

SEMI D48-1107

SPECIFICATION FOR REFERENCE POSITION OF SUBSTRATE ID TO SPECIFY DATUM LINE FOR ID READER FOR HANDING OFF/ON TOOL

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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 datum line of an ID two-dimensional code (hereafter, 2D-ID) reader, by clarifying the positional relationship among equipment, AMHS (including equipment, loader/unloader and robot), substrate, and substrate ID.

2 Scope

2.1 This Standard is used to clarify the position of a 2D-ID reader, when a substrate is loaded to or unloaded from manufacturing equipment by AMHS.

2.2 For the purpose above, this Standard shall define a datum line of the AMHS and the manufacturing equipment that clarifies the positional relationship between the reading position of 2D-ID, AMHS, and manufacturing 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 define the tolerance of the substrate ID itself toward the substrate, nor, the tolerance specific to the equipment.

3.2 The datum point specified in this standard does not increase the accuracy of the substrate ID positioning and 2D-ID reading, nor, evaluate any traceability using 2D-ID.

3.3 Though tolerances to the datum line may differ depending on installation regulations by equipment suppliers, operations purposes, and transportation methods of the substrates, this Standard does not apply those tolerances.

3.4 It may be necessary sometimes in a fab operation to assess the tolerances of the substrates themselves. Depending on the equipment used, it may demand specific tolerances. Tolerances also differ among substrate suppliers and the generation of substrates. Based on these two points, tolerances for installation position of a 2D-ID reader shall be out of the scope of standardization for the substrate datum line.

3.5 Installation reference or tolerances to the datum line may vary depending on installation regulations or accuracy by reader suppliers. This Standard does not apply those installation reference or tolerances.

4 Background

4.1 Comprehensive cost cutting is an important concern for manufacturing of flat panel displays (FPDs) regardless of their size. This becomes more remarkable as their sizes become larger. Also, traceability is considered as an important element for manufacturing lines of TV monitors, which is the most growing field among other applications of FPDs. At the same time, positional relationships of AMHS (including equipment, loader/unloader and robot) and substrate IDs are not defined, which causes necessity of confirmation work between users and AMHS manufacturers, or, high load on design work at AMHS manufacturers, along with unnecessary time for on-site installation and adjustment works of reader. The reduction of time for mutual confirmation and installation/adjustment work is a keen interest by both users and manufacturers. If a substrate is to be positioned within the tolerance required by a manufacturing equipment item through aligning the substrate center line to the equipment center line, the following issues become critical.

NOTE 1: There are two types of generic substrate IDs; Type-A: ID engraved on the glass substrate itself (hereinafter, called Bare Glass ID) and Type-B: ID engraved on the resin coated on the glass substrate (hereinafter, called Resin ID). When they are required to be individually distinguished, they are called Bare Glass ID or Resin ID, but when they are not required to be distinguished, they are generally called Substrate ID.

1. Positional relationship between equipment, substrate, AMHS, and 2D-ID is not clearly defined.
 2. Criteria for the relative position of ID readers are not clearly defined.
 3. Address terms for reference lines and interfacing parts to check the positions of the readers are not standardized.
- 4.2 This standard defines the datum line required to clarify the reading position of 2D-ID when AMHS loads or unloads the substrate to or from the manufacturing equipment.
- 4.3 When standardization of datum lines are to be implemented under these circumstances, characteristics of feature sizes of the current substrates and substrate ID should be understood first. This Standard defines the datum line required to clarify the reading position of 2D-ID, based on characteristics of feature sizes of the current substrates and substrate ID.
- 4.4 By defining the datum lines, both equipment suppliers and users have great advantages because all of them can use common datum lines as references for positioning 2D-ID readers. Also, they can be utilized regardless of the generation of substrates.
- 4.5 This Standard will also apply to the upcoming standardization on resin ID position, in case the specification for substrate ID (position) is revised (see SEMI D32 for bare glass ID).

