

SEMI P10-0709

SPECIFICATION OF DATA STRUCTURES FOR PHOTOMASK ORDERS

This standard was technically approved by the global Micropatterning Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 13, 2009. It was available at www.semi.org in June 2009 and on CD-ROM in July 2009. Originally published in 1990; previously published July 2008.

Table of Contents

1 Purpose	2
2 Scope	2
3 Limitations	2
4 Referenced Standards and Documents	2
5 Terminology	3
6 Instructions and Conventions	3
7 Syntax Specification	5
7.1 Syntax Symbol Definition	5
7.2 Record Syntax	5
7.3 Multi-value Data Field Syntax	5
7.4 Mask Order Structure Syntax	6
7.5 Mask Results Data Structure Syntax	17
8 Terminology and Usage	26
9 Computing the Checksum	70
RELATED INFORMATION 1	71
RELATED INFORMATION 2	73
RELATED INFORMATION 3	80
RELATED INFORMATION 4	84
RELATED INFORMATION 5	86
RELATED INFORMATION 6	94
RELATED INFORMATION 7	102
RELATED INFORMATION 8	105
RELATED INFORMATION 9	106

1 Purpose

1.1 These data structure specifications are intended to facilitate the transmittal of mask order data between software systems to allow:

- automated order placement by mask customers and to allow the automatic processing of such orders by mask shops, and
- automated delivery of actual mask results and qualification data by mask shops and to allow the automatic processing of such data by mask customers.

1.2 By using these standardized structures, software written independently for either mask customers or mask shops should be able to communicate unambiguously with software written by other parties.

2 Scope

2.1 This structure only defines the data format for the transmitted file. No particular database or programming language is specified by this standard, except that an authorized implementation in Extensible Markup Language (XML) format will be posted on the SEMI P10 Web site for those that choose to use it. The data file is to be transmitted as a UTF-8 file. As such, it is compatible with the SECS-II standard.

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 For a given customer, all pattern file names must be unique (i.e., Pattern files which are different may not have the same name).

3.2 For a given customer, all mask writing control file (job file) names must be unique (i.e., Mask writing control files which are different may not have the same name).

3.3 For a given customer, each mask set must have a unique identification.

3.4 For a given customer, each magnetic tape or other physical media delivered to the mask shop must have a unique identification.

3.5 For a given customer, each SEMI P10 <mask_order> file transmitted to a mask supplier must have a unique identification. In particular, revisions to a <mask_order> file must have a revised and unique identification.

3.6 All <pattern_data>, <job_data>, FRACTURE_FILE, MEASURE_FILE_NAME and CD_MATRIX_FILE_NAME files should be introduced through a <data> structure to be used within the <mask_order>. If such files are referenced in a <mask_order> without identification through <data>, specific methods to identify and locate such files must be established between the customer and the vendor.

4 Referenced Standards and Documents

4.1 SEMI Standards

SEMI P1 — Specification for Hard Surface Photomask Substrates

SEMI P2 — Specification for Chrome Thin Films for Hard Surface Photomasks

SEMI P4 — Specification for Round Quartz Photomask Substrates

SEMI P5 — Specification for Pellicles

SEMI P6 — Specification for Registration Marks for Photomasks

SEMI P21 — Guidelines for Precision and Accuracy Expression for Mask Writing Equipment

SEMI P22 — Guideline for Photomask Defect Classification and Size Definition

SEMI P24 — CD Metrology Procedures

SEMI P29 — Guideline for Description of Characteristics Specific to Halftone/Attenuated Phase Shift Masks and Mask Blanks

SEMI P35 — Terminology for Microlithography Metrology

SEMI P37 — Specification for Extreme Ultraviolet Lithography Mask Substrates

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

SEMI P39 — Specification for Open Artwork System Interchange Standard (OASIS)

SEMI P43 — Photomask Qualification Terminology

I SEMI P44 — Specification for Open Artwork System Interchange Standard (OASIS) Specific to Mask Tools

4.2 ISO Standards¹

ISO 4217:2001 — Currency and funds code list²

ISO 8601:2000 — Date and time notation³

ISO/IEC 10646 — UTF-8 character set⁴

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

5 Terminology

5.1 See § 8.

6 Instructions and Conventions

6.1 Each record in the file will be composed of a specific keyword identifier followed by one or more data values. In the case of BNF syntax, each record will be terminated by a carriage return and/or linefeed.

6.2 Only records which are required to specify the order need to be included in the transmitted <mask_order> file, but each record included must appear in the sequence shown in the syntax specification.

6.3 Subsequent modifications or additions to the mask set require transmittal of all the information for the specific masks involved, including previously transmitted keywords and data fields if they still apply. Masks previously ordered which are not affected by the new order transmission may have their <mask_definition>, <mask_group> or <mask_set> omitted as appropriate.

6.4 Options are specified hierarchically such that those specified at a higher level are the default for all masks below, unless overridden at a lower level. The hierarchy is such that mask set options are overridden by mask group options, followed by mask definition, cell definition, cell instance, pattern group definition, and pattern definition.

6.5 Mask groups describe sets of masks which are similarly constructed. In simple cases there will be only one mask group per mask set. Multiple mask groups will be needed to describe mix-and-match sets, or for situations within a mask set where different features are required on some masks.

6.6 Pattern group definitions are intended for patterns which are similarly placed on all or most masks within a mask group (e.g., primary pattern files or test pattern files).

6.7 Cell definitions describe the construction of clusters of pattern groups and/or other cells. The PLACEMENT_TOP_CELL under a mask group describes the overall layout of the cells on all masks within the mask group.

6.8 Within a given mask set, each mask must have a unique identification (MASK_ID), independent of any titles on the mask.

¹ International Organization for Standardization, ISO Central Secretariat, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland. Telephone: 41.22.749.01.11; Fax: 41.22.733.34.30; <http://www.iso.ch>

² http://en.wikipedia.org/wiki/ISO_4217

³ <http://www.cl.cam.ac.uk/~mgk25/iso-time.html>

⁴ http://en.wikipedia.org/wiki/Universal_Character_Set

6.9 Masks which require multiple writing operations (such as phase shift masks) will find those MASK_ID's identified with the same group number by the MULTIWRITE keyword.

6.10 The MASK_ID's defined under a mask group specify the masks to be built. The MASK_ID's also identify which patterns are to appear on the mask. A pattern is placed on the mask if and only if the MASK_ID matches the LEVEL_ID of a pattern referenced under the mask group's PLACEMENT_TOP_CELL.

6.11 <cell instance> and <pattern group instance> LOCATION's position the center of the patterns relative to the center of the CELL_ID referencing them. The cell referenced by the PLACEMENT_TOP_CELL is positioned at the center of the mask.

6.12 Job file data may be supplied in place of cell and pattern group data. In this case, the MASK_ID is understood to correspond to JOB_LEVEL in JOB_NAME.

6.13 For coordinate locations, unless otherwise specified for a given keyword, mask options are relative to the nominal center of the mask, while cell or pattern options are relative to the center of the cell or pattern. Mask coordinates are after scaling and mirroring, whereas cell and pattern options are before scaling and mirroring. The coordinates and directions refer to right-handed, rectangular (Cartesian) coordinates, applied to the substrate being written. All of these features and the orientation of all other patterns written on the substrate assume that it is from the perspective of the mask writing tool (i.e., "chrome side up"). The nominal center of the mask is determined using the bottom and left edges (chrome side up) and assumes nominal substrate dimensions (see SEMI P1).

6.14 All data in the structure will be in the UTF-8 character set. The keyword in each record must include only upper case alphanumeric characters and underscore.

6.15 Records (keyword, data value, comment and new line) may not exceed 256 characters. Some records may be repeated (e.g., BUSINESS_ADDRESS) in order to allow for longer field requirements; these are explicitly indicated in the syntax specification.

6.16 Comments may be included in records by preceding them with an exclamation point (!). Any data following an exclamation point and preceding a carriage return and/or linefeed will be ignored. Such comments are included in the 256 character record limit. If a record starts with an exclamation point, the entire record will be ignored. Only printable/displayable UTF-8 characters (plus spaces and tabs) are permitted in comments. Comments are for development and diagnostic purposes only. In commercial use, comments may always be ignored by the recipient without consequence. On the other hand, ADDITIONAL_..._INFO records must be evaluated by the recipient and applied to the masks being ordered, and may justify delay in mask delivery.

6.17 Spaces or tabs preceding the keyword will be ignored. At least one space or tab must precede the data field. Spaces and tabs embedded in text data fields will be preserved. Spaces or tabs may not be embedded within integer or real number data values, but may be used to separate data values in multi-value numeric data fields. At least one comma must appear between adjacent data values in multi-value data fields; more than one comma may not appear between adjacent data values. Spaces or tabs trailing the last data value in a data field will be ignored.

6.18 All numeric record values which require units will be in metric unless otherwise specified in § 8. Units of length or position will be in microns unless otherwise specified.

6.19 Dates will be in the numeric format YYYY-MM-DD. Times will be in the format HH:MM:SSZ or HH:MMZ. Within the transmitted file, times and dates will always be Coordinated Universal Time (UTC) and times will be followed by the suffix Z.

6.20 Sizing to achieve a CD_TARGET from a CD_DATA must be applied to all pattern files hierarchically affected by the CD_TARGET record.

6.21 Binary data manipulation operations expect operands (input pattern files) to align center-to-center. This requires that DATA_PATTERN_WINDOW be defined for patterns which do not contain an explicit record of file extents.

6.22 All references to horizontal (or "x") and vertical (or "y") correspond to normal Cartesian coordinates and assume the rotational orientation of the substrate when the mask was written.

6.23 All <shippable_data> keywords can be followed by <ship_to> specifying the destination and/or method of transmission for the transmitted data. Whenever applicable, the SEMI <mask_results> file (see § 7.5) should be sent accordingly if electronic transmission is specified.

6.24 <shippable_data> keywords which require reference to specific mask feature locations will reference CD_SITE_ID and/or REGISTR_MARK_ID which must be unique for each location within all transmissions of <mask_order> for a given MASK_SET_ID.

6.25 When modifications to this standard are required between ballot cycles (e.g., new data field values “on request”), users should contact the N.A. SEMI P10 task force leader directly. After a poll of the active task force members, a tentative recommendation will be posted on the SEMI P10 task force Web site at SEMI so that all users can adopt a common interim solution until a formal ballot can officially resolve the issue.

6.26 Every effort should be made to construct a SEMI P10 file without inconsistencies or ambiguities. If a vendor detects such flaws in a file from a customer, the vendor should contact the customer to correct the inconsistencies and/or remove the ambiguities before proceeding with making the mask.

6.27 Data values may be integer, numeric, text, Boolean, or date (with or without time). Some data fields may contain more than one type of data. “text” should be considered to be any printable/displayable UTF-8 character except carriage return, tab or linefeed. Text data corresponds with “string” in the xsd syntax. Boolean data will only have values of “T” or “F.”

7 Syntax Specification

The following specifies the syntax for the mask order structures. The record order is specific; records must appear in the sequence shown. Terminology for the individual records and their allowed data values are specified in § 8.

7.1 *Syntax Symbol Definition* — The lower case syntactic names within < > are used to refer to collections of records. The use of { } around records or collections of records means an arbitrary number of repetitions of the records, including none at all. The use of [] around a record or collection of records means that the collection is optional.

7.2 *Record Syntax* — A keyword is followed by a data field which is followed by an optional comment. The record is terminated by a carriage return and/or linefeed. Each of these elements may be preceded by any combination of spaces or tabs, which will be ignored. At least one space or tab is required preceding the first data value in the record. An exclamation point (!) is required to initiate a comment. Exclamation points, carriage returns, and linefeeds are not allowed in keywords, data values or comments. Note that a record consisting of a comment only is also allowed. The syntax for individual records is defined as:

$$\langle \text{record} \rangle = [\{ \langle \text{separator} \rangle \} \langle \text{keyword} \rangle \langle \text{separator} \rangle \{ \langle \text{separator} \rangle \} \langle \text{data_field} \rangle] \\ [\{ \langle \text{separator} \rangle \} ! \langle \text{comment} \rangle] \{ \langle \text{separator} \rangle \} \langle \text{new_line} \rangle$$

where “separator” is a space or a tab, “comment” is any string of printable ASCII characters (plus spaces and tabs), and “new_line” is a carriage return, linefeed or both.

