

SEMI P40-1103

SPECIFICATION FOR MOUNTING REQUIREMENTS AND ALIGNMENT REFERENCE LOCATIONS FOR EXTREME ULTRAVIOLET LITHOGRAPHY MASKS

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1 Purpose

1.1 This specification covers the mounting requirements for Extreme Ultraviolet Lithography (EUVL) masks.

2 Scope

2.1 This standard details the requirements for EUVL mask mounting. The mask mount is a flat reference surface against which the mask is clamped. The specific design and material of the mask mount are not specified.

2.1.1 The mounting requirements in this standard apply to the exposure tool, the mask pattern generator and the pattern placement metrology tool. As an option, the requirements may be used in other tools used to fabricate or measure EUV masks.

2.2 This standard also defines the area on the EUV mask reserved for proper handling, identification (ID) marks and alignment references. The forms of the alignment and ID marks are not specified.

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 P37 — Specification for Extreme Ultraviolet Lithography Mask Substrates

SEMI P38 — Specification for Absorbing Film Stacks and Multilayers on Extreme Ultraviolet Lithography Mask Blanks

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

4 Terminology

4.1 Abbreviations and Acronyms

4.1.1 *EUV* — extreme ultraviolet

4.1.2 *EUVL* — extreme ultraviolet lithography

4.2 Definitions

4.2.1 *chuck* — the chuck is the physical apparatus in the tools listed in Section 2.1.1 upon which the mask is mounted.

4.2.2 *mounting surface* — the mounting surface is the surface of the chuck in direct contact with the mask. The backside of the mask, which is the unpatterned side, shall be in direct contact with the mounting surface while the mask is being used in the tools listed in Section 2.1.1.

4.2.3 *pin or pedestal* — the surface of the chuck may consist of an array of pins or pedestals. Pins are protrusions from the chuck surface that come to a point at the location on their surface farthest from the chuck. Pedestals have a nominally flat surface at their surface farthest from the chuck. Note that if $S_p = P_p$ in Figure 5, the chuck is referred to as a pin chuck. Otherwise, it is a pedestal chuck.

4.2.4 *user* — this term may refer to the user of fabrication equipment for EUV masks that contains a chuck, or this term may refer to the purchaser of an EUV mask from a mask supplier.

5 Mask Layout Requirements

5.1 The square substrates shall conform to the dimensional tolerances as defined in Section 6 of SEMI P37. Datum points on the edges of the mask substrate are defined in Figure 2 of SEMI P37.

5.2 Masks shall have areas reserved for patterns to be printed, for identification (ID) marks, for reticle alignment on the front side and for handling as shown in Figure 1.

5.2.1 The mask layout shall include an area reserved for the printable area, which has maximum dimensions

of 104 mm by 132 mm. This region is also centered on the mask as shown in Figure 1.

5.2.2 The region outside of the printable area is reserved for alignment marks, ID marks and handling. The location of the regions for these items is to be negotiated between user and supplier.

6 Mounting Requirements

6.1 The mask mounting quality area is indicated in Figure 2. The dimensions of the mask mounting quality area, D and W , are agreed upon between user and supplier. The edge length of the mask substrate, L , is defined in Table 1 of SEMI P37.

6.2 The mounting surface shall meet the flatness requirements defined in Table 1 over the mounting quality area shown in Figure 2.

6.2.1 The flatness error is defined as the maximum deviation of the surface from the best fit plane that minimizes the maximum deviation of the mounting surface from the best fit plane. This definition is illustrated in Figure 3. Note that the mounting surface is defined in Section 4.2.2.

6.3 The mounting surface may be discontinuous and not touch the backside at all points within the flatness quality area. In other words, the mounting surface may be an array of pins or pedestals.

6.3.1 The maximum distance between these pins must meet the requirements shown in Table 4. Figure 5 defines the pin spacing.

6.3.2 Other dimensions of the pins shown in Figure 5 are to be agreed upon between the user and supplier as indicated in Table 4. Note that if $S_p = P_p$ in Figure 5, the chuck is referred to as a pin chuck.

6.3.3 If the mounting surface is discontinuous as allowed in Section 6.3, the plane that defines the maximum deviation will include points near or at the tops of the pins or pedestals. This plane is illustrated in Figure 4.

6.4 The mask will be mounted with a clamping pressure as specified in Table 2. The clamping pressure is the force per unit area in the plane of the mounting surface. The minimum effective bending stiffness of the chuck cross section is specified in Table 3.

6.5 The mask mounting and chuck attributes are not limited to EUVL exposure/stepper tool but apply to the mask pattern generator and pattern placement metrology tools.

7 Test Methods

7.1 *Flatness* — to be agreed upon between user and supplier.

7.2 *Stiffness* — to be agreed upon between user and supplier.

7.3 *Clamping Pressure* — to be agreed upon between user and supplier.

7.4 *Pin or Pedestal Spacing, Height, Period and Sidewall Angle* — to be agreed upon between user and supplier.

8 Certification

8.1 Upon request of the user, a supplier's certification that the chuck was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.