MILITARY SPECIFICATION

VALVES, CHECK, IN-LINE, FOR HYDRAULIC FLUID AND LUBRICATING OIL FLUID

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 in-line check valves for use in hydraulic fluid and lubricating oil fluid systems of Naval ships operating up to a maximum pressure of 3000 pounds per square inch (lb/in^2).

1.2 Classification. In-line check valve assemblies shall be designated by standard part numbers as follows and as specified (see 6.2.1):

M	24630	/1	XX
Prefix to indicate a military specification	Specification number	Applicable specification sheet number	Dash number to represent dimension and flow requirement (see specification sheets for dash numbers)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

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 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

FEDERAL

QQ-N-281 - Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.
QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting.
UU-P-268 - Paper, Kraft, Wrapping.
PPP-C-850 - Cushioning Material, Polystyrene, Expanded, Resilient (for Packaging Uses).
PPP-C-1120 - Cushioning Material, Uncompressed Bound Fiber for Packaging.

MILITARY

MIL-V-3 - Valves, Fittings, and Flanges (except for Systems Indicated Herein); Packaging of.
MIL-S-901 - Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
MIL-G-5514 - Gland Design; Packings, Hydraulic, General Requirements for.
MIL-H-5606 - Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance.
MIL-H-6083 - Hydraulic Fluid, Petroleum Base, for Preservation and Operation.
MIL-R-6130 - Rubber, Cellular, Chemically Blown.
MIL-R-8791 - Retainer, Packing, Hydraulic, and Pneumatic, Tetrafluoroethylene Resin.
DOD-D-1000 - Drawings, Engineering and Associated Lists.
MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
MIL-P-15024/5 - Plates, Identification.
MIL-C-15726 - Copper-Nickel Alloy, Rod, Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate) and Forgings.
MIL-F-17111 - Fluid, Power Transmission.
MIL-L-17331 - Lubricating Oil, Steam Turbine and Gear, Moderate Service.
MIL-H-17672 - Hydraulic Fluid, Petroleum, Inhibited.
MIL-H-19457 - Hydraulic Fluid, Fire-Resistant, Non-Neurotoxic.
MIL-R-20092 - Rubber Sheets and Assembled and Molded Shapes, Cellular, Synthetic, Open Cell (Foamed Latex).
MIL-C-20159 - Copper-Nickel Alloy (70-30 and 90-10): Castings.
MIL-H-22072 - Hydraulic Fluid, Catapult.
MIL-P-26514 - Polyurethane Foam, Rigid or Flexible, for Packaging.
MIL-G-27617 - Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant.
MIL-R-83248 - Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set Resistant.

MILITARY (Continued)

MIL-H-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, NATO Code Number H-537.

MIL-V-24630/1 - Valves, Check, In-Line, Non-Reversible Installation for Hydraulic Fluid and Lubricating Oil Fluid.

MIL-V-24630/2 - Valves, Check, In-Line, for Hydraulic Fluid and Lubricating Oil Fluid.

STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY

MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).

MIL-STD-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels in Ships of the United States Navy.

MIL-STD-740 - Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment.

MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

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

Y14.5 - Dimensioning and Tolerancing. (DoD adopted)

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

ASTM

A 582 - Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished. (DoD adopted)

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL AEROSPACE STANDARD (NAS)
1638 - Cleanliness Requirements of Parts Used in Hydraulic Systems.

(Application for copies should be addressed to the Aerospace Industries Association of America Inc., 1725 DeSales Street, NW, Washington, DC 20036.)

NATIONAL FLUID POWER ASSOCIATION (NFP(A))
T2.6.1 - Method for Verifying the Fatigue and Static Pressure Ratings of the Pressure Containing Envelope of a Metal Fluid Power Component, Appendix Included.

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

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)
ARP 598 - The Determination of Particulate Contamination in Liquids by The Particle Count Method.

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

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

3.2 Qualification. The valves furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.3 Materials. Unless otherwise specifically approved prior to qualification inspection by the qualifying activity, materials shall be limited to those specified herein and on applicable specification sheets. Metals shall be compatible with the fluid, temperature, service and performance requirements specified herein.

3.3.1 Corrosion-resisting steel. Corrosion-resisting steel shall conform to class 304, 304L, 316 or 316L, condition A in accordance with QQ-S-763 or type 303 in accordance with ASTM A 582.

3.3.1.1 Nickel-copper alloy. Nickel-copper alloy shall conform to class A, form 1, hot finished or cold drawn in accordance with QQ-N-281.

3.3.1.2 Copper-nickel alloy. Copper-nickel alloy shall conform to composition 70-30 as specified in MIL-C-15726 or as specified in type I of MIL-C-20159.