7.3 *Multi-value Data Field Syntax* — When a numeric data_field contains more than one data_value, such as (x,y) pairs or (x1,y1,x2,y2) double pairs (see § 8), the individual values must be separated by a comma and any combination of spaces or tabs. One comma is required between each data_value, but not more than one comma. Two commas without an intervening data value are not permissible.

$$\begin{aligned} (x,y) &= \text{data_value} \{ \text{separator} \} \text{comma} \{ \text{separator} \} \text{data_value} \\ (x,y,z) &= (x,y) \{ \text{separator} \} \text{comma} \{ \text{separator} \} (z) \\ (x1,y1,x2,y2) &= (x1,y1) \{ \text{separator} \} \text{comma} \{ \text{separator} \} (x2,y2) \\ (x,y,x1,y1,x2,y2) &= (x,y) \{ \text{separator} \} \text{comma} \{ \text{separator} \} (x1,y1,x2,y2) \end{aligned}$$

For data manipulation operations only, a semicolon separates layers from its datatype, and a dash indicates a range of layers or a range of datatypes.

layer1;datatype6 , layer3-layer4;datatype1-datatype9

7.4 *Mask Order Structure Syntax* — The following syntax definition uses the upper case keyword to represent the permissible applications of the corresponding data record within the mask order structure.

```

start_bnf      maskOrder
<mask_order> = START_ORDER SEMI_REVISION CUSTOMER VENDOR
                FILE_DATE_TIME [OPERATOR_NAME]
                <mask_set> END_ORDER [CHECKSUM]

<mask_set> = MASK_SET_ID <mask_set_options> END_MASK_SET_OPTIONS
              {<mask_group>} END_MASK_SET

<mask_set_options> = [BUSINESS_CONTACT] {BUSINESS_ADDRESS} {BUSINESS_PHONE}
                     {BUSINESS_FAX} [BUSINESS_EMAIL]
                     [BILLING_CONTACT] {BILLING_ADDRESS}
                     {BILLING_PHONE} {BILLING_FAX} [BILLING_EMAIL]
                     [DESIGN_RULE] [FAB_TECHNOLOGY] [WAFER_FAB]
                     {CUSTOMER_SPEC CUSTOMER_SPEC_REVISION}
                     {WAIVER} {WAIVER_OVERRIDE}
                     [PRICE_UNITS]
                     {MASK_EXPORT_NUMBER} [SECURITY_CLASS] [QS9000]
                     [ENGINEERING_CONTACT] {ENGINEERING_ADDRESS} {ENGINEERING_PHONE}
                     {ENGINEERING_FAX} [ENGINEERING_EMAIL]
                     [SHIPPING_CONTACT] {SHIPPING_ADDRESS} {SHIPPING_PHONE}
                     {SHIPPING_FAX} [SHIPPING_EMAIL]
                     {SHIPPING_METHOD}
                     [REPAIRS_AUTHORIZED]
                     [<shippable_data>]
                     {<data>}
                     {<standard_pattern>}
                     [MILESTONES <ship_to>] [PERIODIC_UPDATES <ship_to>]
                     [ESTIMATED_ARRIVALS <ship_to>]
                     [JOB_ONLY_APPROVAL_REQD] [JOB_WITH_PATTERNS_APPROVAL_REQD]
                     {PATTERN_APPROVAL_REQD} [ALL_PATTERNS_APPROVAL_REQD]
                     {APPROVAL_REQD} {REVIEW_REQD}
                     [MASK_SET_NAME [MASK_SET_VERSION] ] [CUSTOMER_MASK_SET_NAME]
                     [ORDER_ID]
                     { DEVICE_NAME [DEVICE_REVISION] }
                     {ADDITIONAL_MASK_SET_INFO}

<data> = DATA_MEDIUM [DATA_LOCATION] [DATA_FILE_NAME] [DATA_ID]
          [DATA_FORMAT [DXF_ANGLE DXF_UNIT] ]
          [DATA_DENSITY] [DATA_FILE_SIZE]
          [TRANSFER_FILE_NAME [DATA_COMPRESSION] [DATA_CONSOLIDATION]
            [DATA_ENCRYPTION] ]
          [DATA_CHECKSUM DATA_CHECKSUM_TYPE ]
          {<pattern_data>} {<job_data>}
          {FRACTURE_FILE FRACTURE_FILE_FORMAT}
          {MEASURE_FILE_NAME [MEASURE_FILE_FORMAT] }
          {CD_MATRIX_FILE_NAME [CD_MATRIX_FILE_FORMAT] }
          END_DATA_MEDIUM

<pattern_data> = DATA_PATTERN_NAME [FILE_IDENTIFIER] <pattern_attributes>
                  {PATTERN_FORMAT} [DATA_FILE_NUMBER]

```

```

[PATTERN_UNITS] [PATTERN_CHARACTER_SET]
[FRACTURE_FILE]
{ [<data_manipulation>] [<data_function>] }
END_DATA_PATTERN_NAME
<pattern_attributes> =
[UNSCALED_PATTERN_SIZE] [PATTERN_ADDRESS_SIZE] [STRIPE_HEIGHT]
[DIGITIZED_DATA_DARK] [MFG_BIAS_PREAPPLIED] [PERCENT_CLEAR]
[PATTERN_VISUAL_ID]
<data_manipulation> =
START_DATA_MANIPULATION
[BOOLEAN]
[PATTERN_GENERATION_AREA]
<data_file_parameters> { <data_file_parameters> } ]
{ <data_fracture> }
END_DATA_MANIPULATION
<data_file_parameters> =
DATA_SOURCE_FILE [PATTERN_FORMAT]
[DATA_TOP_CELL] [DATA_LAYER_ID]
[DATA_PATTERN_WINDOW]
{ <data_fracture> }
END_DATA_SOURCE_FILE
<data_function> =
START_DATA_FUNCTION
DATA_FUNCTION_PURPOSE
{ SOFTWARE_NAME {SOFTWARE_REVISION}
  { RUNSET_NAME [RUNSET_REVISION] [DATA_LOCATION]
    { PARAMETER_FILE_NAME [PARAMETER_FILE_REVISION] }
    { INPUT_FILE_NAME INPUT_FILE_FORMAT
      [TOP_CELL] [DATA_LOCATION] }
    {RESULT_FILE_NAME} {SUMMARY_FILE_NAME} {LOG_FILE_NAME} } }
END_DATA_FUNCTION
<data_fracture> =
START_DATA_FRACTURE
[SIZING [SIZING_RULE] [SIZING_BORDER_RULE] ]
[FRACTURING_SCALE] [DATA_SCALE_FACTOR]
[PATTERN_ADDRESS_SIZE]
[DARK_INTERNAL_WINDOW] [CLEAR_INTERNAL_WINDOW]
[EXTERNAL_WINDOW] [ROTATION] [MIRROR]
END_DATA_FRACTURE
<job_data> =
DATA_JOB_NAME JOB_FORMAT
<standard_pattern> =
STD_PATTERN_NAME PATTERN_FORMAT
<mask_group> =
MASK_GROUP_ID [<mask_options>] END_MASK_GROUP_OPTIONS
PLACEMENT_TOP_CELL {<mask_definition>}
{<cell_definition>} {<pattern_group>} END_MASK_GROUP
<mask_options> =
[BLANKET_PO_NUMBER] [PO_NUMBER] [SO_NUMBER] [ORDER_ID]
[RELEASE_NUMBER] [LINE_ITEM_NUMBER] [QUOTE_NUMBER]
[STATUS]
[DUE_DATE_TIME_REQUESTED] [DUE_DATE_TIME_COMMITTED]
[DELIVERY_PRIORITY]
[LAYER_PRIORITY [ELAPSED_TIME] ]
[MILESTONES <ship_to>] [PERIODIC_UPDATES <ship_to>]
[ESTIMATED_ARRIVALS <ship_to>]
[BUSINESS_CONTACT] {BUSINESS_ADDRESS} {BUSINESS_PHONE}

```

{BUSINESS_FAX} [BUSINESS_EMAIL]
 [BILLING_CONTACT] {BILLING_ADDRESS}
 {BILLING_PHONE} {BILLING_FAX} [BILLING_EMAIL]
 [PRICE]
 {PTC_HOURS [PTC_RATE] [PTC_FIXED] }
 [EWT_THRESHOLD EWT_RATE [EWT_CEILING]]
 [SECURITY_CLASS] [QS9000]
 [SHIPPING_CONTACT] {SHIPPING_ADDRESS} {SHIPPING_PHONE}
 {SHIPPING_FAX} [SHIPPING_EMAIL]
 {SHIPPING_METHOD}
 [REPAIRS_AUTHORIZED]
 [<shippable_data>]
 { MFG_SITE_REQD }
 { [LITHO_EQUIP_REQD] {EQUIP_SITE_REQD}
 { [LITHO_MODEL_REQD] {LITHO_MODE_REQD} } }
 PRODUCT_TYPE [SERVICE_TYPE]
 [PRODUCT_MAGNIFICATION] [PRODUCT_IMAGING_TYPE]
 [QUANTITY] [PRODUCT_AS_DUPLICATE]
 [MULTIWRITE]
 {WAFER_EXPOSURE_TOOL}
 [<wafer_exposure_data> <aerial_image_data>]
 [FAB_TECHNOLOGY] [WAFER_FAB]
 [MFG_BIAS_PREAPPLIED]
 [JOB_NAME] [JOB_LEVEL]
 [RETROFIT_JOB_NAME] [RETROFIT_JOB_LEVEL]
 [RETROFIT_MASK_SET_ID] [RETROFIT_MASK_ID]
 [RETROFIT_MASK_SET_NAME [RETROFIT_MASK_SET_VERSION]
 [RETROFIT_MASK_NAME]]
 {<title_data>}
 {<barcode_data>}
 [JOB_ONLY_APPROVAL_REQD] [JOB_WITH_PATTERNS_APPROVAL_REQD]
 {PATTERN_APPROVAL_REQD} [ALL_PATTERNS_APPROVAL_REQD]
 {APPROVAL_REQD} {REVIEW_REQD}
 [SERIAL_NUMBER]
 [MIRROR_MASK] [MASK_ROTATION]
 <substrate>
 [<phase_shift>]
 [UT1X_UNCUT] [PROCESS] [PROCESS_ETCHING_TYPE]
 {CUSTOMER_SPEC CUSTOMER_SPEC_REVISION}
 {WAIVER} {WAIVER_OVERRIDE}
 {TOP_PELLCLE_TYPE [TOP_PELLCLE_CENTRALITY_ERROR] [PRICE] }
 {BOTTOM_PELLCLE_TYPE [BOTTOM_PELLCLE_CENTRALITY_ERROR] [PRICE]}
 [GUIDES_REQD [PRICE]]
 [CENTRALITY]
 {<registration>}
 [REGISTR_CLOSURE [REGISTR_CLOSURE_REFERENCE_ONLY]
 {REGISTR_CLOSURE_EQUIP_REQD} {EQUIP_SITE_REQD}
 [REGISTR_CLOSURE_BEGIN REGISTR_CLOSURE_END]]

```

[BUTTING_ERROR [BUTTING_ERROR_METHOD]]
{<cd_group>}
{<cd_set>}
{<cd_xy_definition>}
{<cd_clear_dark_definition>}
{<cd_same_tone_definition>}
[MIN_MASK_FEATURE_SIZE] [MIN_CORNER_TO_CORNER_GAP]
[MULTI_LAYER_MASK]
[PERCENT_CLEAR [PERCENT_CLEAR_WINDOW]]
{<opc_definition>}
{<defect_definition>}
[INSPECTION_REF_LOCATION]
{<surface_definition>}
[INSPECT_THROUGH_PELLCLE <defect_definition>]
{<contamination>}
{<sem_photo>}
[QUALITY_GROUP_ID]
[COMPACT_LABEL]
{PACKAGE [MAX_MASKS_IN_PACKAGE] }
{ADDITIONAL_MASK_INFO}
<wafer_exposure_data> =
START_WAFER_EXPOSURE_DATA
WAFER_EXPOSURE_WAVELENGTH
WAFER_EXPOSURE_NUMERICAL_APERTURE
[WAFER_EXPOSURE_SIGMA]
[WAFER_EXPOSURE_SIGMA_INNER WAFER_EXPOSURE_SIGMA_OUTER]
WAFER_EXPOSURE_ILLUMINATION [POLARIZATION]
END_WAFER_EXPOSURE_DATA
<aerial_image_data> =
START_AERIAL_IMAGE_DATA
AIM_WAVELENGTH
[AIM_INTENSITY_VARIATION_DELTA]
[AIM_FLUX_INTENSITY_DELTA]
[AIM_CD_DELTA]
END_AERIAL_IMAGE_DATA
<title_data> =
START_TITLE [TITLE_TEXT] [TITLE_TYPE] [TITLE_FONT] [TITLE_HEIGHT]
[TITLE_WIDTH] [TITLE_CHARACTER_SPACING]
[TITLE_MAG] [TITLE_JUSTIFICATION] [TITLE_LOCATION] [MIRROR_TITLE]
[ROTATE_TITLE] [ROTATE_TITLE_CHARACTERS] END_TITLE
<barcode_data> =
START_BARCODE [BARCODE_TYPE]
[BARCODE_TEXT [BARCODE_TEXT_REFERENCE_ONLY]]
[BARCODE_LOCATION]
[BARCODE_ROTATION] END_BARCODE
<substrate> =
START_SUBSTRATE
[BLANK_SIZE] [BLANK_TYPE] [BLANK_GRADE] [BLANK_FLATNESS]
[MASK_COATING] [RESIST_TYPE] [RESIST_THICKNESS]
[BLANK_BIREFRINGENCE_REQD]
[ATTENUATOR] [COATING_GRADE]
[MINIMUM_COATING_OPTICAL_DENSITY]
[MINIMUM_BINARY_TRANSMITTANCE]

