INCH-POUND
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SUPERSEDING
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DETAIL SPECIFICATION

VALVES, CHECK, IN-LINE, FOR HYDRAULIC FLUID AND LUBRICATING OIL FLUID, 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 in-line check valves for use in hydraulic fluid and lubricating oil fluid systems of naval ships operating up to a maximum pressure of 3,000 pounds per square inch (lb/in).

1.2 Classification. In-line check valve assemblies are designated by standard part numbers as follows (see 1.3) and as specified (see 6.2).

1.3 Part or identifying number (PIN).

M	**24630**	**/1**	**-**	**XX**
Prefix for Military Specification	Specification Number	Applicable specification sheet number	-	Dash number to represent dimension and flow requirement (see specification sheet for dash numbers)

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

QQ-N-281 - Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

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-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-PRF-6083	-	Hydraulic Fluid, Petroleum Base, for Preservation and Operation
MIL-DTL-15024	-	Plates, Tags and Bands for Identification of Equipment, General Specification for
MIL-P-15024/5	-	Plates, Identification
MIL-C-15726	-	Copper-Nickel Alloy, Sheet, Plate, Strip, Bar, Rod, and Wire
MIL-DTL-17111	-	Fluid, Power Transmission
MIL-PRF-17331	-	Lubricating Oil, Steam Turbine and Gear, Moderate Service
MIL-PRF-17672	-	Hydraulic Fluid, Petroleum, Inhibited
MIL-H-19457	-	Hydraulic Fluid, Fire-Resistant, Non-Neurotoxic
MIL-H-22072	-	Hydraulic Fluid, Catapult, NATO Code Number H-579
MIL-DTL-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
MIL-PRF-27617	-	Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant
MIL-PRF-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-167-1	-	Mechanical Vibrations of Shipboard Equipment (Type I – Environmental and Type II – Internally Excited)
MIL-STD-740-2	-	Structureborne Vibratory Acceleration Measurements and Acceptance Criteria of Shipboard Equipment
MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests

(Copies of these documents are available online at http://quicksearch.dla.mil.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

S9074-AR-GIB-010/278 - Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels

(Copies of this document are available online at https://nll.ahf.nmci navy mil, may be requested by phone at 215-697-2626, or may be requested by email at nllhelpdesk@navy mil. This publication can be located by searching the Navy Publications Index for the TMIN without the suffix.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASME

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

(Copies of this document are available online at www.asme.org.)

ASTM INTERNATIONAL

ASTM A582/A582M - Standard Specification for Free-Machining Stainless Steel Bars

ASTM B369 - Standard Specification for Copper-Nickel Alloy Castings

(Copies of these documents are available online at www.astm.org.)

NATIONAL FLUID POWER ASSOCIATION (NFPA)

NFPA-T2.6.1 - Fluid Power Components – Method for Verifying the Fatigue and Establishing the Burst Pressure Ratings of the Pressure Containing Envelope of a Metal Fluid Power Component

(Copies of this document are available online at www.nfpa.com.)

SAE INTERNATIONAL

SAE-AMS7276 - Rubber: Fluorocarbon (FKM) High-Temperature-Fluid Resistant Low Compression Set for Seals in Fuel systems and Specific Engine Oil Systems

SAE-AMS-QQ-S-763 - Steel, Corrosion Resistant, Bars, Wire, Shapes, and Forgings

SAE-AS598 - Aerospace Microscopic Sizing and Counting of Particulate Contamination for Fluid Power Systems

SAE-AS4059 - Aerospace Fluid Power - Cleanliness Classification for Hydraulic Fluids

SAE-AS4716 - Gland Design, O-ring and Other Elastomeric Seals

SAE-AS5781 - Retainers (Backup Rings), Hydraulic and Pneumatic, Polytetrafluoroethylene Resin, Single Turn, Scarf-Cut, for Use in AS4716 Glands

SAE-AS5782	-	Retainers (Backup Rings), Hydraulic and Pneumatic, Polytetrafluoroethylene Resin, Solid, Un-Cut, for Use in AS4716 Glands
SAE-AS8791	-	Hydraulic and Pneumatic Retainers (Back-Up Rings), Polytetrafluoroethylene (PTFE) Resin

(Copies of these documents are available online at www.sae.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (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 valve 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 Qualification. The valves furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 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 SAE-AMS-QQ-S-763 or Type 303 in accordance with ASTM A582/A582M.

