MIL-V-19069B
20 January 1986
SUPERSEDING
MIL-V-19069A(ASG)
30 April 1957

MILITARY SPECIFICATION

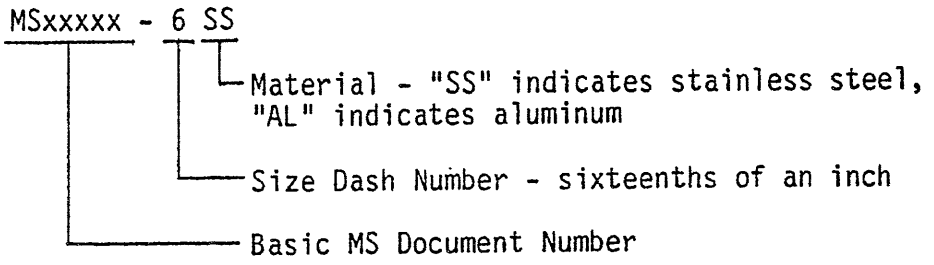
VALVE, CHECK, HYDRAULIC, AIRCRAFT, TYPE II SYSTEMS

This specification has been approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers hydraulic check valves for use in type II aircraft hydraulic systems conforming to specification MIL-H-5440. The complete specification for these check valves consists of specification MIL-H-8775, which covers the general requirements common to all aircraft hydraulic components, and this specification which includes additional requirements specifically applicable to type II check valves.

1.2 Part number. Hydraulic check valves furnished under this specification shall bear the appropriate number code in accordance with the following (see 3.5):



2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, 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 1650

SPECIFICATIONS

MILITARY

MIL-H-5440	Hydraulic Systems, Aircraft, Types I and II, Design and Installation Requirements for
MIL-H-8775	Hydraulic System Components, Aircraft and Missiles, General Specification for

STANDARDS

MILITARY

MIL-STD-129	Marking for Shipment and Storage
MS28765	Valve, Check, Hydraulic, Internal Ports, 3000 PSI, Type II Systems
MS28771	Valve, Check, Hydraulic, Flared, 3000 PSI, Type II Systems
MS28892	Valve, 3000 PSI Hydraulic Check, Flareless, Type II Systems

(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 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

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

3.2 Qualification. Valves furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids (see 4.5 and 6.3).

3.3 Material. The material shall be either stainless steel or aluminum, in accordance with MIL-H-8775 and as specified in the applicable MS sheet.

3.4 Design and construction. Valves shall be of the design, construction and physical dimensions specified (see 3.1). Valves furnished under this specification shall conform to all the requirements of specification MIL-ti-8775 except that in the case of conflict between the requirements of specification MIL-H-8775 and this specification, the requirements of this specification shall govern.

3.5 Marking. Valves shall be stamped with the military part number (see 1.2), the manufacturer's name or code symbol, and date code. The marking shall be stamped on the body of the valve in accordance with the applicable MS sheet.

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 Responsibility for compliance. All items must meet all requirements of Sections 3 and 5. The inspections 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material,

4.2 General. The qualification and quality conformance provisions contained in Section 4 of specification MIL-H-8775 are applicable to, and form a part of, this specification. In addition, the following quality assurance provisions shall apply.

4.3 Inspection conditions.

4.3.1 Positioning. Unless otherwise specified, inspections may be conducted with the valve axes in either of the following positions:

a. Horizontal,

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

4.4 Qualification inspection. The qualification inspections described herein shall be performed on the sample specimen by the manufacturer and the activity responsible for qualification, in the order specified in tables I and II, respectively. These inspections may be supplemented with inspections performed under actual service conditions at the option of the procuring activity.

TABLE I. Manufacturer's preliminary inspection of qualification samples.

Inspections required					
Maximum clearance specimen			Minimum clearance specimen		
Order	Inspection	Paragraph	Order	Inspection	Paragraph
1	Examination	4.5.1	1	Examination	4.5.1
2	Immersion	4.5.2	2	Leakage	4.5.5
3	Proof pressure	4.5.3	3	Proof pressure	4.5.3
4	Surge flow	4.5.4	4	Extreme temperature	4.5.8
5	Leakage	4.5.5			
6	Operational	4.5.6			
7	Pressure drop	4.5.7			
8	Extreme temperature	4.5.8			
9	Endurance cycling	4.5.9			
10	Burst pressure	4.5.10			

TABLE II. Qualification inspections.