```

I <euv_blank_type> =

```
[BLANK_LOT_REQD]
[<euv_blank_type>]
END_SUBSTRATE
START_EUV_BLANK_TYPE
EUV_BLANK_TYPE
EUV_FLATNESS_FRONT
EUV_FLATNESS_BACK
EUV_MULTILAYER_COMPOSITION
EUV_CAPPING_COMPOSITION
EUV_MMR_WAVELENGTH
EUV_MEAN_PEAK_REFLECTIVITY
EUV_PEAK_REFLECTIVITY_UNIFORMITY
EUV_ABSORBER_COMPOSITION
EUV_ABSORBER_OPTICAL_PROPERTIES
EUV_BLANK_RESISTANCE
EUV_EXPANSION_COEFF
END_EUV_BLANK_TYPE
```

I <ship_plot> =

```
START_SHIP_PLOT
PLOT_TYPE PLOT_SCALE QUANTITY [PRICE]
[PLOT_FORMAT] [PATTERN_PLOT_NORMAL_TONE]
[<ship_to>]
END_SHIP_PLOT
```

<phase_shift> =

```
START_PHASE_SHIFT [PHASE_SHIFT_QUALITY_ID]
PSM_WAVELENGTH
[TRANSMISSION_TARGET]
[TRANSMISSION_REFERENCE_ONLY]
[TRANSMISSION_TOLERANCE]
[TRANSMISSION_RANGE] [TRANSMISSION_ERROR]
{TRANSMISSION_EQUIP_REQD [TRANSMISSION_MODE_REQD] }
{ [TRANSMISSION_MARK_SITE_ID] TRANSMISSION_MARK_LOCATION }
[TRANSMISSION_MARK_FEATURE]
[TRANSMISSION_MARK_LOCATION_DRAWING]
[TRANSMISSION_MARK_DRAWING] ]
[PHASE_ANGLE_TARGET]
[PHASE_ANGLE_REFERENCE_ONLY]
[PHASE_ANGLE_TOLERANCE]
[PHASE_ANGLE_RANGE] [PHASE_ANGLE_ERROR]
{PHASE_ANGLE_EQUIP_REQD [PHASE_ANGLE_MODE_REQD] }
{ [PHASE_ANGLE_SITE_ID] PHASE_ANGLE_MARK_LOCATION }
[PHASE_ANGLE_MARK_FEATURE]
[PHASE_ANGLE_MARK_LOCATION_DRAWING]
[PHASE_ANGLE_MARK_DRAWING] ]
[ETCH_DEPTH_TARGET]
[ETCH_DEPTH_REFERENCE_ONLY]
[ETCH_DEPTH_TOLERANCE]
[ETCH_DEPTH_RANGE] [ETCH_DEPTH_ERROR]
{ETCH_DEPTH_EQUIP_REQD [ETCH_DEPTH_MODE_REQD] }
{ [ETCH_DEPTH_SITE_ID] ETCH_DEPTH_MARK_LOCATION }
```

```

[ETCH_DEPTH_MARK_FEATURE]
[ETCH_DEPTH_MARK_LOCATION_DRAWING]
[ETCH_DEPTH_MARK_DRAWING] ]
END_PHASE_SHIFT

<registration> =
START_REGISTR [REGISTR_QUALITY_ID]
[REGISTR_ERROR [REGISTR_ERROR_REFERENCE_ONLY] ]
[REGISTR_SCALE [REGISTR_SCALE_REFERENCE_ONLY] ]
[REGISTR_ANISOTROPIC_SCALE
  [REGISTR_ANISOTROPIC_SCALE_REFERENCE_ONLY] ]
[REGISTR_RESIDUAL [REGISTR_RESIDUAL_REFERENCE_ONLY] ]
[REGISTR_THREE_SIGMA [REGISTR_THREE_SIGMA_REFERENCE_ONLY] ]
[REGISTR_RESIDUAL_THREE_SIGMA
  [REGISTR_RESIDUAL_THREE_SIGMA_REFERENCE_ONLY] ]
[REGISTR_TOLERANCE [REGISTR_TOLERANCE_REFERENCE_ONLY] ]
[REGISTR_ORTHO [REGISTR_ORTHO_REFERENCE_ONLY] ]
[REGISTR_RELATIVE [REGISTR_RELATIVE_REFERENCE_ONLY] ]
{REGISTR_REF_MASK_ID REGISTR_REF_MASK_SET_ID}
{REGISTR_REF_MASK_NAME REGISTR_REF_MASK_SET_NAME
  [REGISTR_REF_MASK_SET_VERSION] }
{REGISTR_EQUIP_REQD} {EQUIP_SITE_REQD}
[REGISTR_STD_GRID] {REGISTR_REF_METHOD_REQD}
[REGISTR_ALGORITHM_TYPE [REGISTR_ALGORITHM_COORDINATES] ]
[REGISTR_COMPENSATION_TEMPERATURE]
{ [REGISTR_MARK_ID] [MASK_REGISTR_MARK] [CELL_REGISTR_MARK]
  [MEASURE_FILE_NAME]
  [REGISTR_MARK_FEATURE]
  [REGISTR_MARK_LOCATION_DRAWING] [REGISTR_MARK_DRAWING]
  [REGISTR_MARK_SEPARATION REGISTR_MARK_COUNT] }
END_REGISTR

<cd_group> =
START_CD
[<cd_definition>]
[NUMBER_OF_CDS]
{ [CD_SITE_ID] CD_LOCATION } [CD_MATRIX_FILE_NAME]
END_CD

<cd_definition> =
[CD_QUALITY_ID] [CD_DATA] [CD_DIGITIZED] [CD_TONE_CLEAR]
[CD_MORPHOGRAPHY]
[CD_PERCENT_CLEAR] [CD_PERCENT_CLEAR_WINDOW]
[CD_TARGET] [CD_ORIENTATION] [CD_PITCH]
[CD_FEATURE] [CD_LOCATION_DRAWING] [CD_DRAWING]
[CD_REFERENCE_ONLY]
[CD_TOLERANCE]
[CD_RANGE] [CD_THREE_SIGMA]
[CD_DEVIATION_FROM_TARGET] [CD_DEVIATION_FROM_MEAN]
[CD_STD] [CD_CORRELATION_ID]
{CD_EQUIP_REQD} {EQUIP_SITE_REQD}

<cd_set> =
START_CD_SET
{CD_GROUP_NAME}
[CD_REFERENCE_ONLY]

```

```

[CD_QUALITY_ID]
[CD_TOLERANCE] [CD_RANGE] [CD_THREE_SIGMA]
[CD_DEVIATION_FROM_TARGET] [CD_DEVIATION_FROM_MEAN]
[CD_STD] [CD_CORRELATION_ID]
END_CD_SET
<cd_xy_definition> =
START_CD_XY_DEFINITION
{CD_X_GROUP} {CD_Y_GROUP}
{<cd_xy_site>}
[CD_XY_TOLERANCE] [CD_XY_DEVIATION]
[CD_FEATURE] [CD_LOCATION_DRAWING] [CD_DRAWING]
[CD_XY_REFERENCE_ONLY]
END_CD_XY_DEFINITION
<cd_xy_site> =
START_CD_XY_SITE
{ [CD_HORIZONTAL_ID] CD_HORIZONTAL_LOCATION
  [CD_VERTICAL_ID] CD_VERTICAL_LOCATION }
END_CD_XY_SITE
<cd_clear_dark_definition> =
START_CD_CLEAR_DARK
CD_CLEAR_SET
CD_DARK_SET
[CD_CLEAR_DARK_TOLERANCE]
[CD_CLEAR_DARK_REFERENCE_ONLY]
END_CD_CLEAR_DARK
<cd_same_tone_definition> =
START_CD_SAME_TONE
CD_SAME_TONE_SET
CD_SAME_TONE_SET
[CD_SAME_TONE_TOLERANCE]
[CD_SAME_TONE_REFERENCE_ONLY]
END_CD_SAME_TONE
<opc_definition> =
START_OPC
[OPC_TYPE [OPC_MINIMUM_FEATURE_SIZE] [OPC_MINIMUM_GAP]
[OPC_PATTERN_SEPARATE] [OPC_PATTERN_MODIFIABLE] ]
END_OPC
<defect_definition> =
START_DEFECT_DEFINITION [DEFECT_QUALITY_ID]
[VISUAL_INSPECTION_OK] [VISUAL_INSPECTION_REQD]
{VISUAL_INSP_CRITERIA}
[AUTO_INSPECTION_REQD] [DIE_TO_DIE_INSPECTION]
[DEFECT_SIZE] [DEFECT_SIZE_CL] [DEFECT_SIZE_DK]
[DEFECT_SIZE_CL_ADJ] [DEFECT_SIZE_CL_ADJ_REP]
[DEFECT_SIZE_DK_ADJ] [DEFECT_SIZE_DK_ADJ_REP]
[DEFECT_SIZE_CL_ISO] [DEFECT_SIZE_CL_ISO_REP]
[DEFECT_SIZE_DK_ISO] [DEFECT_SIZE_DK_ISO_REP]
[DEFECT_DENSITY] [DEFECT_COUNT] [DEFECT_COUNT_REP]
[DEFECTIVE_DIE_DENSITY] [DEFECTIVE_DIE_COUNT]
[DEFECTIVE_DIE_COUNT_REP]
[PERCENT_DEFECTIVE_DIE]
[EDGE_ROUGHNESS]
{INSPECTION_AREA} [INSPECTION_BORDER] {INSPECTION_AREA_EXCLUDE}
{SCRATCH_SIZE_FRONT {SCRATCH_INSP_AREA {SCRATCH_INSP_EXCLUDE }}}

```

```

{SCRATCH_SIZE_BACK {SCRATCH_INSP_AREA {SCRATCH_INSP_EXCLUDE }}}
[GOOD_FIELDS]
{DEFECT_EQUIP_REQD {EQUIP_SITE_REQD} [DEFECT_INSP_MODE_REQD]
  [DEFECT_INSP_PIXEL_SIZE_REQD]
  { DEFECT_TYPE DEFECT_INSP_SENSITIVITY_REQD
    { BIN_SIZE SEVERITY_CRITERION_REQD } }
  [ DEFECT_SETUP_FILE_NAME_REQD ] }
[<database_inspection>]
[<repair_definition>]
END_DEFECT_DEFINITION
<database_inspection> = DATABASE_INSPECTION [PRICE]
[DATABASE_SOURCE]
[DATABASE_TOP_CELL DATABASE_LAYER]
[DATABASE_FILE_NAME]
[DATABASE_UNIT] [USER_UNIT]
[DATABASE_WITH_JOB [DATABASE_JOB_NAME DATABASE_JOB_LEVEL] ]
{DATABASE_AREA}
<repair_definition> = START_REPAIR_DEFINITION
{ REPAIR_EQUIP_REQD {EQUIP_SITE_REQD} }
END_REPAIR_DEFINITION
<surface_definition> = START_SURFACE_DEFINITION
[SURFACE_INSPECTION] [SURFACE_QUALITY_ID]
{ [SURF_INSP_EQUIP_REQD] {EQUIP_SITE_REQD} [SURF_INSP_MODE_REQD]
  [SURF_INSP_PIXEL_SIZE_REQD]
  {SURF_DEFECT_TYPE
    SURF_INSP_SENSITIVITY_REQD
    { BIN_SIZE SEVERITY_CRITERION_REQD } }
  [SURF_INSP_SETUP_FILE_NAME_REQD] }
[SURF_INSP_METHOD] [SURF_INSP_AREA]
[SURF_INSP_PELL_TOP]
[SURF_INSP_PELL_TOP_ON_CLEAR_PATTERN]
[SURF_INSP_PELL_TOP_ON_OPAQUE_PATTERN]
[SURF_INSP_PELL_TOP_OUTSIDE_FRAME]
[SURF_INSP_PELL_TOP_OUTSIDE_ON_OPAQUE]
[SURF_INSP_PELL_TOP_OUTSIDE_MEMBRANE]
[SURF_INSP_PELL_TOP_INSIDE_MEMBRANE]
[SURF_INSP_PELL_TOP_OUTSIDE_ON_FRAME]
[SURF_INSP_PELL_TOP_INSIDE_ON_FRAME]
[SURF_INSP_PELL_BOTTOM]
[SURF_INSP_GLASS_SIDE] [SURF_INSP_PATTERN_SIDE]
[TRANSMISSION_DEFECT_CLEAR] [TRANSMISSION_DEFECT_DARK]
END_SURFACE_DEFINITION
<contamination> = CONTAMINANT CONTAMINATION_LEVEL [CONTAMINATION_METHOD]
<sem_photo> = START_SEM_PHOTO
{ [SEM_PHOTO_SITE_ID] SEM_PHOTO_LOCATION }
[SEM_PHOTO_MATRIX_FILENAME]
[CD_FEATURE] [CD_LOCATION_DRAWING] [CD_DRAWING]
[SEM_PHOTO_SCALE]