3.3.2 Preformed packing (O-rings). O-rings shall be fluorocarbon rubber in accordance with MIL-R-83248.

3.3.3 Back-up rings. Back-up rings shall be made of tetrafluoroethylene (TFE) in accordance with MIL-R-8791 and shall comply dimensionally with a Military standard for back-up rings.

3.3.4 Prohibited materials. The following materials shall not be used:

(a) Toxic materials.
(b) Zinc or zinc plated materials.
(c) Mercury (see 3.3.4.1).
(d) Magnesium or magnesium base alloys.
(e) Radioactive materials.
(f) Asbestos.
(g) Cadmium.
(h) Beryllium.

3.3.4.1 Mercury. Mercury in any form shall not be used in shipboard equipment, including materials and parts thereof. Mercury shall not be used in manufacturing and test processes (including test equipment such as mercury thermometers) applying to the basic valve but may be used in the manufacturing and test processes for materials and parts provided it is used in such a way that contamination of the materials and parts themselves cannot result.

3.3.5 Recovered materials. Unless otherwise specified herein, all equipment, materials and articles incorporated in the products covered by this specification shall be new and shall be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.4 Design and construction.

3.4.1 External. The valve design, construction and overall valve body dimensions shall be as specified herein and on the applicable specification sheet (see 3.1).

3.4.2 Internal. Internal design and construction shall incorporate the reliability and maintainability requirements specified in 3.4.3. Valve design shall offer the least practicable restriction to the flow of hydraulic or lubricating oil fluids such that the pressure drop requirements specified in 3.5.3 are met. Internal parts shall be accurately guided to prevent misalinement, surging or chattering on the seat at rated flow capacities with the valve axis in any position. The valve seat shall be of adequate strength to withstand

high flow velocities up to 40 feet per second and pressure transients up to 4000 pounds per square inch (lb/in^2) which can be associated with hydraulic systems pressurized to a maximum operating pressure of 3000 lb/in^2. Internal parts shall be sized such that these parts will not pass through the valve waterway. Destructive methods such as peening or staking for retaining internal parts are prohibited.

3.4.3 Reliability and maintainability.

3.4.3.1 Reliability. The valve shall demonstrate 50,000 mean cycles between failure (MCBF) during testing as specified in 4.7.6.

3.4.3.2 Maintainability. The mean time to repair (MTTR) of the valve shall not exceed 30 minutes. MTTR is to be limited to fault isolation and repair by parts replacement. Internal parts shall permit easy disassembly and reassembly and shall prevent incorrect reassembly of parts. Individual valve parts shall be self-alining and shall be non-reversible unless such parts when reversed do not alter function or performance.

3.4.4 Special tools. The design shall be such that special tools will not be required for normal maintenance and inspection of the valve. (Special tools are defined as those tools not 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)).

3.4.5 Threads. Threads shall be of the type specified on the applicable specification sheet and shall be in accordance with FED-STD-H28. Pipe threads are prohibited.

3.4.5.1 Valve body connecting threads. Where required to prevent galling, valve body connecting threads shall be lubricated with grease conforming to MIL-G-27617, type I, prior to assembly of the valve.

3.4.6 Sizes. Valves shall conform to sizes shown on the applicable specification sheet.

3.4.7 Fluid compatibility. The valve shall be constructed of materials that are compatible with fluids as specified in MIL-L-17331, MIL-H-19457, MIL-H-17672, MIL-H-22072, MIL-H-5606, MIL-H-6083, MIL-H-83282 and MIL-F-17111.

3.4.8 O-rings and seal lubricants. O-rings and seals shall be lubricated with grease in accordance with MIL-G-27617, type III, prior to assembly of the valve.

3.4.9 Surface finishes. Burrs shall be removed and sharp edges shall be broken to a radius of 0.005 inch minimum. Unless otherwise specified (see 3.1), surface roughness shall not exceed 125 microinches. Surface roughness shall be in accordance with ANSI B46.1.

3.4.10 O-ring glands. O-ring glands shall be designed in accordance with MIL-G-5514.

3.5 Performance.

3.5.1 Maximum operating pressure. The valve shall function at a maximum operating pressure of 3000 lb/in^2 (see 4.7.1).

3.5.2 Rated flow capacity. Rated flow capacity shall be in accordance with the values shown on the applicable specification sheet (see 4.7.1).

3.5.3 Pressure drop. The differential pressure at rated flow shall not be greater than the values shown on the applicable specification sheet (see 4.7.1).

3.5.4 Proof pressure. The valve shall withstand a proof pressure of 4500 lb/in^2 without external leakage, failure or permanent set (see 4.7.2).