Inspections required					
Maximum clearance specimen			Minimum clearance specimen		
Order	Inspection	Paragraph	Order	Inspection	Paragraph
1	Examination	4.5.1	1	Examination	4.5.1
2	Inspection and comparison of results with those on minimum clearance specimen		2	Immersion	4.5.2
			3	Proof pressure	4.5.3
			4	Surge flow	4.5.4
			5	Leakage	4.5.5
			6	Operational	4.5.6
			7	Pressure drop	4.5.7
			8	Extreme temperature	4.5.8
			9	Endurance cycling	4.5.9
			10	Burst pressure	4.5.10

4.4.1 Sample. The sample to be subjected to qualification inspection shall be taken at random from a production run and shall be produced with equipment and procedures normally used in production.

4.4.2 Retention of qualification. Qualification approval based on evaluation of handmade samples or models other than normal production samples will be subject to requalification as directed by the procuring activity. The manufacturer shall furnish the activity responsible for qualification full particulars regarding changes in manufacturing processes, product design

(including component parts thereof) and of resulting changes in performance. Results of tests conducted to prove the acceptability of such changes shall be furnished. Submission of samples for evaluation shall be as directed by the activity responsible for qualification when such changes are made or when conformance of the product to requirements of this specification is questionable.

4.5 Qualification inspection.

4.5.1 Inspection of product. The maximum and minimum clearance specimens shall each be carefully examined to determine conformance with all the requirements of this specification and for any visible defects. The critical clearance dimensions shall be checked and recorded for comparison of results. The dry weight of the assembled valve shall be recorded.

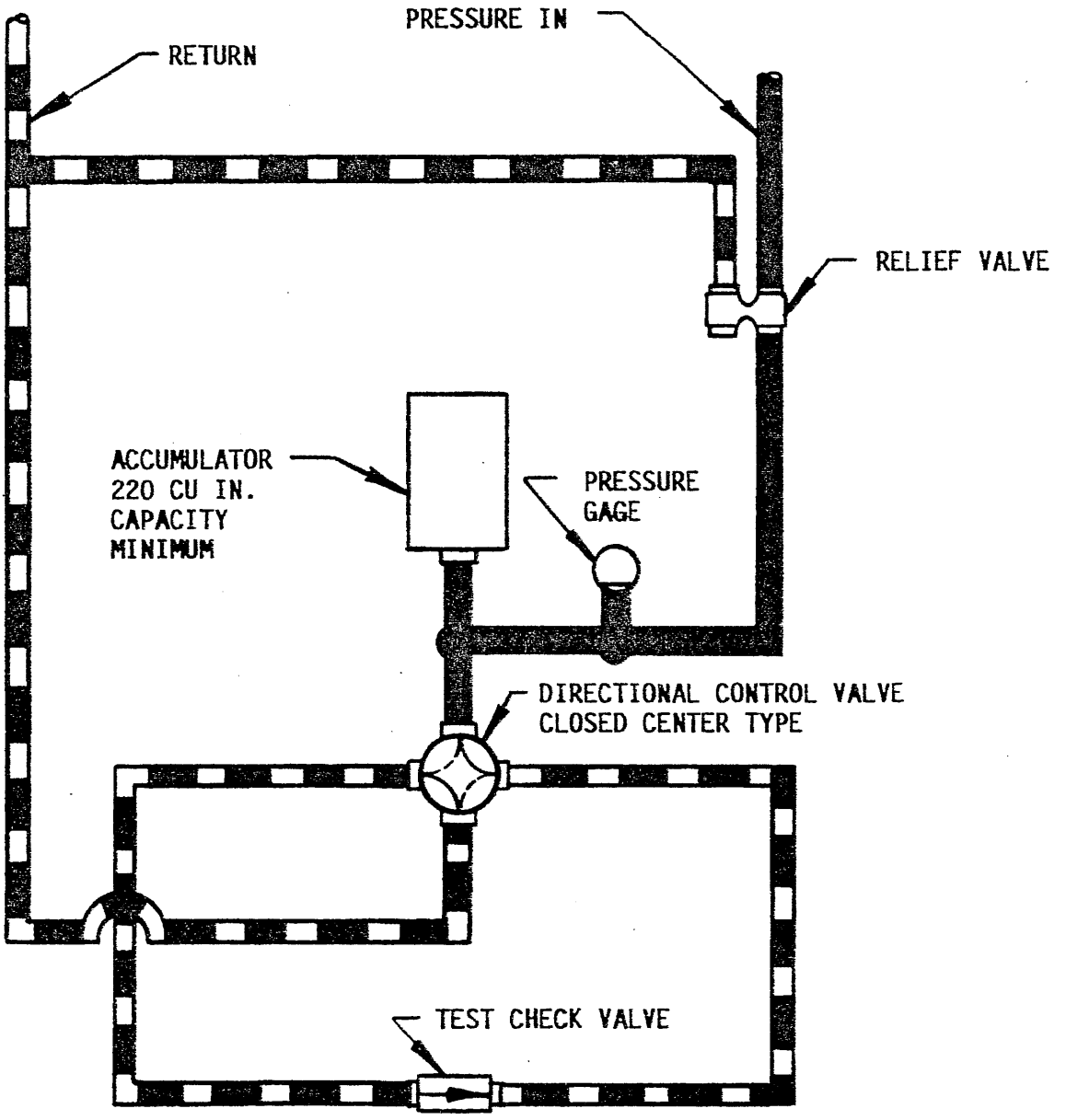
4.5.2 Fluid immersion. All check valves shall be immersed in hydraulic fluid for a continuous period of 72 hours at a fluid temperature of 275°F, prior to conducting the-remainder of the qualification inspections specified herein, All internal parts of the check valve shall be in contact with the fluid during this immersion. After the 72-hour soak period, the check valve shall remain in the fluid at normal room temperature until ready for inspection. The interior of the valve shall not be exposed to air for any appreciable length of time during the inspection.

