



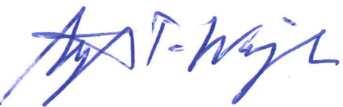


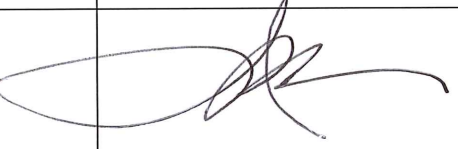
## Standard Operating Procedure

SOP #: 6.025 Rev. 1

### Pressure Test, Closed Coax Containment

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#### Approval

Approving Authority	Name	Signature	Date
Process Systems Manager	Michael Delgado		04/22/15
Quality Assurance Manager	Steve Washington		4/22/15
V.P. Engineering	Steve Rusconi		4/22/15
Operations Manager	Steve Hansen		4/23/15
President	Joseph Parisi		4/27/15

#### Revision History

Revision #	Description of Change	Effective Date	DCR#
0	Initial Issue	03/31/2015	15001
1	Increase test pressure to 100 psig	04/28/2015	15004

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- 1 Objective
  - 1.1 This procedure is to provide guidelines for pressure testing in a closed coax containment in semiconductor systems.
- 2 Scope
  - 2.1 The following procedure shall be applicable to metallic piping for both "Ultra High Purity" (UHP) and the "Clean for Oxygen Service" (CFOS).
- 3 Responsibility
  - 3.1 The Quality Control Manager (QCM) will appoint an Inspector of Record (QAR) for the Project. Pressure testing shall only be performed by contractor personnel who have been qualified by the assigned QAR.
    - 3.1.1 Inspector of Record (QAR) may be employed by a sub-contractor of Therma Corporation.
- 4 Procedure
  - 4.1 Introduction
    - 4.1.1 The purpose of this procedure is to ensure that all pressure testing is carried out in a safe and clean manner and in accordance with the client's specification.
  - 4.2 General
    - 4.2.1 Closed Containment System: defined as a piping system which consists of a carrier line routed inside a larger diameter containment line. In particular it is defined as closed, as the ends of the containment line are sealed to the carrier line with either a close-down fitting or a close-down weld. Typically the close-down is inside of a valve manifold box, a gas cabinet or the inside of the process tool. The containment line in this case is designed to hold pressure.
  - 4.3 Protocol
    - 4.3.1 Piping Foreman shall notify jurisdictional authority, QCM and QAR as required prior to applying pressure test.

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- 4.3.2 The maximum pressure of any test is to be 100 psig.
- 4.3.3 "Caution Pressure Test In Progress" signs shall be posted at the point of connection, all point of use valves on the line or section being tested, and at intervals of ten (10) feet along the length of the line or section being tested.
- 4.3.4 System integrity and cleanliness shall not be jeopardized nor violated in any form.
- 4.3.5 Clean latex gloves shall be worn at all times while handling materials, connecting fittings, etc. for all High Purity Service systems.
- 4.3.6 These tests should be performed to test secondary pressure against primary pressure first to expose any deficiency in a manufactured secondary containment fitting using the premise that once moisture evacuation on the primary begins, the secondary relative to primary containment challenge will have already been met.
- 4.4 Definition of Tests to be Performed.
  - 4.4.1 Gross Failure Test.
    - a. The gross failure test is performed prior to the Pressure Decay Test, to determine whether a weld or component will fail under pressure or there is a gross leak in the system.
    - b. This will entail pressurizing the system to 100 psig incrementally. The system shall then be allowed to stabilize for a period of 15 minutes. Any such gross failure should be readily apparent within this time frame.
  - 4.4.2 Pressure Decay Test.
    - a. The pressure decay test is performed subsequent to the Gross Failure test to determine the leak integrity of the system in order to ascertain which helium leak test shall be most suitable.
    - b. This shall entail maintaining the pressure after completion of the gross failure test, for a minimum of 24 hours. There shall



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be no pressure loss other than that which can be temperature compensated.

#### 4.5 Pretest.

Before any pressure test equipment is connected to the line or section to be tested, a "LINE WALK" must be performed to:

- 4.5.1 Correct any unsafe conditions such as Swagelok caps with nylon ferrules on the system to be pressurized, incomplete construction, isolating valves open to other parts of the system, etc.
- 4.5.2 Isolate/remove instruments or devices which can not withstand the test pressure.
- 4.5.3 When the "LINE WALK" is satisfactory, all details and limits of the section to be tested shall be highlighted on the Piping Drawing, showing positions of all valves, etc. within that section, and the detail drawings signed by both the QCM and the QAR.

