INCH-POUND

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SUPERSEDING
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3 December 1975

MILITARY SPECIFICATION
VALVE, FUEL SYSTEM PRESSURIZATION AND VENT

This specification is approved for use within the Naval Air 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 one type of valve assembly for use in aircraft fuel tanks to sense and relieve positive or negative tank pressures and control pressurization and venting of the tank during fuel transfer and refueling operations.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

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

SPECIFICATIONS

FEDERAL

TT-S-735	Standard Test Fluids; Hydrocarbons

Military

DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4, JP-5 and JP-5/JP-8 ST
MIL-C-7024	Calibrating Fluid, Aircraft Fuel System Components
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Air Systems Command, AIR-5363, Washington, DC 20361-5360, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A
FSC 4820

MIL-S-8879	Screw Threads, Controlled Radius Root with Increased Minor Diameter; General Specification for
MIL-N-25027	Nut, Self-Locking, 250°F, 450°F and 800°F

STANDARDS

Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-480	Configuration Control - Engineering Changes, Deviations and Waivers.
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-889	Dissimilar Metals
MIL-STD-1523	Age Controls of Age-Sensitive Elastomeric Material (for Aerospace Applications)
MIL-STD-2073-1	DOD Materiel Procedures for Development and Application of Packaging Requirements
MS20995	Wire, Safety or Lock
MS33540	Safety Wiring and Cotter Pinning, General Practices for
MS33588	Nuts, Self-Locking, Aircraft, Reliability and Maintainability, Usage Requirements For
MS33649	Bosses, Fluid Connection-Internal Straight Thread

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation (see 6.2).

SOCIETY OF AUTOMOTIVE ENGINEERS, INC.

SAE AS568	Aerospace Size Standard For O-Rings

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

2.2 Order of Precedence. In the event of a conflict between the text of this document and the references cited herein (except for MS standards), the text of this document takes precedence. Nothing in this specification supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The valve furnished under this specification shall be a product which is authorized by the qualifying activity for listing on the applicable qualified products list (QPL) at the time set for opening of bids. (See 6.3)

3.2 Reliability. The valve shall withstand strains, jars, shocks, vibrations, and other conditions incident to installation and service use. All parts of the valve shall be adequately secured to ensure its continued integrity and retention of performance (see 3.6) within prescribed limits during normal shipment and service operation.

3.2.1 Valve Life. The valve shall be designed to withstand 10,000 endurance cycles which simulate conditions of use, as described in paragraph 4.6.5.

3.2.2 Strength. As evidence of structural soundness, the valve will be subjected to:

a. Air pressure of 75 psi applied to the bleed port.

b. Accelerations of 8.59 g forward, 7.75 g rearward, and 10.00 g downward.

c. Impact shocks of 30 g each with 11 millisecond duration.

3.2.3 Vibration. The valve shall withstand vibrations from 5 to 200 Hz, Resonance and Cycling, as described in paragraph 4.6.8.

3.3 Materials. Materials and processes used in the manufacture of the valve shall conform to applicable Government specifications. Materials conforming to contractor or industry specifications may be used provided adequate testing is performed to meet the performance requirements of this specification. Use of contractor or industry specifications shall not constitute waiver of Government inspection. All materials used in the valve shall be resistant to MIL-T-5624 fluids having an aromatic content from 0 to 30 percent.

3.3.1 Metals. All metals that are not of a corrosion-resistant type shall be suitably protected to resist corrosion during the normal service life of the valve. Use of dissimilar metals as defined by MIL-STD-889, especially steel in contact with aluminum or aluminum alloys, shall be avoided where practicable. Magnesium, cadmium, copper and copper alloys shall not be used.

3.3.2 Elastomers. Elastomeric parts, such as O-rings and diaphragms shall be of materials compatible with the requirements of the fuel resistance and extreme temperature test (see 4.6.4) and acceptance test (see 4.5.2).

3.3.2.1 Age Controls. Age sensitive elastomeric materials controlled by MIL-STD-1523, shall not be used.

3.3.3 Finish. Anodizing, plating, and protective treatments shall be such that the finish will not chip, crack, or cause the fuel or fuel system to be affected in any way. Paint and cadmium plating shall not be used.

3.4 Design and Construction. The design and construction of the valve shall be such that disassembly and replacement of parts can be accomplished without use of special tools. Installation characteristics and envelope dimensions shall be as shown in Figure 1.

3.4.1 Threaded Connections.

3.4.1.1 Installation and Inspection Connections. Female threaded connections for tube fittings shall conform to MS33649. All other female threaded connections in aluminum alloys used for installation and inspection shall have steel inserts, the internal threads conforming to the requirements of MIL-S-7742 or MIL-S-8879.

3.4.1.2 Pipe Threads. Pipe threads shall not be used except for permanent closures.

3.4.2 Securing Hardware. Where threaded fasteners, pins, and other methods are used to secure parts of the valve, they shall be safetied by means of self-locking nuts, cotter pins, lockwashers, retaining rings, or safety wire. Safety wire shall conform to MS20995 and be installed in accordance with MS33540. Self locking nuts shall conform to MIL-N-25027 and be used in accordance with MS33588.

3.4.3 O-rings. O-ring sizes shall be as per SAE AS568.

3.4.4 Weight. Component weight shall not exceed 2.7 pounds.

3.4.5 Changes. Changes in design or construction subsequent to qualification approval shall be processed in accordance with MIL-STD-480.

3.5 Maintainability.

3.5.1 Interchangeability. All valves having the same manufacturer's part number shall be completely interchangeable with respect to installation and performance. It shall be the responsibility of the valve manufacturer to prepare specifications or source control drawings for purchased parts to ensure that production valves are the same as the qualification valve.

3.5.2 Adjustments. After assembly and delivery to the procuring activity, the valve shall not require any adjustments in order to function properly. It is intended that this valve is not to be serviced in the fleet.