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, Alloy B (70/30 Cu Ni C96400) of ASTM B369.

3.3.2 Preformed packing (O-rings). O-rings shall be fluorocarbon rubber in accordance with SAE-AMS7276.

3.3.3 Backup rings. Backup rings for new designs shall be in accordance with SAE-AS5781 or SAE-AS5782 for use in O-ring glands conforming to SAE-AS4716. Backup rings that conform to SAE-AS8791 are permitted for use in existing valve designs that have O-ring glands conforming to MIL-G-5514.

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 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

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 misalignment, 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 4,000 lb/in , which can be associated with hydraulic systems pressurized to a maximum operating pressure of 3,000 lb/in . 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 shall not be used.

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 4.6.6.

3.4.3.2 Maintainability. The mean time to repair (MTTR) of the valve shall not exceed 30 minutes. The 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-aligning 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 (see 6.5.2).

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 shall not be used. Where required to prevent galling, valve body connecting threads shall be lubricated with grease conforming to MIL-PRF-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. Unless otherwise specified (see 6.2), the valve shall be constructed of materials that are compatible with fluids as specified in MIL-PRF-17331, MIL-H-19457, MIL-PRF-17672, MIL-H-22072, MIL-PRF-6083, MIL-PRF-83282, and MIL-DTL-17111.

3.4.8 O-rings and seal lubricants. O-rings and seals shall be lubricated with grease in accordance with MIL-PRF-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 ASME B46.1.

3.4.10 O-ring glands. O-ring glands for new designs shall be in accordance with SAE-AS4716. O-ring glands that conform to MIL-G-5514 are permitted for use in existing valve designs.

3.5 Performance.

3.5.1 Maximum operating pressure. The valve shall function at a maximum operating pressure of 3,000 lb/in (see 4.6.1).

3.5.2 Rated flow capacity. Rated flow capacity shall be in accordance with the values shown on the applicable specification sheet (see 4.6.1).

3.5.3 Pressure drop. The differential pressure at rated flow shall be not greater than the values shown on the applicable specification sheet (see 4.6.1).

3.5.4 Proof pressure. The valve shall withstand a proof pressure of 4,500 lb/in without external leakage, failure, or permanent set (see 4.6.2).

3.5.5 Leakage. Leakage through the valve shall not exceed the values shown in table I when tested at the pressures specified (see 4.6.3, 4.6.3.1, and 4.6.3.2).

TABLE I. Leakage.

Pressure (lb/in^2)	Maximum internal leakage	
	New (conformance)	After endurance test (qualification only)
5	As indicated on specification sheet	150 percent of leakage on specification sheet
500	As indicated on specification sheet	150 percent of leakage on specification sheet
3,000	As indicated on specification sheet	150 percent of leakage on specification sheet

3.5.6 Operation.

3.5.6.1 Checking time. The valve shall be completely closed within 1½ seconds after the closing mechanism is released (see 4.6.4.1).

3.5.6.2 Cracking pressure. The cracking pressure (see 6.5.1) shall be not less than 2 lb/in nor greater than 8 lb/in (see 4.6.4.2).

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 -22 to +194 °F (-30 to +90 °C) (see 4.6.5 through 4.6.5.3).

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 SAE-AS4059 (see 4.6.6).

3.5.9 Fatigue rating. The valve assembly shall have a fatigue rated pressure of 3,000 lb/in 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 (see 4.6.7).

3.5.10 Salt spray. There shall be no evidence of surface corrosion of metal parts following the salt spray test (see 4.6.8). The valve shall be subjected to a salt spray test if materials other than specified herein are used for the valve external body.

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 4.6.9).

3.5.12 Shock. The valve shall meet the shock requirements as specified in MIL-S-901 for Grade A, Class I equipment (see 4.6.10).

3.5.13 Structureborne noise. The valves shall meet the structureborne noise requirements of figure 1 when tested in accordance with MIL-STD-740-2 (see 4.6.11).