3.5.5 Leakage. Leakage through the valve shall not exceed the values shown in table I when tested at the pressures specified (see 4.7.3, 4.7.3.1 and 4.7.3.2).

TABLE I. Leakage.

Pressure lb/in^2	Maximum internal leakage	
	New (quality conformance)	After endurance test (qualification only)
5	As indicated on slash sheet	150 percent of leakage on slash sheet
500	As indicated on slash sheet	150 percent of leakage on slash sheet
3000	As indicated on slash sheet	150 percent of leakage on slash sheet

3.5.6 Operation.

3.5.6.1 Checking time. The valve shall be completely closed within 1-1/2 seconds after the closing mechanism is released (see 4.7.4.1).

3.5.6.2 Cracking pressure. The cracking pressure shall be not less than 2 lb/in^2 nor greater than 8 lb/in^2 (see 4.7.4.2).

3.5.6.3 Valve chatter. The valve shall operate without surging or chattering on the seat at flow velocities up to 40 feet per second and with the valve axis in any position.

3.5.7 Temperature extremes. The valve shall operate throughout the temperature range of minus 30 degrees Celsius (°C) to 90°C (see 4.7.5 through 4.7.5.3).

3.5.8 Endurance. The valve shall operate during and at the conclusion of 50,000 cycles of operation at not less than one half of the rated flow capacity in test fluid contaminated to class 10 of NAS 1638 with air cleaner (AC) fine or coarse test dust (see 4.7.6).

3.5.9 Fatigue rating. The valve assembly shall have a fatigue rated pressure of 4000 lb/in^2 in accordance with NFPA T2.6.1 based upon a 90 percent assurance level and a 90 percent confidence level. The cyclic test pressure to be used shall be determined by applicable test duration and variability factors identified in NFPA T2.6.1. Unless otherwise specified herein, test requirements shall be as specified in NFPA T2.6.1 (see 4.7.7).

3.5.10 Salt spray. There shall be no evidence of surface corrosion of metal parts following the salt spray test (see 4.7.8).

3.5.11 Vibration. The valve shall meet the vibration requirements as specified in MIL-STD-167-1 for type I equipment. If the valve is symmetrical about a principal axis, vibration testing shall only be accomplished along two orthogonal axes, one of which must be the principal axis of symmetry (see 4.7.9).

3.5.12 Shock. The valve shall meet the shock requirements as specified in MIL-S-901 for grade A class I equipment (see 4.7.10).

3.5.13 Burst pressure. The valve shall withstand a burst pressure of 12,000 lb/in^2 (see 4.7.11).

3.5.14 Airborne noise. The valves shall meet airborne noise grade D requirements shown in table II when tested in accordance with MIL-STD-740 (see 4.7.12).

TABLE II. Sound pressure acceptance levels for machinery and equipment in decibels (dB) relative to 20 micro pascals.

Noise grade	Octave band center frequency - Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
D	91	88	85	82	79	76	73	70	67

3.5.15 Structureborne noise. The valves shall meet the structureborne noise requirements of figure 1 when tested in accordance with MIL-STD-740 (see 4.7.13).