4.5.3 Proof pressure. This inspection shall be performed at a temperature of 275°F. A proof pressure of 4500 psi shall be applied in both the free- and reverse-flow directions at least two successive times in each direction and held for two minutes for each pressure application. For the reverse-flow direction, the poppet shall be mechanically unseated between applications of the proof pressure. There shall be no measurable external leakage, failure or permanent set.

4.5.4 Surge flow. This inspection shall be performed within a temperature range of 70° to 120°F; An inspection setup similar to figure 1 shall be used, and the precharge pressure for the accumulator shall be stabilized at 1000 psi. The hydraulic test pressure shall be 3000 psi. The directional control valve shall be operated in the following sequence for 25 complete cycles. The following four-point sequence shall total one complete cycle:

a. The directional control valve handle shall be in a neutral position to permit the buildup of rated hydraulic pressure in the accumulator.

b. The directional control valve handle shall be quickly actuated to permit flow through the check valve in the free-flow direction. The directional control valve handle shall be permitted to remain in this position until the hydraulic pressure drops to not more than the specified precharge in the accumulator.



ALL TUBE OD'S SHALL BE AT LEAST ONE SIZE LARGER THAN THE CHECK VALVE TUBE SIZE. TUBE LENGTHS SHALL BE A MINIMUM. HOSE SHALL NOT BE USED.

FIGURE 1. Typical setup for surge flow test.

c. The valve handle shall be returned to the neutral position to permit the buildup of the rated hydraulic pressure-in the accumulator.

d. The directional control valve handle shall be quickly actuated to permit reverse flow to the check valve, The valve handle shall be allowed to remain in this position for at least three seconds and then moved to the original neutral position.