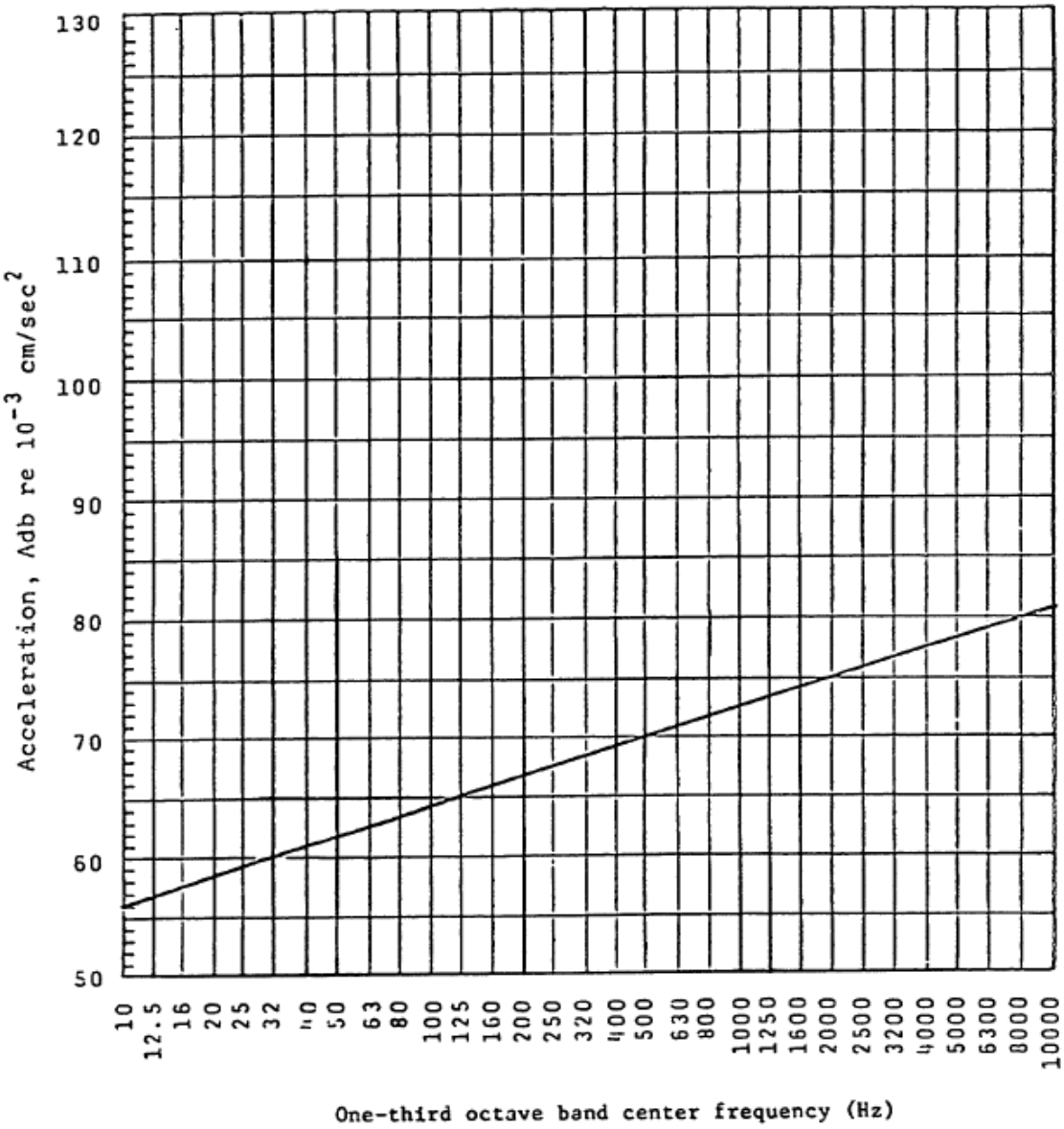

FIGURE 1. Structureborne noise acceptance criteria.

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 the free flow (see 3.7.1.2).

e. Assembly date (by quarter and year).

f. Material heat number on pressure boundary parts (when specified, [see 6.2]).

3.7.1 Marking method.

3.7.1.1 Information. Marking shall be clearly and permanently applied on the valve body or it shall be on severe service identification plates in accordance with MIL-DTL-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 S9074-AR-GIB-010/278.

3.9 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 adversely affect the performance of the part for the purpose intended.

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall be conducted at a laboratory acceptable to NAVSEA. Qualification inspection shall consist of the inspections shown in table II as outlined in 4.2.1.

TABLE II. Qualification and conformance inspections.