3.6 Performance Characteristics. When installed in a fuel tank, the valve shall meet the following performance requirements (test descriptions are based on a float activated valve): **NOTE:** Unless otherwise specified, all pressures are static gage.

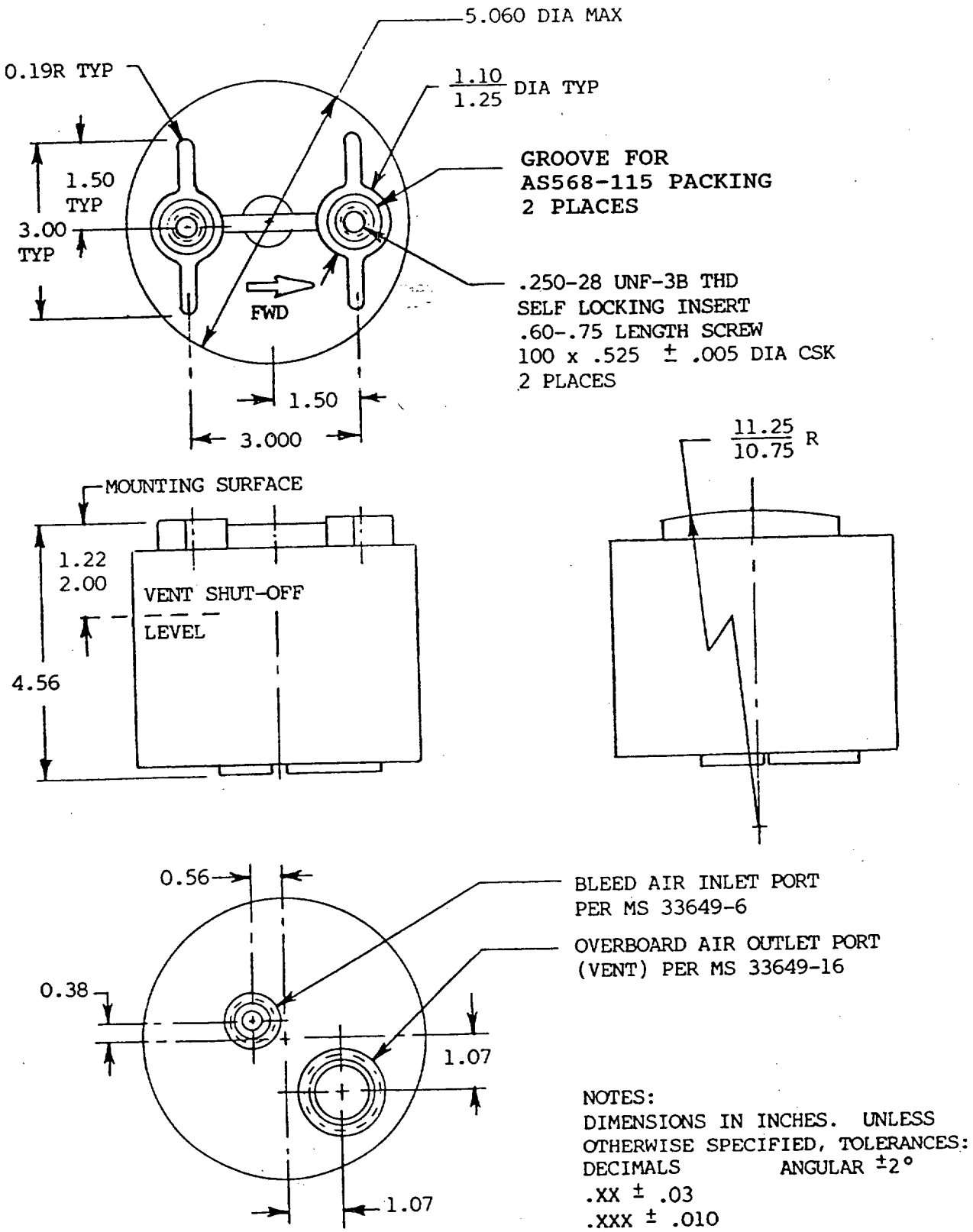


Figure 1. Installation Characteristics and Envelope Dimensions

3.6.1 Venting.

a. With float down and no pressure applied at the bleed air port, the inlet vent port (the inlet side of the overboard vent system) shall open, and air shall pass through the valve and out the overboard outlet. Tank pressure necessary to attain full flow shall not exceed 2.0 psi.

b. With float up, the inlet vent port shall be closed.

c. With float down, application of air pressure of 3.0 through 20.0 psi to the bleed-air port shall close the inlet vent port allowing bleed air flow into the tank, but not overboard through the vent system except for trickle flow through a relief orifice (see 3.6.2.d). The inlet vent port shall remain closed as long as bleed air pressure equals or exceeds tank pressure, but shall reopen by the time bleed air pressure is reduced to 2 psi below tank pressure.

d. With float down, with a flow of 30 scfm of air (see 6.4), the pressure drop through the valve from inlet vent to overboard outlet shall not exceed 2.0 psi.

3.6.1.1 Attitude Vent Control.

a. With the float uncovered and the aircraft in a 20° through 60° climb attitude, or a 20° through 45° dive attitude, and a 0° through ±15° roll angle, the inlet vent port shall close to prevent fuel from flowing out of the vent line.

b. To prevent spillage through the overboard vent system during catapult launch with a full or partially filled tank, the valve shall hold the inlet vent port closed at all forward accelerations to a maximum of 8.59g when tested in accordance with 4.6.7.2, (see 6.4).

3.6.2 Pressurizing.

a. With float down, application of an increasing or stable air pressure of 3.0 through 20.0 psi through the bleed-air port shall close the vent port. Steady state tank pressure shall be not more than 0.5 psi below bleed-air pressure.
NOTE: Tank pressurization must also occur with float up - tank full.

b. With float down and tank vented to atmosphere, an air pressure of 0.7 psi applied to the bleed-air port shall cause a flow of not less than 2.4 scfm.

c. The valve assembly shall not be damaged by application of 75 psi pressure for two minutes on the bleed-air pressure port.

