

SEMI E76-0299 (Reapproved 0913) GUIDE FOR 300 mm PROCESS EQUIPMENT POINTS OF CONNECTION TO FACILITY SERVICES

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NOTICE: This Document replaces SEMI E76-0998 in its entirety.

NOTICE: This Document was reapproved with minor editorial changes.

1 Purpose

1.1 Factory design variations make it difficult for equipment manufacturers to predict or agree on consistent points of connection for hookup of equipment to facility services. Similarly, device manufacturers cannot easily pre-facilitate their factories for equipment because the connections on the equipment are not consistently located. Standardization of connection locations and utilizing pre-facilitation strategies decreases the cost of and time required for equipment installation.

1.2 This Document is a guide for 300 mm equipment manufacturers to define the positioning of the equipment points of connection (EPOC), required on semiconductor processing equipment for hookup to facility utility services. The document identifies locations for the EPOC's and provides EPOC consistency recommendations that should allow for efficient equipment installation. In addition, this document defines strategies to support the device manufacturer's ability to pre-facilitate the utility point of connection (UPOC). Recommendations for supplier-provided EPOC documentation are also included.

2 Scope

2.1 This Guide addresses three areas that are necessary to improve the efficiency of and reduce the duration of equipment installations.

1. Recommendations for EPOC location, grouping, consistency and reduction to increase confidence in the accuracy and repeatability of EPOC's, and reduce the amount of work required to hookup equipment. As a result, device manufacturers can employ standard pre-facilitation strategies and increase the efficiency of equipment installation.
2. Pre-facilitation recommendations that provide the ability for UPOC's to be efficiently and accurately installed prior to equipment delivery, thus allowing immediate hook-up of the equipment upon arrival in the wafer fab. This includes recommendations for jigs, templates, mating pedestal bases, and associated interface panels.
3. Documentation recommendations to be required by the device manufacturer and provided by the equipment supplier relative to EPOC location, group, consistency, pre-facilitation strategies and hardware. This includes additional documentation recommended to support equipment installations but not directly related to EPOC's.

2.2 This Guide applies to 300 mm semiconductor processing equipment and any supplier-provided support equipment for installation into new factories.

2.3 The following groups of utilities are covered in this Guide.

- Electrical Power
- Data communications
- Exhaust and other process effluents
- Process fluids (liquids and gases)
- Support equipment interconnects

2.4 The primary focus for this Guide is hookup of semiconductor processing equipment including but not limited to the following equipment types.

- Etch equipment (Dry and Wet)
- Film deposition equipment (CVD, PVD and Plating)
- Thermal equipment
- Surface prep and clean
- Photolithography equipment (Stepper and Tracks)
- Chemical Mechanical Polishing equipment
- Ion Implant equipment
- Metrology equipment

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 This Standard does not apply to assembly and test equipment.

3.2 International, national, and local codes, regulations and laws should be consulted to ensure that the equipment meets regulatory requirements in each location.

3.3 This Guide is not intended to address design issues related to safety. Safety issues are addressed in other SEMI Standards (see SEMI S2).

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI E6 — Guide for Semiconductor Equipment Installation Documentation

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

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

5 Terminology

5.1 *Definitions*

5.1.1 *bottom feed* — equipment utility supply lines enter the equipment from its underside typically through the floor.

5.1.2 *equipment configuration* — specifically, the arrangement, location, type and quantity of EPOC's needed for installation. Also known as tool configuration.

5.1.3 *equipment point of connection (EPOC)* — a fitting or other terminal provided with the processing equipment (either external or internal) for utility connection, the equipment end/termination of the hookup. Also known as tool point of connection.

5.1.4 *external connection* — an external connection is located outside the main frame of equipment.

5.1.5 *facilities interface specification* — documentation provided by an equipment supplier that contains the equipment requirements for utilities and installation. [SEMI E6]

5.1.6 *facility services* — any gas, exhaust, liquid, power, data communications or other material which are supplied to or carried away from the equipment and used in the process. Also referred to as utilities or facilities.

5.1.7 *footprint* — the total area or floor space consumed by a piece of equipment when viewed perpendicular to the area of reference (e.g., normally, when viewed from directly overhead and considering the floor).

5.1.8 *hazardous production materials (HPM)* — a solid, liquid, or gas that has a degree of hazard rating in health, flammability, or reactivity of class 3 or 4 as ranked by NFPA 704 and that is used directly in research, laboratory, or production processes that have as their end product materials that are not hazardous.

5.1.9 *hookup* — the set of activities and organization required to accept incoming process equipment, move it into place, connect the equipment to all facilities, and test the connections. The connection of all necessary facilities and interconnects required to make the equipment package fully operational.

5.1.10 *interconnect* — connections between equipment mainframe and peripheral equipment subsystem equipment. [SEMI E6]

5.1.11 *internal connection* — an internal connection is a utility connection to the equipment which is located internal to the equipment and typically associated with hazardous utilities.

