TECHNICAL SPECIFICATIONS
FOR
SUPPLY, INSTALLATION & COMMISSIONING
OF
Critical Dimension
Scanning Electron Microscope (CD SEM) - TOOL

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1.00.00 SCOPE OF WORK

Vendor’s scope of work shall cover supply, installation & commissioning of CD SEM with a handler system capable of handling & measuring Silicon wafers of size 200 mm (With SMIF Loader) and 150mm (with Open cassette loader) as per Semi-Standards for CMOS device manufacturing process in 180 nm or better technology node. The scope of work shall include the following:

- Supply of CD SEM as per the required specifications.
- Supply of all support tools including chamber vacuum pumps, Chillers, etc.
- Installation of the tool and Support equipment, including all utility connections.
- Commissioning of the Tool and demonstration of its functionality as per the required specifications.
- On-site training to concerned SCL personnel on Operations, Maintenance & Trouble shooting of the tool.

It is not the intent of this document to completely specify all details of design and construction. Nevertheless the systems shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing the operations in a safe and efficient manner as per industry codes. The Tool shall meet all SEMI regulations and must be SEMI complied.

1.01.00 ELIGIBILITY CRITERIA

Only OEMs (Original Equipment Manufacturers) of similar CD-SEM tools are eligible to participate in the tender. The tool shall be refurbished and supplied by the OEM. The bidder should have experience in the manufacture and maintenance support of semiconductor equipment, and have supplied similar CD SEM Tool(s) to Semiconductor manufacturing industry during the last seven (7) years. Parties shall provide list of similar installations (with client details) carried out by them during the last seven (7) years.

1.02.00 SCOPE OF SUPPLY

1.02.01 Vendor shall supply the tool, including support tools viz. Chiller units, Vacuum pumps, etc. as per the Technical Specifications (Refer clause 3.00.00).

1.02.02 Vendor shall supply all the auxiliary items like interconnect matching cables for electrical connections; interconnect fittings, vacuum line etc. for support tool installations as may be required to complete the installation and commissioning of the tool.

Any items not specifically mentioned in the specifications but required for safe and efficient operations of the system shall deem to be included in the scope of supply of the vendor unless explicitly indicated in the bid by the vendor.
1.03.00 SCOPE OF INSTALLATION AND COMMISSIONING

1.03.01 It shall be the responsibility of the vendor to ensure installation & commissioning of the tool at SCL including supply and installation of pedestals for distribution of equipment load on to the existing concrete floor.

1.03.02 Vendor shall provide guidelines for preparation of installation site.

1.03.03 Vendor shall also supply the installation drawings giving detailed information regarding the port size & type for the utility connections.

1.03.04 Vendor shall uncrate the tool, move the same to the respective area(s) and install the tool on foundations, etc. SCL will provide utilities hook-up upto the tool.

1.03.05 Vendor shall Commission the systems with the required utilities (to be supplied by SCL) and demonstrate the functionality of the tool supplied, at SCL site.

1.03.06 Vendor shall bring all necessary tools/instruments/special tools etc. that may be required for successful commissioning/ installation/ verification/ acceptance of the tool and sub tools of the tool.

1.04.00 TRAINING

1.04.01 During commissioning of the tool vendor shall provide on-site hands-on training to the concerned SCL personnel (including classroom training) on Operations/Process, application software, related applications, trouble-shooting and Preventive Maintenance of the tool supplied. The training shall be extensive (at least for five days) enough so that quick diagnostics of problems and remedial actions is possible at SCL.

2.00.00 ACCEPTANCE PROCEDURE

2.01.00 Vendor shall demonstrate, at site, the functionality as per the tool acceptance procedure specified at Annexure-A besides their standard Acceptance Test Procedures. SCL shall have the option for Pre-shipment inspection at vendor’s premises. Final acceptance, however, will be done after installation and demonstration of the functionality of the tool, as per the acceptance procedure (Annexure-A)

3.00.00 TECHNICAL SPECIFICATIONS

Following are the detailed technical specifications of the required system. Vendor has to provide complete information as required in various sections for proper evaluation of the system. Vendor has to provide clause by clause compliance as per Annexure C. The statements in the compliance sheet shall be supported by relevant documents/brochures.
3.01.00 APPLICATION

Critical Dimension Scanning Electron Microscope (CD SEM) is required with a handler system capable of handling and measurement of SEMI standard 200 mm (With SMIF Loader) and 150mm (with Open cassette loader) silicon wafers for CMOS device manufacturing process. The CD SEM will be used for inline measurement of Develop Inspect Critical Dimension (DICD) and Final Inspect Critical Dimension (FICD) for Lines, Holes, Spaces and Islands. The System shall be equipped with automatic handling of SEMI standard 200 mm silicon wafers with V notch and 150 mm silicon wafers with Major Flat for 180 nm/1.2 µm technology node or better for VLSI manufacturing.

3.02.00 SYSTEM REQUIREMENT

The system shall be configured to accommodate preferably 200 mm (With SMIF Loader) and 150mm (Open cassette loader) Semi-Standard Silicon wafers with V notch (in case of 200 mm wafers) and Major Flat (in case of 150 mm wafers).

