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Tool & Machine, Inc.

PP478

## Vacuum Testing Process Parameters 64880/1 PPPL NCSX Prototype Vacuum Vessel Segment

### 1.0 PURPOSE

This document establishes the procedure to ensure that the NCSX Prototype Vacuum Vessel Segment Port Extension is tested within the guidelines specified in NCSX-CSPEC-121-01-01 3.2.1.1

### 2.0 REFERENCE DOCUMENTS

- Product Specification NCSX-CSPEC-121-01-01
- PP475 Cleanliness Control Process Parameters
- ASTM E498 Standard Leak Test Methods
- MTM MIT / Quality Assurance Plan 64880/1

### 3.0 EQUIPMENT AND SUPPLIES

- MTM Recirculating oven
- Turbo-molecular pump with a minimum pumping speed of 30 liters per second N<sub>2</sub>. With ultimate pressure rating of 10<sup>-8</sup> min.
- Mass Spectrometer Leak Detector or Residual Gas Analyzer in the Tracer Probe Mode

### 4.0 PREPARATION FOR VACUUM TESTING

4.1 Prior to bake-out and vacuum testing, the area being tested (and all hardware (e.g. bolting, seals, etc...)) will be cleaned and verified according to PP475. The Conflat Flange, seals, and related hardware will be installed per the MTM manufacturing routing.

4.2 A "bake-out" will be performed to remove any residual moisture from the materials being tested. The part being tested will be heated to 150°C (302°F) for 6 hours.

### 5.0 VACUUM TESTING PARAMETERS

Caution: The vacuum test procedure will subject the vessel to an internal vacuum that generates tremendous forces. Failure of any part of the vessel or test equipment could result in implosive/explosive reactions, ejected parts and dangerous noise levels. Appropriate safety precautions must be observed. Unnecessary personnel should vacate the test area whenever a vacuum is present in the vessel (Except essential personnel). The contractor / testing expert is responsible to ensure the proper safety guidelines are followed by all persons involved, and in the surrounding area.

5.1 The Port Extension will be tested in compliance with ASTM E498 test method C, and the following:

5.1.1 The Port Extension Assembly under test shall be evacuated using a turbo molecular pump to an internal pressure of  $= 1 \times 10^{-7}$  torr. The total helium leak rate of the test shall be  $= 1.7 \times 10^{-9}$  torr-l/s.

5.1.2 Any parts that may have become contaminated prior to, or during the test, will be re-cleaned per PP475. The test will be repeated if necessary.



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**6.0 MAJOR TOOL AND MACHINE Q/A WITNESS**

6.1 MTM Quality Assurance Inspector will assist with, and overview the entire performance of the test. A MTM QAI acknowledgement / signature is required on all quality records and relevant documentation..

6.2 Visual Inspection – After the vacuum testing is complete, the parts shall be visually inspected for deformation. Irregularities will be reported via MTM NCR.

**7.0 QUALITY / DOCUMENTATION REQUIREMENTS**

7.1 Once the test is completed, a Vacuum Test Certificate is required from the supplier of the test. The certification must include the following information:

7.1.1 Date / time of test, part number, part description, specific test requirements, list of equipment and serial numbers used, actual results, name of contractor, name / signature of inspector, name / signature of MTM Q/A witness, MTM P.O. number, chart record of test.

**8.0 ADDITIONAL REQUIREMENTS**

8.1 Process change recommendations. If the vacuum test contractor realizes items that could be changed or improved to better facilitate performance during the execution of the full production vessel, this information must be included with the test certification for the PVVS Port Extension.

8.2 Written and signed cost proposal for testing the VVSA. Based on the experience of testing the PVVS. Testing supplier is to provide a firm / fixed cost proposal to test the three 120 degree VVSA periods individually. The proposal must include (as a minimum), a firm / fixed cost (per period), a list necessary equipment, and tooling requirements, and approximate required support from MTM personnel.