```

```

[SEM_PHOTO_TILT] [SEM_PHOTO_ROTATION]
END_SEM_PHOTO
<mask_definition> =
MASK_ID [ MASK_NAME [MASK_NAME_VERSION] ]
[CUSTOMER_LAYER_NAME]
DELIVERABLE_MASK
<mask_options> END_MASK
<cell_definition> =
CELL_ID [<pattern_options>] END_CELL_OPTIONS
{<cell_instance>} {<pattern_instance>} END_CELL
<pattern_group> =
PATTERN_GROUP_ID [<pattern_options>]
END_PATTERN_GROUP_OPTIONS {<pattern_definitions>}
END_PATTERN_GROUP
<pattern_definitions> =
LEVEL_ID
[PATTERN_NAME] [PATTERN_VISUAL_ID] [FIGURE_COUNT]
[MINIMUM_FEATURE_SIZE {MINIMUM_FEATURE_LOCATION; }
{<opc_definition>}
[OPTICAL_MASK_SET_ID OPTICAL_MASK_ID]
[OPTICAL_MASK_TITLE]
[<pattern_options>]
END_PATTERN_DEFINITION
<cell_instance> =
CELL_INSTANCE [<pattern_options>]
END_CELL_INSTANCE_OPTIONS {<placement>}
END_CELL_INSTANCE
<pattern_instance> =
PATTERN_GROUP_INSTANCE [<pattern_options>]
{<placement>}
END_PATTERN_GROUP_INSTANCE
<placement> =
START_PLACEMENT
{ LOCATION [STEPPING_DISTANCE STEPPING_COUNT]
{DROPOUT [SCRIBE_TONE SCRIBE_INSIDE_CORNERS
SCRIBE_OUTSIDE_CORNERS] } }
[ARRAY_DIAMETER ARRAY_CENTER [ARRAY_DIAMETER_INCLUSIVE] ]
[LOCATION_SPEC]
END_PLACEMENT
<pattern_options> =
START_PATTERN_OPTIONS [PATTERN_FUNCTION]
{PATTERN_EXPORT_NUMBER} {CHIP_EXPORT_NUMBER}
[DATA_FILE_SIZE] [DATA_CHECKSUM DATA_CHECKSUM_TYPE ]
[PATTERN_ADDRESS_SIZE] [SCALE_FACTOR]
[DIGITIZED_DATA_DARK]
[STRIPE_HEIGHT]
[UNSCALED_PATTERN_SIZE]
[MFG_BIAS_PREAPPLIED]
{ LITHO_MODE_REQD } [VIRTUAL_ADDRESS]
[SURROUNDING_TONE SURROUNDING_WIDTH SURROUNDING_HEIGHT]
[DATA_PATTERN_WINDOW]
[MIRROR_PATTERN]
{<ship_plot>} [PATTERN_PLOT_APPR_REQD]
[<phase_shift>]
{<registration>}
{<cd_group>}

```

<shippable_data> =

```
{<cd_set>}
{<cd_xy_definition>}
{<cd_clear_dark_definition>}
{<cd_same_tone_definition>}
[MULTI_LAYER_FIELD [PERCENT_CLEAR_REQUESTED
    [PERCENT_CLEAR_WINDOW]]]
[PERCENT_CLEAR [PERCENT_CLEAR_WINDOW]]
[INSPECT_ALL_SITES]
{<defect_definition>}
{<sem_photo>}
[BUTTING_ERROR [BUTTING_ERROR_METHOD]]
[ADDITIONAL_PATTERN_INFO]
END_PATTERN_OPTIONS
START_SHIPPABLE_DATA
[SEND_MASK_SHIPPED_DATE_TIME [<ship_to>]]
[SEND_FINAL_AUDIT_DATE_TIME [<ship_to>]]
[SHIP_CD_DATA [<ship_to>]]
[SHIP_CD_PRINTOUT [<ship_to>]]
[SHIP_CD_UNIFORMITY_MAP [<ship_to>]]
[SHIP_AIM_DATA [<ship_to>]]
[SHIP_DEFECT_DATA [<ship_to>]]
[SHIP_THRU_PELLCLE_DATA [<ship_to>]]
[SHIP_MANUAL_INSPECTION_FORM [<ship_to>]]
[SHIP_INSP_DATABASE_DATA [INSP_DATABASE_DATA_FORMAT] [<ship_to>]]
[SHIP_FIRST_PREPELL_DIE_DB_MSK_MAP [<ship_to>]]
[SHIP_FIRST_PREPELL_DIE_DB_PTN_MAP [<ship_to>]]
[SHIP_FIRST_PREPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FIRST_ROT_PREPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FINAL_PREPELL_DIE_DB_MSK_MAP [<ship_to>]]
[SHIP_FINAL_PREPELL_DIE_DB_PTN_MAP [<ship_to>]]
[SHIP_FINAL_PREPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FINAL_ROT_PREPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FIRST_POSTPELL_DIE_DB_MSK_MAP [<ship_to>]]
[SHIP_FIRST_POSTPELL_DIE_DB_PTN_MAP [<ship_to>]]
[SHIP_FIRST_POSTPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FIRST_ROT_POSTPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FINAL_POSTPELL_DIE_DB_MSK_MAP [<ship_to>]]
[SHIP_FINAL_POSTPELL_DIE_DB_PTN_MAP [<ship_to>]]
[SHIP_FINAL_POSTPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_FINAL_ROT_POSTPELL_DIE_DIE_MAP [<ship_to>]]
[SHIP_REPAIR_DATA [<ship_to>]]
[SHIP_REGISTR_DATA [<ship_to>]]
[SHIP_ARRAY_REGISTR_MAP [<ship_to>]]
[SHIP_CLOSURE_DATA [<ship_to>]]
[SHIP_DIE_FIT_MAP [<ship_to>]]
[SHIP_MEASURE_FILE_REGISTR_MAP [<ship_to>]]
[SHIP_FIELD_FIT_MAP [<ship_to>]]
[SHIP_CENTRALITY_DATA [<ship_to>]]
```

```
[SHIP_CENTRALITY_MAP [<ship_to>]]
[SHIP_SURF_INSP_MEASUREMENTS [<ship_to>]]
[SHIP_SURF_INSPECTION_MAP [<ship_to>]]
[SHIP_SURF_INSP_PELL_TOP_MAP [<ship_to>]]
[SHIP_SURF_INSP_PELL_BOTTOM_MAP [<ship_to>]]
[SHIP_SURF_INSP_GLASS_SIDE_MAP [<ship_to>]]
[SHIP_SURF_INSP_PATTERN_SIDE_MAP [<ship_to>]]
[SHIP_STARLIGHT_MAP [<ship_to>]]
[SHIP_PHASE_SHIFT_MEASUREMENTS [<ship_to>]]
[SHIP_PHASE_SHIFT_REPORT [<ship_to>]]
[SHIP_SEM_PHOTOS [<ship_to>]]
{<ship_plot>}
[SHIP_CERTIFICATE_OF_CONFORMANCE [<ship_to>]]
{SHIP_CUSTOMER_QUALITY_FORM [<ship_to>]}
[SHIP_TRAVELER [<ship_to>]]
[PERCENT_CLEAR_REQUESTED [PERCENT_CLEAR_WINDOW] [<ship_to>]]
{SHIP_SPECIAL_REQUEST [<ship_to>]}
END_SHIPPABLE_DATA
<ship_to> =
START_SHIP_TO
{EMAIL_ADDRESS} [<ftp_address>] [WEB_ADDRESS]
{MAILING_ADDRESS} [SHIP_TO_FAX]
[DUE_DATE_TIME_REQUESTED]
END_SHIP_TO
<ftp_address> =
FTP_HOST_NAME [FTP_LOGIN] [FTP_PASSWORD] [FTP_DIRECTORY]
[FTP_MODE] END_FTP_HOST
maskOrder
```

<ship_to> =

<ftp_address> =

end_bnf

7.5 *Mask Results Data Structure Syntax* — The following syntax definition uses the upper case keyword to represent the permissible applications of the corresponding data record within the mask results data structure. This structure allows the vendor to deliver to the customer actual data regarding masks being built.

```

start_bnf          maskResults
<mask_results> =   START_MASK_RESULTS SEMI_REVISION CUSTOMER VENDOR
                    FILE_DATE_TIME [OPERATOR_NAME]
                    MASK_SET_ID [MASK_SET_NAME [MASK_SET_VERSION] ]
                    [CUSTOMER_MASK_SET_NAME]
                    [BLANKET_PO_NUMBER] [PO_NUMBER] [SO_NUMBER]
                    [ORDER_ID]
                    [RELEASE_NUMBER] [LINE_ITEM_NUMBER] [QUOTE_NUMBER]
                    [<vendor_info>]
                    {MASK_GROUP_ID [<vendor_info>]
                      {MASK_ID [ MASK_NAME [MASK_NAME_VERSION] ]
                      [CUSTOMER_LAYER_NAME]
                      <mask_results_options>
                      END_MASK}
                    END_MASK_GROUP}
                    END_MASK_SET
                    END_MASK_RESULTS
                    [CHECKSUM]
<mask_results_options> = START_MASK_RESULTS_OPTIONS
                        [STATUS]
                        [<vendor_info>]
                        [<billing_information>]
                        [<materials_used>]
                        {MFG_SITE_REQD} [MFG_SITE_USED]
                        PRODUCT_TYPE [SERVICE_TYPE]
                        [PRODUCT_MAGNIFICATION] [PRODUCT_IMAGING_TYPE]
                        { TITLE_TEXT [TITLE_TYPE] }
                        [DUE_DATE_TIME_COMMITTED] [ELAPSED_TIME_COMMITTED]
                        [MILESTONE [ADDITIONAL_MILESTONE_INFO] ]
                        [PERIODIC_UPDATE [ADDITIONAL_MILESTONE_INFO] ]
                        [ESTIMATED_ARRIVAL [ADDITIONAL_MILESTONE_INFO] ]
                        [MASK_SHIPPED_DATE_TIME]
                        [FINAL_AUDIT_DATE_TIME]
                        [DESIGN_RULE]
                        {MASK_EXPORT_NUMBER} [SECURITY_CLASS]
                        [<wafer_exposure_data> <aerial_image_data>]
                        [FAB_TECHNOLOGY] [WAFER_FAB]
                        [JOB_ONLY_APPROVED] [JOB_WITH_PATTERNS_APPROVED]
                        [ALL_PATTERNS_APPROVED]
                        [APPROVAL_GRANTED]
                        [MIRROR_MASK] [MASK_ROTATION]
                        {CUSTOMER_SPEC CUSTOMER_SPEC_REVISION}
                        {WAIVER} {WAIVER_OVERRIDE}
                        { [BARCODE_TYPE] BARCODE_TEXT [BARCODE_TEXT_REFERENCE_ONLY]

```

```

        BARCODE_ROTATION }
    [SHIPPING_METHOD_USED]
    { [MULTI_LAYER_FIELD] MEASURED_PERCENT_CLEAR
        [PERCENT_CLEAR_WINDOW] }
    [CENTRALITY] [MEASURED_CENTRALITY]
    {<litho_information>}
    {<pattern_group_results>}
    [<phase_shift_measurements>]
    {<registr_measurements>}
    {<closure_measurements>}
    {<cd_group_measurements>}
    {<cd_set_results>}
    {<cd_xy_results>}
    {<cd_clear_dark_results>}
    {<cd_same_tone_results>}
    {<defect_measurements>}
    [THROUGH_PELLCLE_DEFECTS {<defect_measurements> } ]
    {<surface_insp_measurements>}
    {<contamination_measurements>}
    [QUALITY_GROUP_ID]
    [FINAL_QC_AUDITOR]
    {ADDITIONAL_RESULTS_INFO}
    END_MASK_RESULTS_OPTIONS
<vendor_info> =
    START_VENDOR_INFO
    [VENDOR_CONTACT] [VENDOR_PHONE] {VENDOR_ADDRESS}
    [VENDOR_FAX] [VENDOR_EMAIL]
    [FINAL_QC_AUDITOR]
    [VENDOR_ORDER_ID]
    END_VENDOR_INFO
<billing_information> =
    START_BILLING_INFORMATION
    [BLANKET_PO_NUMBER] [PO_NUMBER] [SO_NUMBER] [RELEASE_NUMBER]
    END_BILLING_INFORMATION
<materials_used> =
    START_MATERIALS_USED
    [TOP_PELLCLE_USED] [BOTTOM_PELLCLE_USED]
    [PACKAGE_USED]
    [<substrate>] END_MATERIALS_USED
<substrate> =
    START_SUBSTRATE
    BLANK_LENGTH [BLANK_WIDTH] BLANK_THICKNESS [BLANK_SIZE]
    BLANK_TYPE [BLANK_GRADE]
    [BLANK_FLATNESS] [BLANK_FLATNESS_USED] [BLANK_VENDOR]
    [BLANK_BIREFRINGENCE_REQD] [BLANK_BIREFRINGENCE_USED]
    {<coating>}
    [BLANK_INDEX_OF_REFRACTION]
    [MINIMUM_BINARY_TRANSMITTANCE]
    [MEASURED_BINARY_TRANSMITTANCE]
    [BLANK_LOT_REQD] [BLANK_LOT] [BLANK_DATE_OF_MFG]
    [MASK_BLANK_ID]
    [ADDITIONAL_SUBSTRATE_INFO]

