MILITARY SPECIFICATION

VALVE, AIR, DUAL, PYROTECHNIC-ACTUATED

FZU-43/B

This specification is approved for use by 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 establishes the requirements for manufacture and acceptance of the FZU-43/B Pyrotechnic-Actuated Dual Air Valve, referred to herein as the valve.

2. APPLICABLE DOCUMENTS.

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-S-22473	Sealing, Locking and Retaining Compounds, Single-Component.
MIL-C-45662	Calibration System Requirements.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Engineering Specifications and Standards Department (ESSD), Code 93, 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.

FSC 1336

STANDARDS

FEDERAL

FED-STD-102	Preservation, Packaging, and Packing Levels.

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	Marking for Shipment and Storage.
MIL-STD-167-1	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts.
MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Tests for.
MIL-STD-810	Environmental Test Methods.
MIL-STD-1246	Product Cleanliness Levels and Contamination Control Program.
MIL-STD-1695	Environments, Working, Minimum Standards for.

DRAWINGS

Naval Air Systems Command
(Code Ident 30003)

DL 1186AS150	Valve, Air, Dual, Pyrotechnic-Actuated, FZU-43/B, Data List.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 171-178 Transportation.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.)

3. REQUIREMENTS.

NOTE: Drawings referenced herein are listed on the DL cited in Section 2.

3.1 Item description. The valve is a pyrotechnic-actuated device consisting of a housing, piston assembly, initiator adapter, and a shear pin. The valve mounts on the aft end of the missile warhead assembly and is connected to the fuze by two flexible pneumatic lines. The valve and fuze combine to prevent detonation of the loaded warhead until certain prerequisite events have occurred after missile launch. At the required time, electrical power is supplied to fire an initiator which moves the piston to the stroked or valved position. This movement shears the shear pin and the four air manifold tips, thereby breaking the fuze seal and opening the missile air data system to the fuze for the pneumatic input required to arm the fuze. The major components and the general configuration of the valve are shown on Figure 1.

3.1.1 Government-furnished property. The Government will furnish the independent test facility specified in the contract or purchase order with electric initiators (76Z2843-3, General Dynamics) in a quantity sufficient to perform the applicable tests specified herein (see 6.2.1).

3.2 Characteristics.

3.2.1 Performance.

3.2.1.1 Valve firing. The valve shall fire upon application of 5.1 ±0.1 amperes direct current (Adc) for 50 ±5 milliseconds (ms) to the electric initiator (see 3.1.1). Upon electric initiator firing, the piston (Drawing 1186AS153) shall shear the shear pin (Drawing 1186AS114) and the four air manifold tips (Drawings 1186AS175 and 1186AS302), and shall wedge in the housing (Drawing 1186AS152).

3.2.1.2 Leak rate. With an input air pressure equal to 2.17 ±0.04 pounds per square inch gage (psig) (60 ±1 inches of water), the differential air pressure leak in each air passage (total and static) shall not exceed 4 inches of water during a period of 30 ±2 seconds.

3.2.1.3 Flow rate. With a 1.19 ±0.04 psig (33 ±1 inches of water) reservoir exhausted through each air passage (total and static) to ambient pressure, each air passage shall allow a flow rate of 250 cubic centimeters per second (cm^3/s) minimum of air at standard temperature and pressure (STP).

3.2.1.4 Visual. The shear pin shall show no evidence of bending or fracturing after exposure of the valve to the environmental conditions of 3.2.2 and prior to valve firing. The valve shall have no obvious damage or defects which could affect operability (see 6.3.2).

3.2.1.5 Electrical.

3.2.1.5.1 Insulation resistance. The bridgewire circuit resistance to the case or housing shall be 100 megohms (Mohms) minimum when 500 volts direct current (Vdc) ±10 percent is applied across the shorted connector pins and the case or housing for 10 +2, -0 seconds at 70 ±20 degrees Fahrenheit (°F).

3.2.1.5.2 Bridgewire resistance. The resistance of each bridgewire shall be 1.1 ±0.2 ohms when 0.10 ampere (A) maximum is applied to each bridgewire for 1 minute maximum at 70 ±20°F.