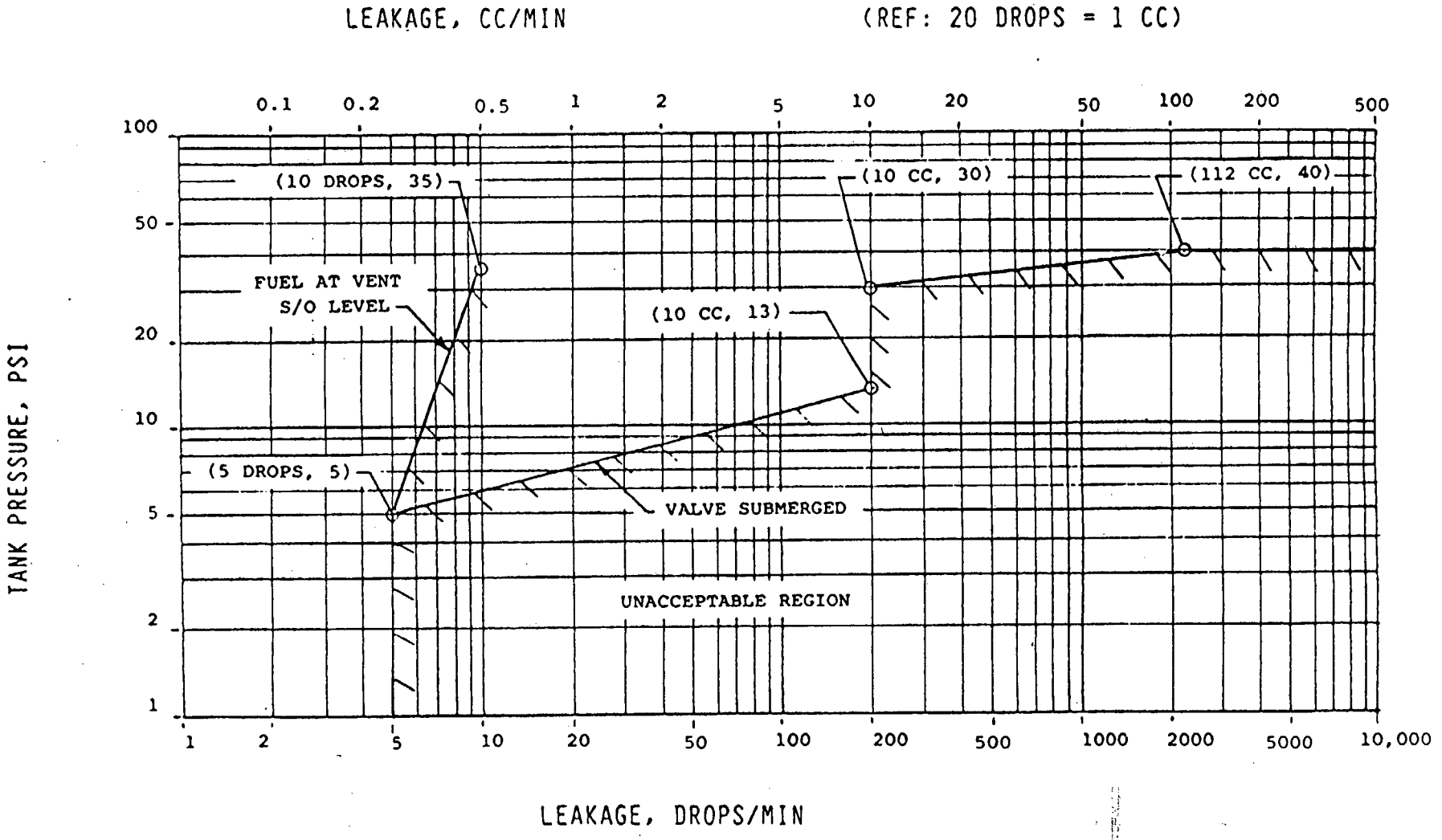


Figure 2. Maximum Fuel Leakage

d. If the valve is pressurized through the bleed-air port, closing the bleed air supply line shall not trap air. The air shall dissipate, and the inlet vent port shall reopen. If a diaphragm actuated valve is used to control venting and pressurizing, the bleed-air side of the diaphragm may be vented to the overboard outlet through an orifice or equivalent opening.

3.6.3 External Leakage.

a. With fuel at vent shut-off level (1.61 $\pm$ 0.39 inches from the top of the valve), fuel leakage to overboard port shall not exceed the limits of Figure 2.

b. With the valve submerged to the mounting surface, and with the tank pressurized to 13 psi by means other than through the bleed-air line, leakage in the reverse direction through the bleed-air port shall not exceed five drops per minute.

c. With the valve submerged to the mounting surface, fuel leakage to overboard shall not exceed the limits of Figure 2.

3.6.4 Shut-off and Reopening Levels.

a. At all rising fuel levels below vent shut-off level, the inlet vent port shall be open to overboard. (See 3.6.3.a and Figure 1)

b. At all fuel levels above vent shut-off level with tank pressure at any value from zero up to relief valve cracking pressure, the inlet vent port shall be closed.

c. Under conditions of falling fuel level and no bleed-air pressure applied, the inlet vent port shall reopen within 0.5 inches of the closing level determined in 3.6.4.a.

3.6.5 Pressure Relief Valve Assembly. The assembly shall incorporate a pressure relief valve set to relieve tank pressure at 40 to 50 psi, and shall be capable of flowing 50 scfm of air with a maximum tank pressure of 50 psi.

3.6.6 Suction Relief. The assembly shall incorporate a suction relief valve capable of flowing 80 scfm from the overboard outlet port into the tank with a maximum pressure drop of 3.5 psi.

3.7 Environmental Conditions. The valve shall withstand the fuel and air temperatures for the time periods listed in Table I:

Table I. Environmental Conditions.

