

SEMI D49-0707

SPECIFICATION OF SINGLE SUBSTRATE ORIENTATION FOR LOADING/UNLOADING INTO/FROM EQUIPMENT TO SPECIFY ID READER POSITION

This standard was technically approved by the global Flat Panel Display - Factory Automation Committee.
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1 Purpose

1.1 This standard is intended to further specify the single substrate ID reader position by specifying more clearly the orientation of single substrate for loading/unloading indicated with a virtual datum line that is prescribed in SEMI D44 — Specification for Reference Position of Single Substrate for Handling Off On Tool.

2 Scope

2.1 For this purpose, this standard specifies only the orientation of single substrate in loading/unloading into/from AMHS and equipment and does not specifies the orientation of single substrate inside the equipment.

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 Limitations

3.1 This standard does not define the tolerance of the substrate itself nor the tolerance specific to the equipment.

3.2 The standard does not increase the accuracy of the substrate positioning nor evaluate any results related to the FPD manufacturing.

3.3 Depending on the differences of the installation standard of equipment supplier, purpose of operation, means of conveying a substrate, and so on or for reason of layout or conveyance efficiency, an orientation of single substrate other than specified in this standard may be used intentionally. Alternatively, inside the equipment or for transport through multiple continuous units of equipment that is regarded as transport inside the equipment, an orientation other than specified in this standard may be used. This standard is not intended to be applied to such a special case.

4 Referenced Standards and Documents

4.1 SEMI Standards

SEMI D9 — Terminology for FPD Substrates

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

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

SEMI D48 — Specification for Reference Position of Substrate ID to Specify Datum Line for ID Reader for Handling off/on Tool

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *LRE* — Long Reference Edge

5.1.2 *SRE* — Short Reference Edge

5.2 Definitions

5.2.1 Substrate Definitions [SEMI D9, SEMI D24, SEMI D44, and SEMI D48]

5.2.1.1 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.

5.2.1.2 Pattern Surface — a surface defined as the orientation corner, where device patterns are mainly formed.

5.2.1.3 Definitions of Substrate Datum Line

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

5.2.1.3.1.1 Long Reference Edge (LRE) — two long edges of a substrate and their extension lines.

5.2.1.3.1.1.1 LRE1 — extension line of LRE on the orientation corner.

5.2.1.3.1.1.2 LRE2 — extension line of LRE on the opposite side of the orientation corner.

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

5.2.1.3.2.1 Short Reference Edge (SRE) — two short edges of a substrate and their extension lines.

5.2.1.3.2.1.1 SRE1 — extension line of SRE on the orientation corner side.

5.2.1.3.2.1.2 SRE2 — extension line of SRE on the opposite side of the orientation corner.

5.2.1.4 Substrate Center Line — the bisection line of LRE1 and LRE2 (see Figure 1).

5.2.2 Equipment Datum Definitions

5.2.2.1 Equipment Opening Plane — an opening through which AMHS loads/unloads substrates (see Figure 2).

5.2.2.2 Virtual Center Line (Virtual Datum Line) — this line is shared with the center line of a substrate placed in a loader/unloader (with no openings), and, the center line of Equipment Opening Plane (see Figures 2–6).

5.2.3 Orientation of Substrate Relative to Equipment and Direction of Transport

5.2.3.1 Substrate Orientation — four entry patterns of single substrate to the equipment concerning the orientation are shown with the pattern face up (see Figure 2).

5.2.3.2 There are three patterns for equipment, namely Stand-Alone Type (see Figures 3 and 4), Inline Type (see Figure 5), and Inline Complex Type (see Figure 6).

5.2.3.2.1 Stand-Alone Type — equipment that carries out an independent process and is not related to the previous and following processes, such as inspection equipment and repair equipment. This type is further classified into two types. Figure 3 shows a through type (Stand-Alone Case 1) of which the entrance and the exit are provided independently as equipment openings. A substrate is loaded into the equipment and, at the exit, it is rotated half turn and unloaded for preparation for the next process. On the other hand, Figure 4 shows a type in which one or more equipment openings are provided and a single substrate is loaded and unloaded through the same or different openings (Stand-Alone Case 2). In this type, the orientation of the substrate in unloading is the same as in loading for preparation for the following process.

5.2.3.2.2 Inline Type — as following process of equipment A, equipment B is placed, and equipment A and equipment B are supplied by separate suppliers (see Figure 5).

5.2.3.2.3 Inline Complex Type — three units of equipment, equipment A, equipment B, and equipment C constitute a process. (In the case of Figure 6, four or more units may be used.)

6 Requirements

6.1 For loading a single substrate into the equipment, the short reference edge with orientation corner must be always leading to the equipment (see Figures 3–6).

6.2 For unloading a single substrate from the equipment, two methods can be used: The side with the orientation corner SRE1 (refer to Figure 1) is leading to the equipment (refer to Figures 5 and 6) or the side without orientation