4.5.5 Leakage. This inspection shall be performed with the valve in the horizontal position. Unless otherwise specified, this inspection shall be conducted at a fluid temperature of 100°F. The valve shall be tested for internal leakage by applying the pressure listed in table III for a minimum period of 32 minutes each. The pressures shall be applied in the direction of reverse flow and the valve poppet shall be mechanically unseated between pressure applications. The leakage measurement period shall be a least 30 minutes in duration and shall begin two minutes after application of the required pressure. The internal leakage shall not exceed the amounts stated in table III. There shall be no measurable external leakage during this inspection.

TABLE III. Leakage.

Pressure (psi)	Maximum internal leakage (cubic cm for 30 minutes)
5	1.5
1000	No measurable amount
3000	No measurable amount

4.5.6 Operational inspection. Operational inspection shall consist of two separate inspections: (1) checking time and (2) checking pressure. These inspections shall be conducted within a temperature range of 70° to 120°F. When included as part of another inspection, the temperature specified for that inspection shall apply.

4.5.6.1 Checking time. The valve poppet shall be mechanically actuated to the full-open position against a static fluid head of 5 psi maximum; it should then be allowed to check before the static head of fluid decreases to 1 psi minimum, The time between the release of the poppet and the cessation of fluid flow shall be the checking time and shall not exceed 1.5 seconds.

4.5.6.2 Cracking pressure. Gradually increasing pressure shall be applied in the free-flow direction beginning with zero pressure. Cracking pressure is defined as that pressure at which fluid is bypassed through the valve, and shall be not less than 2 psi or greater than 8 psi.

4.5.7 Pressure drop. This inspection shall be performed at a fluid temperature of 100°F. The pressure drop through the check valve shall be measured at a flow equal to the rated flow capacity. The fluid flow shall be

held constant. A manometer connected across the check valve may be used for accurate measurement of the pressure drop- The pressure drop shall not exceed the values specified in table IV.

TABLE IV. Maximum pressure drop.

Valve size dash no.	Tube size (in.)	Rated flow capacity, min (gpm)	Pressure drop max (psi)
4	1/4	1.2	10
6	3/8	3.5	10
8	1/2	6.0	10
10	5/8	10.5	10
12	3/4	16.0	10
16	1	29.0	10

4.5.8 Extreme temperature functioning.

4.5.8.1 Low temperature functioning. The valve shall be connected to a static head of one to three feet of hydraulic fluid in the reverse-flow direction. This arrangement shall be maintained at a temperature not warmer than -65°F for a period of four hours. After this period, the valve poppet shall be mechanically actuated ten times. After the tenth actuation, the leakage inspection shall be performed at -65°F and the requirements therein shall be satisfied. Operational inspection (checking time and cracking pressure) shall then be performed at -65°F and the requirements of those inspections shall be satisfied.

4.5.8.2 Rapid warmup. The low temperature setup shall be rapidly warmed until the fluid temperature reaches 275°F. While the temperature is being raised, the valve poppet shall be mechanically actuated at approximate 70°F increments of fluid temperature rise to determine satisfactory operation throughout the temperature range.

hydraulic fluid on the valve in the reverse-flow direction, the poppet shall be mechanically actuated ten times, After the tenth actuation, the leakage inspection shall be conducted and the requirements therein shall be satisfied. Operational inspections (checking time and cracking pressure) shall then be performed, and the requirements therein shall be satisfied.

cycles of operation at a rate of 35 + 5 cycles per minute. Each cycle shall consist of flow through the valve at-the rated flow capacity for the valve size, followed by a reversal of the direction of flow and application of the maximum rated pressure. Of the total number of cycles, 12,500 shall be performed in accordance with the procedure outlined herein for high temperature cycling. The remaining 37,500 cycles shall be performed in accordance with the procedure outlined herein for intermediate temperature cycling. Surge

