

SEMI F106-0308 (Reapproved 1012)

TEST METHOD FOR DETERMINATION OF LEAK INTEGRITY OF GAS DELIVERY SYSTEMS BY HELIUM LEAK DETECTOR

This Standard was technically approved by the Facilities Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on August 30, 2012. Available at www.semiviews.org and www.semi.org in October 2012; originally published March 2008.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Purpose

1.1 This Standard defines the inboard helium leak test method for gas delivery systems.

2 Scope

2.1 This Test Method covers both conventional metal face sealing and surface mount gas delivery systems.

2.2 This Test Method applies to all types of high purity gas delivery system used in semiconductor manufacturing facilities and comparable research and development areas.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 All components must meet quality requirements as established and controlled by manufacturers prior to testing (e.g., dimensional, functional, etc.).

3.2 Care should be exercised in handling of components to maintain manufacturer's specifications.

4 Referenced Standards and Documents

4.1 None.

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *MFC* — mass flow controller

5.2 Definitions

5.2.1 *calibrated leak* — a calibrated leak is the standard equipment leak rate that is used for calibrating the leak detector. The standard equipment divides into the permeation type and the capillary type; the permeation type is based on the gas permeation properties of fused quartz and the capillary type uses very thin stainless steel pipes.

5.2.2 *component* — an individual piece or a complete assembly of individual pieces capable of being joined with other pieces or components. The typical components referred to by this Specification are valves, fittings, regulators, pressure gauges, pressure and flow sensors, mass flow controllers, and tubing welded to fittings.

5.2.3 *leak* — a path (or paths) in a sealed system that will pass helium gas when a pressure differential or diffusion path exist. There are two leak mechanisms: a mechanical passage and a material through which gas can diffuse or permeate. A leak may have both mechanisms operating in parallel.

5.2.4 *leakage, inboard* — leakage from outside to inside occurring when the internal pressure is less than the external pressure acting on a component. Inboard leakage is typically determined by introducing a tracer gas around the exterior of the piping system or component under test.

6 Procedure

6.1 Inboard Leak Test (1)

6.1.1 Open valves, mass flow controllers (MFCs), regulators that compose the system.

6.1.2 Connect the helium leak detector to outlet port and plug inlet port of the system. However, if the system includes check valves, orifices, MFCs, or other components which reduce gas conductance, both the inlet and the outlet ports must be connected to the helium leak detector in order to achieve a vacuum.

6.1.3 Evacuate the system to the working pressure of the leak detector (2 Pa). Stabilize the background of helium leak detector.

6.1.4 If the fitting has leak check ports, spray helium gas into each port at least a second after the back ground is stabilized, and monitor the indicator. If the fitting does not have any leak check ports, spray helium gas over each connection for at least a second, and monitor the indicator.

6.1.5 Test time should be based on actual times to a calibrated leak placed at the furthest point in the system from the leak detector.

6.1.6 A recommended test schematic for inboard leak test (1) is shown in Figure 1.

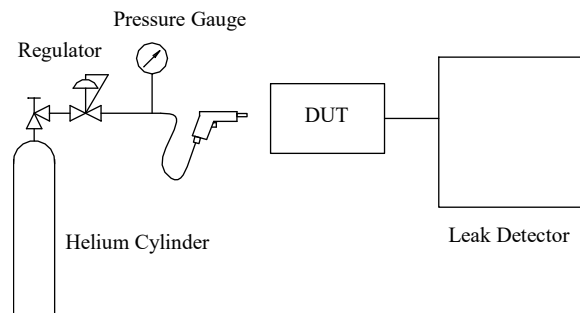


Figure 1
Recommended Test Schematic for Inboard Test (1)

6.2 Inboard Leak Test (2)

6.2.1 Open valves, MFCs, regulators that compose the system.

6.2.2 Connect the helium leak detector to outlet port and plug inlet port of the system. However, if the system includes check valves, orifices, MFCs, or other components which reduce gas conductance, both the inlet and the outlet ports must be connected to the helium leak detector in order to achieve a vacuum.

6.2.3 Evacuate the system to the working pressure of the leak detector (2 Pa). Stabilize the background of helium leak detector.

6.2.4 After the background is stabilized, introduce helium gas into a bag or other enclosure around the system. Ensure that the enclosure is sufficiently well-purged of air to minimize dilution of helium (e.g., introduce helium gas with 0.1 MPa into the bag or other enclosure for 5 minutes, and then, hold for another 5 minutes).

6.2.5 Test time should be based on actual times to a calibrated leak placed at the furthest point in the system from the leak detector.

6.2.6 A recommended test schematic for inboard leak test (2) is shown in Figure 2.