SAE Aerospace
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AEROSPACE STANDARD

SAE AS1214

REV. A

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Minimum Standards for Valve, High Pressure Oxygen, Line Shut Off, Manually Operated

1. SCOPE:

This standard covers all types of manually operated high pressure oxygen line shut off valves utilizing either metallic or nonmetallic valve seats for use in general and commercial type aircraft. It is intended that the line valve should be installed in a position accessible in flight, when the cylinder mounted oxygen valves are not. The line shutoff valve may also be used optionally in large systems as a maintenance aid where only a portion of the system need be opened up and purged after repair or replacement of one or more parts.

1.1 Purpose:

The purpose of this Aerospace Standard is to define general minimum standards for the design, fabrication, test and packaging of manually operated, high pressure oxygen line shut off valves.

2. REFERENCES:

AS861 Minimum General Standards for Oxygen Systems
AS1065 Quality and Serviceability Requirements for Aircraft Cylinder Assemblies Charged with Aviator's Breathing oxygen
AIR1176 Oxygen System and Component Cleaning and Packaging
MIL-STD-810, Method 514 Equipment Class 1, Mounting A, Curve C
Specification BB-N-411
Federal Standard 595

3. REQUIREMENTS:

3.1 General Requirements:

The requirements of AS861, Minimum General Standards for Oxygen Systems are applicable to valves made under this standard.

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
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3.1.1 Construction:

1. Wrench Flats - The valve body shall have adequate wrench flats and be sturdy enough to withstand installation and removal from typical oxygen systems.

2. Manual On-Off Mechanism-Color - The manual mechanism shall be colored “oxygen green” comparable to color No. 14187 of Federal Standard 595.

3. Locking Device - All valve parts which if loosened or inadvertently removed would cause leakage or escape of oxygen shall be secured by a self-locking device or shall be safety wired.

4. Weight and Size - The weight and size of the valve shall be a minimum consistent with the performance requirements and within the limitations of sound design practices.

5. Mounting Provisions - The valve shall have provisions for mounting to aircraft structure. The mounting provisions shall be of sufficient strength to withstand the vibration, torque and shock loads which are anticipated in service.

6. Materials - The requirements and recommendations of AS861 shall be considered in design of the valve. Valve seat, seals and other nonmetallic materials if used shall be compatible with oxygen at the maximum working pressure and the environmental conditions anticipated. The amount of nonmetallic materials used should be held to an absolute minimum. Metal valve seat only is preferred.

7. Protective Treatment - When materials are used in the construction of the valve that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

8. Elastomers - All elastomers used shall have been compounded within 24 months of the date of manufacture and such cure date shall be provided on the elastomer if sufficient area is available; otherwise the end product must be identified as to earliest cure date of elastomer component included therein. If silicone elastomers are used, cure dating is not applicable.

9. Heat Dissipation - The valve and all high pressure passages shall be so constructed that heat generated by adiabatic compression (when oxygen is admitted suddenly under high pressure) is readily dissipated.

3.1.2 Operating Temperature: The valve shall be operative and permit the normal flow and shutoff of oxygen while being subjected to ambient temperatures in the range of -40 and -120 °F.

3.1.3 Operating Medium: The operating medium shall be dry oxygen, aviators breathing, per Specification AS1065.

3.1.4 Degreasing: All internal parts not adversely affected shall be degreased by using a vapor phase degreaser in accordance with AIR1176. Ultrasonics may be used in conjunction with vapor phase degreasing for the cleaning of components. After completion of the cleaning and when assembled adequate testing apparatus shall be used to determine the absence of cleaning compound.

3.1.5 Lubrication: The use of lubrication shall be held to a minimum using only lubricants compatible with high pressure oxygen. No lubrication shall be applied in any area which will be in direct contact with oxygen during normal operation.

3.1.6 Interchangeability: All parts having the same manufacturer's designation and part number shall be directly and completely interchangeable with each other with respect to installation and performance.

3.1.7 Orientation: The valve shall be capable of meeting the requirements specified herein while oriented in any position.

3.1.8 Inlet and Outlet Ports: The inlet and outlet ports shall be designed in accordance with purchaser specifications and shall be permanently marked. A directional arrow shall be permanently marked on the valve to indicate direction of flow.

3.2 Detail Requirements:

3.2.1 Opening Characteristics: The valve shall be of a slow opening type; i.e., as the valve is opened, the rate of flow shall increase gradually and the slope of the curve shall not exceed the slope of the maximum curve nor be less than the slope of the minimum curve of Figure 1 at any position of the valve handle.

3.2.2 Manual On-Off Control: The control must be a minimum of 1.5 inches in diameter and must be grooved, lobed, or otherwise shaped to provide a good gripping surface. Whenever possible the lobes or grooves should be uni-directional to provide a torque-assist in the opening direction only.

3.2.3 Operating Forces: The valve shall be designed to close completely with a torque of 15 in-lb, and must open at a torque value of 25 in-lb or less. A maximum torque of 60 in-lb shall not result in damage to the valve mechanism. No calibrated slippage device (clutch, etc.) shall be used which may result in the valve remaining open when slip occurs.

3.2.4 Operating Pressure: Unless otherwise stated by the purchaser, the valves shall operate up to a maximum pressure of 2,100 psig.

