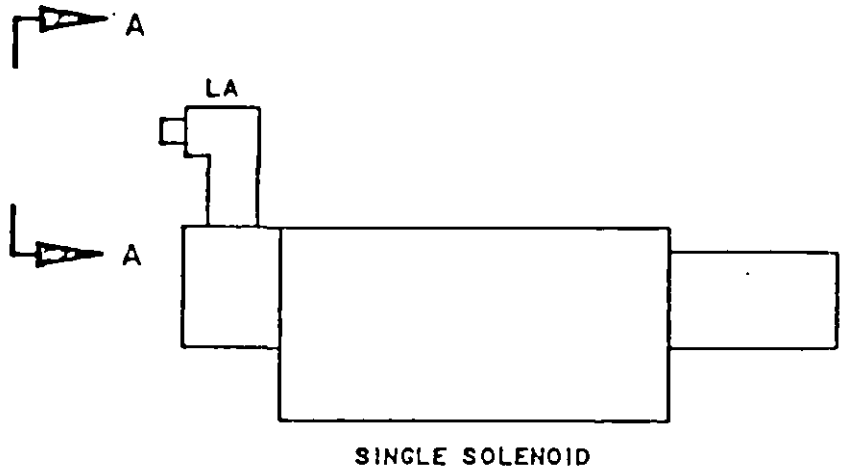
6.9 Drawing recommendations. The specification sheets identify all technical requirements and ensure interchangeability of various manufacturer's valves. Therefore, drawings are not normally required for reacquisition purposes. Data is recommended which will permit emergency repair of the valves when the manufacturer is unable to repair or provide repair parts within the required time.

Accordingly, only limited technical data rights are required when the items being acquired are completely identified by the specification sheets. Level 3 drawings are not required for proprietary quieting technology except as necessary to permit emergency repair. A contractor with the right to furnish limited data, may furnish such limited data directly to the Government rather than through the prime contractor.

6.10 Subject term (key word) listing.

Control valve
Hydraulic component
Hydraulic control
Hydraulic operated
Solenoid operated

Preparing activity:
Navy - SH
(Project 4810-N076)



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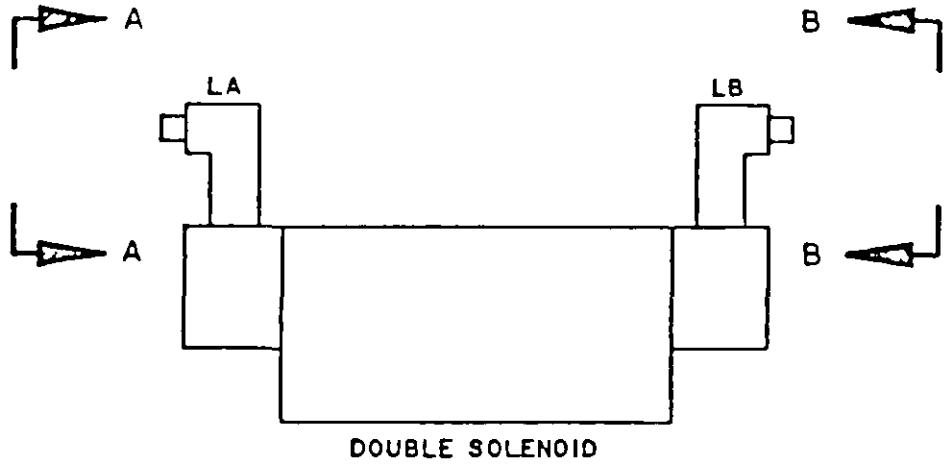
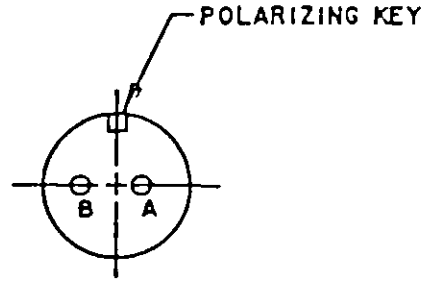
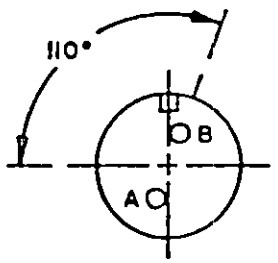


DOUBLE SOLENOID



VIEW A-A

INSERT ARRGT
ELECTRICAL PLUG
4P DESIGNATION
ENLARGED



VIEW B-B

INSERT ARRGT
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4PX DESIGNATION
ENLARGED

SH 13232029

FIGURE 1. Valve orientation.

APPENDIX

ENGINEERING DRAWINGS TECHNICAL CONTENT REQUIREMENTS

10. SCOPE

10.1 Scope. This appendix covers the technical requirements that should be included on drawings when required by the contract or order. This appendix is mandatory only when data item description DI-DRPR-80651 is cited on the DD Form 1423.

20. APPLICABLE DOCUMENTS

20.1 Government documents.

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

SPECIFICATION

MILITARY
DOD-D-1000 - Drawings, Engineering and Associated Lists.

STANDARD

MILITARY
DOD-STD-100 - Engineering Drawing Practices.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

20.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
Y32.10 - Graphic Symbols for Fluid Power Diagrams. (DOD adopted)

(Application for copies should be addressed to the American National Standards Institute Inc., 1430 Broadway, New York, NY 10018.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

30. DRAWINGS

30.1 Engineering drawings technical content requirements. Engineering drawings and associated lists shall meet the requirements of DOD-D-1000 for Level 3 drawings.

30.1.1 Quiet component technology. Level 3 drawings are not required for proprietary quieting technology except as necessary for emergency repair of the valves. This quiet technology includes manufacturing drawings and processes.

30.1.2 Assembly drawings. Valve assembly drawings in accordance with DOD-STD-100 shall be prepared which do not contain any restrictions as to limited data. As a minimum, each drawing shall contain the following information:

(a) Outline dimensions of the valve or valve assembly.
(b) Cross-sectional views showing internal flow paths.
(c) ANSI Y32 [illegible]ymbol of the valve.
(d) Port location and dimensions.
(e) Associated parts list.
(f) Torque requirements for all threaded fasteners.
(g) Dry and wet weight of the valves. (Calculated values may be indicated when the actual weight is unknown.)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-V-868(SH)	VALVES, HYDRAULIC DIRECTIONAL CONTROL, GENERAL SPECIFICATION FOR

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

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.