

SEMI HB13-1219

SPECIFICATION OF SUSCEPTOR FOR HB-LED MOCVD EQUIPMENT COMMUNICATION INTERFACE

This Standard was technically approved by the HB-LED Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on August 19, 2019. Available at www.semiviews.org and www.semi.org in December 2019.

1 Purpose

1.1 The purpose of this Standard is to provide a supplement for the equipment automation interface for communication and control of process, automation and metrology equipment used in HB-LED manufacturing. It intends to define the data collection for tracking wafer activity when using a susceptor or a wafer carrier.

1.2 This Standard serves as a reference for both HB-LED manufacturers and equipment suppliers.

1.3 The document details properties and functions of variables related to susceptors and wafers which are used in the HB-LED manufacturing process on the basis of SEMI HB4. It also references a collection of SEMI and other standards and should give guidance on how to apply them in the HB-LED manufacturing environment in order to establish a reliable and extensible communication framework for the IT integration of equipment.

2 Scope

2.1 This Specification for HB-LED equipment communication interface applies to all HB-LED manufacturing equipment including process, automation and metrology systems used in production. However, it is not limited to these areas of application.

2.2 This Specification defines requirements for the communication interface used to integrate equipment within factory automation systems.

2.3 This Specification defines physical requirements for the susceptor and wafer.

2.4 This Specification can be applied to single wafer equipment as well as batch equipment.

2.5 This Standard shall define and formalize the requirements of LED susceptor and wafer in communication software (SECS/GEM).

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 is not an all-inclusive list of applicable standards. Additional standards may be applicable and used as needed.

3.2 This Standard is focused on the abilities of the equipment. How a host system uses the equipment communication interfaces is beyond the scope of this Specification.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI E5 — SEMI Equipment Communications Standard 2 Message Content (SECS-II)

SEMI E30 — Generic Model for Communications and Control of Manufacturing Equipment (GEM)

SEMI HB4 — Specification of Communication Interfaces for High Brightness LED Manufacturing Equipment (HB-LED ECI)

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

5 Terminology

5.1 Refer to the SEMI Standards Compilation Terms (COTs) for a list of the current Abbreviations, Acronyms, Definitions, and Symbols.

5.2 Abbreviations and Acronyms

5.2.1 *HB-LED* — high brightness light emitting diode

5.2.2 *HB-LED ECI* — HB-LED Equipment Communication Interface

5.2.3 *GEM* — Generic Model for Communication and Control of Manufacturing Equipment

5.2.4 *HSMS* — High Speed SECS Message Service

5.2.5 *SECS* — SEMI Equipment Communication Standard

5.2.6 *SMN* — XML SECS-II Message Notation

5.3 Definitions

5.3.1 *HB-LED Equipment Communication Interface (HB-LED ECI)* — the HB-LED ECI is a SECS-II and SEMI HB4 compliant interface. Messages are transmitted via an Ethernet network using HSMS protocol. The functionality is based on GEM (SEMI E30) with the restrictions and additions as defined in the SEMI HB4 specification.

5.3.2 *HB-LED equipment* — a manufacturing equipment that implements the HB-LED ECI Specification (SEMI HB4).

5.3.3 *susceptor* — a supporting structure for the purpose of carrying wafers during the HB-LED production process. In some cases, a wafer carrier or process tray is used instead of a susceptor.

5.3.4 *wafer ID* — the unique identifier of a wafer.

6 Susceptor, Wafer and Wafer Location Requirements

6.1 Susceptor Requirements

6.1.1 The susceptor, being the supporting structure for carrying wafers, typically remains in the process chamber together with the wafers during the entire process.

6.1.2 Each susceptor shall have a susceptor ID for unique identification (See Table 1 for detailed information) which is provided by susceptor supplier. For equipment with sub-susceptor, the susceptor ID shall be in the format of “Main susceptor ID&Sub-susceptor ID”. See Figure 3.

6.1.3 There shall be a marker on susceptor, which is used as the starting point for wafer location numbering. This marker may be physical or virtual.

6.1.4 Wafer locations on the susceptor shall be organized into concentric rings about the center of the susceptor. These rings may be perfectly circular or a polygonal shape such as a hexagon.

