Procedure 03-8083-P05

Helium Leak Detection

REVISION RECORD

Revision	Date of Issue	Description of Change	Prepared by	Reviewed by	Approved by
0	01/15/03	New	Elaine Steele	Tom Gilmore	Dave Rioux
1	01/12/04	Modified to address Rohwedder's comments	Gary Armstrong	Tom Gilmore	Dave Rioux
2	02/02/04	Modified to address Rohwedder's comments	Gary Armstrong	Tom Gilmore	Dave Rioux

Purpose:

The purpose of this procedure is to check the vacuum integrity of the Prototype Vacuum Vessel Segment.

Scope:

This Procedure has been developed to examine the vacuum integrity through a pump-down/helium leak check process in accordance with the specifications outlined in the Product Specification NCSX-CSPEC-121-01-01.

References:

- Prototype Vacuum Vessel Segment Product Specification NCSX-CSPEC-121-01-01.
- Helium Leak Detector – HLT 160 User's Guide.
- Helium Leak Detector – HLT 160 Short Operating Instructions.
- TPG 300 Operating Instruction.

Equipment:

- HLT-160 Leak Detector
- Edwards Mechanical Booster
- Leybold Turbo Vac 1000C
- TPG (Total Pressure Controller) 300
- Turbotronik NT 1000
- Turbo Blower
- Pfeiffer Roughing Pump
- Water supply
- Miller Coolmate 3 water-cooler
- Helium Gas

Procedure:

1. Turn on the roughing pump and blower with the switch on the wall (by the hot water tank).
2. Turn on the Miller Coolmate 3 water-cooler.
3. Turn on the air compressor.
4. Connect the flex line from the test equipment to the Prototype Vacuum Vessel Segment (Port Extension).
5. Open valve #1 on the pump by plugging the power source into it.
6. When pressure reaches 1.0×10^{-2} Torr (or 1.3×10^{-2} mbar) on the TPG 300 unplug gate valve #1, plug power source into gate valve #2, allow to pump for 2 minutes and press "start" on the Turbotronik.
7. When "normal operation" light illuminates on the Turbotronik NT 1000, turn the red switch on gate valve (#3) from a horizontal to vertical position making sure pressure is still below 5.0×10^{-2} Torr.
8. When vacuum reaches base pressure of $\leq 1 \times 10^{-7}$ Torr as specified by the Customer turn on the HLT-160 Leak Detector.
9. If optimum base pressure cannot be reached, remove chamber from pumps and perform a bake-out. The bake-out shall consist of heating chamber to 150 C for 6 hours, then resume with leak check. Return to Step #4.
10. When the "vent" light illuminates on the hand control of the HLT-160, push the "pump" button and wait approximately 1 minute.

11. Plug power source into valve #4.
12. Helium is used to detect leaks in the chamber. Open the valve on the helium tank, then open the valve on the helium wand that is connected to the helium tank to allow a light flow of helium to escape.
13. Run the helium wand along all welded, flanged and sealed joints periodically checking for the flow of helium.
14. The total acceptable helium leak rate for the Prototype Vacuum Vessel Segment (Port Extension) shall be $\leq 1.7 \times 10^{-9}$ Torr-l/s.
15. If no alarm is heard then there are no leaks, record the highest reading observed on the helium leak detector and go on to step (17). If the alarm sounds on the hand control, there is a leak that has to be located on the chamber and documented on a Non-Conformance Report, FormF043.
16. To locate a leak when the base pressure is above 5.0×10^{-2} Torr, use red-dyed methyl hydrate around suspected leak area and watch the TPG 300 reading. A pressure reading increase (high spike) indicates that methyl hydrate has leaked inside the chamber. Repair as per Weld Repair Procedure 03-8083-P013. Once the leak has been fixed, return to Step #4 to initiate the testing process again.
17. If the base pressure and sensitivity are consistent with what the above criteria, then the chamber has passed, release vacuum and remove pumps and fill out the Helium Leak Test Report, Form F056.