```

```

[<euv_blank_type>] END_SUBSTRATE
<coating> =
START_COATING
COATING_TYPE [COATING_COMPOSITION] [COATING_THICKNESS]
[COATING_REFLECTANCE] [COATING_TRANSMITTANCE]
[COATING_WAVELENGTH] [COATING_GRADE]
[COATING_PHASE]
[MINIMUM_COATING_OPTICAL_DENSITY] [COATING_OPTICAL_DENSITY]
[COATING_LOT_NUMBER] [COATING_DATE_TIME]
[COATING_MASK_VENDOR_APPLIED] [COATING_EQUIP_USED]
END_COATING
<euv_blank_type> =
START_EUV_BLANK_TYPE
EUV_BLANK_TYPE
EUV_FLATNESS_FRONT
EUV_FLATNESS_BACK
EUV_MULTILAYER_COMPOSITION
EUV_CAPPING_COMPOSITION
EUV_MMR_WAVELENGTH
EUV_MEAN_PEAK_REFLECTIVITY
EUV_PEAK_REFLECTIVITY_UNIFORMITY
EUV_ABSORBER_COMPOSITION
EUV_ABSORBER_OPTICAL_PROPERTIES
EUV_BLANK_RESISTANCE
EUV_EXPANSION_COEFF
END_EUV_BLANK_TYPE
<wafer_exposure_data> =
START_WAFER_EXPOSURE_DATA
WAFER_EXPOSURE_WAVELENGTH
WAFER_EXPOSURE_NUMERICAL_APERTURE
[WAFER_EXPOSURE_SIGMA]
[WAFER_EXPOSURE_SIGMA_INNER WAFER_EXPOSURE_SIGMA_OUTER]
WAFER_EXPOSURE_ILLUMINATION
END_WAFER_EXPOSURE_DATA
<aerial_image_data> =
START_AERIAL_IMAGE_DATA
AIM_WAVELENGTH
[AIM_INTENSITY_VARIATION_DELTA]
[AIM_FLUX_INTENSITY_DELTA]
[AIM_CD_DELTA]
END_AERIAL_IMAGE_DATA
<litho_information> =
START_LITHO_INFORMATION
{ [LITHO_EQUIP_REQD] {EQUIP_SITE_REQD}
  { [LITHO_MODEL_REQD] {LITHO_MODE_REQD} } }
[LITHO_EQUIP_USED] [EQUIP_SITE_USED]
[LITHO_MODEL_USED] [LITHO_MODE_USED]
[MACHINE_SERIAL_NUMBER]
[MASK_SERIAL_NUMBER]
[PROCESS]
[WRITE_DATE_TIME] [ELAPSED_WRITE_TIME]
[OPERATOR]
END_LITHO_INFORMATION

```

```

<pattern_group_results> =
START_PATTERN_GROUP_RESULTS
PATTERN_GROUP_ID
{PATTERN_APPROVED}
{PATTERN_EXPORT_NUMBER} {CHIP_EXPORT_NUMBER}
{<phase_shift_measurements>}
{<registr_measurements>}
{<closure_measurements>}
{<cd_group_measurements>}
{<cd_set_results>}
{<cd_xy_results>}
{<cd_clear_dark_results>}
{<cd_same_tone_results>}
{<defect_measurements>}
END_PATTERN_GROUP_RESULTS

<phase_shift_measurements> =
START_PHASE_SHIFT_MEASUREMENTS
PSM_WAVELENGTH
[PHASE_SHIFT_QUALITY_ID]
[ START_TRANSMISSION_MEASUREMENTS
[TRANSMISSION_MEASUREMENT_DATE]
[TRANSMISSION_EQUIP_USED]
[TRANSMISSION_MODE_USED]
[TRANSMISSION_MEASUREMENT_FILE_NAME]
TRANSMISSION_TARGET
[TRANSMISSION_REFERENCE_ONLY]
[TRANSMISSION_TOLERANCE]
[TRANSMISSION_RANGE]
[TRANSMISSION_ERROR]
[MEASURED_TRANSMISSION_AVERAGE]
[MEASURED_TRANSMISSION_TOLERANCE]
[MEASURED_TRANSMISSION_RANGE]
[TRANSMISSION_MARK_FEATURE]
[TRANSMISSION_MARK_LOCATION_DRAWING]
[TRANSMISSION_MARK_DRAWING]
{MEASURED_TRANSMISSION_MARK_SITE_ID
[ TRANSMISSION_MARK_LOCATION ]
MEASURED_TRANSMISSION_MARK_LOCATION
MEASURED_TRANSMISSION
[MEASURED_TRANSMISSION_ERROR]
END_MEASURED_TRANSMISSION_SITE }
END_TRANSMISSION_MEASUREMENTS ]
[ START_PHASE_ANGLE_MEASUREMENTS
[PHASE_ANGLE_MEASUREMENT_DATE]
[PHASE_ANGLE_EQUIP_USED]
[PHASE_ANGLE_MODE_USED]
[PHASE_ANGLE_MEASUREMENT_FILE_NAME]
PHASE_ANGLE_TARGET
[PHASE_ANGLE_REFERENCE_ONLY]
[PHASE_ANGLE_TOLERANCE]

```

```

[PHASE_ANGLE_RANGE]
[PHASE_ANGLE_ERROR]
[MEASURED_PHASE_ANGLE_AVERAGE]
[MEASURED_PHASE_ANGLE_TOLERANCE]
[MEASURED_PHASE_ANGLE_RANGE]
[PHASE_ANGLE_MARK_FEATURE]
[PHASE_ANGLE_MARK_LOCATION_DRAWING]
[PHASE_ANGLE_MARK_DRAWING]
{MEASURED_PHASE_ANGLE_MARK_SITE_ID
 [ PHASE_ANGLE_MARK_LOCATION ]
 MEASURED_PHASE_ANGLE_MARK_LOCATION
 MEASURED_PHASE_ANGLE
 [MEASURED_PHASE_ANGLE_ERROR]
 END_MEASURED_PHASE_ANGLE_SITE }
END_PHASE_ANGLE_MEASUREMENTS ]
[ START_ETCH_DEPTH_MEASUREMENTS
[ETCH_DEPTH_MEASUREMENT_DATE]
[ETCH_DEPTH_EQUIP_USED]
[ETCH_DEPTH_MODE_USED]
[ETCH_DEPTH_MEASUREMENT_FILE_NAME]
ETCH_DEPTH_TARGET
[ETCH_DEPTH_REFERENCE_ONLY]
[ETCH_DEPTH_TOLERANCE]
[ETCH_DEPTH_RANGE]
[ETCH_DEPTH_ERROR]
[MEASURED_ETCH_DEPTH_AVERAGE]
[MEASURED_ETCH_DEPTH_TOLERANCE]
[MEASURED_ETCH_DEPTH_RANGE]
[ETCH_DEPTH_MARK_FEATURE]
[ETCH_DEPTH_MARK_LOCATION_DRAWING]
[ETCH_DEPTH_MARK_DRAWING]
{MEASURED_ETCH_DEPTH_MARK_SITE_ID
 [ETCH_DEPTH_MARK_LOCATION]
 MEASURED_ETCH_DEPTH_MARK_LOCATION
 MEASURED_ETCH_DEPTH
 [MEASURED_ETCH_DEPTH_ERROR]
 END_MEASURED_ETCH_DEPTH_SITE }
END_ETCH_DEPTH_MEASUREMENTS ]
[OPERATOR]
END_PHASE_SHIFT_MEASUREMENTS
START_REGISTR_MEASUREMENTS
[REGISTR_QUALITY_ID]
{REGISTR_EQUIP_REQD} {EQUIP_SITE_REQD} {REGISTR_REF_METHOD_REQD}
[REGISTR_STD_GRID]
[REGISTR_ALGORITHM_TYPE [REGISTR_ALGORITHM_COORDINATES] ]
[REGISTR_COMPENSATION_TEMPERATURE]
[REGISTR_EQUIP_USED] [EQUIP_SITE_USED] [REGISTR_REF_METHOD_USED]
[REGISTR_STD_GRID_USED] [REGISTR_ALGORITHM_USED]

```

<registr_measurements> =

```

[REGISTR_MEASUREMENT_DATE]
[REGISTR_REF_MASK_ID REGISTR_REF_MASK_SET_ID]
[REGISTR_ERROR [REGISTR_ERROR_REFERENCE_ONLY] ]
[REGISTR_SCALE [REGISTR_SCALE_REFERENCE_ONLY] ]
[REGISTR_ANISOTROPIC_SCALE
  [REGISTR_ANISOTROPIC_SCALE_REFERENCE_ONLY] ]
[REGISTR_RESIDUAL [REGISTR_RESIDUAL_REFERENCE_ONLY] ]
[REGISTR_THREE_SIGMA [REGISTR_THREE_SIGMA_REFERENCE_ONLY] ]
[REGISTR_RESIDUAL_THREE_SIGMA
  [REGISTR_RESIDUAL_THREE_SIGMA_REFERENCE_ONLY] ]
[REGISTR_TOLERANCE [REGISTR_TOLERANCE_REFERENCE_ONLY] ]
[REGISTR_ORTHO [REGISTR_ORTHO_REFERENCE_ONLY] ]
[REGISTR_RELATIVE [REGISTR_RELATIVE_REFERENCE_ONLY] ]
{<measured_registr_mark>}
[MEASURED_REGISTR_ERROR] [MEASURED_REGISTR_SCALE]
[MEASURED_REGISTR_ANISOTROPIC_SCALE]
[MEASURED_REGISTR_THREE_SIGMA]
[MEASURED_REGISTR_RESIDUAL]
[MEASURED_REGISTR_RESIDUAL_THREE_SIGMA]
[MEASURED_REGISTR_TOLERANCE]
[MEASURED_REGISTR_MINIMUM] [MEASURED_REGISTR_MAXIMUM]
[MEASURED_REGISTR_ORTHO] [MEASURED_REGISTR_RELATIVE]
[MEASURED_REGISTR_FILE_NAME]
[OPERATOR]
END_REGISTR_MEASUREMENTS
<measured_registr_mark> =
START_MEASURED_REGISTR_MARK
MEASURED_REGISTR_MARK_ID
[VENDOR_REGISTRATION_MARK_ID]
[ MASK_REGISTR_MARK_LOCATION ]
MEASURED_REGISTR_MARK_LOCATION
[ MEASURED_REGISTR_MARK_ERROR ]
[ MEASURED_REGISTR_MARK_RESIDUAL ]
END_MEASURED_REGISTR_MARK
<closure_measurements> =
START_CLOSURE_MEASUREMENTS
{REGISTR_CLOSURE_EQUIP_REQD} {EQUIP_SITE_REQD}
[REGISTR_CLOSURE_EQUIP_USED] [EQUIP_SITE_USED]
[REGISTR_CLOSURE]
[REGISTR_CLOSURE_REFERENCE_ONLY]
MEASURED_REGISTR_CLOSURE
{ MEASURED_CLOSURE_READING [MEASURED_CLOSURE_LOCATION] }
[OPERATOR]
END_CLOSURE_MEASUREMENTS
<cd_group_measurements> =
START_CD_GROUP_MEASUREMENTS
[CD_QUALITY_ID]
[CD_TONE_CLEAR]
[CD_MORPHOGRAPHY]
[CD_PERCENT_CLEAR] [CD_PERCENT_CLEAR_WINDOW]
[CD_TARGET]
[CD_ORIENTATION]
[CD_PITCH]

```

```

[CD_FEATURE]
[CD_REFERENCE_ONLY]
[CD_TOLERANCE]
[CD_RANGE] [CD_THREE_SIGMA]
[CD_DEVIATION_FROM_TARGET]
[CD_DEVIATION_FROM_MEAN]
[CD_STD] [CD_CORRELATION_ID]
{CD_EQUIP_REQD} {EQUIP_SITE_REQD}
[CD_EQUIP_USED] [EQUIP_SITE_USED]
[CD_MEASUREMENT_DATE]
[NUMBER_OF_CDS]
{<cd_measurement>}
[MEASURED_CD_MEAN] [MEASURED_CD_MIN] [MEASURED_CD_MAX]
[MEASURED_CD_TOLERANCE]
[MEASURED_CD_RANGE] [MEASURED_CD_THREE_SIGMA]
[MEASURED_CD_DEVIATION_FROM_TARGET]
[MEASURED_CD_DEVIATION_FROM_MEAN]
[MEASURED_CD_FILE_NAME]
[OPERATOR]
END_CD_GROUP_MEASUREMENTS
<cd_measurement> =
START_CD_MEASUREMENT
[[CD_SITE_ID] CD_LOCATION ]
MEASURED_CD_SITE_ID
MEASURED_CD_LOCATION
MEASURED_CD
END_CD_MEASUREMENT
<cd_set_results> =
START_CD_SET_RESULTS
{CD_GROUP_NAME}
[CD_REFERENCE_ONLY]
[CD_QUALITY_ID]
[CD_TOLERANCE] [CD_RANGE] [CD_THREE_SIGMA]
[CD_DEVIATION_FROM_TARGET] [CD_DEVIATION_FROM_MEAN]
[MEASURED_CD_MEAN] [MEASURED_CD_MIN] [MEASURED_CD_MAX]
[MEASURED_CD_TOLERANCE]
[MEASURED_CD_RANGE] [MEASURED_CD_THREE_SIGMA]
[MEASURED_CD_DEVIATION_FROM_TARGET]
[MEASURED_CD_DEVIATION_FROM_MEAN]
END_CD_SET_RESULTS
<cd_xy_results> =
START_CD_XY_RESULTS
{CD_X_GROUP} {CD_Y_GROUP}
{<cd_xy_site>}
[CD_XY_TOLERANCE] [CD_XY_DEVIATION] [CD_XY_REFERENCE_ONLY]
[MEASURED_CD_XY_TOLERANCE] [MEASURED_CD_XY_DEVIATION]
[MEASURED_CD_XY_MORPHOGRAPHY]
[MEASURED_CD_XY_TONE_CLEAR]
END_CD_XY_RESULTS
<cd_xy_site> =
START_CD_XY_SITE
[CD_HORIZONTAL_ID CD_HORIZONTAL_LOCATION ]
[CD_HORIZONTAL_MORPHOGRAPHY] [CD_HORIZONTAL_TONE_CLEAR]