3.2.5 Proof Pressure: The valve shall have a minimum proof pressure 1-2/3 times the maximum operating pressure.

3.2.6 Burst Pressure: The valve shall have a minimum burst pressure of 2.22 times operating pressure.

3.2.7 External Leakage: When tested at maximum operating pressure, the external leakage shall not exceed 5 cc/minute NTPD.

3.2.8 Thru Leakage: When tested with maximum and minimum operating pressure and with the valve in the off position, the thru leakage shall not exceed 15 cc/minute NPTD.

3.2.9 Storage Temperature: The valve shall retain its performance capabilities as specified herein after having been exposed to temperatures of -65 °F and +160 °F for a period of 24 hours each.

3.2.10 Endurance: The valve shall function as specified herein after 5,000 operating functions applied at maximum operating pressure.

3.2.11 Vibration: Unless otherwise stated by the purchaser, the valve shall be designed to withstand vibration in accordance with MIL-STD-810, Method 514 Equipment Class 1, Mounting A, Curve C.

4. QUALITY ASSURANCE:

4.1 Classification and Scope:

4.1.1 Qualification Tests: Qualification tests shall consist of those tests listed in 4.3 and should be completed and satisfactorily reported to the purchaser prior to shipment of production parts.

4.1.2 Acceptance Tests: Acceptance tests shall consist of those listed in 4.3.1, 4.3.4, 4.3.5, and 4.3.6, and shall be conducted, except as noted, on each production part prior to shipment.

4.2 Test Media:

The test media shall be (1) dry oxygen, aviators breathing, conforming to AS1065, (2) oil-free nitrogen conforming to Specification BB-N-411, or (3) oil-free air equivalent in dryness conforming to Specification BB-N-411 and meeting its contamination requirements. All acceptance tests must be performed using dry oxygen per AS1065 only.

4.3 Test Methods:

4.3.1 Examination of Product: Each valve shall be examined for visible defects, burrs, and cleanliness to determine conformance to this standard.

4.3.2 Opening Characteristics: The line valve assembly shall be adjusted to the fully closed position. The maximum operating pressure shall be applied to the inlet of the valve assembly with the outlet attached to a suitable flow measuring device. The valve assembly shall then be opened, in increments of half turns. The maximum flow rate for each half turn increment shall be recorded. The flow rates for each half turn shall be within the limits as specified in Figure 1. The above test shall be repeated at an inlet pressure of 250 psig.

4.3.3 Maximum Torque: With no inlet pressure applied to the valve, a torque of 58 to 60 in-lb shall be applied to the valve in both the maximum open and maximum closed positions. This procedure shall be repeated 50 times. The valve shall then be subjected to and comply with all the requirements of 4.3.5 and 4.3.6.

4.3.4 Proof Pressure: Each valve shall be subjected to an oxygen pressure of 1-2/3 times maximum operating pressure applied at the inlet with the valve in the open position and the outlet capped. At the end of a 2 minute period, there shall be no distortion or leakage in excess of 5 cc/minute NTPD. After relieving the pressure, the valve shall be manually closed and the outlet shall be uncapped. The same pressure shall again be applied for a 2 minute period. At the end of this period, there shall be no evidence of leakage in excess of 5 cc/minute NTPD. If leakage is tested by liquid immersion, dry after test.

4.3.5 External Leakage: With the vale in the “on” mode, suitably plug the outlet and apply maximum operating pressure to the inlet. Submerge valve in a suitable fluid and observe for leakage. External leakage shall not exceed 5 cc/minute NPTD. Repeat this test with the valve in the “off” mode and the outlet plugged. Note: Provisions must be made to preclude fluid from entering the outlet port. Dry valve after test.

4.3.6 Thru Leakage: With the valve in the “off” mode, torque the On-Off mechanism to a maximum of 15 in-lb. Apply a pressure of 250 psi to the inlet port. The outlet port shall be attached to a suitable measuring device. Leakage from the outlet shall not exceed 15 cc/minute NTPD. Repeat this test with maximum operating pressure.

4.3.6.1 Valve Handle/Spindle External Leakage: With the valve outlet capped and 100 and 1800 psi applied alternately to valve inlet, submerge valve in pan of clean water. With valve handle alternately in closed, half-opened and full-opened position apply approximate 4 - 5 lb side load to handle with finger pressure. Leakage in excess of 5 cc/minute NTPD when a side load is applied is cause for valve rejection.

4.3.7 Storage Temperature: The valve shall be conditioned at a temperature of -65 °F minimum for a period of 24 hours. At the end of this period, the valve shall, within 1 hour, be conditioned at a minimum of +160 °F for an additional 24 hours. The valve shall then be returned to room temperature and after at least 30 minutes be subjected to and comply with the requirements of 4.3.5 and 4.3.6.

4.3.8 Operating Temperature: With the valve conditioned at a temperature of -40 °F, for a minimum of 4 hours, the valve shall be tested to and comply with the requirements of 4.3.5 and 4.3.6. This test shall be repeated at a temperature of +120 °F minimum.

4.3.9 Endurance: The vale shall be cycled 5,000 times without maintenance. A cycle shall consist of opening the valve to a torque valve of 15 in-lb and closing the valve fully to a torque value of 15 in-lb at maximum operating pressure, relieving downstream pressure after each cycle. Note: The outlet must be attached to a vessel with a minimum internal volume of 20 cubic inches. This test must be conducted using oxygen only. The valve shall then be subjected to and comply with the requirements of 4.3.5 and 4.3.6.