6.2 Wafer Requirements

6.2.1 Each wafer shall have a serial number which is the unique identification of the wafer.

6.2.2 The serial number is called a Wafer ID in this document and should be provided by the wafer supplier.

6.2.3 When placed on a susceptor, each wafer shall have a location ID to identify where it is located on the susceptor.

6.3 Wafer Location Requirements

6.3.1 The wafer location on a susceptor shall be called the wafer location ID.

6.3.2 Identifying the wafer location on a susceptor shall follow the rules in this section.

6.3.3 Many functions can be realized through clear wafer location identification:

- Identify the position of each wafer;

- Configure and bind wafer to a series of variables (e.g. temperature, pressure, etc.) in its area; and
- Provide other systems with variables bound to wafer upon request.

6.3.4 Two numbers shall be used to identify the wafer location ID on a susceptor. One is the concentric ring number and the other is wafer's circular order around the ring.

6.3.5 The susceptor shall be organized by concentric rings. Numbering of the concentric ring location on the susceptor shall be consecutively ordered from the inner ring to the outer ring, starting with ring 1. Figure 1 shows an example numbering for the variant with concentric circular rings and Figure 2 shows an example with concentric polygons. A wafer located in the center of the susceptor shall be designated to be in ring 0.

6.3.6 Numbering of wafer locations around each ring shall be clockwise starting with the first wafer location of the ring that intersects with or is located nearest to a virtual line going from the center of the susceptor marker to the center of the susceptor. Numbering shall start with 1 and continue in consecutive rotational order around the ring. See Figures 1 and 2.

6.3.7 A wafer location ID on the susceptor shall be a combination of the susceptor ID, concentric ring number and the ordered wafer location around the ring delimited by a hyphen (ASCII code 45) in this manner, "<susceptor ID>-<concentric ring #>-<circular order>". The example in Figure 1 shows how to identify both the concentric ring number and circular order. For example, the second wafer located on concentric ring number 1 is positioned at wafer location ID "<susceptorID>-1-2".