5.1.12 *interface box* — an enclosure located between the equipment mainframe and facility services typically containing components for pressure regulation and filtration. It functions to consolidate facility service requirements to single points of connection. The interface box can provide location and ability to pre-facilitate equipment hookups in advance of equipment delivery.

5.1.13 *jig* — a three dimensional fixture, typically a frame that contains equipment installation aides which serve to indicate location and type of connection needed for equipment hook-up.

5.1.14 *location plane* — the common area on a piece of equipment where EPOC's may be located (e.g., back, side, top, bottom).

5.1.15 *pedestal* — structural support element upon which equipment or raised floor rests.

5.1.16 *pre-facilitation* — the stage in the equipment installation process that follows base build and precedes equipment delivery/equipment hookup. Pre-facilitation brings the various facilities services close to the new equipment location, including new facilities services and structural modifications required to prepare the facility to accept the equipment.

5.1.17 *pre-facilitation pedestal* — a matching equipment floor mounting surface intended to act as a means to expedite equipment hookup, as well as save fab floor space by having pre-plumbed connections. Ideally, the pedestal would be installed and facilitated to the UPOC's prior to the equipment arrival.

5.1.18 *raised floor* — the removable floor system installed above the actual building floor within cleanroom environments to control air flow and allow access for utility routing and connection.

5.1.19 *seismic bracing* — structural reinforcement to minimize damage due to earthquakes.

5.1.20 *single line drop* — a hookup strategy where a piece of processing equipment has only one point of connection per facility service. All manifolding for an individual service is handled with in the equipment.

5.1.21 *specialty gas* — nonbulk process gases typically stored in cylinders and used to supply one or more process equipment through specialized manifolds.

5.1.22 *subfab* — the area below or outside of the cleanroom production area that can be a single or multiple levels and may or may not be clean.

5.1.23 *support equipment* — ancillary equipment not part of the main chassis.

5.1.24 *template* — provides a dimensional outline of the equipment footprint including overall dimensions, equipment datum point, utility connection/penetration locations, equipment interconnect/penetration locations, maintenance and access spaces, and wafer load/unload stations. It can be made from any cleanroom compatible material.

5.1.25 *tool* — any piece of semiconductor fabrication or inspection equipment designed to process wafers. Often used synonymously with equipment in the silicon wafer processing industry.

5.1.26 *tool accommodation* — a methodology by which semiconductor processing equipment is installed in a cost-effective and timely manner.

5.1.27 *top feed* — where utility supply lines enter the equipment from the topside.

5.1.28 *utility point of connection (UPOC)* — the mating fitting or terminal provided by the facility for interconnection with the EPOC for utility supply, the facility end/termination of the hookup at the equipment.

Table 1 Equipment Point of Connection Location Recommendations

<i>Facility Service/Utility</i>	<i>Bottom Location Plane Preference</i>	<i>Back Location Plane Alternate</i>	
Gas, Bulk	Bottom	Back (lower)	
Gas, Specialty	Bottom	Back (lower)	Back
Exhaust, Corrosive	Bottom	Back (lower)	Back
Exhaust, Flammable	Bottom	Back (lower)	Back
Exhaust, Solvent	Bottom	Back (lower)	Back
Exhaust, General	Bottom	Back (lower)	Back
Chemical Supply, Inorganic	Bottom	Back (lower)	
Chemical Supply, Organic	Bottom	Back (lower)	
Ultrapure Water	Bottom	Back (lower)	
Cooling Water	Bottom	Back (lower)	
Hot Ultrapure Water	Bottom	Back (lower)	
Drain, Inorganic	Bottom	Bottom	Back (lower)
Drain, Waste Chemical, Organic	Bottom	Bottom	Back (lower)
Power, 100V	Bottom	Back (above wet EPOC)	
Power, 200/400V	Bottom	Back (above wet EPOC)	
Fire Suppression	Bottom	Back	
Ancillary Component Interconnect	Bottom	Back (above wet EPOC)	
Signal Cable	Bottom	Back (above wet EPOC)	
Vacuum Foreline	Bottom	Bottom	Back
Process Vacuum	Bottom	Back	

NOTE 1: Connections located on the top are not recommended because of possible interference with overhead wafer handling and minienvironment equipment.

Table 2 EPOC Consistency Recommendations

<i>Equipment Delivered Compared To</i>	<i>EPOC Locations</i>	<i>EPOC Types</i>	<i>EPOC Sizes</i>
Supplier-provided Facilities Interface Specification	Should match	Should match	Should match
Similar Equipment (Same Model and Revision) for Same Process Application	Should match	Should match	Should match
Similar Equipment (Same Model and Revision) for Different Process Application	Should match for same utilities. Could match unique utilities to unique locations within the appropriate EPOC group.	Should match	Could match, technical reasons should exist for differences.
Similar Equipment (Different Model) for Same Application	Could match	Could match	Could Match