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AEROSPACE STANDARD

AS 1225

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Revised

HIGH PRESSURE OXYGEN SYSTEM FILLER VALVE

1. PURPOSE

The purpose of this Aerospace Standard is to define optimum standards of design, construction and performance for one type of high pressure oxygen system filler valve.

2. SCOPE

This AS covers oxygen filler valves for use in aircraft to ensure safe servicing of high pressure oxygen system cylinders. The intent is that the valve shall automatically control the rate of fill such that the temperature rise in the oxygen system caused by compression heating of the gas will be within acceptable limits. In addition, the valve shall have a pressure sensitive closing valve to automatically control the final pressure for a correct amount of oxygen in the system cylinder. The pressure closing level may be manually selected by means of adjustment dials on the valve.

3. REQUIREMENTS

3.1 Design and Construction:

3.1.1 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.

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

3.1.3 Materials: The requirements and recommendations of AIR 825 and AS 861 shall be considered in design of the valve. Valve seat, seals and other nonmetallic materials used shall be compatible with oxygen at the maximum working pressure as determined by analysis using test data for the environmental conditions anticipated, including operational effects. The amount of nonmetallic materials used should be held to an absolute minimum. All elastomeric materials shall be completely excluded if possible.

3.1.4 Mounting Provisions: The valve shall have provisions for mounting to the aircraft filling panel or for mounting to the oxygen ground service cart. The mounting provisions shall be of sufficient strength to withstand the vibration, torque and shock loads which are anticipated in service as established by purchaser's specification.

3.1.5 Fail-Safe Design Goal: The valve design goal shall be to provide features so that in case of failure, such as fire, occurring any time during the filling process, the valve will contain the fire or minimize its outbreak and propagation. This can be accomplished by utilizing materials having high ignition temperature and low heat energy such as brass or monel for valve body construction.

3.1.6 Inlet and Outlet Ports: The valve shall have inlet and outlet ports, thus permitting installation in the aircraft oxygen system or in the oxygen ground service cart. Inlet port fitting for valve used in aircraft oxygen system shall have configuration conforming to AND 10089-3 or configuration to be established by purchaser's specification in order to mate with the filling connection normally used on the oxygen ground service cart.

3.1.7 Final Filling Pressure Adjustment Dial: The valve shall have an adjustment dial to permit manual selection of the final filling pressure in terms of ambient temperature conditions. The dial marking shall be permanent and legible and have at least the following on the face: -40, -20, 0, 20, 40, 60, 80, 100 and 120 F. In addition, a pressure compensation dial which is marked in terms of initial cylinder pressures of 100, 300, 500, 700, 900, 1100, 1300, 1500 and 1850 psi should be added. This will permit readjustment of the final filling pressure level to compensate for the anticipated gas temperature rise due to compression heating and obtain the correct amount of oxygen in the receiving cylinder.

3.1.8 Operating Medium: The valve operating media shall be aviator breathing oxygen per Military Specification MIL-O-27210, Type I, or AS 1065.

3.1.9 Lubrication: Lubrication shall be held to a minimum, using lubricants compatible with high pressure oxygen as determined by analysis of test data for the environmental conditions anticipated including operational effects. Where practical, lubricant shall not be used in areas which will be in direct contact with oxygen during normal operation.

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

3.2 Performance:

3.2.1 General: The valve shall automatically control the filling rate of oxygen to eliminate an excessive gas temperature rise at any point within the oxygen cylinders or in the aircraft oxygen system high pressure lines connected to the cylinders. In addition, the valve shall automatically shut off the flow of oxygen when the system oxygen cylinder pressure reaches a predetermined level so as to prevent over filling of the system cylinder and to ensure the proper quantity of oxygen in the system cylinder being filled, e.g., 1850 psi at 70 F.

3.2.2 Outlet Pressure and Flow Control: When the valve inlet is connected to an adequate supply of oxygen ranging from 2400 psi to 3000 psi and the valve outlet connected to an oxygen cylinder with a water volume of 1500 $in.^3$ (114 cu ft gas at 14.7 psi and 70 F), the valve shall automatically shut off the oxygen flow to the receiving cylinder so that its final pressure is at 1850 psi after cooled down to 70 F.

3.2.3 Flow Limitation: The valve shall automatically shut off the flow of oxygen when the system cylinder pressure reaches a level selected by the manual adjustment dials on the valve.

