

CIL
EMU CRITICAL ITEMS LIST

Page: 1
Date: 12/02/91

12/24/91 SUPERVEDES 08/31/90

ANALYST:

NAME P/N QTY	CRF	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
02 PRESSURE REGULATOR 2ND STAGE, ITEM 2130 ----- 64799042-3 (1)	1/1	21301N03A: Regulation band drifts above 4.2 but less than 4.55 psid. CAUSE: Contamination. Wear of ball actuator stem or balance bar, balance stem or actuator stem sticks, ball seat deteriorates.	END ITEM: Higher emergency oxygen consumption rate. SFE INTERFACE: Reduction in the 50 minute availability of emergency oxygen in proportion to the percent drift in regulation band. MISSION: Abort EVA. Less than 50 minutes available while on SDP. CREW/VEHICLE: Possible loss of crewman due to insufficient oxygen if regulation drift is significant. Loss of estimate of time remaining on SDP.	A. Design - A change in the position of the ball in the seat does not significantly affect regulation. A 0.005 inch change in ball seat position changes the regulated pressure 0.1 psi. Vespel is a creep resistant material. The system is cleaned to MS3150 level EMSOA before operation which minimizes the amount of contamination initially in the system. Particle generation during operation is minimized by material selection and surface finishes. The second stage regulator is protected by a 25 micron absolute nickel filter to minimize the chance of jamming. Nominal rating of the filter is 18 micron which is equivalent to a particle size of 0.0007 inches. Diametrical clearance between sliding parts is small to minimize cocking. It is 0.0010-0.0015 inch between the valve seat and housing, and 0.0005-0.0025 inch between the spring seat and housing, and 0.0005-0.0025 inch between the stem guide and pressure balance stem. The filter reduces the probability of a particle jamming these close tolerances. The housing and stem guide are made of stress relieved Inconel 600, and the valve stem, spring seat, and pressure balance stem are made of age hardened Inconel K 500 to minimize the chance of galling. All sliding surfaces have either a 16 or 32 microinch finish, all edges are either radius or chamfered. The L/D ratio for the valve stem - housing combination is 7; for the spring seat - housing combination is 3.6; and for the pressure balance stem - stem guide is 7. B. Test - Component Acceptance Test - The Vendor, CIL, performs the following tests to assure the second stage regulator setpoint has not drifted: Contamination or clogging of the inlet filter is reduced/minimized by cleaning off of the regulator internal details and oxygen passageways to MS 3150 EMSOA. The test facility hardware and gases also meet this requirement. The regulator pressure and flow capability are verified during Acceptance test by performance tests at sea level with an inlet pressure of 7400 psid and a varying flow rate from 0.06 to 5.3 to 0.06 pph. The performance test is also performed at Vacuum Conditions with inlet pressures of 7400, 5055, 2710, and 350 psid and a varying flow rate from 0.06 to 5.3 to 0.06 pph.

SEM-44-001H
Page 1264

12/24/91 SUPERSEDES 08/31/90

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	1/1	2130M03A:		<p>PDA Testing - Contamination or clogging of the inlet filter is reduced/minimized by cleaning all interacting inlet test fixtures and hoses to MS3150 EN58A. Test gases also meet this requirement.</p> <p>Proper regulator performance is verified in a series of performance and endurance tests. The regulator is performance tested initially at sea level ambient at 7400 psig and 350 psig inlet pressures. At each inlet pressure, the outlet pressure is monitored over the flow ranges of 0-8.2 lbs/hr O2 (max) and 0.2 -0 lbs/hr O2. The SOP is allowed to blowdown from 7400 psig to 350 psig, while verifying proper regulator function. With the inlet at 7400 psig, the item is endurance flowed at 4.5-5.25 lbs/hr O2 for 5 hours minimum and at 0.5-2.0 lbs/hr O2 for 2.5 hours minimum. Again, the end item (SOP) is allowed to blowdown from 7400 to 350 psig. With the inlet pressure at 350 psig, the item is endurance flowed at 4.5-5.25 lbs/hr O2 for 5 hours minimum, and at 0.5-2.0 lbs/hr O2 for 2.5 hours minimum. After the blowdown and endurance testing, the item is performance tested at sea level and vacuum ambient with inlet pressures of 7400 psig and 350 psig. For each configuration, the outlet pressure is monitored over the flow ranges of 0-8.2 lbs/hr O2 (max) and 0.2 (max) -0 lbs/hr O2. An additional blowdown is performed prior to vacuum testing.</p> <p>Certification Testing - The item completed the following cycle tests during 5/85; ON/OFF Actual 9025, Spec 1011; No flow Hours Actual 984, Spec 10; Blowdown Actual 112, Spec 33. No Class I Engineering Changes have been incorporated since this configuration was certified.</p> <p>C. Inspection - Details are 100% inspected per drawing dimensions and surface finish characteristics. Details are manufactured from material with certified physical and chemical properties. All details, gases and test facilities are cleaned and inspected to MS3150 EN58A to preclude contamination clogging. The ball seat is visually inspected under 30x magnification for sharp edges and surface defects. The running and final torque of threaded connections are</p>

SEM-44-001H
Page 1265

CIL
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Page: 3
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	1/1	2130/M03A:		<p>verified by vendor and DCAS inspectors. A trial assembly is run on all details and then they are visually inspected. The demand valve pinle and balance stem are manually depressed during assembly to assure free motion.</p> <p>D. Failure History - None.</p> <p>E. Ground Turnaround - Tested per PEMU-R-001, SOP servicing for flight, Sea Level Regulator Performance and Flow Limiting Check.</p> <p>F. Operational Use - Crew Response - EVA: Since EVA termination is required as soon as SOP is flowing, crew would quicken EVA termination when improper regulation is detected. Special Training - Standard EMU training covers this failure mode. Operational Considerations - EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Flight rules define go/no go criteria related to EMU pressure integrity and regulation. Flight rules define EMU as lost for loss of operational SOP. Real Time Data System allows ground monitoring of EMU systems.</p>