NOTE: Please note that this exercise is not to be misconstrued as an installation Punchlist, as the Piping Foreman should present a "COMPLETED" system or section for testing.

- 4.5.4 The piping foreman can now proceed with pressure testing.

#### 4.6 Material Requirements.

- 4.6.1 The following items detail the requirements for one (1) UHP Test Rig assembly, to be used to test both the Ultra High Purity and Clean for Oxygen Service systems.
  - (1) 6" diameter Mirror Backed Dial Gauge, 0-300 psig capability in 1 psig increments. 1/2" VCR connection. Calibration certificate to be supplied by vendor.
  - (1) Nupro 1/4 turn valve DL type, VCR male ends.
  - (1) 0.1 Micron filter, 1/4 VCR male ends.
  - (1) 1/4" VCR tee, female ends.
  - (2) 1/4" VCR caps.
  - (1) 1/4" VCR reducing adapter, 1/2" female to 1/4" male.
  - (5) 1/4" nickel VCR gaskets.
  - (1) 1/2" nickel VCR gasket.

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- (1) ¼" double female connector, for connection to the system line or section to be pressure tested.
- 4.6.2 Please note that only VCR components shall be used in the test rig assembly.
- 4.6.3 In addition to the above, a UHP Dewar container of liquid capable of generating the required 220 psig, ¼" electropolished 401 stainless steel tubing and regulator assembly shall be required to connect to the test rig and a 0.1 degree temperature indicator for monitoring the atmospheric temperature at start and finish of test.
- 4.6.4 The Pressure test rig/s must be maintained at a pressure no less than 10 psig and capped when not in use.
- 4.7 Pressurizing the System.
  - 4.7.1 Install Test Rig as detailed above, on portion of system to be tested, then proceed to close and seal all system purge outlet(s) of portion to be tested. Confirm that there is no disruption of purge flow to adjacent system(s) resulting from isolations.
  - 4.7.2 Connect a regulated pressure supply line to the annulus section of the containment system.
  - 4.7.3 Follow the next steps, noting that the maximum system pressure for a Coaxial system shall be 100 psig:
    - a. Ensure ¼ turn valve on Test Rig is in "Closed" position.
    - b. Increase pressure in Test Rig connection line to 20 psig.
    - c. Open ¼ turn valve on Test Rig assembly, slowly.
    - d. Gradually increase the pressure, in increments of ten (10) psig, using the regulator, (thus avoiding "shocking" the system) to 100 psig.

NOTE: Monitoring of the gauge(s) and system should be continuously carried out during the pressurizing procedure to ascertain whether the system has any "gross" failure or has developed any problems.



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- e. Close the  $\frac{1}{4}$  turn valve on the Test Rig when the gauge shows 100 psig.
- f. Let the pressure stabilize for 15 minutes. This procedure shall serve as the "Gross Failure" Test. All gross leaks shall be repaired and gross failure test accepted prior to start "Pressure Decay" test.

NOTE: Start "Pressure Decay" Test.

- g. If necessary (after system stabilization) add to system pressure to equal 100 psig.
- h. Once Test Pressure has been achieved and stabilized, ensure the  $\frac{1}{4}$  turn valve is closed.

NOTE: Begin to fill out pressure test form FN.6.004.1, note start time/pressure, date, system, and test #.

- i. Reduce the pressure being developed by the regulator, and break the connection to the Test Rig at the connection to the  $\frac{1}{4}$  turn valve. DO NOT DISCONNECT COMPLETELY!
- j. Reduce the flow through the regulator and the "loosened Connection" to a trickle.
- k. Disconnect the Pressurizing line from the Test Rig, and cap the  $\frac{1}{4}$  turn valve with a  $\frac{1}{4}$ " VCR cap, and new gasket.
- l. Cap the Pressurizing line from the Dewar, where it has been disconnected from the Test Rig, to maintain the integrity of the line.

#### 4.8 Test Duration.

- 4.8.1 The test duration shall be calculated by the QAR to ensure the maximum sensitivity is obtained, though shall be a maximum of 24 hours, with no Pressure Loss other than that which can be attributed to the changes in temperature.

#### 4.9 Test Results.

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- 4.9.1 QAR must witness start and finish of all test being performed, therefore it is the responsibility of the tester to ensure that the QAR is advised of any pending tests accordingly.
- 4.9.2 QAR shall submit all test reports to QCM for review and acceptance.
- 4.9.3 QCM shall indicate acceptance with signature and date and forward to project manager for inclusion in turnover package.