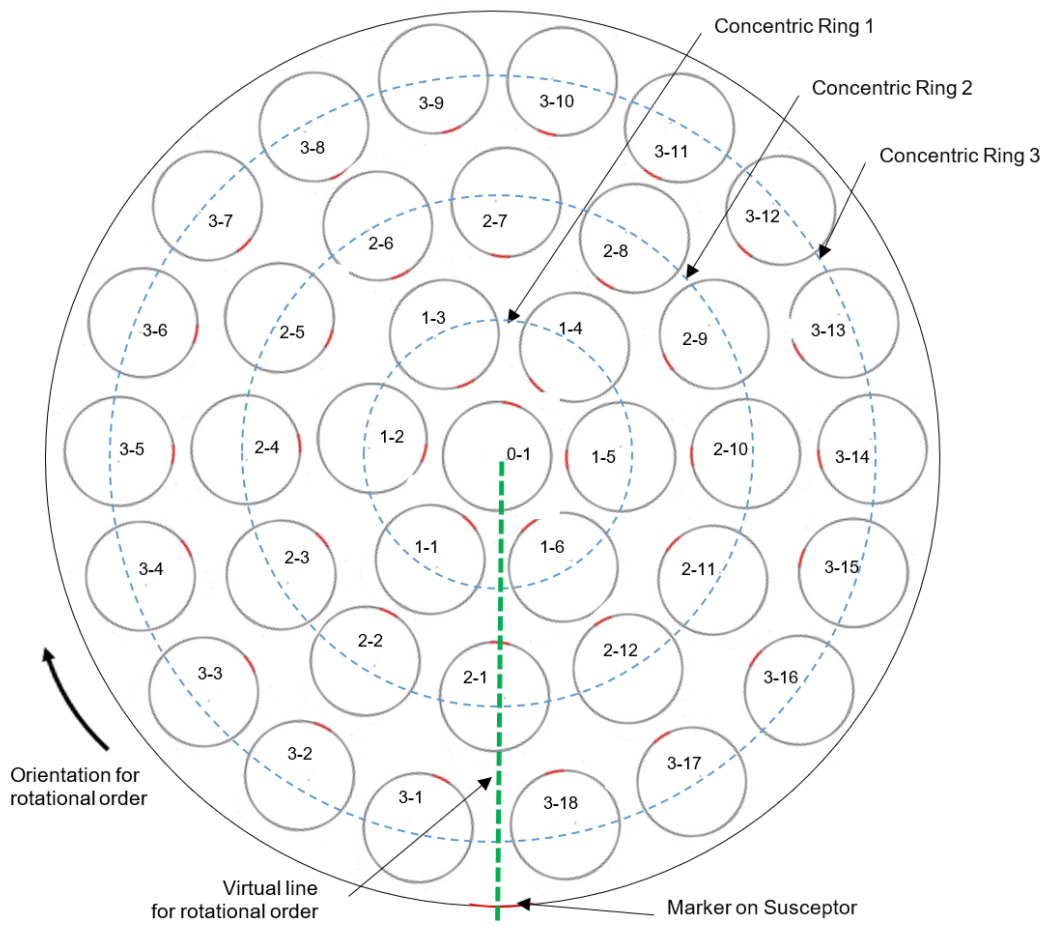


Figure 1
Wafer Location: Concentric Rings and Rotational Order Identification for Circular Rings

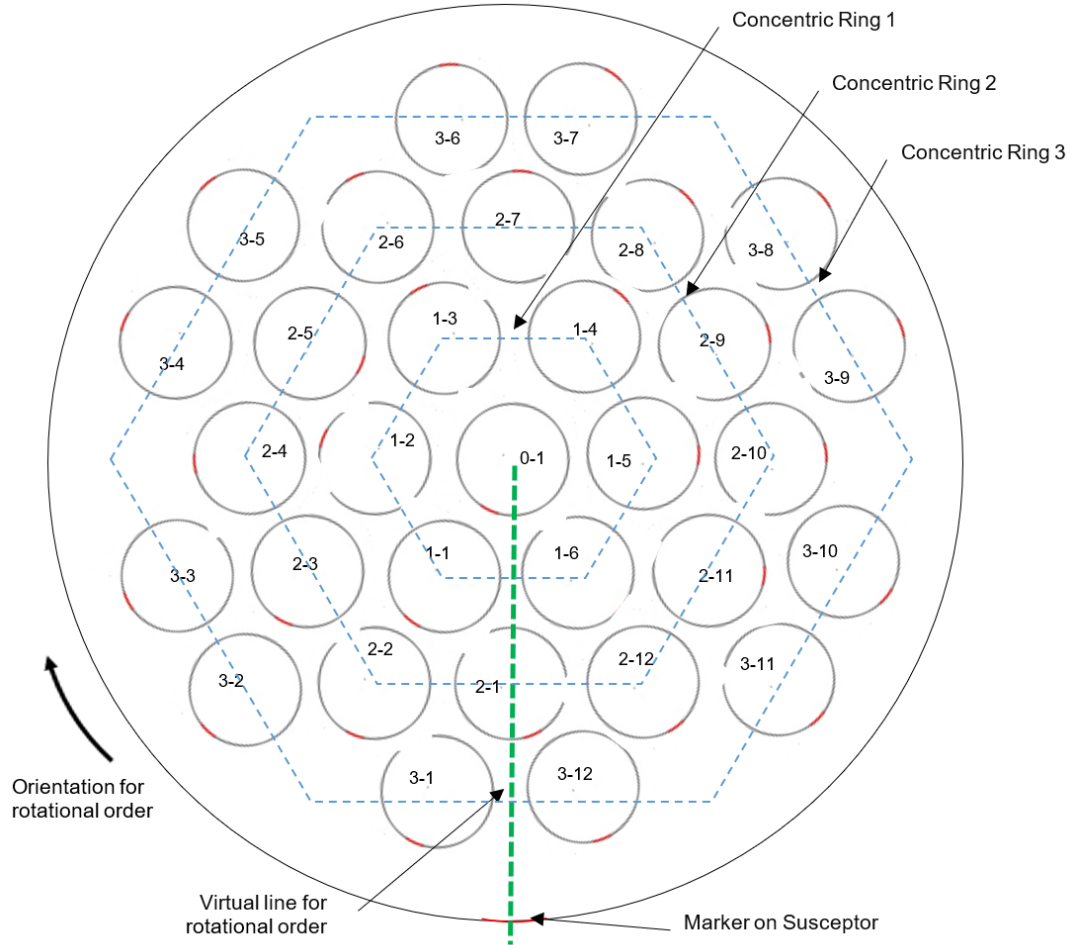


Figure 2
Wafer Location: Concentric Rings and Rotational Order Identification for Polygonal Rings