Environmental Fluid	Temperature (°F)	Exposure Period
Ambient Air	-65 to +160	Continuous
	+220	30 Minutes
	+240	2½ Minutes
Pressurization Air	-65 to +250	Continuous
	+350	30 Minutes
Fuel	-40 to +135	Continuous

3.8 Identification of Product. Assemblies and parts shall be marked for identification in accordance with MIL-STD-130. The following information shall be marked on the valve assembly:

Valve, Fuel System Pressurization and Vent
Manufacturer's Part Number (including dash number, if applicable)
Manufacturer's Serial Number
National Stock Number
Manufacturer's Name, Code Number

3.9 Workmanship. All parts shall be clean and free of dirt, sand, metal chips, and other foreign matter during and after assembly. Attention shall be given to quality and thoroughness of assembly, alignment of parts, tightness of assembly screws and bolts, marking of parts, and removal of burrs and sharp edges.

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 (examination and tests) 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for Compliance. All valves shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known

defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of Inspections. Inspection requirements are classified as follows:

a. Qualification inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 Qualification Samples. Two qualification test samples consisting of the part number for which approval is desired shall be submitted to the qualifying activity (see 6.3). One of the samples shall have been inspected as described in 4.3.1; the other sample shall be for selective Government testing. The samples shall be accompanied by a report of the inspections and a complete set of drawings conforming to DOD-D-1000, to permit technical evaluation of compliance with design and construction requirements (see 3.4).

4.3.1 Qualification Inspection. Qualification inspection shall be performed by the manufacturer, at a laboratory acceptable to the Government, on one sample valve manufactured with equipment and procedures used in production. The sample shall be subjected to the qualification inspections specified in Table II in the order shown.

4.3.2 Retention of Qualification. Retention of qualification for the valve on the applicable QPL shall be dependent upon test data and periodic written certification by the manufacturer of continued compliance with the requirements of this specification. Tests shall consist of Quality Conformance Inspections (see 4.4) and when deemed necessary by the Government, Qualification Inspections.

4.4 Quality Conformance Inspections. Quality conformance inspections shall consist of individual tests (see 4.4.1) and sampling inspections (4.4.2).

4.4.1 Individual Tests. Every valve shall be subjected to the following tests in sequence:

a. Examination (See 4.6.1).

b. Leakage (see 4.6.2.c).

c. Calibration (Perform 4.6.3 with the exception that 4.6.3.2, 4.6.3.4.1 and 4.6.3.6.3 need be done only on every 25th unit).

TABLE II. Qualification Inspections.

Inspection	Requirements Paragraph	Test Method
a. Examination	3.3 thru 3.5 3.8 thru 3.9	4.6.1
b. External Pressure and Leakage Tests	3.6.3	4.6.2
c. Calibration	3.6.1 thru 3.6.2 3.6.4 thru 3.6.6	4.6.3
d. Fuel Resistance and Extreme Temperature	3.3 and 3.7	4.6.4
e. Endurance I	3.2 and 3.2.1	4.6.5
f. Accelerated Corrosion	3.3.1	4.6.6
g. Strength	3.2.2	4.6.7
h. Vibration	3.2.3	4.6.8
i. Endurance II	3.2.1	4.6.9
j. Disassembly and Inspection	3.4	4.6.10

4.4.2 Sampling Inspections. One valve shall be selected for sampling inspections from each lot of 200 valves, or fraction thereof, or at intervals specified in the contract or purchase order (see 6.2). "Lot" refers to valves manufactured and submitted for acceptance at the same time. Failure of the sample shall be cause for rejection of the lot represented. Sampling inspections shall consist of the following:

a. Examination (see 4.6.1)

b. Leakage (see 4.6.2, all parts)

c. Calibration (see 4.6.3, all parts)

d. Strength (see 4.6.7)

NOTE: The tests of 4.4.2 duplicate some of the tests of 4.4.1. If the individual tests are witnessed and documented, they need not be repeated for the sampling tests.

4.5 Inspection Conditions. Unless otherwise specified, all inspections and tests of this document shall be performed under the following conditions.

4.5.1 Cleaning. Prior to testing the valve, all lubricants and preservative compounds, except permanent protective coatings, shall be removed from all surfaces which are normally wetted with fuel.

4.5.2 Test Fluid. The fluid used for testing shall be the fluid for which the component is intended. Use of calibrating fluid MIL-C-7024 Type II is permissible for production acceptance tests.

4.5.3 Room Temperature and Pressure. All tests shall be conducted at room temperature (60°F through 90°F) and pressure.

4.5.4 Attitude. All tests shall be conducted with the valve installed in normal mounting attitude - mounting bosses approximately horizontal.

4.5.5 Pressure measurements. All pressure measurements are static gage.

4.5.6 Port Conditions. All ports, poppets, vents or flappers shall be free to operate as if installed in a flight tank. Nothing shall be locked or blocked unless specifically cited in a test description.

4.6 Test Methods.

4.6.1 Examination. Each valve submitted for acceptance shall be completely examined for conformance with the requirements of this specification and applicable contractor drawings and specifications.

4.6.2 External Pressure and Leakage Test. With the valve installed in the test setup of Figure 3, the following tests shall be conducted.

a. Raise the level of the test fluid to vent shut-off level. Measure leakage at two pressures by applying 5 psi and 35 psi to the test tank. After a three minute wait at each pressure, record the leakage. Fuel leakage to overboard shall be not greater than 5 drops per minute at 5 psi, and 10 drops per-minute at 35 psi. (See Figure 2)

b. Raise the test fluid level until the valve is completely submerged (fluid at the mounting surface). Pressurize the tank to 13 psi and record reverse leakage through the bleed-air pressure port. Leakage shall be not greater than 5 drops per minute after a 3-minute waiting period at each pressure.

c. With the valve completely submerged, pressurize the tank to the schedule below. Record leakage overboard at each pressure. Leakage shall be within the limits of Figure 2.
SCHEDULE: For the individual tests of 4.4.1, pressurize at 5 and 30 psi. For qualification and Sampling Inspections of 4.4.2, pressurize at 5, 13,30 and just under the relief valve cracking pressure of 40 psi.