```

```

MEASURED_HORIZONTAL_CD
[CD_VERTICAL_ID CD_VERTICAL_LOCATION ]
[CD_VERTICAL_MORPHOGRAPHY] [CD_VERTICAL_TONE_CLEAR]
MEASURED_VERTICAL_CD
END_CD_XY_SITE
<cd_clear_dark_results> =
START_CD_CLEAR_DARK_RESULTS
CD_CLEAR_SET
CD_DARK_SET
[CD_CLEAR_DARK_TOLERANCE]
[CD_CLEAR_DARK_REFERENCE_ONLY]
[MEASURED_CD_CLEAR_SET_MEAN MEASURED_CD_DARK_SET_MEAN]
[MEASURED_CD_CLEAR_SET_TOLERANCE
MEASURED_CD_DARK_SET_TOLERANCE]
[MEASURED_CD_CLEAR_DARK_TOLERANCE]
END_CD_CLEAR_DARK_RESULTS
<cd_same_tone_results> =
START_CD_SAME_TONE_RESULTS
CD_SAME_TONE_SET
CD_SAME_TONE_SET
[CD_SAME_TONE_TOLERANCE]
[CD_SAME_TONE_REFERENCE_ONLY]
[MEASURED_CD_SAME_TONE_SET_MEAN
MEASURED_CD_SAME_TONE_SET_MEAN]
[MEASURED_CD_SAME_TONE_TOLERANCE]
END_CD_SAME_TONE_RESULTS
<defect_measurements> =
START_DEFECT_MEASUREMENTS
[DEFECT_QUALITY_ID]
[INSPECTION_REF_LOCATION]
{INSPECTION_AREA} [INSPECTION_BORDER] {INSPECTION_AREA_EXCLUDE}
{VISUAL_INSP_CRITERIA}
DIE_TO_DIE_INSPECTION
DIE_TO_DIE_MEASUREMENTS
{<defect_measurement_reqd>}
[<defect_measurement_used>]
[DEFECT_INSP_DATE]
{REPAIR_EQUIP_REQD {EQUIP_SITE_REQD} }
[REPAIR_EQUIP_USED [EQUIP_SITE_USED] ]
{MEASURED_INSPECTION_AREA} {MEASURED_INSPECTION_AREA_EXCLUDE}
<defect_measurement_site>
[DEFECT_SIZE] [DEFECT_SIZE_CL] [DEFECT_SIZE_DK]
[DEFECT_SIZE_CL_ADJ] [DEFECT_SIZE_CL_ADJ_REP]
[DEFECT_SIZE_DK_ADJ] [DEFECT_SIZE_DK_ADJ_REP]
[DEFECT_SIZE_CL_ISO] [DEFECT_SIZE_CL_ISO_REP]
[DEFECT_SIZE_DK_ISO] [DEFECT_SIZE_DK_ISO_REP]
[ [DEFECT_DENSITY] MEASURED_DEFECT_DENSITY]
[ [DEFECT_COUNT] MEASURED_DEFECT_COUNT]
[ [DEFECT_COUNT_REP] MEASURED_DEFECT_COUNT_REP]
[MEASURED_DEFECT_COUNT_WITHIN_SPEC]
[ [DEFECTIVE_DIE_DENSITY] MEASURED_DEFECTIVE_DIE_DENSITY]

```

```

[ [DEFECTIVE_DIE_COUNT] MEASURED_DEFECTIVE_DIE_COUNT]
[ [DEFECTIVE_DIE_COUNT_REP] MEASURED_DEFECTIVE_DIE_COUNT_REP]
[ [PERCENT_DEFECTIVE_DIE] MEASURED_PERCENT_DEFECTIVE_DIE]
{MEASURED_DEFECT_FILE_NAME}
[PRE_PELL_INSPECTION_ID] [PRE_PELL_INSPECTION_DATE_AND_TIME]
[POST_PELL_INSPECTION_ID] [POST_PELL_INSPECTION_DATE_AND_TIME]
[OPERATOR]
END_DEFECT_MEASUREMENTS

<defect_measurement_reqd> = DEFECT_EQUIP_REQD {EQUIP_SITE_REQD}
                             [DEFECT_INSP_MODE_REQD] [DEFECT_INSP_PIXEL_SIZE_REQD]
                             {DEFECT_TYPE DEFECT_INSP_SENSITIVITY_REQD
                              {BIN_SIZE SEVERITY_CRITERION_REQD } }
                             [DEFECT_SETUP_FILE_NAME_REQD]

<defect_measurement_used> = DEFECT_EQUIP_USED [EQUIP_SITE_USED]
                             [DEFECT_INSP_MODE_USED] [DEFECT_INSP_PIXEL_SIZE_USED]
                             {DEFECT_TYPE DEFECT_INSP_SENSITIVITY_USED
                              {BIN_SIZE SEVERITY_CRITERION_USED } }
                             [DEFECT_SETUP_FILE_NAME_USED]

<defect_measurement_site> = START_DEFECT_SITE
                             [DEFECT_TYPE] [DEFECT_TYPE_P22]
                             MEASURED_DEFECT_LOCATION
                             [MEASURED_DEFECT_SIZE]
                             [ADDITIONAL_DEFECT_MEASUREMENTS_INFO]
                             END_DEFECT_SITE

<surface_insp_measurements> = START_SURFACE_INSP_MEASUREMENTS
                               [SURFACE_QUALITY_ID]
                               {<surface_insp_reqd>}
                               [<surface_insp_used>]
                               [MEASURED_DEFECT_COUNT]
                               [MEASURED_DEFECT_COUNT_WITHIN_SPEC]
                               [PRE_PELL_INSPECTION_ID] [PRE_PELL_INSPECTION_DATE_AND_TIME]
                               [POST_PELL_INSPECTION_ID] [POST_PELL_INSPECTION_DATE_AND_TIME]
                               [OPERATOR]
                               END_SURFACE_INSP_MEASUREMENTS

<surface_insp_reqd> = SURF_INSP_EQUIP_REQD {EQUIP_SITE_REQD}
                      [SURF_INSP_MODE_REQD] [SURF_INSP_PIXEL_SIZE_REQD]
                      {SURF_DEFECT_TYPE SURF_INSP_SENSITIVITY_REQD
                       {BIN_SIZE SEVERITY_CRITERION_REQD } }
                      [SURF_INSP_SETUP_FILE_NAME_REQD]

<surface_insp_used> = SURF_INSP_EQUIP_USED [EQUIP_SITE_USED]
                      [SURF_INSP_MODE_USED] [SURF_INSP_PIXEL_SIZE_USED]
                      {SURF_DEFECT_TYPE SURF_INSP_SENSITIVITY_USED
                       {BIN_SIZE SEVERITY_CRITERION_USED } }
                      [SURF_INSP_SETUP_FILE_NAME_USED ]

<contamination_measurements> = CONTAMINANT CONTAMINATION_LEVEL [CONTAMINATION_METHOD]
                                MEASURED_CONTAMINATION_LEVEL
                                [MEASURED_CONTAMINATION_METHOD]

end_bnf maskResults

```

8 Terminology and Usage

8.1 Syntax for Keywords

8.1.1 Keyword names will always be followed by the data type (enclosed in parentheses) of their data_field. Data types will consist of numeric, integer, text, Boolean and date (which may include time as well) (e.g., “(text)”).

8.1.2 When the data_field allows a multi-value data field (see § 7.3), the data type will be followed by the sequenced list of those parameters enclosed in parentheses and separated by commas (e.g., “(x,y)” which indicates the acceptable data value must be an ordered pair of dimensions, coordinates, repeat counts, file names, or other parameters, “(x,y,z)” indicates an ordered triple, or “(x1,y1,x2,y2)” which indicates a window with two ordered pairs, (x1,y1) and (x2,y2), describing the lower left and upper right corners respectively).

8.1.3 When specific alternative data values for the keyword are enumerated, they will be surrounded by square brackets (“[]”) and separated by the “pipe” operator (“|”) (e.g., “[A | B | C | D | E]”). These values must be transmitted exactly as shown with the same spelling and case. Boolean data fields imply data values [T | F]. Data fields without specified alternative values may have any appropriate data value.

8.1.4 If, in addition to the specifically listed alternative data values for the keyword, additional values chosen by the user are allowed, the list will be followed by an ellipsis (e.g., “[A | B | C | D | E | ...]”). Such additional values should be submitted to the SEMI P10 Task Force so they may be considered for inclusion in future revisions to the standard. They should also be discussed with the mask supplier before implementation.

8.2 start_dictionary — Delimiter denoting start of dictionary for automatic translation to XML format.

8.3 ADDITIONAL_DEFECT_MEASUREMENTS_INFO — (text) Additional information supplied by the vendor regarding the associated defect measurements.

8.4 ADDITIONAL_MASK_INFO — (text) Any information necessary to specify the overall mask set which cannot be specified elsewhere in the order structure; must be brought to the attention of mask vendor personnel.

8.5 ADDITIONAL_MASK_SET_INFO — (text) Any information necessary to specify the overall mask set which cannot be specified elsewhere in the order structure; must be brought to the attention of mask vendor personnel.

8.6 ADDITIONAL_MILESTONE_INFO — (text) Additional information supplied by the vendor regarding the status of the mask.

8.7 ADDITIONAL_PATTERN_INFO — (text) Any information necessary to specify the pattern(s) which cannot be specified elsewhere in the order structure; must be brought to the attention of mask vendor personnel.

8.8 ADDITIONAL_RESULTS_INFO — (text) Any information necessary to supply information to the customer which cannot be specified elsewhere in the <mask_results> structure; must be brought to the attention of customer personnel.

8.9 ADDITIONAL_SUBSTRATE_INFO — (text) Additional information supplied by the vendor regarding the substrate used.

8.10 AIM_CD_DELTA — (numeric) For aerial imaging metrology, the percentage CD width variation between comparable non-defective features. Used for CD defect measurement across or between features. If this keyword appears as a <mask_option>, then AIM_WAVELENGTH, WAFER_EXPOSURE_NUMERICAL_APERTURE, WAFER_EXPOSURE_SIGMA, and WAFER_EXPOSURE_ILLUMINATION must all also appear under <mask_option>. Appearance of this keyword as a <mask_option> does not require aerial imaging metrology for the mask, but merely sets the conditions under which it should be used if it is deemed necessary by the mask maker, based on their negotiated agreements with the customer.

8.11 AIM_FLUX_INTENSITY_DELTA — (numeric) For aerial imaging metrology, the percentage dimensional area variation between comparable non-defective areas. Used for contact and via defect measurement. If this appears as a <mask_option>, then AIM_WAVELENGTH, WAFER_EXPOSURE_NUMERICAL_APERTURE, WAFER_EXPOSURE_SIGMA, and WAFER_EXPOSURE_ILLUMINATION must also appear under <mask_option>. Appearance of this keyword as a <mask_option> does not require aerial imaging metrology for the mask, but merely sets the conditions under which it should be used if it is deemed necessary by the mask maker, based on their negotiated agreements with the customer.

8.12 AIM_INTENSITY_VARIATION_DELTA — (numeric) For aerial imaging metrology, the percentage intensity variation between comparable non-defective areas. Used for edge or isolated defect measurement. If this keyword appears as a <mask_option>, then AIM_WAVELENGTH, WAFER_EXPOSURE_NUMERICAL_APERTURE, WAFER_EXPOSURE_SIGMA, and WAFER_EXPOSURE_ILLUMINATION must all also appear under <mask_option>. Appearance of this keyword as a <mask_option> does not require aerial imaging metrology for the mask, but merely sets the conditions under which it should be used if it is deemed necessary by the mask maker, based on their negotiated agreements with the customer.

8.13 AIM_WAVELENGTH — (numeric) Wavelength in nanometers to be used for <aerial_image_data> measurements. AIM_WAVELENGTH would usually match WAFER_EXPOSURE_WAVELENGTH, but is provided as a separate parameter in the case that aerial image measurement needs to be done at a different wavelength. This keyword may also appear in addition to PSM_WAVELENGTH for a single MASK_ID, though the values of the two should usually be the same.

8.14 ALL_PATTERNS_APPROVAL_REQD — (Boolean) All patterns must be approved before the mask(s) may be written.

8.15 ALL_PATTERNS_APPROVED — (date) Date of approval of all patterns was granted by customer.

8.16 APPROVAL_REQD — (text) If present, indicates that no mask(s) are to be written until the approval is explicitly granted by the customer. The data field describes the items to be approved.