3.2.2 Environmental conditions. The valve shall not be damaged nor shall safety or subsequent performance be degraded by exposure to the following environments.

3.2.2.1 Transportation vibration-temperature. The valve shall meet the requirements of MIL-STD-331, Test 119, Procedure 2, and shall be safe (see 6.3.1) and operable (see 6.3.2) following exposure to the environment of 4.4.7.1.

3.2.2.2 Shipboard vibration. The valve shall meet the requirements of MIL-STD-167-1, Type I, and shall be safe (see 6.3.1) and operable (see 6.3.2) following exposure to the environment of 4.4.7.2.

3.2.2.3 Launch shock. The valve shall meet the requirements of MIL-STD-202, Method 213, Test Condition A, and shall be safe (see 6.3.1) and operable (see 6.3.2) following exposure to the environment of 4.4.7.3.

3.2.2.4 Flight vibration (boost phase). The valve shall meet the requirements of MIL-STD-810, Method 514, Procedure V, Part 1 (Curve P) and Part 2 (Curve AE), and shall be safe (see 6.3.1) and operable (see 6.3.2) following exposure to the environment of 4.4.7.4.

3.2.2.5 Flight vibration (cruise phase). The valve shall meet the requirements of MIL-STD-810, Method 514, Procedure I, Part 1 (Curve J), except vibration shall be applied for 30 minutes minimum along each of the three major axes. The valve shall be safe (see 6.3.1) and operable (see 6.3.2) following exposure to the environment of 4.4.7.5.

3.2.2.6 Flight vibration (terminal phase). The valve shall meet the requirements of MIL-STD-810, Method 514, Procedure I, Part 1 (Curve J), except vibration shall be applied for 20 minutes minimum along each of the three major axes. The valve shall remain operable (see 6.3.2) following exposure to the environment of 4.4.7.6.

3.2.3 Final visual. There shall be no evidence of external damage, such as cracks, dents, or other blemishes, which may interfere with functioning or fit of the valve at the next assembly.

3.3 First article (preproduction sample). Unless otherwise specified in the contract or purchase order, the contractor shall furnish a preproduction sample of 18 valves to the testing activity designated in the contract or purchase order for first article inspection and approval (see 4.1.2.1 and 6.2.1). The preproduction sample shall be manufactured using the same methods, materials, processes, and procedures proposed for production. Any production prior to approval of the preproduction sample shall be at the risk of the contractor.

3.4 Construction. The construction of the valve shall meet the requirements specified herein and on the drawings and documents listed on DL 1186AS150.

3.4.1 Production drawings. The valve shall meet the requirements of and be manufactured and assembled in accordance with the drawings and documents listed on DL 1186AS150.

3.4.1.1 Interface. The valve mechanical interface shall be in accordance with the requirements of Drawing 1186AS151.

3.4.2 Test equipment calibration. When specified in the contract or purchase order, all test equipment shall be calibrated and maintained in accordance with a plan meeting the requirements of MIL-C-45662 (see 4.3). The calibration plan shall be prepared in accordance with the data item description (DID) cited in 6.2.2 and shall be approved by the Government prior to use.

3.4.3 Test plan and test procedures. When specified in the contract or purchase order, the contractor shall prepare a test plan and test procedures in accordance with the DID cited in 6.2.2. The test plan and test procedures shall be approved by the Government prior to use.

3.4.4 Inspection record. When specified in the contract or purchase order, the contractor shall prepare an inspection record in accordance with the DID cited in 6.2.2 for each valve produced under a specified contract. The required test data shall be extracted from the inspection and acceptance records maintained by the contractor.

3.4.5 Standards of manufacture.

3.4.5.1 Product cleanliness. Product cleanliness shall meet the requirements of MIL-STD-1246, Level 200. No oils or solid lubricants of any kind shall be used on any part of the valve after final cleaning of components, except as specified on the drawings or herein.

3.4.5.2 Working environment. The working environment shall meet the minimum levels and requirements specified in MIL-STD-1695.

3.4.5.3 Workmanship. The valve shall be constructed and finished in a manner that ensures compliance with the requirements specified on the drawings and herein.