3.2.4 Leakage: With a pressure of 3000 psi applied at the inlet of the valve and the outlet capped, there shall be no external leakage. With the outlet cap removed, the internal leakage through the pressure closing valve shall not exceed 100 cc per minute, NTPD.

3.2.5 Proof Pressure: The valve shall withstand an inlet and outlet pressure of 5000 psi for 5 minutes. There shall be no evidence of permanent deformation or damage.

3.2.6 Operation Temperature: The valve shall function as specified herein at any temperature between -40 and +120 F.

3.2.7 Temperature Endurance: The valve shall retain its performance capabilities at normal temperature as specified herein after having been exposed to temperatures of +160 F for a period of 7 hr and -65 F for a period of 7 hours.

3.2.8 Life Cycle: The valve shall be capable of performing 1000 complete filling cycles with no evidence of failure. Each cycle consists of filling a 1500 $in.^3$ cylinder from approximately 100 psi to approximately 1850 psi at room temperature condition.

4. QUALITY ASSURANCE

4.1 Classification:

4.1.1 Qualification Tests: Qualification tests shall consist of those tests listed in 4.3.

4.1.2 Acceptance Tests: Acceptance tests shall consist of those listed in 4.3.1, 4.3.2, and 4.3.6 only, and shall be conducted, except as noted, on each production part prior to shipment.

4.2 Test Media: The gas media shall be aviator's breathing oxygen, conforming to AS 1065, Military Specification MIL-O-27210, Type I, or nitrogen conforming to Federal Specification BB-N-411; or air conforming to Federal Specification BB-A-001034.

4.3 Test Methods:

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

4.3.2 Operation Test: Connect an adequate supply of oxygen or equivalent gas as specified in 4.2 to the inlet of the valve and a 1500 in.^{3} capacity cylinder to the outlet of the valve. The residual pressure of the cylinder shall be 100 psi. Manually set the adjustment dials to select the cylinder final filling pressure 1850 psi (equivalent to 70 F for adjustment dial calibrated to ambient temperature) and the initial cylinder pressures of 100 psi. Fill the cylinder. Measure the pressure rise in the cylinder during each filling. The pressures in the receiving cylinder after cool down to 70 F shall be at 1850 psi.

4.3.3 Proof Test: Plug the outlet of the valve and apply a pressure of 5000 psi to the inlet of the valve for 5 minutes. There shall be no evidence of permanent deformation or damage.

4.3.4 Temperature Endurance Test: All temperature tests shall be performed in accordance with MIL-STD-810 unless otherwise stated in this standard.

4.3.4.1 High Temperature Endurance: The valve shall be placed in a temperature controlled chamber. The internal temperature of the chamber shall be raised to and maintained at 160 F for a period of 7 hours. Upon return to temperatures within operating condition of +120 F, repeat the test in 4.3.2 and 4.3.6.

4.3.4.2 Low Temperature Endurance Test: The valve shall be placed in a cold chamber. The temperature of the chamber shall be lowered to and maintained at -65 F for a period of 7 hours. Upon return to temperatures within operating condition of -40 F, repeat the tests in 4.3.2 and 4.3.6.

4.3.5 Vibration: The valve shall be vibrated in accordance with MIL-STD-810, Method 514, Class 1, Mounting A, Curve C. High pressure gas (2000 psi) shall be applied to the inlet of the valve with the valve in the fully operated position (temperature and pressure dials selected in accordance with the laboratory ambient temperature and the initial receiving cylinder pressure of 100 psi condition) and valve outlet port capped. There shall be no evidence of failure as a result of this test. Use of oxygen shall be avoided if the vibration test facilities permit the presence of oil. The valve shall be thoroughly cleaned and dried after this test.

4.3.6 Leakage Test: Plug the outlet of the valve and apply a pressure of 3000 psi to the inlet of the valve for a period of 5 minutes. There shall be no evidence of external leakage as determined by leak test solution. With the valve temperature adjustment dial set to 70 F, maintain a pressure of 1850 psi to the valve outlet port and inlet port open to atmosphere. The internal leakage through the pressure closing valve shall not exceed 100 cc per minute NTPD.

4.3.7 Life Cycle Test: Perform the test of 4.3.2 1000 times. There shall be no evidence of failure or malfunction of the valve at the end of the test. Check leakage per 4.3.6. Inspect the valve occasionally; there shall be no evidence of excessive wear. Fifteen percent of the cycles shall be conducted at the lowest operation temperature (-40 F) and 15% at the highest operating temperature (+120 F).