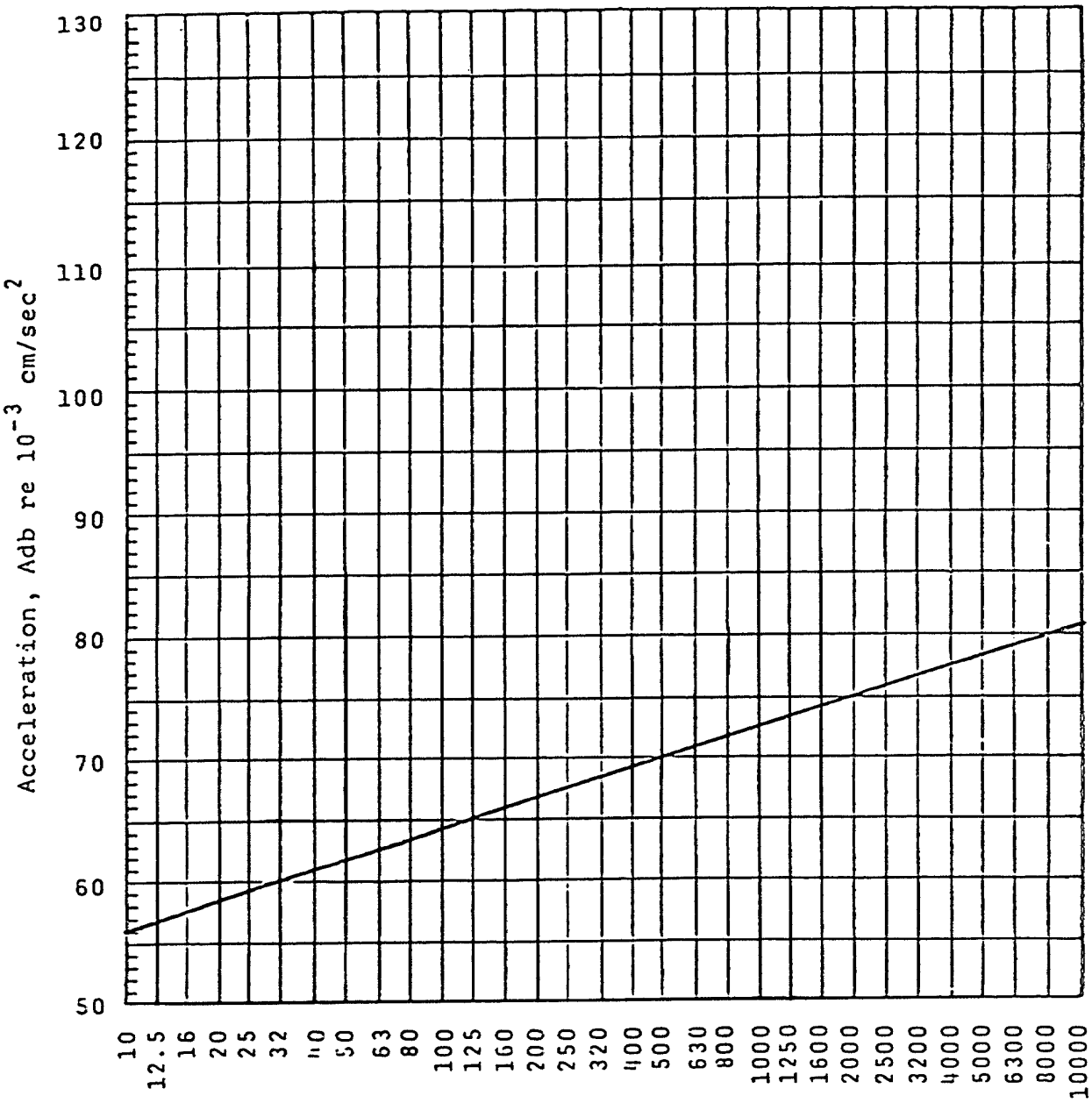

FIGURE 1. Structureborne noise acceptance criteria.

3.6 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance and strength.

3.7 Marking. Each valve shall be clearly and permanently marked with the following information and symbol:

(a) Manufacturer's name, trademark or logo.
(b) Military part number (that is, M24630/1-20).
(c) Manufacturer's part number.
(d) Arrows (2) showing the direction of free flow.
(e) Assembly date (by quarter and year).
(f) Material heat number on pressure boundary parts (if required by acquisition document).

3.7.1 Marking method.

3.7.1.1 Information. Marking shall be applied directly on the valve body by electrochemical etch, vibro tool, cast or forged, or it shall be on severe service identification plates in accordance with MIL-P-15024 and MIL-P-15024/5.

3.7.1.2 Symbol. Two arrows showing direction of free flow along with the word "Flow" shall be located on the valve body at approximately 180 degree increments.

3.8 Radiography. Valves larger than 2-inch nominal pipe size (nps) that are of cast material shall be radiographed in accordance with MIL-STD-278.

3.9 Drawings. When specified (see 6.2.1), one set of reproducible (or microfilm) drawings shall be prepared in accordance with the data ordering document included in the contract or order (see 6.2.2).

3.10 Workmanship. The valve body and internal parts shall be free of contaminants such as lint, dirt, shavings and burrs, sharp edges or any other damage or defect that could make the part unsatisfactory for the purpose intended.

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 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 assure supplies and services conform to prescribed requirements.

4.1.1 Inspection system. The contractor shall provide and maintain an inspection system in accordance with the data ordering documents included in the contract or order (see 6.2.2).

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

(a) Qualification inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to NAVSEA. Copies of drawings as specified in 3.9 shall be submitted with the application for qualification inspection. Qualification inspection shall consist of the inspections shown in table III as outlined in 4.3.1.

TABLE III. Qualification and quality conformance inspections.