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 specified herein (see 6.2.1). 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 (see 6.2.1). The Government reserves the right to perform or witness 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 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Preproduction sample inspections (see 4.1.2.1).

b. Quality conformance inspections (see 4.2).

4.1.2 Special tests and examinations.

4.1.2.1 Preproduction sample inspections. The preproduction sample of 18 valves (see 3.3) shall be subjected to the inspections of Figure 2 in the sequence shown. The inspections below the dashed line of Figure 2 shall be performed at an independent facility designated in the contract or purchase order (see 6.2.1).

4.1.2.1.1 Preproduction sample acceptance and rejection criteria. Each valve of the preproduction sample shall meet the applicable performance requirements of Section 3 on the first and only trial. The failure of any valve to meet all the requirements specified in the contract or purchase order, on the drawings, or herein shall cause rejection of the preproduction sample.

4.2 Quality conformance inspections.

4.2.1 Inspection lot. Unless otherwise specified in the contract or purchase order, an inspection lot shall consist of not less than 51 nor more than 150 valves (see 6.2.1). An inspection lot, as defined in MIL-STD-105, shall consist of completed valves, fabricated under the same conditions and offered for inspection at the same time.

4.2.2 Quality conformance inspection sequence. Nine valves shall be randomly sampled from the inspection lot in accordance with MIL-STD-105 and subjected to the inspections of Figure 2 in the sequence shown. The inspections below the dashed line of Figure 2 shall be performed at an independent facility designated in the contract or purchase order (see 6.2.1). The remainder of the lot shall be held in bond pending the results of the inspections below the dashed line of Figure 2.

4.2.3 Quality conformance acceptance and rejection criteria. Each valve of the 9-valve sample shall meet the applicable performance requirements of Section 3 on the first and only trial. The failure of any valve to meet all the requirements specified in the contract or purchase order, on the drawings, or herein shall cause rejection of the inspection lot.

4.3 Test equipment and conditions.

4.3.1 Standard test equipment. The contractor shall provide and maintain an adequate system of inspection and test equipment necessary to ensure that parts and products will meet the contract or purchase order, specification, and drawing requirements. Unless otherwise specified herein, the magnitude of any error introduced by the test equipment shall not exceed 10 percent of the allowable tolerance of the requirement being measured. All test equipment utilized by the contractor for performance of the inspections specified herein shall be calibrated and maintained as specified in 3.4.2.

4.3.2 Special test equipment and circuits. When special test equipment and circuits, other than as specified herein, are devised or commercially-available equipment is employed, all test equipment, circuits, and methods shall meet the requirements of 4.3.1 and are subject to approval by the procuring activity.

4.3.3 Gages. The contractor shall provide whatever gages are necessary to ensure conformance with the dimensional requirements of this specification and the applicable drawings. Unless otherwise specified in the contract or purchase order, the procuring activity will furnish drawings of pertinent Government final inspection gages (see 6.2.1). This procedure does not relieve the contractor of his responsibility for the design and manufacture of the gages required for satisfactory fulfillment of the contract requirements, but is intended to facilitate acceptance of all components and assemblies by Government final acceptance gages.

4.3.4 Test environment. Unless otherwise specified herein, the inspection methods of 4.4 shall be performed under the conditions specified in 3.4.5.2.

4.4 Methods of inspection.

NOTE: The results of all inspections shall be recorded on the inspection record (see 3.4.4).

4.4.1 Drawing inspections. To determine conformance to 3.4.1, perform drawing inspections on each lot of parts, subassemblies, and assemblies of the valve during manufacture, and on the completely assembled valve in accordance with the drawings listed on DL 1186AS150. The sampling plans and acceptance criteria shall be as specified on the drawings.

WARNING

The valve contains pyrotechnics when the electric initiator (see 3.1.1) is installed. Suitable safety precautions and procedures must be observed during handling and performance of the inspections below the dashed line of Figure 2 (see 6.4).

4.4.2 Valve firing. To determine conformance to 3.2.1.1, install the electric initiator (see 3.1.1) and fire the valve by applying 5.1 ±0.1 Adc for 50 ±5 ms, using a Government-approved test fixture.

