

SAA09SY07-013
 REV. A
 B/L: 53.00
 SYS: 19/GD

S0502240
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Critical Item: Hydrogen Leak Detection Sensor (21)

Find Number: A125340, A125341, A125342, A125343
 A125344, A125345, A125346

Criticality Category: 1S

SAA No: 09SY07-013 REV A

System/Area: FCSS/OPF HB 1, 2 & 3
 (7 Per HB)

NASA
Part No: 79K13448-

PMN/ S70-1220/
Name: Hydrogen Leak Detection Sensor

Mfg/ Rexnord/
Part No: Model 880

Drawing/
Sheet No: 79K09245, 79K21153, 80K52897

Function: Monitors the areas of the OPF High Bay for the Fuel Cell Servicing System, for Hydrogen Leaks which may occur during Cryo off-load/drain operations.

Critical Failure Mode/Failure Mode No: Undetected low/no output/
 FM No. 09SY07-013.001

Failure Causes: Structural failure of an internal piece part or failure of a discrete component within the sensor.

Failure Effect: System could fail to detect a hydrogen leak which could result in a fire/explosion with loss of life and/or vehicle.

Acceptance Rationale

Design:

- o The Hydrogen Leak Detection Sensor meets design requirements in accordance with NASA Specifications 79K80419, "Specification for Hydrogen Leak Detection Sensor (S70-1220)":
 - o Explosion proof housing
 - o MTBF of 50,000 hours (5 years) in outdoor environment at KSC at 28V+4V dc
 - o Solid state device with over voltage and reverse polarity protection
 - o Analog output of 0-5V dc (-10,000 to +40,000 ppm hydrogen concentration)
 - o Repeatability - 5%
 - o Temperature - 40° - 158°F
 - o Response time - 1 second for 90% of change

Hydrogen Leak Detection Sensor (Continued)

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- o OMRSD File VI requires verification of proper operation by stimulating the sensor with 2% Hydrogen in air sample gas prior to each use per OMI V3543 "FCSS/HLDS Operations Support (LPS)."

Inspection:

- o The OMRSD File VI requires that inspection and preventive maintenance be performed on the Leak Detection Sensors prior to each use per OMI V6D87, "Preventive Maintenance Hydrogen Leak Detection Sensors."
- o The OMRSD File VI requires verification of proper installation of leak detection sensors prior to each use per OMI V3543, Preoperational Setup 1.

Failure History:

- o There were 667 PV-6 PRACA reports reviewed against the Hydrogen Leak Detection Sensors 79K13448. There were 12 PR's identified in the "fail low" failure mode which were detected during the test/calibration type OMI's. There are no known failures in the Critical Failure Mode during system operation.
- o The GIDEP failure data interchange system has been researched and no failures of that component were found.

Operational Use:

- o The Fixed Hydrogen Leak Detection Sensors in the OPF are used during Cryo off-loading operations when a Return to Launch Site (RTL) is called or when the Shuttle lands at KSC. During Cryo off-loading, portable H2 leak detectors are used, when requested, in addition to the Fixed H2 Leak Detection Sensors to check for any hydrogen leaks. (See OMI V1091 (section 1.6.2, item 12), Orbiter PRSD Cryo Drain.) 4 sensors, A125340-A125344-A125345 and A125346, are used during the single cell voltage tests per OMI V1093.
- o Each sensor is monitored from the Firing Room LPS console in the LCC. An audible alarm indication is received by the LPS Console Engineer when the level of hydrogen is above specified limits. Personnel within the OPF area are notified by the Orbiter Test Conductor of proper actions required by the Emergency Instructions of the OMI being performed.

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Operational Use: (Continued)

- o A detectable loss of the Hydrogen Leak Detector System such as loss of LPS or loss of 28V DC special power during cryo drain operations is considered to be non-critical].
- o Correcting Action:
There is no action which can be taken to mitigate the failure effect.
- o Timeframe:
Since no correcting action is available, timeframe does not apply.