Inspection	Requirement paragraph	Test method paragraph	Qualification		Quality conformance
			Sample 1 (maximum clearance)	Sample 2 (mininum clearance)	
Visual, mechanical and radiographic inspection	3.1, 3.3, 3.4, 3.6, 3.7, 3.8 and 3.10	4.6.1		X	X
External	3.4.1	4.6.1.1	X	X	X
Internal	3.4.2	4.6.1.2	X	X	X
Interchangeability	3.6	4.6.1.3	X	X	
Maintainability	3.4.3, 3.4.3.1, 3.4.3.2	4.6.1.4		X	
Pressure drop at rated flow capacity	3.5.2, 3.5.3	4.7.1	X	X	
Proof pressure	3.5.4	4.7.2	X	X	X
Leakage	3.5.5	4.7.3	X	X	X
Operation	3.5.6	4.7.4	X	X	
Checking time	3.5.6.1	4.7.4.1	X	X	X
Cracking pressure	3.5.6.2	4.7.4.2	X	X	X
Temperature extremes	3.5.7	4.7.5, 4.7.5.1, 4.7.5.3		X	
Endurance	3.5.8	4.7.6	X		
Fatigue rating	3.5.9	4.7.7	X 1/	X 1/	
Salt spray	3.5.10	4.7.8		X	
Vibration	3.5.11	4.7.9	X	X	
Shock	3.5.12	4.7.10		X	

TABLE III. Qualification and quality conformance inspections. - Continued

Inspection	Requirement paragraph	Test method paragraph	Qualification		Quality conformance
			Sample 1 (maximum clearance)	Sample 2 (mininum clearance)	
Burst pressure	3.5.13	4.7.11	X		
Airborne noise	3.5.14	4.7.12	X	X	
Structureborne noise	3.5.15	4.7.13	X	X	

1/ While tests can be conducted on a single sample, additional samples allow reduction in test pressure.

4.3.1 Test specimens. Qualification tests shall be conducted in accordance with the following criteria:

(a) Qualification of a specific size valve can be extended to the next larger and next smaller size by similarity. For example, if a 1-inch nps valve is qualified, then the 3/4-inch nps and the 1-1/4 inch nps valve of the same design may be qualified by similarity.
(b) Qualification tests shall be conducted on at least two specimens of each size valve. Unless waived by NAVSEA, the two specimens shall be prepared to adverse dimensions in accordance with 4.3.1.1 through 4.3.1.3.
(c) For those sizes selected for full qualification testing, the inspections shown in table III shall be satisfactorily accomplished.
(d) For those sizes selected for similarity qualification, the tests specified in 4.7.1, 4.7.2, 4.7.4.1 and 4.7.4.2 shall be satisfactorily accomplished.

4.3.1.1 Minimum clearance specimen. One specimen shall be assembled from parts which have been selected to provide that the clearance with regard to linear and diametrical tolerances between moving and non-moving members, conducive to malfunctioning at extreme temperatures, will not exceed 110 percent of the minimum designed clearance permitted by the manufacturer's drawings. For cases of sliding parts where packing friction would influence the performance of the component, such as pistons operated by spring, the maximum packing friction anticipated shall be induced in the test specimen. In these cases, O-ring packing glands shall be fabricated to provide maximum design O-ring squeeze, including the effect of adverse O-ring cross section tolerances. This specimen shall be marked "MIN".

4.3.1.2 Maximum clearance specimen. The second specimen shall be assembled from parts which have been selected to provide that the clearance with regard to linear and diametrical tolerances between moving members, conducive to malfunctioning as a result of wear associated with prolonged operation, will be not less than 90 percent of the maximum designed clearance permitted by the manufacturer's drawings. This specimen shall be marked "MAX".

4.3.1.3 Tolerance considerations. In machining these specimens, surface finishes shall be of no finer degree than the surface finishes as will be produced on production units. Where friction is not a factor, packing glands may be fabricated to nominal dimensions. Lapped or selectively fitted parts need not be made to adverse limits. In order to fabricate specimens with adverse tolerance, it is permissible for one of the mating parts required to produce the critical clearance to be outside of drawing tolerances, provided that the clearance, as fabricated falls within the range specified. In the event that the design clearances in themselves are extremely close, the 10 percent limitations on clearance may be adjusted or waived entirely, but at the discretion of NAVSEA. In case of waiver of adverse tolerance specimens, tests shall be conducted on two representative production samples, and the test report shall analyze the effects of adverse tolerance conditions.

4.3.2 Drawings. Two sets of assembly drawings and one set of detail machining drawings shall be furnished with each check valve assembly submitted for qualification tests. Assembly drawings shall show a cutaway section of details in their normal assembly positions and shall carry part numbers of details and subassemblies. The following data shall be furnished on, or together with, the assembly drawings:

(a) Outline dimensions of the complete assembly.
(b) Dimensional location of ports, and port sizes.
(c) Cross-sectional views showing internal flow paths.
(d) Bill of material, listing specifications, grade, and condition, or other data needed to identify the material proposed.
(e) Complete disassembly procedure and description of tools needed.
(f) Assembly torques for all threaded assemblies.