4.4.3 Leak rate. To determine conformance to 3.2.1.2, test the valve as follows and in accordance with the schematic of Figure 3:

a. Insert a sheared fuze air manifold and a sheared valve air manifold (or simulated manifolds) into the valve in one air passage (total or static) and secure (see Figure 3). Leave the other air passage open to the atmosphere.

b. Close solenoid valves 1, 2, and 3, respectively.

c. Open solenoid valve 4 to vent the manometer to the atmosphere.

d. Set the pressure regulator to read 60 inches of water on the manometer.

e. Close solenoid valve 4 to obtain the pneumatic circuit depicted on Figure 3.

f. Open solenoid valve 1. The manometer will read zero inches.

g. Open solenoid valves 2 and 3. Close solenoid valve 1. Observe the leak rate for 30 ±2 seconds. Read the leak rate on the manometer in inches of water.

h. Close solenoid valves 2 and 3. Remove the air manifolds from the valve.

i. Repeat a through h, applying pressure to the other air passage.

4.4.4 Flow rate. To determine conformance to 3.2.1.3, individually test each air passage of a fired valve in accordance with the schematic of Figure 4. When testing one passage, the other passage shall remain open to the atmosphere.

4.4.5 Visual inspection. To determine conformance to 3.2.1.4, inspect the external surfaces of the valve for damage or defects which could affect operability. Remove the shear pin and visually inspect it for evidence of bending or fracturing. When replacing the shear pin, apply sealing compound (MIL-S-22473, Grade C) to the shear pin threads and torque to 6 ±2 inch-pounds.

4.4.6 Electrical. The inspections of 4.4.6.1 and 4.4.6.2 shall be performed using an Alinco meter, Model 101-5BF (or equivalent equipment limited to 5 milliamperes), which meets the requirements of 4.3.1 and has been approved by the Government for use with electro-explosive devices. The connector pins are contained within the electric initiator (see 3.1.1).

4.4.6.1 Insulation resistance. To determine conformance to 3.2.1.5.1, modify and test the valve as follows:

a. Short all connector pins together external to the electric initiator.

b. Connect the megohmeter leads between the shorted connector pins and the case or housing.

c. Test the valve in accordance with MIL-STD-202, Method 302, Test Condition B. Apply the voltage for 10 +2, -0 seconds at 70 ±20°F.

4.4.6.2 Bridgewire resistance. To determine conformance to 3.2.1.5.2, apply 0.10 A maximum for 1 minute maximum at 70 ±20°F to each bridgewire.

4.4.7 Environmental.

4.4.7.1 Transportation vibration-temperature. To determine conformance to 3.2.2.1, test the valve in accordance with MIL-STD-331, Test 119, Procedure 2.

4.4.7.2 Shipboard vibration. To determine conformance to 3.2.2.2, test the valve in accordance with MIL-STD-167-1, Type I.

4.4.7.3 Launch shock. To determine conformance to 3.2.2.3, test the valve in accordance with MIL-STD-202, Method 213, Test Condition A.

4.4.7.4 Flight vibration (boost phase). To determine conformance to 3.2.2.4, test the valve in accordance with MIL-STD-810, Method 514, Procedure V, Part 1 (Curve P) and Part 2 (Curve AE).

4.4.7.5 Flight vibration (cruise phase). To determine conformance to 3.2.2.5, test the valve in accordance with MIL-STD-810, Method 514, Procedure I, Part 1 (Curve J), except vibration shall be applied for 30 minutes minimum along each of the three major axes.

4.4.7.6 Flight vibration (terminal phase). To determine conformance to 3.2.2.6, test the valve in accordance with MIL-STD-810, Method 514, Procedure I, Part 1 (Curve J), except vibration shall be applied for 20 minutes minimum along each of the three major axes.

4.5 Final visual inspection. Prior to packaging, visually inspect the valve to determine conformance to 3.2.3 and the general requirements of Section 3.

4.6 Packaging inspection. Prior to shipment, inspect the packaging, packing, and marking of the valve to determine conformance to Section 5.