4.6.3 Calibration. With the valve installed in the test setup of Figure 3, perform the following:

4.6.3.1 Pressure Relief Valve. The pressure relief valve shall be pretested to relieve at 40 to 50 psi. With the inlet vent port secured shut, pressurize the test tank to obtain an air flow of 50 scfm overboard. Tank pressure shall not exceed 50 psi.

4.6.3.2 Suction Relief Valve. With the test tank empty and vented to atmosphere, pressurize the overboard outlet port to obtain a reverse air flow of 80 scfm. The pressure drop shall not exceed 3.5 psi.

4.6.3.3 Overboard Vent Control.

a. With the test tank empty of fuel, slowly pressurize the bleed-air port to 20 psi. The inlet vent port shall close at or before 3 psi and remain closed as long as bleed-air pressure equals or exceeds tank pressure. After tank pressure has stabilized - tank pressure must be at least 19.5 psi - reduce the bleed-air pressure to zero at a rate of 17 $\pm$2 psi per minute. The vent port shall open before bleed-air pressure has dropped to 17.5 psi.

b. Reapply 20 psi to the bleed-air port and stabilize the tank pressure. Close the supply line valve to the bleed-air port. Trapped bleed-air shall dissipate, allowing the vent port to reopen.

4.6.3.4 Pressure Drop.

4.6.3.4.1 Bleed-air Pressure Drop. With the tank vented to atmosphere, apply air pressure at the bleed-air pressure port. Air flow into the tank shall be at least 2.4 scfm with a maximum pressure drop of 0.7 psi.

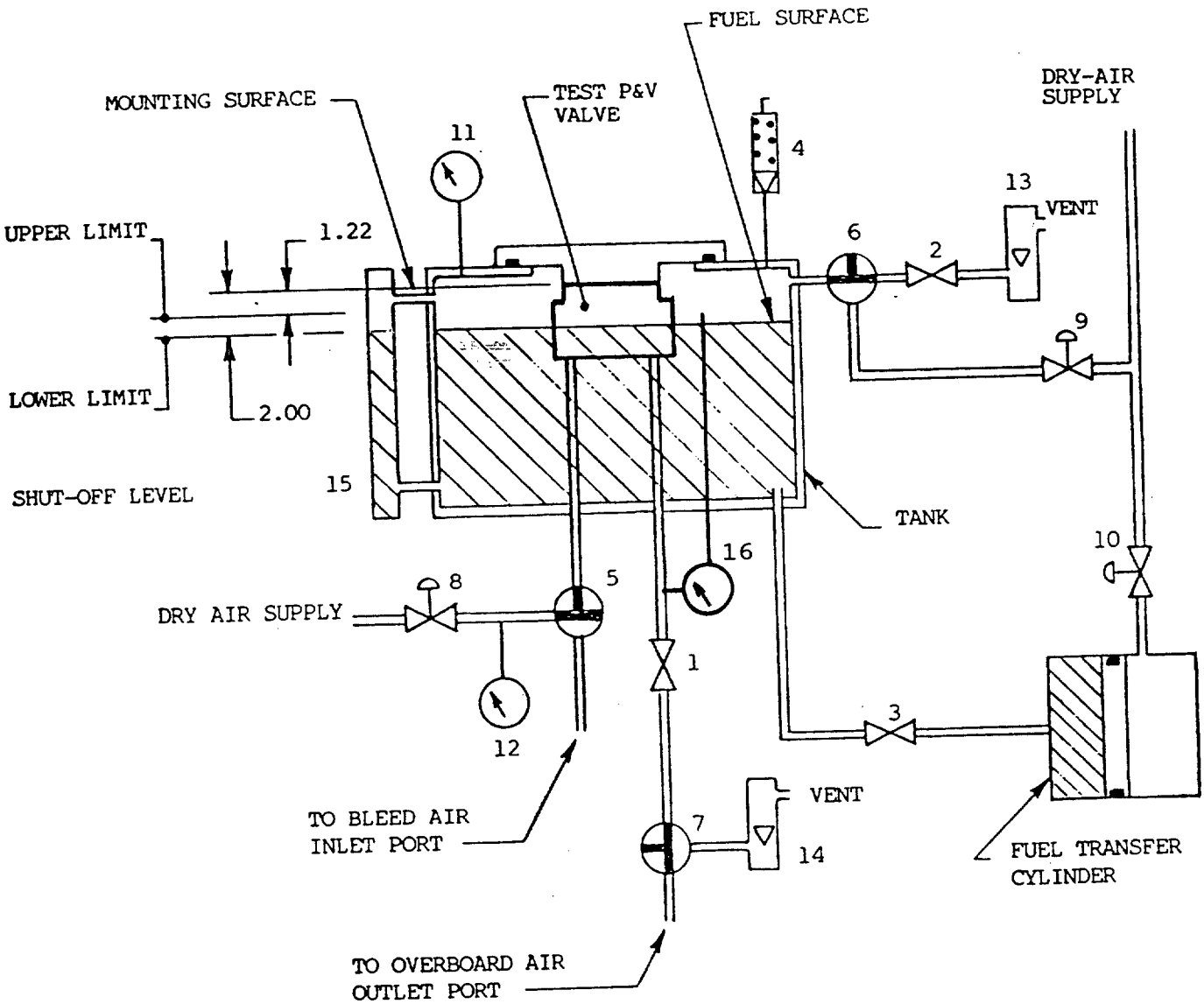
4.6.3.4.2 Vent Pressure Drop. With the overboard outlet port vented to atmosphere, apply air pressure to the test tank. The inlet vent port shall open and air flow through the valve shall be at least 30.0 scfm with a maximum pressure of 2.0 psi.