Inspection	Requirement paragraph	Test method paragraph	Qualification [1/]		Conformance
			Sample 1 (maximum clearance)	Sample 2 (minimum clearance)	
Visual, mechanical, and radiographic inspection	3.1, 3.3, 3.4, 3.6, 3.7, 3.8, and 3.9	4.5.1		X	X
External	3.4.1	4.5.1.1	X	X	X
Internal	3.4.2	4.5.1.2	X	X	X
Interchangeability	3.6	4.5.1.3	X	X	
Maintainability	3.4.3, 3.4.3.1, 3.4.3.2	4.5.1.4		X	
Pressure drop at rated flow capacity	3.5.2, 3.5.3	4.6.1	X		
Proof pressure	3.5.4	4.6.2	X	X	X
Leakage	3.5.5	4.6.3	X	X	X
Operation	3.5.6	4.6.4	X	X	
Checking time	3.5.6.1	4.6.4.1	X	X	
Cracking pressure	3.5.6.2	4.6.4.2	X	X	X
Temperature extremes	3.5.7	4.6.5, 4.6.5.1, 4.6.5.3		X	
Endurance	3.5.8	4.6.6	X		
Fatigue rating	3.5.9	4.6.7	X[2/]		
Salt spray	3.5.10	4.6.8		X	
Vibration	3.5.11	4.6.9		X	
Shock	3.5.12	4.6.10		X	
Structureborne noise	3.5.13	4.6.11	X		

NOTES:

[1/] For the purpose of qualification, a valve of the next smaller or larger size may be used to fulfill the requirement for two samples.

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

4.2.1 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 the next smaller size by similarity. For example, if a 1-inch NPS valve is qualified, then the ¾-inch NPS and the 1¼-inch NPS valve of the same design may be qualified by similarity.

b. Qualification tests shall normally be conducted on at least two specimens of each size valve, manufactured to the adverse dimensions of 4.2.1.1 and 4.2.1.2. However, qualification tests may be conducted on a single specimen manufactured to nominal dimensions when approved by the qualifying activity based on an engineering analysis, which shows that the valve will operate as required with adverse tolerances. When a single specimen is tested for qualification, the tests for sample 2 shall be conducted in addition to the tests for sample 1. Tests that are the same for both samples need not be repeated when a single sample is tested.

c. For those sizes selected for full qualification testing, the inspections shown in table II shall be accomplished.

d. For those sizes selected for similarity qualification, the tests specified in 4.6.1, 4.6.2, 4.6.4.1, and 4.6.4.2 shall be accomplished. Only a single specimen is required for these tests, and the adverse tolerance requirements of 4.2.1.1 and 4.2.1.2 do not apply.

4.2.1.1 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."

4.2.1.2 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 may be fabricated to nominal dimensions. 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 Conformance inspection. Conformance inspection shall include the examination of 4.5 and the tests of 4.6 through 4.6.11. 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 Test conditions.

4.4.1 Temperature. Unless otherwise specified herein, the tests shall be conducted at room temperature of 59 to 86 °F (15 to 30 °C).

4.4.2 Test fluid and fluid temperature. Unless otherwise specified herein, the fluid used for pressure drop tests shall be in accordance with MIL-PRF-17331 and shall be maintained at a temperature at which the actual fluid viscosity is 100 centistokes (cSt). This temperature shall be maintained to ±35.6 °F (±2 °C). Viscosity data used to determine test temperature (approximately 100.4 °F [38 °C]) should be recorded.

4.4.3 Positioning. Unless otherwise specified (see 6.2), 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).

4.5 Examination.

4.5.1 Visual and mechanical examination.

4.5.1.1 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.

4.5.1.2 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.

4.5.1.3 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 tolerances, the interchangeability test of that part shall be waived. The internal components shall then be reassembled in the original valve bodies as received.

4.5.1.4 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.

4.6 Tests.

4.6.1 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.

4.6.2 Proof pressure.

4.6.2.1 Proof pressure (qualification). A proof pressure of 4,500 lb/in 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.

4.6.2.2 Proof pressure (acceptance). The proof pressure of 4,500 lb/in 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.

4.6.3 Leakage.

4.6.3.1 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 4.4.3. 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 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.

4.6.3.2 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 3,000 lb/in in the reverse-flow direction. The valve shall be opened mechanically between pressure applications. 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 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.

4.6.4 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.

4.6.4.1 Checking time. The valve shall be in the vertical position defined in 4.4.3. The valve shall be mechanically actuated to the full-open position against a static fluid head of 5 lb/in 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 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 1½ seconds.

4.6.4.2 Cracking pressure. Gradually increasing pressure shall be applied in the free-flow direction beginning with zero pressure. Cracking pressure shall be observed and shall be not less than 2 lb/in or greater than 8 lb/in (see 6.5.1).