5. PACKAGING.

5.1 Preservation-packaging. Preservation and packaging shall be in accordance with FED-STD-102, Level C.

5.1.1 Level C. The valve shall be packaged in commercially-available materials in a manner which will afford adequate protection against corrosion, deterioration, and physical damage during direct shipment from the supply source to the first receiving activity.

5.2 Packing. Packing shall be in accordance with FED-STD-102, Level C.

5.2.1 Level C. Valves, packaged in accordance with 5.1.1, shall be packed in commercially-available materials in a manner which will provide protection from damage during direct shipment from the supply source to the first receiving activity. Packing and containers shall conform to 49 CFR 171-178.

5.3 Marking. In addition to any special marking required by the contract or purchase order, all marking shall be in accordance with MIL-STD-129 (see 6.2.1).

6. NOTES.

6.1 Intended use. The valve is intended for use in arming the fuze of the Tomahawk Cruise Missile.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

a. Number, title, and date of this specification.

b. Government-furnished property. The contracting officer should arrange to furnish the property cited in 3.1.1.

c. First article. When a first article is required, it should be tested and approved under the appropriate provisions of 7-104.55 of the Defense Acquisition Regulations (DAR). The first article should be a preproduction sample consisting of 18 valves, as specified in 3.3 and 4.1.2.1. The contracting officer should include specific instructions in all instruments regarding arrangements for examinations, tests, and approval of the first article.

d. Responsibility for inspection and inspection facilities, if other than as specified in 4.1.

e. Independent test facility to perform the inspections below the dashed line of Figure 2 (see 4.1.2.1 and 4.2.2).

f. Inspection lot size, if other than as specified in 4.2.1.

g. Government final inspection gage drawings (see 4.3.3).

h. Special marking, if required (see 5.3).

6.2.2 Data requirements. When this specification is used in a procurement which incorporates a Contract Data Requirements List (DD Form 1423) and invokes the provisions of 7-104.9(n) of the DAR, the data requirements identified below will be developed as specified by an approved DID (DD Form 1664) and delivered in accordance with the approved DD Form 1423 incorporated in the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification are cited as follows:

Paragraph	Data Requirement	Applicable DID
3.4.2	Calibration Plan	UDI-T-23742A
3.4.3	Test Plan and Test Procedures	DI-T-5204
3.4.4	Inspection Record	DI-T-2072

(Copies of DIDs required by the contractor in connection with specific procurement fuctions should be obtained from the procuring activity or as directed by the contracting officer.)

6.3 Definitions.

6.3.1 Safe. Safe is defined as the ability of the valve to maintain its safety features in a condition which will not create a hazard for personnel or cause any subsequent action to occur during its service life which will nullify the required safety conditions of service use. For nonservice use, safe is defined as the ability of the valve to maintain its safety features in a condition which will permit disposal without injury to personnel.

6.3.2 Operable. Before firing, operable is defined as the ability of the valve to perform to completion its specified function and sequence. Upon firing, operable is defined as the ability of the valve to produce the specified outputs within the required operational period at the specified point of time.

6.4 Explosives safety precautions. Minimum explosives safety precautions for use by the contractor are detailed in DoD Instruction 4145.26M, DoD Contractors' Safety Manual for Ammunition, Explosives, and Related Dangerous Material.

Preparing activity:
Navy - AS

(Project 1336-N367)