Dimensioning and tolerancing on drawings shall be in accordance with ANSI Y14.5. Drawings shall be in accordance with DOD-D-1000 requirements for level 2 drawings.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the examination and tests shown in table III. Each valve in the contract quantity shall be subjected to the inspection. Any valve which fails to conform to the inspection shall be rejected.

4.4.1 Quality conformance inspection report. The contractor shall prepare quality conformance inspection reports in accordance with the data ordering document included in the contract (see 6.2.2).

4.5 Test conditions.

4.5.1 Temperature. Unless otherwise specified herein, the tests shall be conducted at room temperature of 15 to 30°C.

4.5.2 Test fluid and fluid temperature. Unless otherwise specified herein, the fluid used for pressure drop tests shall be in accordance with MIL-L-17331 and shall be maintained at a temperature at which the actual fluid viscosity is 100 centistokes (cSt). This temperature shall be maintained to plus or minus 2°C. Viscosity data used to determine test temperature (approximately 38°C) shall be included in the test report.

4.5.3 Positioning. Unless otherwise specified (see 6.2.1), tests may be conducted with the valve axis in either of the following positions:

(a) Horizontal.
(b) Vertical (the force of gravity acting opposite to the checking action).

4.6 Examination.

4.6.1 Visual and mechanical examination.

4.6.1.1 External. Each valve shall be subjected to an external visual and dimensional examination to determine conformance with the requirements of this specification, applicable specification sheets and manufacturer's drawings.

4.6.1.2 Internal. Each valve shall be disassembled and shall be subjected to a visual and dimensional examination to determine conformance with the requirements of this specification, applicable specification sheets and manufacturer's drawings.

4.6.1.3 Interchangeability. The internal parts of both valves shall be interchanged and the valves shall then be reassembled and each shall be mechanically opened three times and visually examined to ensure the valve closes after each opening. If the valves fail to conform to the examination or the interchangeability requirement of 3.6, the valves shall be rejected and no further testing shall be conducted. If, in order to fabricate specimens with adverse tolerances, a part is made outside drawing tolerances, the interchangeability test of that part shall be waived. The internal components shall then be reassembled in the original valve bodies as received.

4.6.1.4 Maintainability demonstration. The maintainability requirements specified in 3.4.3.2 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.

4.7 Tests.

4.7.1 Pressure drop at rated flow. Pressure drop through the check valve shall be measured at a flow equal to the rated flow capacity. The fluid flow shall be accurately maintained. A manometer connected across the check valve may be used for accurate measurement of the pressure drop. The pressure drop through the valve shall not exceed the values specified on the applicable specification sheet. The valve shall not exhibit surging or chattering on the seat during this test.

4.7.2 Proof pressure.

4.7.2.1 Proof pressure (qualification). A proof pressure of 4500 lb/in^2 shall be applied in both the free- and reverse-flow directions at least two successive times in each direction and held for 2 minutes for each pressure application. For the reverse-flow direction, the valve shall be opened mechanically between applications of the proof pressure. There shall be no measurable external leakage, failure or permanent set.

4.7.2.2 Proof pressure (acceptance). The proof pressure of 4500 lb/in^2 shall be applied in both the free- and reverse-flow directions and held 2 minutes for each pressure application. For the reverse-flow direction, the valve shall be opened mechanically between applications of the test pressure. There shall be no evidence of external leakage, failure or permanent set.

4.7.3 Leakage.

4.7.3.1 Leakage (qualification). This test shall be performed with the valve in the horizontal position and repeated with the valve held in the vertical position as specified in 4.5.3. The valve shall be tested for internal leakage by applying the pressures listed in table I. The pressure shall be applied in the direction of reverse flow, and the valve shall be mechanically opened between pressure applications. The leakage measurement period shall be at least 3 minutes but not more than 10 minutes in duration and shall begin within 1 minute after application of the required pressure. The internal leakage shall not exceed the amount shown in table I, with a fluid in accordance with MIL-H-17672 at a temperature which results in a viscosity of 50 cSt or less at atmospheric pressure. There shall be no external leakage during this test.

4.7.3.2 Leakage (acceptance). This test may be performed with the valve in any position. The valve shall be tested for internal leakage by applying pressures of 5 and 3000 lb/in^2 in the reverse-flow direction. The valve shall be opened mechanically between pressure applications. The leakage measurement period shall not be less than 2 minutes or more than 5 minutes. The leakage measurement period shall begin with 1 to 3 minutes of pressure application. The internal leakage shall not exceed the amounts shown in table I with a fluid conforming to MIL-H-17672 at a temperature which results in a viscosity of 50 cSt or less at atmospheric pressure. There shall be no external leakage during this test.

