

SEMI F80-0309 (Reapproved 0914) TEST METHOD FOR DETERMINATION OF GAS CHANGE/PURGE EFFICIENCY OF GAS DELIVERY SYSTEM

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1 Purpose

1.1 This Standard is a guide to a test method to determine gas change/purge efficiency of gas delivery system.

2 Scope

2.1 It covers both conventional metal face sealing and surface mount gas delivery systems.

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

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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 *APIMS* — atmospheric pressure ionization mass spectrometer

5.2 Definitions

5.2.1 *Gas A* — a gas supplied into the process line in this Test Method.

5.2.2 *Gas B* — a gas supplied into the purge line in this Test Method.

5.2.3 *purge efficiency* — the ratio of Gas A concentration before and after the purge event.

5.2.4 *required concentration* — the maximum allowable concentration of Gas A after the purge event.

6 Condition

6.1 Test shall be performed at $22^{\circ}\text{C} \pm 4^{\circ}\text{C}$.

6.2 Test gas shall be used for measuring equipment and shall not be adsorptive gas. Two gases shall be used as the test gases. They are indicated as Gas A and Gas B in this Test Method.

6.3 Atmospheric pressure ionization mass spectrometer (APIMS) or measuring equipment that has a low detectable limit and has a good response capability of gas densitometer.

NOTE 1: APIMS is widely used for this type of measurement.

NOTE 2: Qmass is not considered as a recommended option as the following reasons; (1) Special sampling valve needs to be installed on the testing equipment. (2) Detectable limit of Qmass is high.

NOTE 3: An oximeter is not considered as a recommended option because it does not have enough capability of response.

6.4 Flow rate of each gas for this test shall be determined by a mass flow controller of the System Under Test and a capability of the measuring equipment.

7 Procedure

7.1 *Case (1)* — This is the test method in consideration of purge line in the gas delivery system.

7.1.1 A recommended test flow schematic is shown in Figure 2.

7.1.2 The test is to evaluate a purge efficiency of gas delivery systems by using its process line and purge line.

7.1.3 Set each component for the following condition before starting the test. APV1, APV2, APV3, APV4, and APV5 are closed condition. Rest of the components in the System Under Test are open condition. Supply Gas A to the upstream of APV1. Supply Gas B to the upstream of APV2. Refer to Figure 2.

7.1.4 Open APV5 and flow Gas A from Bypass line. (1) Close PV3, open APV3, and vacuum the System Under Test. (2) Refer to Figure 3.

7.1.5 Open APV2 and flow Gas B from the Purge line. When flowing, close APV3 and fill the line with Gas B up to PV2. Then, close PV2. Gas B also fills the line downstream of PV2. Open APV3, vacuum inside of the line, and vent Gas B. Then, close APV3. (3) Refer to Figure 4.

7.1.6 (a) Open APV1 and flow Gas A from the Process line. (b) Close PV1, open APV3 and vacuum the process line. Then, Close APV3, open and close PV1, and open APV3. (c) Repeat this operation (b) three times and close APV3 to sufficiently fill process line with Gas A. (4) Refer to Figure 5.

7.1.7 Close APV5. Then open APV4 and flow Gas A to the System Under Test. Measure the concentration of Gas A by measuring equipment. Refer to Figure 6.

7.1.8 Close PV1, open PV2 and flow Gas B to the System Under Test. The measuring equipment continuously monitors the Gas A concentration. Record the time to achieve required concentration for Gas A from the start of flowing Gas B. Refer to Figure 7.

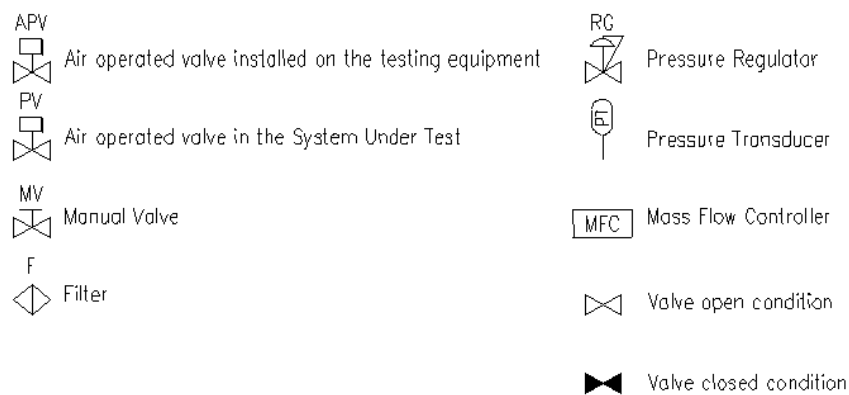


Figure 1
Abbreviations and Symbols