4.6.3.5 Fuel Level Control.

a. Establish a 5 scfm air flow into the test tank. Raise fuel level until overboard air flow ceases. Record fuel level (vent shut off level). Level must meet the requirements of 3.6.3.a and Figure 3.

b. Lower fuel level until overboard air flow restarts. Record reopening fuel level. The difference in levels shall be not greater than 0.5 inches.

c. Repeat the above for five cycles. At all fuel levels below reopening level, the valve shall allow air flow out of the overboard vent system as long as sufficient tank pressure is present. For all fuel levels at or above vent shut-off level, the vent system shall close regardless of tank pressure.



Valves:

1. Shut-off, overboard vent line
2. Needle, air flow
3. Needle, fuel level control
4. Relief, tank, 100 psi

Valve, Selector, 2-way, 3-position:

5. Bleed air
6. Tank
7. Overboard vent

Pressure Regulators:

8. Bleed air
9. Tank
10. Fuel transfer

Gauges:

11. Pressure, 0-100 psi
12. Pressure, 0-100 psi
13. Flowmeter, 1-11 SCFM
14. Flowmeter, 4-11 SCFM
15. Fuel level, sight glass
16. Differential pressure, psi - (Tank vapor space to test valve outlet)

Figure 3. Typical Test Setup

4.6.3.6 Attitude. Starting with the float just uncovered, the inlet vent port shall close under the following conditions to prevent fuel from flowing out the overboard outlet port.

4.6.3.6.1 Climb Attitude. The vent port shall close at not more than 20° and shall remain closed through 60°.

4.6.3.6.2 Dive Attitude. The vent port shall close at not more than 20° and shall remain closed through 45°.

4.6.3.6.3 Roll Attitude. There shall be no leakage in excess of 5 drops per minute for a roll attitude of -15° to +15°. The vent port shall remain closed when the climb or dive attitudes are combined with a -15° to +15° roll attitude.

4.6.4 Fuel Resistance and Extreme Temperature. Fuel resistance and extreme temperature tests shall be conducted on the valve in accordance with the procedures outlined in Table III.

4.6.5 Endurance I. The valve shall be subjected to 9000 endurance cycles as specified in paragraph 4.6.5.1 through 4.6.5.4.

a. One cycle shall consist of raising the fuel level above vent shut-off level, and lowering the fuel below vent reopening level as determined in 4.6.3.5. Throughout each test, monitor the fuel level, count and record the number of cycles.

b. At the end of each portion of Endurance I, (Room temperature, High temperature, Low temperature and Contaminated fuel) conduct the tests of paragraphs 4.6.2, 4.6.3.3, 4.6.3.4 and 4.6.3.5.

4.6.5.1 Room Temperature Endurance. The valve shall be subjected to 4000 cycles using MIL-T-5624 fluid at room temperature (see 4.5.3).

4.6.5.2 High Temperature Endurance. The valve shall be subjected to 2000 cycles as follows:

a. The temperature of the valve and fluid shall be held at 125° ±5°F for 4 hours prior to and during the test. Test fluid shall be TT-S-735, type III.

b. Bleed-air temperature shall be maintained at 350°F for 30 minutes before and during the portion of calibration testing specified in 4.6.3.3 and pressure drop test of 4.6.3.4.

c. The cycles conducted during the high temperature portion of the fuel resistance test specified in 4.6.4 may be credited toward the total cycles of this endurance test.

4.6.5.3 Low Temperature Endurance. The valve shall be subjected to 2000 cycles. The temperature of the valve and fluid shall be held at -65° ±5°F for 4 hours prior to and during the test. Test fluid shall be TT-S-735, type I.

TABLE III. Fuel resistance and extreme temperature test schedule.

TEST PERIOD 1/	PHASE I SOAK	FUEL RESISTANCE			LOW TEMPERATURE
		PHASE I DRY	PHASE II SOAK	PHASE II DRY	
Component Configuration	2/ ----------	Drained and blown dry, normal condition as would be expected under service conditions, ports open	2/ ----------	Drained and blown dry, normal condition as would be expected under service conditions, ports open	Mounted as would be expected under normal service conditions. 2/
Test Fluid	TT-S-735, type III	None	TT-S-735, type III	None	TT-S-735, type I
Period Duration	96 hours (4 days).	24 hours.	18 hours.	30 hours.	18 hours.
Ambient and test fluid temperature	158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	Circulating air at 158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	Circulating air at 158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	Lower the fluid temperature to -67° ±2°F, then maintain the fluid temperature at -67° ±2°F for a minimum of 18 hours. 3/
Operation or tests during period	Actuate component at least 4 cycles per day in a normal manner.	None	Actuate component at least 4 cycles per day in a normal manner.	None	None
Operation or test immediately after period	Conduct leakage test, using TT-S-735, type III fluid (4.6.2).	(a) Actuate components for 5 cycles. (b) Conduct leakage test, using TT-S-735, type I fluid (4.6.2).	Conduct leakage test, using TT-S-735, type III fluid (4.6.2).	(a) Actuate components for 5 cycles. (b) Conduct leakage test, using TT-S-735, type I fluid (4.6.2).	With temperature not higher than -65°F, conduct functional and leakage tests, using TT-S-735, type I fluid (4.6.1 and 4.6.2).

1/ Each period shall follow immediately after the proceeding one in the order noted.
2/ The component shall be maintained in such a manner as to insure complete contact of all nonmetallic parts with the test fluid as would be expected under normal service conditions.
3/ Unless an increased test period is specified by the procuring activity.

4.6.5.4 Contaminated Fuel Endurance. The valve shall be subjected to 1000 cycles using contaminated fluid, as shown in Table IV, in the test tank. The fluid shall be agitated to keep the contaminants in suspension throughout the test. After completing the cycles, the valve shall be flushed with clean fuel and drained. Then the tests specified in 4.6.5b shall be performed.

TABLE IV. Fuel Endurance Test Contaminant.