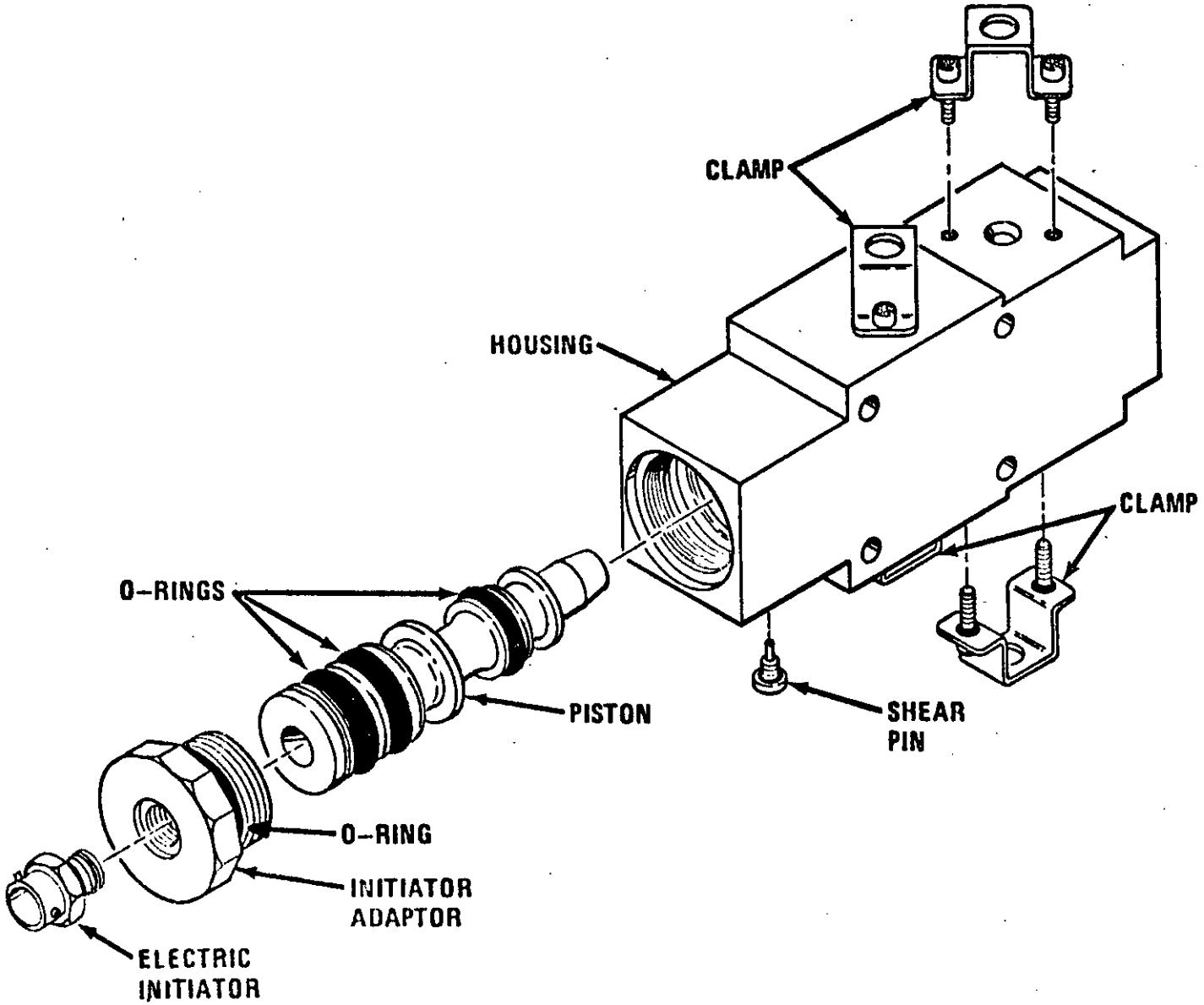