8.17 APPROVAL_GRANTED — (date) date approval was granted by customer for APPROVAL_REQD.

8.18 ARRAY_CENTER — (numeric) (x,y) Center of circular array limit, relative to the nominal center of the mask (chrome side up).

8.19 ARRAY_DIAMETER — (numeric) Diameter of circular array limit to be applied to pattern files.

8.20 ARRAY_DIAMETER_INCLUSIVE — (Boolean) If T, then die which are at least partially included within the circular array limit must be included in the array. If F, then only die which are wholly included within the circular array limit may be included in the array.

8.21 ATTENUATOR — (text) [MoSi | TiNSiN | ZrSi | ...] Attenuator Mask_Coating used for Embedded Attenuated Phase Shift Masks, or any other material agreed upon between customer/vendor. May be used in conjunction with other Mask_Coatings.

8.22 AUTO_INSPECTION_REQD — (Boolean) Automated inspection of the mask for defects is required.

8.23 BARCODE_LOCATION — (numeric) (x,y) Location to place the center of the vendor-generated barcode, relative to the nominal center of the mask (chrome side up).

8.24 BARCODE_ROTATION — (integer) [0 | 90 | 180 | 270] Degrees the barcode is to be rotated counterclockwise (before mirroring).

8.25 BARCODE_TEXT — (text) Encoded content to be used by the vendor to build the barcode.

8.26 BARCODE_TEXT_REFERENCE_ONLY — (Boolean) If T, indicates that BARCODE_TEXT is not to be used by the mask supplier to construct a barcode. When barcodes are supplied by the customer as pattern files, this gives the customer a way to identify the textual content of a barcode pattern, and the mask supplier the same information to supply in <mask_results>.

8.27 BARCODE_TYPE — (text) [ASM | ASET | CANON | GCA | NIKON_STD | NIKON_CODE39 | UT1X_10 | UT1X_24 | UT_XLS | ...] Encoding system to be used by the vendor to build the required barcode.

8.28 BILLING_ADDRESS — (text) Address for billing.

8.29 BILLING_CONTACT — (text) Name of person to contact for billing purposes.

8.30 BILLING_EMAIL — (text) Internet address for BILLING_CONTACT.

8.31 BILLING_FAX — (text) Phone number for facsimile machine of BUSINESS_CONTACT.

8.32 BILLING_PHONE — (text) Phone number for BILLING_CONTACT.

8.33 BIN_SIZE — (numeric) size of defect for SEVERITY_CRITERION_REQD sorting.

8.34 **BLANK_BIREFRINGENCE_REQD** — (numeric) The required degree to which the substrate used to make the mask refracts an incident beam of unpolarized light into two separate beams of opposite polarization, expressed as nanometers per centimeter (nm/cm).

8.35 **BLANK_BIREFRINGENCE_USED** — (numeric) The measured degree to which the substrate used to make the mask refracts an incident beam of unpolarized light into two separate beams of opposite polarization, expressed as nanometers per centimeter (nm/cm).

8.36 **BLANK_DATE_OF_MFG** — (date) The date of manufacture of the substrate used to make the mask as supplied by the mask blank vendor.

8.37 **BLANK_FLATNESS** — (numeric) [0.25 | 0.5 | 1 | 2 | 5 | 10 | 15 | 20 | ...] Flatness within quality area (see SEMI P1).

8.38 **BLANK_FLATNESS_USED** — (numeric) The flatness within the quality area of the mask blank used, as specified by the mask blank supplier or as measured by the mask vendor.

8.39 **BLANK_GRADE** — (text) A designation of the relative defectivity of the substrate as specified by the mask blank vendor.

8.40 **BLANK_INDEX_OF_REFRACTION** — (numeric) The ratio of the velocity of light of a given wavelength in a vacuum to the velocity of light in the substrate used to make the mask.

8.41 **BLANK_LENGTH** — (numeric) The x-axis dimension of the substrate used to make the mask, as specified by the mask blank vendor.

8.42 **BLANK_LOT** — (text) The mask blank vendor's manufacture lot identification for the substrate used to make the mask.

8.43 **BLANK_LOT_REQD** — (text) The mask blank vendor's manufacturing lot identification for the substrate required to be used to make the mask.

8.44 **BLANK_SIZE** — (text) [2.5/60 | 3/60 | 3.5/60 | 4/60 | 4/90 | 4/250 | 5/60 | 5/90 | 5/250 | 6/90 | 6/120 | 6/150 | 6/250 | 7/120 | 7/150 | 7/250 | 7.25R/150 | 9/120 | 9/350 | 14/120 | 14/190 | 29/1570 | ...] Nominal edge length (in inches) and thickness (in mils) of square substrate; 7.25R/150 is a round substrate (see SEMI P1). **BLANK_SIZE** in <mask_results> simply mimics the value in the <mask_order>; it does not report the substrate material actually used or delivered.

8.45 **BLANK_THICKNESS** — (numeric) The z-axis dimension of the substrate used to make the mask, as specified by the mask blank vendor.

8.46 **BLANK_TYPE** — (text) [DFS | MFS | HTE | LTE | ULTE | SFS | DSFS | WC | SL | EUV | POLY | NIL_CUT | E-FORM/ETCHED | SS-MESH] Durable Fused Silica, Modified Fused Silica, high-, low-, and ultralow thermal expansion glass (see SEMI P1). SFS is synthetic fused silica and is commonly referred to as "quartz," having ultralow thermal expansion. DSFS is durable synthetic fused silica, is suitable for 193 nm exposure, and also has ultralow thermal expansion. ULTE is retained only for backward compatibility and vendors should interpret it to be SFS. WC and SL indicate White Crown and soda lime glass. EUV is for Extreme Ultraviolet applications. POLY, NIL_CUT, E-FORM/ETCHED and SS-MESH are for stencil and screen masks.

8.47 **BLANK_VENDOR** — (text) Standard vendor identification code for the mask blank vendor of the substrate used to make the mask.

8.48 **BLANK_WIDTH** — (numeric) The y-axis dimension of the substrate used to make the mask, as specified by the mask blank vendor.

8.49 **BLANKET_PO_NUMBER** — (text) Blanket purchase order number.

8.50 **BOOLEAN** — (text) [NONE | OR | AND | NOT | XOR | MINUS | REVERSE] Logical operation to be performed on one or more following pattern files. Data value meanings are:

8.50.1 **NONE** — no logical operation to be performed; sizing/scaling may still be performed,

8.50.2 **OR** — logical union of two files,

8.50.3 **AND** — logical intersection of two files,

- 8.50.4 NOT — logical inverse of one file,
- 8.50.5 XOR — logical union of two files, excluding all areas in which the two intersect, and
- 8.50.6 MINUS — logical difference between input file 1 and input file 2 (i.e., logically removing from input file 1 the portions of all digitized geometry which overlap with digitized geometry in input file 2).
- 8.50.7 REVERSE — reverse the tone of the output layer to produce a negative image of the layer. REVERSE is performed after all sizing and scaling have been completed for the current data manipulation step.
- 8.51 BOTTOM_PELLCLE_CENTRALITY_ERROR — (numeric) (x,y,rotation) Maximum misplacement in micrometers and microradians of pellicle mounting, relative to the nominal center of the mask. The nominal center is determined using the bottom and left edges (chrome side up).
- 8.52 BOTTOM_PELLCLE_TYPE — (text) Brand and model of acceptable pellicle for the glass side of the mask. If multiple pellicles are listed, they are listed with the most preferred first and then in declining preference.
- 8.53 BOTTOM_PELLCLE_USED — (text) The pellicle vendor's part number of the pellicle applied to the nonpatterned surface of the mask.
- 8.54 BUSINESS_ADDRESS — (text) Address of person placing the order.
- 8.55 BUSINESS_CONTACT — (text) Name of person placing the order.
- 8.56 BUSINESS_EMAIL — (text) Internet address for BUSINESS_CONTACT.
- 8.57 BUSINESS_FAX — (text) Phone number for facsimile machine of BUSINESS_CONTACT.
- 8.58 BUSINESS_PHONE — (text) Phone number for BUSINESS_CONTACT.
- 8.59 BUTTING_ERROR — (numeric) Maximum misalignment of features due to stitching of adjacent fields in the segmented writing of a mask.
- 8.60 BUTTING_ERROR_METHOD — (text) Description of the method to be used to measure butting error.
- 8.61 CD_CLEAR_DARK_TOLERANCE — (numeric) (P [, M]) Maximum acceptable difference between the mean-to-target of all measured critical dimensions in CD_CLEAR_SET and the mean-to-target of all measured critical dimensions in CD_DARK_SET. As these CDs are of opposite tone, the difference is computed by adding the mean-to-target of all CD measurements of the CD_DARK_SET to the mean-to-target of all CD measurements of the CD_CLEAR_SET. If only one data value (P) appears in the data field, the tolerance is considered symmetrical (+/-) about zero. If two data values (P [, M]) appear, then the first is the maximum positive value and the second is the maximum negative value (and should be entered as a negative number). The comma and second half of the argument are optional in the syntax (P [, M]) where P = the positive and M = the negative value for non-symmetric tolerances; if only P is specified, the positive and negative tolerances are assumed to be symmetric.
- 8.62 CD_CLEAR_DARK_REFERENCE_ONLY — (Boolean) If T, indicates that the CD_CLEAR_DARK_TOLERANCE is to be measured and the data transmitted to the customer (if requested by SHIP_CD_DATA), but that deviations in its measured value due to mask processing would NOT be cause for mask rejection. (This does not exempt mishandling of the data in pattern preparation from being a cause for mask rejection.)
- 8.63 CD_CLEAR_SET — (text) Identifies a <cd_set> or <cd_group> for critical dimension analysis. Data field must match data field of START_CD in the <cd_group> or START_CD_SET in the <cd_set>. The CD_TONE_CLEAR of all groups referenced must be explicitly "T."
- 8.64 CD_CORRELATION_ID — (text) Date or other identification of the vendor/customer correlation test to be used in measuring CDs. (This is one method of satisfying the "measured feature width ... correlation" described in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_STD.)
- 8.65 CD_DARK_SET — (text) Identifies a <cd_set> or <cd_group> for critical dimension analysis. Data field must match data field of START_CD in the <cd_group> or START_CD_SET in the <cd_set>. The CD_TONE_CLEAR of all groups referenced must be explicitly "F."
- 8.66 CD_DATA — (numeric) Size of critical dimension feature in data as supplied in the pattern file.

8.67 **CD_DEVIATION_FROM_MEAN** — (numeric) (P [, M]) Maximum acceptable deviation of any of the customer-required CD measurements from the mean of those measurements. If only one data value (P) appears in the data field, the tolerance is considered +/- symmetrically about CD_TARGET. If two data values (P [, M]) appear, then the first is the maximum amount by which deviation is allowed larger than CD_MEAN, and the second is the maximum amount by which deviation is allowed smaller than CD_MEAN. The comma and second half of the argument are optional in the syntax (P [, M]) where P = the positive and M = the negative value for non-symmetric tolerances; if only P is specified, the positive and negative tolerances are assumed to be symmetric. If M is entered, it should appear as a negative number (see Related Information 1 at the end of this standard).

8.68 **CD_DEVIATION_FROM_TARGET** — (numeric) (P [, M]) Maximum acceptable deviation of any of the customer-required CD measurements from the CD_TARGET. If only one data value (P) appears in the data field, the tolerance is considered +/- symmetrically about CD_TARGET. If two data values (P [, M]) appear, then the first is the maximum amount by which deviation is allowed larger than CD_TARGET, and the second is the maximum amount by which deviation is allowed smaller than CD_TARGET. The comma and second half of the argument are optional in the syntax (P [, M]) where P = the positive and M = the negative value for non-symmetric tolerances; if only P is specified, the positive and negative tolerances are assumed to be symmetric. If M is entered, it should appear as a negative number (see Related Information 1 at the end of this standard). (This corresponds to “maximum feature width deviation from target” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY. When used in combination with START_CD_SET comprised of multiple START_CD groups with differing CD_TARGET, this can also satisfy the “feature linearity error” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY. Furthermore, when used in combination with START_CD_SET comprised of multiple START_CD groups with differing CD_TARGET, CD_FEATURE, CD_ORIENTATION and/or CD_PITCH, this can also satisfy the “feature linearity error” and/or “feature inter-proximity error” in SEMI P43.)

8.69 **CD_DIGITIZED** — (Boolean) If T, critical dimension in pattern is digitized data. If F, critical dimension in pattern is non-digitized data.

8.70 **CD_DRAWING** — (text) The uniquely identified (for each customer) document which shows the CD structure itself, and may show the place within the CD structure to be measured.

8.71 **CD_EQUIP_REQD** — (text) Identification of acceptable equipment for measuring critical dimensions. (This is one method of satisfying the “measured feature width ... measurement tool” described in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_EQUIP_USED.)

8.72 **CD_EQUIP_USED** — (text) Identification of equipment used for measuring critical dimensions. (This is one method of satisfying the “measured feature width ... measurement tool” described in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_EQUIP_REQD.)