5 Referenced Standards and Documents

5.1 SEMI Standards and Safety Guidelines

SEMI D9 — Terminology for FPD Substrates

SEMI D24 — Specification for Glass Substrates Used to Manufacture Flat Panel Displays

SEMI D32 — Specification for Improved Information Management for Glass FPD Substrates through Orientation Corner Unification

SEMI D43 — Test Method for Mechanical Vibration in AMHS for FPD Manufacturing

SEMI D44 — Specification for Reference Position of Single Substrate for Handing Off on Tool

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

6 Terminology

6.1 Abbreviations and Acronyms

6.1.1 *IDL* — ID on Long Reference Edge Leading

6.1.2 *IDS* — ID on Short Reference Edge Leading

6.1.3 *LRE* — Long Reference Edge

6.1.4 *SRE* — Short Reference Edge

6.1.5 *VCL* — Virtual Center Line

6.2 Definitions

6.2.1 *Substrate Definitions* (see SEMI D9 and SEMI D24)

6.2.1.1 *orientation corner* — as defined by SEMI D9. Due to the nature of the substrate manufacturing process, a substrate has an orientation corner (also called orientation flat) at a specific location. Opposite edges of the substrate are parallel.

6.2.1.2 *pattern surface* — a surface defined as the orientation corner, where device patterns are mainly formed.

6.2.1.3 Definition of Substrate Datum Line (see Figure 1)

6.2.1.3.1 *Length (L)* — datum line for a long edge of a substrate.

6.2.1.3.1.1 *Long Reference Edge (LRE)* — two long edges of a substrate and their extension lines [SEMI D44].

6.2.1.3.1.2 *LRE1* — extension line of LRE on the orientation corner [SEMI D44].

6.2.1.3.1.2.1 *LRE2* — extension line of LRE on the opposite side of the orientation corner [SEMI D44].

6.2.1.3.2 *Width (W)* — base line for short edge of a substrate.

6.2.1.3.2.1 *Short Reference Edge (SRE)* — two short edges of a substrate and their extension lines [SEMI D44].

6.2.1.3.2.1.1 *SRE1* — extension line of SRE on the orientation corner side [SEMI D44].

6.2.1.3.2.1.2 *SRE2* — extension line of SRE on the opposite side of the orientation corner [SEMI D44].

6.2.1.4 *Definition of Substrate Center Line* — the bisection line of LRE1 and LRE2, or the bisection line of SRE1 and SRE2 [SEMI D44].

6.2.1.5 Definition of Substrate Datum Point

6.2.1.5.1 *Datum Point 1* — intersection of LRE1 and SRE1 on the orientation corner side [SEMI D44].

6.2.1.5.2 *Datum Point 2* — intersection of the Substrate Center Line and either SRE1 or LRE1 [SEMI D44].

6.2.1.5.3 *Datum Point 2A* — intersection of the Substrate Center Line and either SRE2 or LRE2 (located on the opposite side of the datum point 2) [SEMI D44].

6.2.1.6 Vertical (Z-direction) Dimension

6.2.1.6.1 *Z1* — height of datum point 1 from the floor [SEMI D44].

6.2.1.6.2 *Z2* — height of datum point 2 from the floor [SEMI D44].

6.2.2 Equipment Definitions

6.2.2.1 *Equipment Opening Plane* — an opening through which AMHS loads/unloads substrates [SEMI D44].

6.2.2.2 *Datum Line of an Equipment Opening plane; Y-Axis* — a line parallel to a front of the opening plane and tangent to the bottom of the opening plane [SEMI D44].

6.2.2.3 *X1* — an extended line tangent to either side of the bottom of the equipment opening plane and orthogonal to the Y-axis [SEMI D44].

6.2.2.4 *X2* — an extension of a line tangent to other side of the bottom of the equipment (on the opposite side and parallel to X1), and orthogonal to Y-axis (see Figures 1 and 2) [SEMI D44].

6.2.2.5 *Equipment Opening Width* — length of an equipment opening plane through which AMHS loads or unloads substrates (see Figure 1) [SEMI D44].

6.2.2.6 *Equipment Center Line* — it shall be the center of the width of an equipment opening plane (center line of the equipment opening plane) [SEMI D44]. In other words, it shall be a center line of two extension lines X1 and X2 orthogonal to Y-axis which is the datum line of the equipment opening plane.

6.2.2.7 *Virtual Center Line (Virtual Datum Line)* — the center line of a substrate placed in a loader/unloader (with no openings) shall be the virtual center line (virtual datum line) [SEMI D44].

6.2.2.8 *Substrate Stop Position in a Manufacturing Equipment* — substrate location in the equipment where it halts when loaded to or unloaded from the equipment.

6.2.3 ID Definitions

6.2.3.1 *ID Position on a substrate* — as specified in SEMI D32. However, a 2D Code is not always parallel with SRE1 or LRE1 (refer to Figure 1). Also, an ID denotes a 2D Code.

6.2.3.2 *IDL* — an extended line which is parallel with LRE and runs through the center point of the 2D-ID.