4.6.5 Temperature extremes. The fluid for the temperature functioning tests shall be in accordance with MIL-DTL-17111 or MIL-PRF-5606.

4.6.5.1 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 -22 °F (-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 4.6.3.1 shall be performed at -22 °F (-30 °C), and the requirements therein shall be satisfied. Checking time and cracking pressure tests of 4.6.4.1 and 4.6.4.2, respectively, shall then be performed at -22 °F (-30 °C) and the requirements of those tests shall be satisfied.

4.6.5.2 Rapid warm-up. The low temperature arrangement shall be warmed rapidly until the fluid temperature reads 194 °F (90 °C). While the temperature is being raised, the valve shall be mechanically actuated at approximately 68 °F (20 °C) increments of fluid temperature rise to determine proper operation as specified in 4.6.4.1 and 4.6.4.2 throughout the temperature range.

4.6.5.3 High temperature functioning. The following tests shall be conducted at a temperature of 194 °F (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 4.6.3.1 shall be conducted and the requirements therein shall be satisfied. Checking time and cracking pressure tests of 4.6.4.1 and 4.6.4.2, respectively, shall then be performed and the requirements therein shall be satisfied.

4.6.6 Endurance. The valve shall demonstrate 50,000 MCBF at a working pressure of 3,000 lb/in with the test fluid contaminated to Class 10 of SAE-AS4059 prior to starting the test. The valve shall be rechecked and additional contaminant added every 12,500 cycles. Test fluid contamination levels shall be determined by the method specified in SAE-AS598. 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 4.6.3.1 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 4.6.4.1 and 4.6.4.2, respectively, shall be performed and the requirements therein shall be satisfied. Following the test, the valve shall be disassembled and examined as specified in 4.5.1.1 and 4.5.1.2. Any evidence of distortion, physical damage or abnormal wear shall be cause for rejection.

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

4.6.8 Salt spray. The valve shall be subjected to the salt fog (corrosion) test as specified in Method 509 of 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. The salt fog test shall not be required if the valve body is constructed of material specified in 3.3.1, 3.3.1.1, and 3.3.1.2. For other body materials, the salt fog test may be waived, but only at the discretion of NAVSEA. When more than one design is developed by the same contractor who uses the same method of surface preservation for all designs, only one representative unit shall require this test, provided the same materials are used. Test data on similar equipment with the same base, coating materials, and equivalent coating thickness may be used to meet this requirement.

4.6.9 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 4.6.3.1 and the requirements therein shall be satisfied. The valve shall also be examined as specified in 4.5.1.1 and 4.5.1.2 and the requirements therein shall be satisfied. Any sign of external or internal damage shall be cause for rejection.

4.6.10 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 4.6.3.1, checking time requirements of 4.6.4.1, cracking pressure requirements of 4.6.4.2, or shows any signs of external or internal damage when examined in accordance with 4.5.1.1 and 4.5.1.2. The valve shall be pressurized to the maximum operating pressure specified in 3.5.1. Shock tested valves will be post shock test examined and retained by the qualifying activity.

4.6.11 Structureborne noise. The valve shall be tested and shall comply with the structureborne noise requirements of 3.5.13.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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 described in this specification are intended for use in hydraulic fluid and lube oil systems of naval ships. The non-reversible MIL-DTL-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 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. Hydraulic fluid compatibility requirements (see 3.4.7).
e. Material heat number marking (see 3.7f).
f. Positioning of valve axis when testing, if other than specified (see 4.4.3).
g. Packaging requirements (see 5.1).
h. Provisioning requirements (see 6.4).
i. Union nut material requirements, if other than specified (see applicable specification sheet).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.3.1 Provisions governing qualification. Copies of SD-6, "Provisions Governing Qualification" may be obtained using the ASSIST Online database at https://assist.dla.mil.

6.4 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified (see 6.2). When ordering spare 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 Definitions.

6.5.1 Cracking pressure. Cracking pressure is defined as that pressure at which flow through the valve changes from drops to a solid stream.

6.5.2 Special tools. Special tools are defined as those tools not listed in the General Services Administration (GSA) Global Supply Catalog. Copies of this catalog are available online at http://gsa.gov.

6.6 Subject term (key word) listing.

Non-reversible

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

Custodian:
Navy – SH

Preparing activity:
Navy – SH
(Project 4820-2013-006)

Review activity:
DLA – CC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.