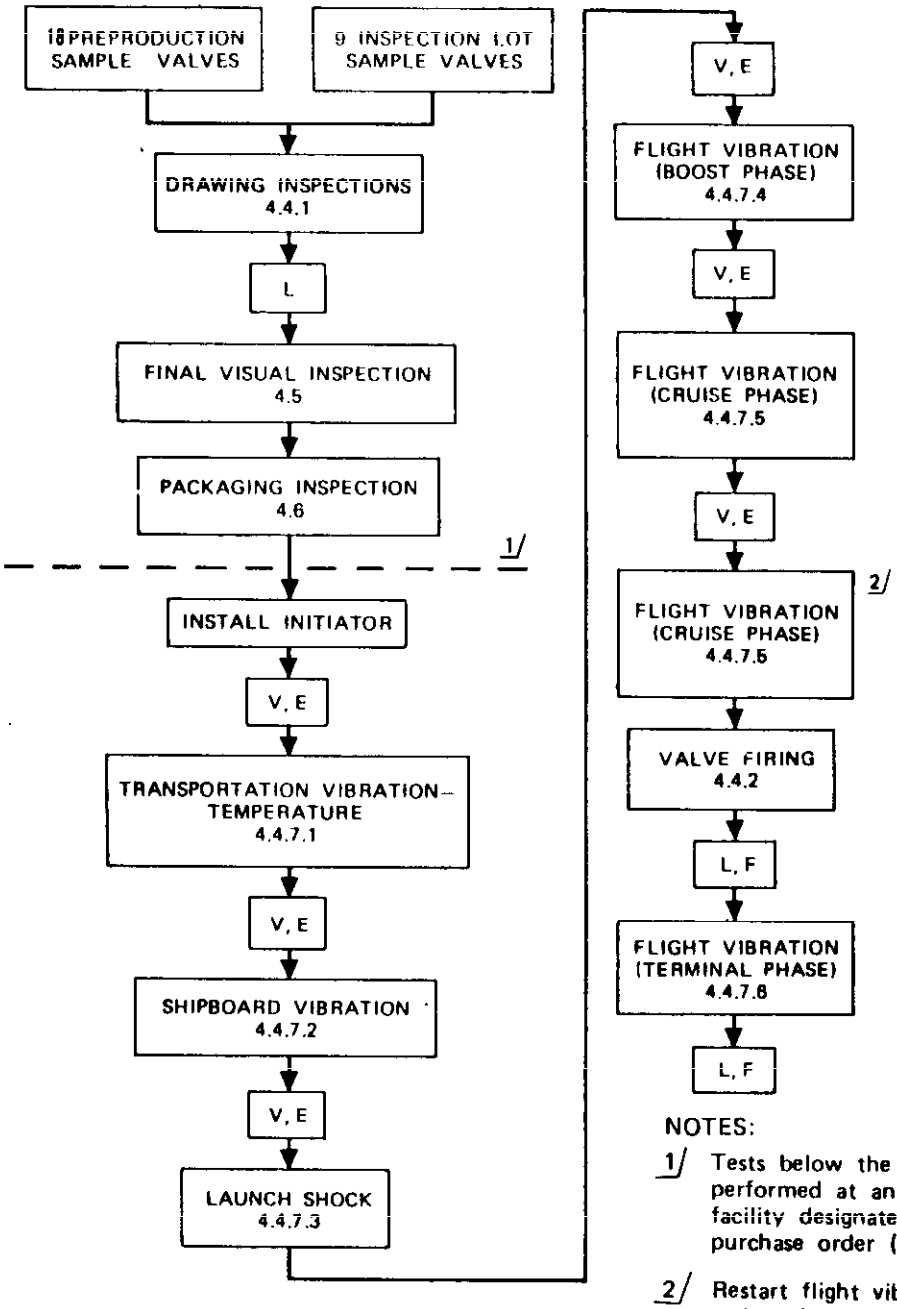