Contaminant	Particle Size	Quantity
Iron oxide	0-5 microns 5-10 microns	28.5 gm/400 gal. 1.5 gm/400 gal.
Crushed quartz	150-300 microns 300-420 microns	1.0 gm/400 gal. 1.0 gm/400 gal.
Prepared dirt conforming to AC Spark Plug Division P/N 1543637 (Coarse Arizona Road Dust)	Mixture as follows: 0-5 microns (12%) 5-10 microns (12%) 10-20 microns (14%) 20-40 microns (23%) 40-80 microns (30%) 80-200 microns (9%)	8.0 gm/400 gal.
Cotton linters	Stable below 7, second cut linters (U.S. Department of Agriculture Grading Standards).	0.1 gm/400 gal.
Crude napthenic acid	-	0.03% by volume
Salt Water solution containing 4 parts NaCl to 96 parts H_2O by weight	-	0.01% entrained

4.6.6 Accelerated Corrosion. The valve with bleed-air, overboard vent, and relief valve ports open, shall be submerged three times in a saturated salt solution. The unit shall then be drained for 30 seconds. The component shall be placed immediately in a test chamber maintained at a temperature of 85° ±5°F with a relative humidity of 100 percent for a period of 20 minutes. Upon completion of the humidity exposure period, the unit shall be placed in a normal operating attitude, in an air oven maintained at a temperature of 130°F for a period of 20 minutes. The component shall not be functionally operated until a total of 50 immersions, high humidity, and drying cycles have been completed. Immediately after completion, the component shall be washed with warm water to remove all exposed salt accumulations, may be dried with an air hose (no wiping), installed in the test setup (see Figure 3), and subjected to the calibration tests specified in 4.6.3.3 through 4.6.3.5.

4.6.7 Strength.

4.6.7.1 Proof Pressure Test. With the valve in an empty test tank (Figure 3) with the pressure relief valve secured closed, apply a pressure of 75 psi to the bleed-air port for a period

of two minutes. Then conduct leakage tests specified in 4.6.2 and calibration tests specified in 4.6.3.3 through 4.6.3.5.

4.6.7.2 Acceleration Test. With fuel at the vent shut-off level, the valve shall be subjected to the following:

a. Functional Evaluation. Using a linear accelerator, the valve shall be subjected to three simulated catapult launches. Each launch shall have a duration of 1.2 ±0.2 seconds, during which a peak forward acceleration of 8.59 g shall be imposed. Valve leakage shall be not greater than 25 cc per launch.

b. Structural Evaluation. The valve, mounted on a centrifuge, shall be subjected to one minute periods of steady acceleration at the following levels:

10.00 g - Vertically downward
7.75 g - Horizontally rearward

Leakage shall be recorded. The valve shall then pass the leakage tests specified in 4.6.2.

4.6.7.3 Shock Test. A shock testing machine, designed and fabricated according to MIL-STD-810, or equivalent, shall be used. The valve shall be subjected to 18 impact shocks of 30 g, each shock impulse having a time duration of 11 ±1 milliseconds. The intensity shall be within ±10 percent when measured with a filter having a band width of 5 to 100 cycles per second. The shock shall be applied in the following directions:

a. Vertically, 3 shocks in each direction.

b. Parallel to the fore and aft axis, 3 shocks in each direction.

c. Horizontally at 90° to the fore and aft axis, 3 shocks in each direction.

The unit shall then pass the leakage tests specified in 4.6.2.

4.6.8 Vibration Test. The valve shall be attached to a rigid fixture capable of transmitting the vibration conditions specified in 4.6.8.1 and 4.6.8.2. Attachment of the valve to the fixture shall be made at the valve mounting pads. The amplitude of applied vibration shall be monitored on the test fixture near the valve mounting points and shall vary with frequency as shown in Figure 4. Upon completion of the tests, the valve shall pass the leakage tests of 4.6.2 and calibration tests of 4.6.3.

4.6.8.1 Resonance. Resonant modes of the test valve shall be determined by varying the frequency of applied vibration slowly through the range of 5 to 200 Hz with amplitudes not greater than those shown in Figure 4. Individual resonance surveys shall be conducted with vibration applied along each of three mutually perpendicular axes. The test valve shall be vibrated at the indicated resonant conditions for the periods shown in Table V and with the applied double amplitudes of vibratory accelerations in Figure 4. These periods of vibration shall be accomplished along each of the axes surveyed. When more than one resonance is

encountered with vibration applied along any one axis, each resonance shall be sustained for 30 minutes as shown in the applicable portion in Table V.

4.6.8.2 Cycling. The valve shall be vibrated for the applicable periods listed in Table V. The frequency shall be cycled through the range of 5 to 200 Hz at an applied double amplitude of 0.036 inch or an applied acceleration of 10 g, whichever is the lower value. The rate of change of frequency shall be logarithmic, and such that 15 minutes are required to traverse the range in both directions. When there are no provisions for logarithmic cycling, a linear rate of frequency change may be used.

TABLE V. Vibration Test Schedule.

Number of Resonances	0	1	2	3	4
Total time at Resonance (30 minutes at each resonance)	-	½ hr	1 hr	1½ hrs	2 hrs
Cycling time	3 hrs	2½ hrs	2 hrs	1½ hrs	1 hr

4.6.9 Endurance II. The valve shall be subjected to 1000 room temperature endurance cycles. (See para. 4.6.5.a and 4.6.5.1). Monitor fuel level (valve opening and closing). At the completion of 1000 cycles, conduct leakage tests specified in 4.6.2 and calibration tests specified in 4.6.3.3, 4.6.3.4 and 4.6.3.5.

4.6.10 Disassembly and Inspection. The test valve shall be disassembled and visually examined. Evidence of excessive wear or deterioration of any part shall be cause for rejection.

5. PACKAGING

5.1 Preservation and Packaging. Preservation and packaging shall be prepared for delivery in accordance with levels A or C of MIL-STD-2073-1, as specified in the contract or purchase order (see 6.2).

5.2 Packing. Packing shall be level A, B or C of MIL-STD-2073-1, as specified in the contract or purchase order (see 6.2).