4.7.4 Operational test. Operational tests shall consist of checking time and cracking pressure tests. These tests shall be conducted within a temperature range required to maintain fluid viscosity at 100 cSt. When included as part of another test, the temperature describing such test shall apply.

4.7.4.1 Checking time. The valve shall be in the vertical position defined in 4.5.3. The valve shall be mechanically actuated to the full-open position against a static fluid head of 5 lb/in^2 maximum applied in the reverse flow direction; it shall then be allowed to check before the static head of fluid decreases to 1 lb/in^2 minimum. The time between the release of the closing mechanism and the cessation of fluid flow shall be the checking time and shall not exceed 1-1/2 seconds.

4.7.4.2 Cracking pressure. Gradually increasing pressure shall be applied in the free-flow direction beginning with zero pressure. Cracking pressure shall be observed and shall not be less than 2 lb/in^2 or greater than 8 lb/in^2. Cracking pressure is defined as that pressure at which flow through the valve changes from drops to a solid stream.

4.7.5 Temperature extremes. The fluid for the temperature functioning tests shall be in accordance with MIL-F-17111.

4.7.5.1 Low temperature functioning. The valve shall be connected to a static head of 1 to 3 feet of fluid in the reverse-flow direction. This arrangement shall be maintained at a temperature not warmer than minus 30°C for a period of at least 16 hours. After this period, the valve shall be actuated mechanically five times. After the fifth actuation, the leakage test (qualification) of 4.7.3.1 shall be performed at minus 30°C, and the requirements therein shall be satisifed. Checking time and cracking pressure tests of 4.7.4.1 and 4.7.4.2, respectively shall then be performed at minus 30°C and the requirements of those tests shall be satisfied.

4.7.5.2 Rapid warmup. The low temperature arrangement shall be warmed rapidly until the fluid temperature reads 90°C. While the temperature is being raised, the valve shall be mechanically actuated at approximately 20°C increments of fluid temperature rise to determine proper operation as specified in 4.7.4.1 and 4.7.4.2 throughout the temperature range.

4.7.5.3 High temperature functioning. The following tests shall be conducted at a temperature of 90°C. With a head of 1 to 3 feet of fluid on the valve in the reverse-flow direction, the poppet shall be actuated mechanically 10 times. After the tenth actuation, the leakage test (qualification) of 4.7.3.1 shall be conducted and the requirements therein shall be satisfied. Checking time and cracking pressure tests of 4.7.4.1 and 4.7.4.2, respectively, shall then be performed and the requirements therein shall be satisfied.

4.7.6 Endurance. The valve shall demonstrate 50,000 MCBF at a working pressure of 3000 lb/in^2 with the test fluid contaminated to class 10 of NAS 1638 prior to starting the test. The valve shall be rechecked and additional contaminant added every 12,500 cycles. Contaminant shall be standardized AC fine or coarse test dust or some combination thereof. Test fluid contamination levels shall be determined by the method specified in ARP 598 and shall be made a part of the test report (see 4.4.1). Each cycle shall consist of imposing not less than one half of the rated flow (see 3.1) in the free flow direction through the valve followed by reducing the pressure to zero. Cycling shall be at a rate not to exceed 30 cycles per minute. There shall be no chatter or surging during the test. The leakage test (qualification) of 4.7.3.1 shall be conducted at 25, 50, 75 and 100 percent of the required cycles, and the requirements therein shall be satisfied. At the conclusion of the test, the checking time and cracking pressure tests of 4.7.4.1 and 4.7.4.2, respectively shall be performed and the requirements therein shall be satisfied. Following the test, the valve shall be disassembled and examined as specified in 4.6.1.1 and 4.6.1.2. Any evidence of distortion, physical damage or abnormal wear shall be cause for rejection.

4.7.7 Fatigue impulse test. One or more assemblies shall be subjected to a fatigue rating verification test as specified in 3.5.9. A photograph showing the actual impulse curve, as indicated by oscilloscope (or equivalent method), shall be included in the qualification test report.

4.7.8 Salt spray. The valve shall be subjected to the salt fog (corrosion) test as specified in method 509.1 in accordance with MIL-STD-810. Following the test, the valve shall be disassembled and examined for evidence of corrosion on metal parts. Any evidence of surface corrosion shall be cause for rejection.