FIGURE 1. FZU-43/B Pyrotechnic-Actuated Dual Air Valve general configuration.



LEGEND:

L – Leak rate, 4.4.3.
F – Flow rate, 4.4.4.
V – Visual inspection, 4.4.5.
E – Electrical, 4.4.6.

NOTES:

1/ Tests below the dashed line shall be performed at an independent test facility designated in the contract or purchase order (see 4.1.2.1 and 4.2.2).

2/ Restart flight vibration (cruise phase) and perform valve firing as soon as practicable.

FIGURE 2. Valve inspection sequence.

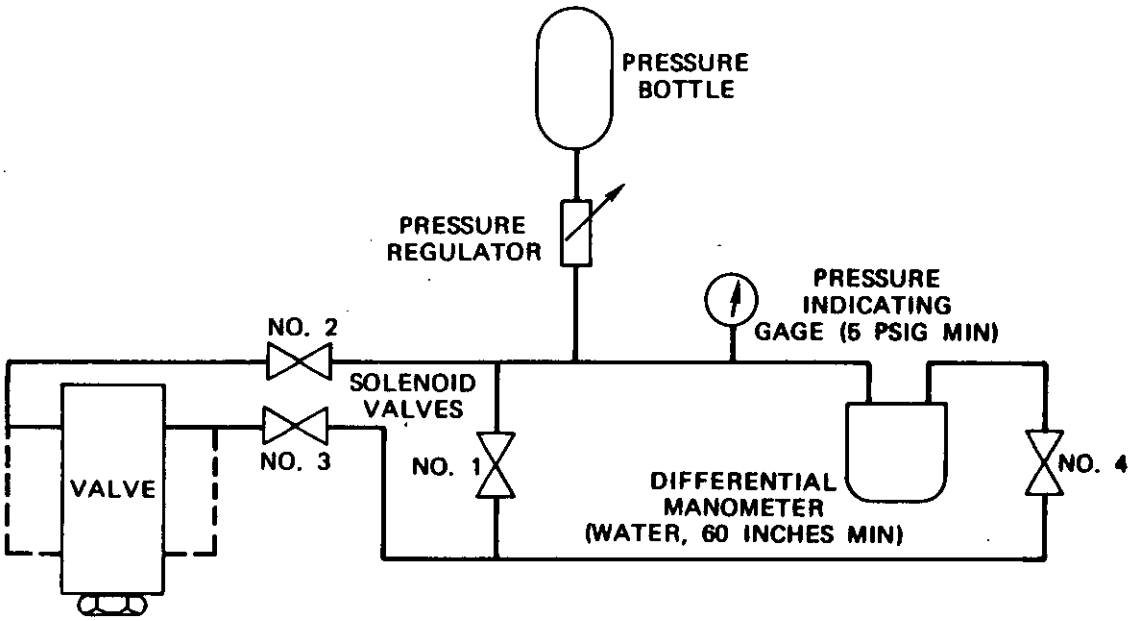


FIGURE 3. Pneumatic schematic for leak inspection.

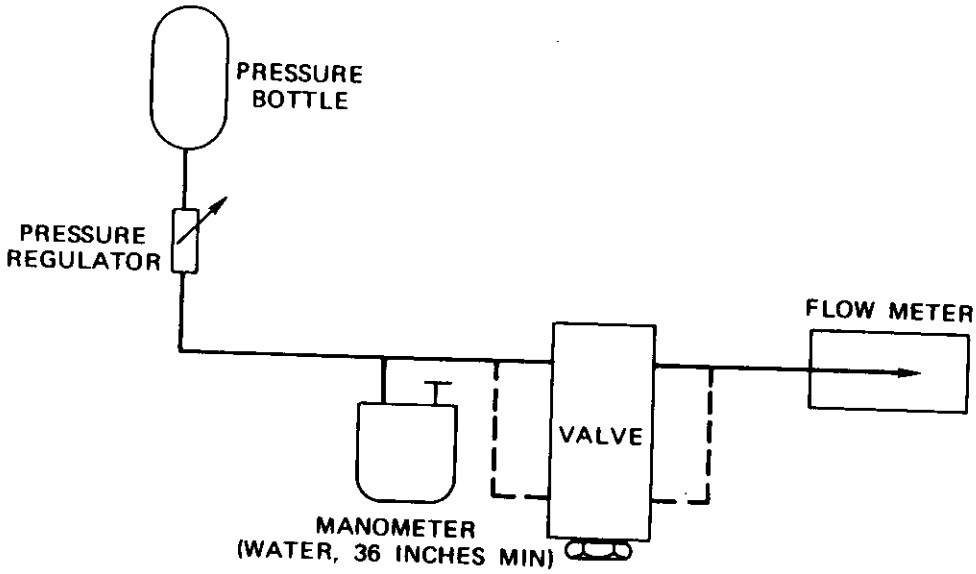


FIGURE 4. Pneumatic schematic for flow inspection.

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DOCUMENT IDENTIFIER *(Number)* AND TITLE
MIL-V-85402(AS), Valve, Air, Dual, Pyrotechnic-Actuated, FZU-43/B

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

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DATE

DD FORM 1426 1 OCT 76

Replaces edition of 1 Jan 72 which may be used.

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