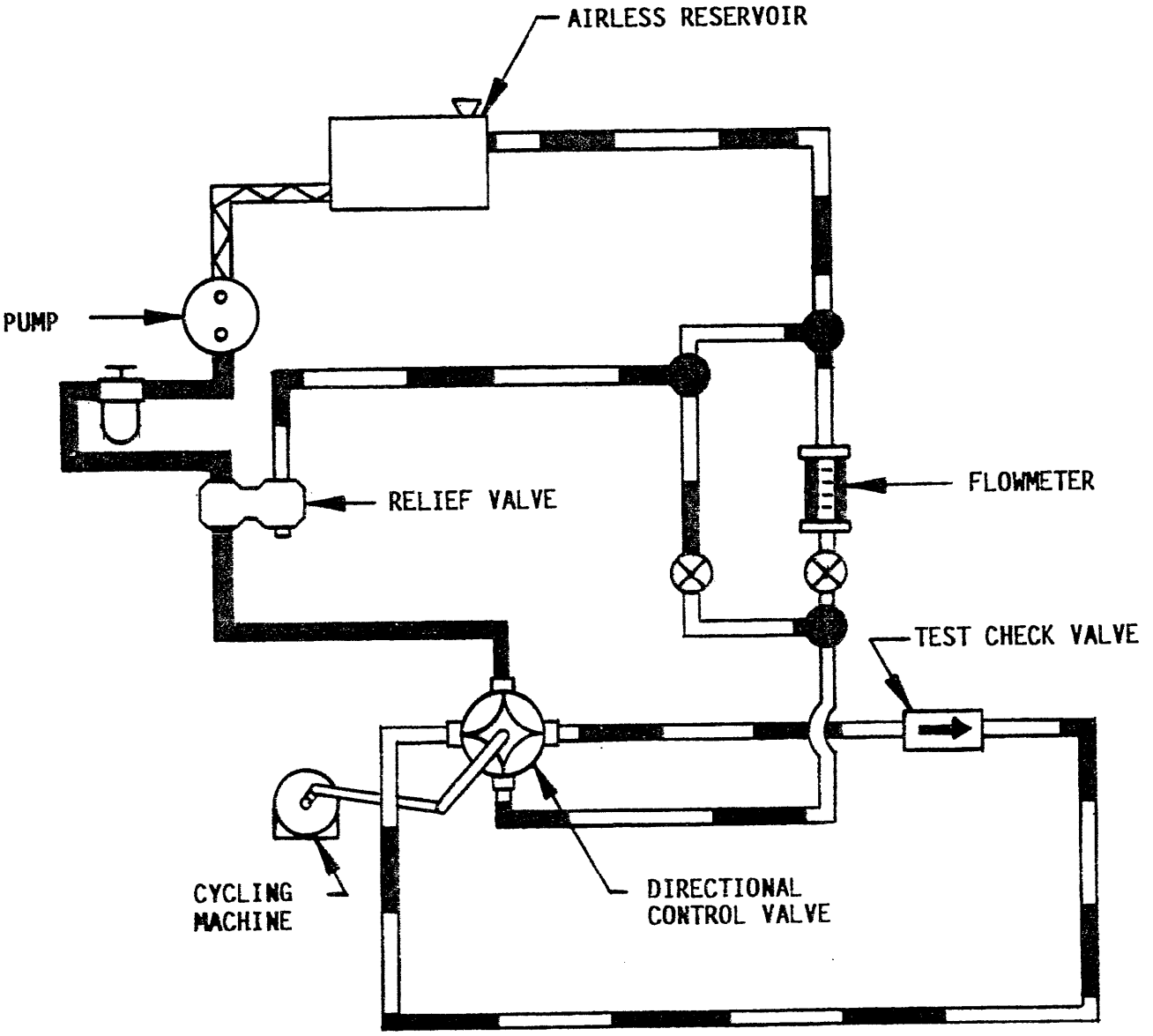


FIGURE 2. Typical setup for endurance cycling test.

pressure during the pressure buildup portion of each cycle shall be 150 ± 5 percent of the rated pressure. Surge pressure in the free-flow direction shall be between 125 and 150 percent of the rated pressure. The rated flow capacity shall be as indicated in table IV.

4.5.9.1 High temperature cycling. The valve shall be subjected to 12,500 cycles of operation at a temperature of 275°F. Upon completion of these 12,500 cycles, the valve shall be soaked at a temperature of 275°F for a period of one hour with the rated pressure applied to the valve in the reverse-flow direction. The pressure shall then be relieved to approximately zero, and the valve soaked for an additional one hour at a temperature of 275°F. The temperature shall then be reduced to the 70° to 120°F range, and the operational inspections (checking time and cracking pressure) shall be conducted, and the requirements therein shall be satisfied. The temperature shall then be lowered to not higher than -65°F. When the temperature of the test specimen has been stabilized, the operational inspections shall be conducted, and the requirements therein shall be satisfied.

