

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
FEEDWATER RELIEF VALVE, ITEM 135 ----- SV769404-7 (1)	2/1R	135FM01A Internal water leakage, fails open. Seat contamination, spring fracture, diaphragm leakage, plunger fails to close. Housing seal bypass leakage.	END ITEM: Water leakage to ambient. GFE INTERFACE: Depletion of the water reservoir. Loss of cooling and defog. MISSION: Terminate EVA when the water supply drops below CWS limits. CREW/VEHICLE: None for single failure. Possible loss of crewman with loss of SOP. TIME TO EFFECT /ACTIONS: Minutes. If there is insufficient water to provide cooling/defog, open purge valve to activate the SOP. TIME AVAILABLE: Minutes. TIME REQUIRED: Seconds.	A. Design - A 38 micron inlet filter and 140 micron outlet filter protect the valve details from contamination. The spring is stressed conservatively in this small stroke application. The plunger and bore are teflon coated to reduce friction. The bead seal on the elastameric diaphragm circumference provides seal squeeze under all loading conditions. The valve diaphragm is designed to minimize membrane stresses by limiting the stroke to 0.020 inches max. and utilizing a teflon coated piston for support. B. Test - Component Acceptance Test - An internal leakage test is run per AT-E-135 using one of two methods. In the first method, the relief valve is pressurized to 15.5-16.5 psig with nitrogen. No bubbles are allowed from the outlet for a 5 minute minimum test period. If this test is not passed, the relief valve is then pressurized to 16.0-17.0 psig with water for 60 minutes minimum. The water leakage is not to exceed 0.01 cc/hr. A performance test is run in which the relief valve must have a cracking pressure of 18.0-20.0 psid. Cracking pressure is defined as water just starts to flow through the valve. The valve must also reseat at 18.0-20.0 psid. In addition with the valve pressurized to 20.0-20.2 psid it must flow 0.9-22.7 cc/min of water. All rig lines and test fixtures are cleaned to HS3150 EM150 to prevent them from contaminating the item. PDA Test - During testing per SEMU-60-010 the relief valve must have a cracking pressure and a reseat pressure of 18.0-20.0 psig. Certification Test - Certified for a useful life of 20 years (ref. EMUM-1079). C. Inspection - A cleanliness level of HS3150 EM150 is maintained during the assembly and testing of the valve. This level requires a mandatory inspection for verification. The 140 micron screen is 100% inspected for being properly resistance welded and bonded to the valve housing as well as visually for defects. The 38 micron screen is 100% inspected for being properly bonded to the valve seat as well as visually for defects. The spring is 100% inspected to meet dimensional and force displacement requirements. The sealing interfaces between the valve housing and the valve body are 100% inspected to meet dimensional and surface finish requirements. The diaphragm is 100% inspected to meet dimensional and surface finish requirements, along with being visually inspected for defects. The diaphragm surface that opens and closes flow to the valve seat orifice is inspected under 10x magnification for any surface defects. An inprocess test is run to check for internal leakage around the diaphragm. No leakage is allowed. The interfacing surfaces between the valve plunger and housing are 100% inspected to meet dimensional and surface finish requirements, as well as for

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		REDUNDANCY SCREENS: A-PASS B-PASS C-PASS		<p>being properly teflon coated.</p> <p>The interfacing surfaces between the valve module housing and the valve housing are 100% inspected to meet dimensional and surface finish requirements.</p> <p>The O-seals are inspected for surface characteristics per SVHS3431; 100% for Classes I and II, at least 1.5 AQL for Class III.</p> <p>An inprocess test is run to check for housing seal bypass leakage. No leakage is allowed.</p> <p>D. Failure History -</p> <p>H-EMU-135-A001 (8-12-81) The 135 valve failed internal leakage during acceptance test due to aluminum oxide contamination drying on the diaphragm and valve seat after the valve was removed from the system. Corrective action: A procedure has been instituted that requires flush cleaning and vacuum drying of any valve removed from the system.</p> <p>H-EMU-135-D002 (4-14-83) Internal seat leakage due to an improper test fixture. Corrective action: The test fixture was revised.</p> <p>H-EMU-135-D004 (9-27-83) The 135 valve experienced an excessive leakage rate during component acceptance testing. Inspection of the valve diaphragm (P/N SV767683-2) revealed a defect of the sealing surface. Corrective action: The diaphragm acceptance criterion now requires a 10x magnification inspection of the diaphragm surface condition.</p> <p>B-EMU-135-A001 (10-6-88) The 135 valve failed to reseal due to excessive contamination drying on the diaphragm and valve seat after the PLSS was stored for over a year. Corrective action: Prior to the 135 crack and reseal test, a 135 valve which has not undergone a crack/reseat test in the last 30 days will be subjected to maximum water flow for five minutes. The 135 crack and reseal test will then be performed.</p> <p>H-EMU-135-D007 (11/09/95) - Item 135 Feedwater Relief Valve S/N 007 exceeded leakage during acceptance testing with 0.023 cc/hr vs. spec of 0.01 cc/hr. A new diaphragm and seat were installed and leakage increased to 0.033 cc/hr. Valve was tested over a six month period with no significant change. Analysis showed that the valve leakage could be increased without impacting overall PLSS leakage limit. EC 182135-023 increased internal water leakage from .01 cc/hr to .05 cc/hr.</p> <p>E. Ground Turnaround -</p> <p>Tested for non-EET processing per FEMU-R-001, water servicing, leakage and gas removal. None for EET processing.</p> <p>F. Operational Use -</p> <p>Crew Response -</p> <p>EVA: When CWS data confirms activation of reserve water tank, terminate EVA.</p> <p>Training -</p> <p>Standard EMU training covers this failure mode.</p> <p>Operational Considerations -</p> <p>Flight rules require termination of EVA when minimum primary consumables remain. EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Real Time Data System allows ground monitoring of EMU systems.</p>

EXTRAVEHICULAR MOBILITY UNIT
SYSTEMS SAFETY REVIEW PANEL REVIEW
FOR THE
I-135 FEEDWATER RELIEF VALVE
CRITICAL ITEM LIST (CIL)
EMU CONTRACT NO. NAS 9-97150

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