4.7.9 Vibration. The valve shall be subjected to and pass the vibration tests as specified in 3.5.11. Following the vibration test, the valve shall be subjected to the leakage test (qualification) of 4.7.3.1 and the requirements therein shall be satisified. The valve shall also be examined as specified in 4.6.1.1 and 4.6.1.2 and the requirements therein shall be satisfied. Any sign of external or internal damage shall be cause for rejection.

4.7.10 Shock. The valve shall be subjected to high-impact (H.I.) mechanical shock tests in accordance with the requirements for grade A, subsidiary component, class I, lightweight, type B, fixture 4A of MIL-S-901. A valve will be considered to have failed the shock test if it will not meet the leakage test (qualification) requirements of 4.7.3.1, checking time requirements of 4.7.4.1, cracking pressure requirements of 4.7.4.2, or shows any signs of external or internal damage when examined in accordance with 4.6.1.1 and 4.6.1.2. The valve shall be pressurized to maximum operating pressure specified in 3.5.1. Shock tested valves shall be post shock test examined and retained by the qualifying activity. These valves shall not be shipped as part of the purchase order.

4.7.11 Burst pressure. Any fluid may be used for this test. Fluid pressure shall be applied in the free-flow direction, with the outlet port plugged, until a pressure of 12,000 lb/in^2 is obtained. The burst pressure shall be applied for not less than 2 minutes. At the end of this period, the valve shall be examined as specified in 4.6.1.1 and 4.6.1.2 and any sign of damage or ruptured parts shall be cause for rejection.

4.7.12 Airborne noise. The valve shall be subjected to and pass the airborne noise tests as specified in 3.5.14.

4.7.13 Structureborne noise. The valve shall be tested and shall comply with the structureborne noise requirements of 3.5.15.

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

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.5).

5.1 Preservation and packaging, packing and marking. Valves shall be individually preserved and packaged level A or C, packed level A, B or C and marked in accordance with MIL-V-3, as specified (see 6.2.1). Protective end covers shall be installed on each valve to prevent thread damage, O-ring sealing surface damage or internal contamination during shipment and storage.

5.2 Cushioning and wrapping materials. Use of loose-fill excelsior, newspaper, shredded paper (all types, including wax paper) and similar hygroscopic or non-neutral materials for applications such as cushioning, filler, stuffing

and dunnage for materials destined for shipboard stowage and use shall be prohibited. Cushioning and wrapping materials selected shall have properties and characteristics for resistance to fire. Examples are:

UU-P-268	- Paper, kraft, wrapping, type II, grade C or D
PPP-C-850	- Polystyrene, expanded, grade SE, type I or II only
PPP-C-1120	- Bound fiber, uncompressed, grade 1, type III or IV, class A
MIL-R-6130	- Cellular rubber, grade A
MIL-R-20092	- Cellular rubber, class 1 or 5
MIL-P-26514	- Polyurethane foam (rigid or flexible).

5.3 Talc or talcum used in the packaging process of items shall be free of asbestos or asbestiform like materials.

5.4 Data. Data shall be prepared for delivery in such a manner as to ensure the required information is protected against deterioration, physical damage, or loss during shipment from the contractor to the receiving activity. Packages or shipping containers shall, as a minimum, conform to the level C requirements of 5.1.

6. NOTES

6.1 Intended use. The valves described in this specification are intended for use in hydraulic fluid and lube oil systems of Naval ships. The non-reversible MIL-V-24630/1 configuration is intended for use in new designs while the MIL-V-24630/2 configuration is intended for logistic support of valves used in existing applications.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number and date of this specification.
(b) Title, number and date of the applicable specification sheet.
(c) Military part number (see 1.2).
(d) Material heat number marking (see 3.7(f)).
(e) Whether reproducible or microfilm is provided (see 3.9).
(f) Positioning of valve axis when testing if other than specified (see 4.5.3).
(g) Applicable levels of preservation and packaging, and packing required (see 5.1 and 5.4).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph no.	Data requirement title	Applicable DID no.	Option
3.9	Drawings, engineering and associated lists	DI-E-7031	Level 2 Drawing number - contractor Design designation - contractor
4.1.1	Inspection system program plan	DI-R-4803	----
4.4.1	Reports, test	DI-T-2072	10.1.b

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.2.2.2 Where the Government has limited rights in the data shown on the drawings as determined by the contractual provisions regarding rights in technical data, the drawing may be marked with a legend. If used, the "Limited Rights Legend" of DAR should be used.

6.3 With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL-24630 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362 and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.4.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.5 Sub-contracted material and parts. The preparation for delivery 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.

Preparing activity:
Navy - SH
(Project 4820-N451)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-V-24630(SH)	Valves, Check, In-Line, For Hydraulic Fluid and Lubricating Oil Fluid

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ 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)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.