8.73 **CD_FEATURE** — (text) Description of the feature to be used for CD measurement. (This corresponds to “type of feature” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.74 **CD_GROUP_NAME** — (text) Identifies a <cd_group> to be included in the <cd_set>. The data field must match the data field of START_CD in the referenced <cd_group>.

8.75 **CD_HORIZONTAL_ID** — (text) CD_SITE_ID of CD_HORIZONTAL_LOCATION.

8.76 **CD_HORIZONTAL_LOCATION** — (numeric) (x,y) Location of critical dimension feature. The CD_ORIENTATION of the feature must be HORIZONTAL. If CD_HORIZONTAL_LOCATION appears in <mask_options>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up). If CD_HORIZONTAL_LOCATION appears in <pattern_options>, then the (x,y) coordinates are relative to the center of the pattern or cell, before mirroring or scaling. If CD_HORIZONTAL_LOCATION appears in <mask_results>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up), even if the original CD_HORIZONTAL_LOCATION was in <pattern_options>.

8.77 **CD_HORIZONTAL_MORPHOGRAPHY** — (text) CD_MORPHOGRAPHY of the individual CD_HORIZONTAL_ID feature.

8.78 **CD_HORIZONTAL_TONE_CLEAR** — (Boolean) CD_TONE_CLEAR of the individual CD_HORIZONTAL_ID feature. If T, the critical dimension feature on mask is clear. If F, the critical dimension feature on mask is opaque.

8.79 CD_LOCATION — (numeric) (x,y) Location of critical dimension feature. If CD_LOCATION appears in <mask_options>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up). If CD_LOCATION appears in <pattern_options>, then the (x,y) coordinates are relative to the center of the pattern or cell, before mirroring or scaling. If CD_LOCATION appears in <mask_results>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up), even if the original CD_LOCATION was in <pattern_options>. (This is one method of satisfying the “spatial distribution” of SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_LOCATION_DRAWING.)

8.80 CD_LOCATION_DRAWING — (text) The uniquely identified (for each customer) document which shows the location of the CD structure. (This is one method of satisfying the “spatial distribution” of SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_LOCATION.)

8.81 CD_MATRIX_FILE_NAME — (text) Name of file to be used for critical dimension measurement locations. It is not to be used in conjunction with CD_LOCATION within the same START_CD to END_CD set.

8.82 CD_MATRIX_FILE_FORMAT — (text) [MF2 | MF3 | KMS | ...]

8.83 CD_MEASUREMENT_DATE — (date) Date CD measurement was made.

8.84 CD_MORPHOGRAPHY — (text) [DENSE | ISOLATED | ...] Feature density surrounding CD location. (This corresponds to “description of the surrounding area” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.85 CD_ORIENTATION — (text) [VERTICAL | HORIZONTAL] Direction in which the CD feature is to be scanned for measurement. In other words, a HORIZONTAL CD is scanned in the x direction (left to right), and a VERTICAL CD is scanned in the y direction (top to bottom). (Note that this is the opposite of “orientation of feature” as used in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, wherein orientation is determined by the feature’s length, rather than by the direction in which it is scanned.)

8.86 CD_PERCENT_CLEAR — (numeric) Calculated percentage of clear area within CD_PERCENT_CLEAR_WINDOW in the mask data.

8.87 CD_PERCENT_CLEAR_WINDOW — (numeric) (x1,y1,x2,y2) window coordinates over which CD_PERCENT_CLEAR is calculated, relative to the nominal center of the mask.

8.88 CD_PITCH — (numeric) Local spacing of the critical dimension from the center of the geometry to the center of adjacent geometries. This will be designated by the customer as required and reported in <mask_results> for analysis by the customer. (This corresponds to “pitch of feature” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY. When used in combination with START_CD_SET comprised of multiple START_CD groups with differing CD_PITCH, this can also satisfy the “interval of pitches” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.89 CD_QUALITY_ID — (text) Customer’s label for a collection of CD quality specifications, to be used only in addition to explicit quality requirement keywords. This may be used in the data structure in addition to, but not in place of, explicit quality requirement keywords. This may not be used in combination with QUALITY_GROUP_ID. Customer and vendor should document the meaning of this quality grade before using it in SEMI P10.

8.90 CD_RANGE — (numeric) Maximum acceptable variation of all measured critical dimensions of same nominal size, same tone and same orientation, relative to each other (see Related Information 1 at the end of this standard). (This is one method of satisfying the “feature width uniformity...critereon” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.91 CD_REFERENCE_ONLY — (Boolean) If T, indicates that the CD location, <cd_group> or <cd_set> is to be measured and the data transmitted to the customer (if requested by SHIP_CD_DATA_), but that deviations in its measured value due to mask processing would NOT be cause for mask rejection. (This does not exempt mishandling of the data in pattern preparation from being a cause for mask rejection.)

8.92 CD_SAME_TONE_SET — (text) Identifies a <cd_set> or <cd_group> for critical dimension analysis. Data field must match data field of START_CD in the <cd_group> or START_CD_SET in the <cd_set>. The CD_TONE_CLEAR of all groups referenced must all be explicitly “T” or must all be explicitly “F.”

8.93 CD_SAME_TONE_TOLERANCE — (numeric) (P [, M]) Maximum acceptable difference between the mean of all measured critical dimensions in the first CD_SAME_TONE_SET following

START_CD_SAME_TONE and the second CD_SAME_TONE_SET following START_CD_SAME_TONE. As these CDs are of the same tone, the difference is computed by subtracting the mean of all the CD measurements of the second CD_SAME_TONE_SET from the mean of all the CD measurements of the first CD_SAME_TONE_SET. If only one data value (P) appears in the data field, the tolerance is considered symmetrical (+/-) about zero. If two data values (P [, M]) appear, then the first is the maximum positive value and the second is the maximum negative value (and should be entered as a negative number). The comma and second half of the argument are optional in the syntax (P [, M]) where P = the positive and M = the negative value for non-symmetric tolerances; if only P is specified, the positive and negative tolerances are assumed to be symmetric.

8.94 CD_SAME_TONE_REFERENCE_ONLY — (Boolean) If T, indicates that the CD_SAME_TONE_TOLERANCE is to be measured and the data transmitted to the customer (if requested by SHIP_CD_DATA), but that deviations in its measured value due to mask processing would NOT be cause for mask rejection. (This does not exempt mishandling of the data in pattern preparation from being a cause for mask rejection.)

8.95 CD_SITE_ID — (text) Unique identifier of each critical dimension location within MASK_SET_ID to identify individual cd locations when using <mask_results>. If the same coordinates apply to locations on different masks within the mask set, they may have the same CD_SITE_ID, but it is not mandatory. If CD_SITE_ID is used with a CD_LOCATION within a <pattern_options>, it will be associated with as many mask locations as the cell has instances. (See MEASURED_CD_SITE_ID for more information.)

8.96 CD_STD — (text) [NBS | NIST | ROGER_SHERMAN | CUSTOMER | MASKSHOP | VLSI_STD | ...] reference standard to be used to correlate critical dimension measurements. (This is one method of satisfying the “measured feature width...correlation” described in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY, the other being CD_CORRELATION_ID.)

8.97 CD_TARGET — (numeric) Desired final size of critical dimension feature on mask (see Related Information 1 at the end of this standard). (This corresponds to “targeted feature width” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.98 CD_THREE_SIGMA — (numeric) Maximum acceptable 3-sigma deviation of all measured critical dimensions to the mean of all measured critical dimensions (see Related Information 1 at the end of this standard). (This is one method of satisfying the “feature width uniformity...critereon” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.99 CD_TOLERANCE — (numeric) (P [, M]) Maximum acceptable deviation of the mean of all measured critical dimensions to the CD_TARGET (see Related Information 1 at the end of this standard). If the mean CD is larger than the target, then the value will be positive; if the mean CD is smaller than the target, then the value will be negative. If only one data value (P) appears in the data field, the tolerance is considered +/- symmetrically about CD_TARGET. If two data values (P [, M]) appear, then the first is the maximum amount by which mean is allowed larger than CD_TARGET, and the second is the maximum amount by which mean is allowed smaller than CD_TARGET. The comma and second half of the argument are optional in the syntax (P [, M]) where P = the positive and M = the negative value for non-symmetric tolerances; if only P is specified, the positive and negative tolerances are assumed to be symmetric. If M is entered, it should appear as a negative number (see Related Information 1 at the end of this standard). (This corresponds to “feature mean-to-target” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.100 CD_TONE_CLEAR — (Boolean) If T, the critical dimension feature on mask is clear. (This corresponds to “tone of feature” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.101 CD_VERTICAL_ID — (text) CD_SITE_ID of CD_VERTICAL_ID.

8.102 CD_VERTICAL_LOCATION — (numeric) (x,y) Location of critical dimension feature. The CD_ORIENTATION of the feature must be VERTICAL. If CD_VERTICAL_LOCATION appears in <mask_options>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up). If CD_VERTICAL_LOCATION appears in <pattern_options>, then the (x,y) coordinates are relative to the center of the pattern or cell, before mirroring or scaling. If CD_VERTICAL_LOCATION appears in <mask_results>, then the (x,y) coordinates are relative to the nominal center of the mask (chrome side up), even if the original CD_VERTICAL_LOCATION was in <pattern_options>.

8.103 CD_VERTICAL_MORPHOGRAPHY — (text) CD_MORPHOGRAPHY of the individual CD_VERTICAL_ID feature.

8.104 CD_VERTICAL_TONE_CLEAR — (Boolean) CD_TONE_CLEAR of the individual CD_VERTICAL_ID feature. If T, critical dimension feature on mask is clear.

8.105 CD_X_GROUP — (text) Identifies a <cd_group> for use in comparing horizontally scanned critical dimensions to a vertically scanned critical dimensions. Data field must match data field of a START_CD in a <cd_group>. The <cd_group> must contain CD_ORIENTATION with data value HORIZONTAL.

8.106 CD_Y_GROUP — (text) Identifies a <cd_group> for use in comparing horizontally scanned critical dimensions to a vertically scanned critical dimensions. Data field must match data field of a START_CD in a <cd_group>. The <cd_group> must contain CD_ORIENTATION with data value VERTICAL.

8.107 CD_XY_DEVIATION — (numeric) Maximum deviation, on a site-by-site basis, of a horizontally scanned critical dimension to a vertically scanned critical dimension within a <cd_xy_definition>. The two critical dimensions at each <cd_xy_site> site must be the same size in the pattern data and the same tone on the mask (see Related Information 1 at the end of this standard). (This corresponds to “X-Y deviation uniformity” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.108 CD_XY_REFERENCE_ONLY — (Boolean) If T, indicates that the <cd_xy_definition> is to be measured and the data transmitted to the customer (if requested by SHIP_CD_DATA), but that deviations in its measured value due to mask processing would NOT be cause for mask rejection. (This does not exempt mishandling of the data in pattern preparation from being a cause for mask rejection.)

8.109 CD_XY_TOLERANCE — (numeric) Maximum acceptable deviation of the mean of all measured horizontally scanned critical dimensions to the mean of all measured vertically scanned critical dimensions within a {<cd_xy_site>} and/or between the sites in {CD_X_GROUP} and the sites in {CD_Y_GROUP}. Critical dimensions at all sites must be the same size in the pattern data and the same tone on the mask (see Related Information 1 at the end of this standard). (This corresponds to “mean X-Y deviation” in SEMI P43, PHOTOMASK QUALIFICATION TERMINOLOGY.)

8.110 CELL_ID — (text) Name of the cell which follows; must be used in all references within this MASK_SET_ID to this cell definition.

8.111 CELL_INSTANCE — (text) Identifies CELL_ID to be placed by the following location information.

8.112 CELL_REGISTR_MARK — (numeric) (x,y) Location of registration reference mark in <mask_order> data, relative to center of the cell (before mirroring or scaling). When CELL_REGISTR_MARK precedes REGISTR_MARK_SEPARATION, it indicates the origin of the registration mark array being defined.

8.113 CENTRALITY — (numeric) (x,y,rotation) Maximum misplacement in millimeters and, optionally, microradians of all patterns as a group, relative to the nominal center of the mask.

8.114 CHECKSUM — (integer) For <mask_order>, an ASCII 16 bit crc checksum encompassing all records from START_ORDER through END_ORDER, inclusive. For <mask_results>, an ASCII 16 bit crc checksum encompassing all records from START_MASK_RESULTS through END_MASK_RESULTS, inclusive. The checksum is strongly recommended for the BNF version of both <mask_order> and <mask_results> files to discourage manual editing of the data. Computing a checksum for an XML file becomes ambiguous so CHECKSUM should be excluded from XML versions of both <mask_order> and <mask_results> files (see COMPUTING THE CHECKSUM, § 9).

8.115 CHIP_EXPORT_NUMBER — (text) (agency,number) Identifies the applicable export control entity (agency) and the export control number (number, which can be any printable/displayable text) to allow for export control of chips built using the associated pattern or pattern group.

8.116 CLEAR_INTERNAL_WINDOW — (numeric) (x1,y1,x2,y2) Area to have all digitized data removed within the window described by (x1,y1,x2,y2), relative to the coordinate space of DATA_SOURCE_FILE. The extents of the output pattern file will be the same as DATA_SOURCE_FILE.

8.117 COATING_DATE_TIME — (date) The date and time that the coating was applied by the mask vendor.