4.5.9.2 Intermediate temperature cycling. After completing the high temperature cycling 'inspection, the valve shall be subjected to 37,500 cycles of operation at a temperature of 225°F. Upon completion of these 37,500 cycles, the high temperature functioning inspection shall be conducted at a temperature of 225°F, and the requirements therein shall be satisfied. The temperature shall then be reduced to the 70° to 120°F range and the fluid temperature stabilized at 100°F. The leakage inspection shall then be conducted and the requirements therein shall be satisfied.

4.5.10 Burst pressure. This inspection shall be performed at a temperature of 275°F and any suitable fluid may be used. Hydraulic pressure shall be applied in the free-flow direction, with the outlet port plugged, at a rate of approximately 25,000 psi per minute, until a pressure of 7500 psi is obtained. The valve shall withstand this burst pressure for a period of two minutes without rupture of internal or external parts.

4.6 Quality conformance inspection. Each check valve to be furnished under this specification shall be examined to determine conformance with material and design requirements and shall be subjected to the following tests described under "Quality conformance inspection methods":

a. Examination of product

b. Proof pressure

c. Leakage

d. Cracking pressure

4.7 Quality conformance inspection methods.

4.7.1 Examination of product. Each valve shall be carefully examined to determine conformance with the requirements of this specification with regard

to design, construction, weight, workmanship, identification of product, conformance to applicable drawings and for any visible defects. The manufacturer's drawings and the manufacturer's applicable specifications which were submitted when qualification approval was granted shall be used by the Inspector, as necessary, to determine that the product submitted under contract is identical to the item as qualified.

4.7.2 Proof pressure. The proof pressure of 4500 psi shall be applied in both the free- and reverse-flow directions at least two successive times in each direction, and held for two minutes for each pressure application. For the reverse-flow direction, the poppet shall be mechanically unseated between applications of the test pressure. There shall be no evidence of external leakage, failure or permanent set.

4.7.3 Leakage. This inspection shall be conducted with fluid and ambient temperatures between 70° and 120°F. This inspection may be performed with the valve held in any position. The valve shall be inspected for internal leakage by applying the pressures listed in table III in the reverse-flow direction for a minimum of five minutes each. The poppet shall be mechanially unseated between pressure applications. For each pressure, the leakage measurement period shall consist of the last three minutes of the five-minute period. The internal leakage shall not exceed three drops in a three-minute period. There shall be no measurable external leakage during this inspection.

4.7.4 Cracking pressure. An Inspection identical to cracking pressure specified for qualification (see 4.5.6.2) shall be performed.

4.7.5 Packing and marking. The inspector snail ascertain that the packing and marking of the valves conforms to this specification.

5. PACKAGING

5.1 Packing. Hydraulic check valves shall be sealed with closures conforming to MIL-C-5501. For Navy aircraft, only metal closures conforming to MIL-C-5501 as required by NAVAIR manual NAVAIR 01-14-17 shall be used.

5.2 Marking. Interior packages and exterior shipping containers snail be marked in accordance with MIL-STD-129. In addition, the following shall be added:

MS Part No.
Manufacturer's Part No.

6. NOTES

6.1 Intended Use. The valves covered by this specification are intended for use in aircraft type II hydraulic systems conforming to specification MIL-H-5440.

6.2 Ordering data. Procurement documents shall specify the MS part number of the valve desired (see 1.2).

6.3 Qualification. 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 No. 19069) whether or not such products have 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 Naval Air Systems Command (Attention, Commanding Officer, Naval Air Engineering Center, SESD (Code 93), Lakehurst, NJ 08733) and information pertaining to qualification of products may be obtained from that activity.

Custodians:
Navy - AS
Air Force - 99

Preparing activity:
Navy - AS
(Project No. 1650-0397)

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

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-V-19069B	VALVE, CHECK, HYDRAULIC

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 1426

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