

SEMI E49-1104

GUIDE FOR HIGH PURITY AND ULTRAHIGH PURITY PIPING PERFORMANCE, SUBASSEMBLIES, AND FINAL ASSEMBLIES

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1 Purpose

1.1 The purpose of this overview document is to provide a basic set of terminology and reference documents for SEMI E49.2–E49.8 and E137.

2 Scope

2.1 This document contains terminology and reference documents used in SEMI E49.2–E49.8 and E137, which will reference performance and method standards as well as recommended practices.

2.1.1 The SEMI E49 subdocuments are organized by types of piping distribution systems — gas, DI/chemical, solvent — and by types of assembly and testing procedures — sub-assembly for stainless steel, sub-assembly for polymer and final tool assembly. Final assemblies should be tested or validated for all appropriate parameters (e.g., purity, integrity, failure rate) as specified in the applicable E49 subdocuments.

2.1.2 The piping distribution documents (SEMI E49.2 through E49.8) include guidelines for system design, performance, materials, and components. Purity and performance grades are described for each of the three types of distribution systems.

2.1.3 Users should complete an overall tool cost of ownership analysis (see SEMI E35) to determine the optimum application of HP or UHP tool features. Key parameters should include facilities cost and installation cycle time, piping system reliability and maintainability factors, tool and sub-system contribution to contamination, and resultant effects on wafer quality and wafer throughput factors.

2.2 Final assemblies should be evaluated according to the criteria of SEMI S2 for Environmental, Health and Safety (EH&S) issues associated with their use.

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards

3.1 SEMI Standards

SEMI C41 — Specifications and Guidelines for 2-Propanol

SEMI E10 — Specification for Definition and Measurement of Equipment Reliability, Availability, and Maintainability (RAM)

SEMI E35 — Cost of Ownership for Semiconductor Manufacturing Equipment Metrics

SEMI E49.2 — Guideline for the Qualification of Polymer Assemblies Used in Ultrapure Water and Liquid Chemical Systems in Semiconductor Process Equipment

SEMI E49.4 — Guide for High Purity Solvent Distribution Systems In Semiconductor Manufacturing Equipment

SEMI E49.5 — Guide for High Purity Solvent Distribution Systems In Semiconductor Manufacturing Equipment

SEMI E49.6 — Guide for Subsystem Assembly and Testing Procedures - Stainless Steel Systems

SEMI E49.7 — Purity Guide for the Design and Manufacture of Ultrapure Water and Liquid Chemical Systems in Semiconductor Process Equipment

SEMI E49.8 — Guide for High Purity and Ultrahigh Purity Gas Distribution Systems In Semiconductor Manufacturing Equipment

SEMI E137 — Guide for Final Assembly, Packaging, Transportation, Unpacking, and Relocation of Semiconductor Manufacturing Equipment

SEMI F1 — Specification for Leak Integrity of High-Purity Gas Piping Systems and Components

SEM F19 — Specification for the Surface Condition of the Wetted Surfaces of Stainless Steel Components

SEMI F20 — Specification for 316L Stainless Steel Bar, Forgings, Extruded Shapes, Plate, and Tubing for Components Used in General Purpose, High Purity and Ultra-High Purity Semiconductor Manufacturing Applications

SEMI F27 — Test Method for Moisture Interaction and Content of Gas Distribution Systems and Components by Atmospheric Pressure Ionization Mass Spectrometry (APIMS)

SEMI F58 — Test Method for Determination of Moisture Dry-Down Characteristics of Surface-Mounted and Conventional Gas Distribution Systems by Atmospheric Pressure Ionization Mass Spectrometry (APIMS)

SEMI F60 — Test Method for ESCA Evaluation of Surface Composition of Wetted Surfaces of Passivated 316L Stainless Steel Components

SEMI F63 — Guidelines for Ultrapure Water Used in Semiconductor Processing

SEMI F70 — Test Method for Determination of Particle Contribution of Gas Delivery System

SEMI F73 — Test Method for Scanning Electron Microscopy (SEM) Evaluation of Wetted Surface Condition of Stainless Steel Components

SEMI F74 — Test Method for the Performance and Evaluation of Metal Seal Designs for Use in Gas Delivery Systems

SEMI F78 — Practice for Gas Tungsten Arc (GTA) Welding of Fluid Distribution Systems in Semiconductor Manufacturing Applications

SEMI F81 — Specification for Visual Inspection and Acceptance of Gas Tungsten Arc (GTA) Welds in Fluid Distribution Systems in Semiconductor Manufacturing Applications

SEMI S2 — Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment

3.2 *American Society of Mechanical Engineers*¹

ASME SA479 — Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels (ASTM A 479/A 479-90) (Boiler and Pressure Vessel Codes, 1989)

3.3 *ASTM Standards*²

ASTM A 269 — Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

ASTM A 479 — Standard Specification for Stainless and Heat-Resisting Steel Bar and Shapes for Use in Boilers and Other Pressure Vessels

ASTM A 632 — Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service

ASTM D 4327 — Standard Test Method for Anions in Water by Chemically Suppressed Ion Chromatography

ASTM F 1373 — Test Method for Determination of Cycle Life of Automatic Valves for Gas Distribution System Components

ASTM F 1394 — Standard for Determination of Particle Contribution from Gas Distribution System Valves

ASTM F 1397 — Test Method for Determination of Moisture Contribution for Gas Distribution System Components

ASTM F 1400 — Test Method for Determination of Helium Leak Rate for Gas Distribution System Components

ASTM F 1438 — Test Method for Determination of Surface Roughness by Scanning Tunneling Microscopy for Ultra Pure Water Distribution Components

3.4 *ISO Standards*³

ISO 14644-1 — Cleanrooms and associated controlled environments Part 1: Classification of air cleanliness

ISO 14644-2 — Cleanrooms and associated controlled environments Part 2: Specifications for testing and monitoring to prove continued compliance with ISO 14644-1

ISO 14644-4 — Cleanrooms and associated controlled environments Part 4: Design, construction, and startup

1 American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, USA, Telephone: 800.843.2763 (U.S./Canada), 95.800.843.2763 (Mexico), 973.882.1167 (outside North America), Website: www.asme.org

2 American Society of Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA. Telephone:

610.832.9585, Fax: 610.832.9555 Website: www.astm.org

3 International Organization for Standardization, ISO Central Secretariat, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland, Telephone: 41.22.749.01.11, Fax: 41.22.733.34.30, Website: <http://www.iso.ch>