5.3 Marking. In addition to any special marking required by the contract or purchase order (see 6.2), interior and exterior containers shall be marked in accordance with MIL-STD-129.

6. NOTES

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

6.1 Intended Use. The valve covered by this specification is intended for use in aircraft fuel tanks to sense and relieve positive or negative tank pressure and to control venting during fuel transfer.

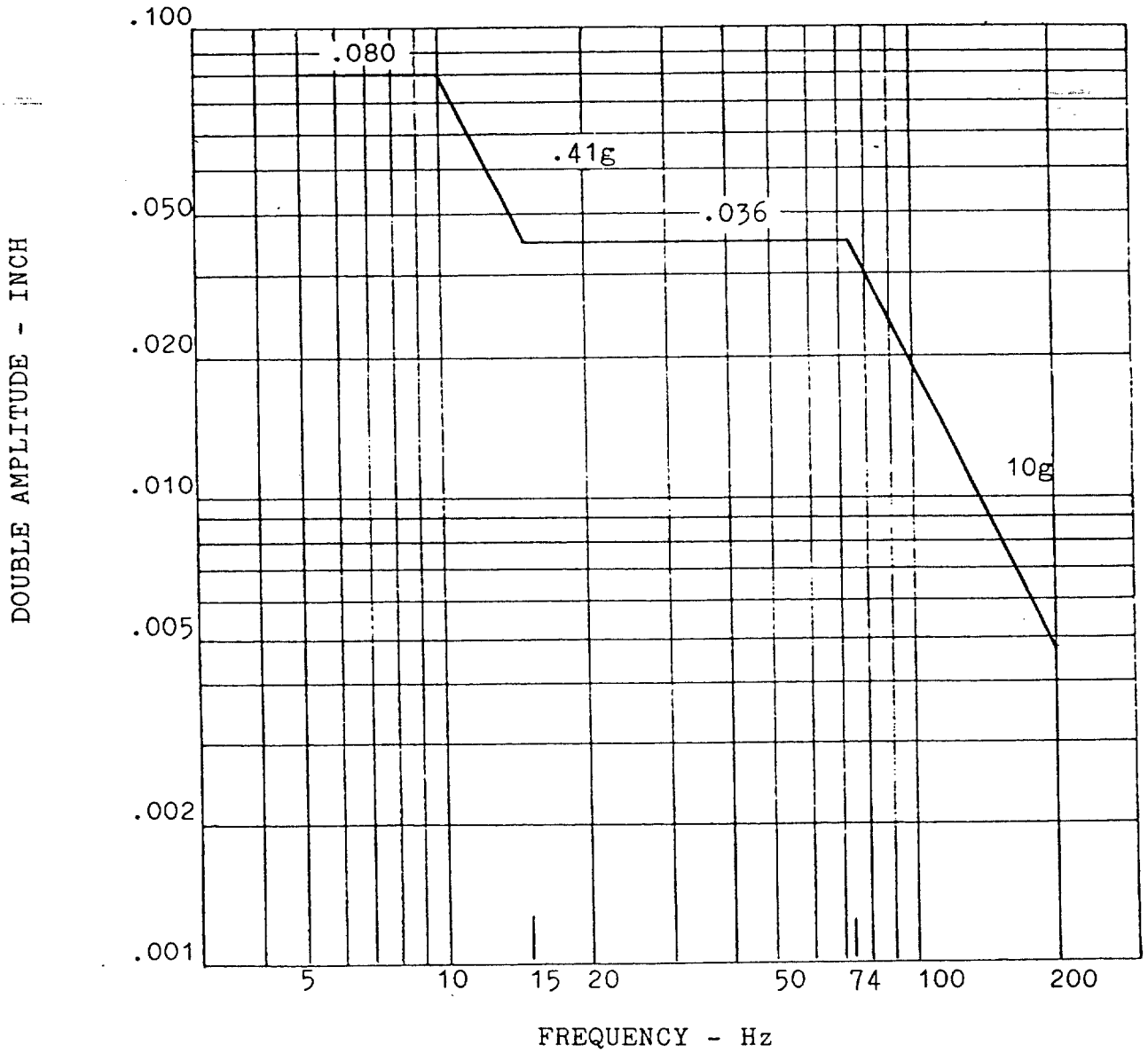


Figure 4. Range Curve for Vibration Tests

6.2 Ordering Data.

6.2.1 Acquisition Requirements. Acquisition documents should specify the following:

a. Title, number and date of the specification.

b. Qualification inspection location (see 4.1).

c. Required sampling tests (see 4.4.2).

d. Levels of preservation and packing (see section 5.1 and 5.2).

e. Marking of containers (see 5.3).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products which are, prior to the time set for opening of bids, qualified for inclusion in the Qualified Products List (QPL-81356) 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 Air Systems Command, AIR-5363C, Washington, DC 20361-5360. Information pertaining to qualification of products may be obtained from the Naval Air Warfare Center Aircraft Division, (PE32), P.O. Box 7176, Trenton, NJ 08628-0176.

6.4 Definitions and Symbols.

g	-	Acceleration of gravity (32.2 feet per second/per second).
scfm	-	Standard cubic feet minute (cubic feet at 14.7 psia and 59°F)
Vent Shut-off Level	-	The distance from the valve mounting surface to the top of the fuel when the inlet vent port closes and overboard venting ceases due to rising fuel level.

6.5 Subject Term (key word) Listing.

Vent, Aircraft Fuel Tank
Valve, Fuel Systems
Valve, Pressure-Vent Control

6.6 Changes From Previous Issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

Preparing Activity:
Navy - AS
(Project Number 4820-N079)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-V-81356B	2 November 1992

3. DOCUMENT TITLE
VALVE, FUEL SYSTEM PRESSURIZATION AND VENT

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial	(2) AUTOVON
Naval Air Systems Command AIR-5363C	202-692-2653.	222-2653
c. ADDRESS (Include Zip Code) Naval Air Systems Command AIR-5363C Washington, DC 20361-5360	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	