3.03.00 TECHNICAL SPECIFICATIONS

GENERAL

3.03.01 Measurement range : 0.1 µm to 2 µm
3.03.02 Resolution@ 800 Vacc : better than 3 nm
3.03.03 Measurement repeatability (Line, Space and Contact hole): ≤ 3nm (3 sigma) or 1%, whichever is larger
3.03.04 Throughput : ≥ 20 WPH with 5 points/wafer measurement

ELECTRON OPTICAL SYSTEM

3.03.05 Accelerating voltage : 500 -1600 V with 10 V steps (typical)
3.03.06 Probe current range : 5 – 24 pA or wider
3.03.07 SEM magnification : Typical 1000 X to 300,000 X
3.03.08 Beam alignment : Automatic beam alignment
3.03.09 Objective lens : Manual or Automatic objective aperture alignment
3.03.10 Focus : Automatic focus system with manual over-ride
3.03.11 Brightness and Contrast : Automatic and manual control
**OPTICAL MICROSCOPE SYSTEM**

3.03.12 Optical magnification : 100X or better

3.03.13 Focus : Automatic focus system

**WAFER HANDLER AND STAGE SYSTEM**

3.03.14 Wafer handling : Automatic wafer handling from SMIF POD using robotic handling (Compatible with Entegris M200 SERIES SMIF POD P/N M200-ET046-10) & 150mm (with Open cassette loader)

3.03.15 Stage control : Programmable stage to move to specific position as given in recipe with stage positioning accuracy of 5 µm or better

3.03.16 Pre-alignment accuracy : ± 10 µm

3.03.17 Wafer alignment : Automatic alignment with pattern recognition capability

**WORK STATION**

3.03.18 Operator interface : PC controlled system with user friendly GUI with image storage in JPEG or BMP or TIFF format

3.03.19 Data and recipe storage : High capacity HDD (40 GB or more)

3.03.20 External I/O port (CD R/W, USB port etc) : Vendor to specify

3.03.21 Data export : Provision for data export to remote PC for further SPC or analysis. Vendor to provide software and hardware requirement for the same

3.03.22 Communication interface (GEM/SECS) : Vendor to specify
3.03.23 Defects / PWP: Equipment shall not add more than 10 particles (>0.20 µm) per pass.

3.03.24 Calibration: (i) Vendor to provide factory calibration certificate (NIST Std.) for the system with the delivery of the system. (ii) Guidelines to be provided regarding the calibration frequency, procedure, etc. along with list of tools required for calibration. (iii) Vendor to supply at least 1 no. of standard wafer or suitable calibration device for calibration of equipment with feature sizes covering the equipment measurement range.

3.03.25 Environment: System to be compatible for class 10 Clean room.

3.04 Defect review (Optional): (i) Vendor to quote separately for the option of Defect Review and classification capability. (ii) The tool shall accept the KLARF (KLA Result File) from Patterned wafer defect inspection station (Make KLA, Model 2139) and Un-patterned wafer defect inspection station (Make KLA, Model SP1-TBI).
4.00.00 APPROVED MANUFACTURERS

<table>
<thead>
<tr>
<th>SN</th>
<th>ITEM</th>
<th>Recommended Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Vacuum Pumps</td>
<td>Edward/Leybold/Varian/Pfeiffer</td>
</tr>
<tr>
<td>B</td>
<td>Ion Pumps</td>
<td>Edward/Leybold/Varian/Pfeiffer</td>
</tr>
<tr>
<td>C</td>
<td>Turbo Molecular pump (TMP)</td>
<td>Edward/Leybold/Varian/Pfeiffer</td>
</tr>
</tbody>
</table>

**GENERAL:**

a) All pipes/ tubing, valves and components (in all paths – process, vent, purge etc.) shall be Stainless Steel 316L Electro polished 10 RA max (Or vendor may specify other options as used).

b) Valves, pipes and components connection shall be either welded or with VCR fittings only.

5.00.00 WARRANTY

Vendor to provide a comprehensive part and labor warranty for a period of 12 months after acceptance of the system at SCL. Vendor to guarantee 85% uptime for the tool based on 24 hours working, 7 days a week. Vendor to give two Preventive Maintenance Visits in the Warranty Period of the tool. Vendor to provide all consumables and spares which will be required during preventive maintenance during the period of warranty.

6.00.00 POST WARRANTY SYSTEM SUPPORT

Spares and maintenance support required for 5 years after the expiry of warranty period. Vendor to quote for Post-warranty ‘labor-only’ AMC charges per year for a period of 5 years.

7.00.00 RECOMMENDED SPARES AND CONSUMABLES

Vendor to provide separate itemized Quote (optional, for reference) for recommended essential spares and consumables which may be required for meeting the essential above stated tool uptime.

8.00.00 SAFETY

- Appropriate safety mechanism in terms of alarms and EMO shall be provided for operator safety. Vendor to provide the details.
- The system shall be design to be compliant with CE standards or other Industrial safety standard.
- Fitted with all necessary safety interlocks (Hardware and software) for safe operation.
• The system shall be designed in a manner so that the radiation level outside is as per the industry standard.

9.00.00 TECHNICAL DOCUMENTATION
Vendor to supply technical documentation (in English language) containing, but not limited to, the following:
1. System user manuals
2. System Hardware / Software manuals.
3. Maintenance / Diagnostic / Trouble shooting manuals including schematics, Circuit diagram (Electrical & Plumbing) along with Parts for all spares.
4. OEM system/subsystem/accessories manuals
5. Vendor to recommend/ specify type of pump, accessories and type of oils/grease to be used along with pump operation & maintenance manual to minimize pump down time.
6. Vendor shall supply all additional information such as application development notes, paper published/process information etc. related to the system.
ACCEPTANCE PROCEDURE

Part 1: Vendor to perform complete standard Acceptance Test Procedures (ATP) as per their Tool acceptance guidelines

Part 2: Besides standard ATP, the following tests shall be performed either as part of Standard ATP if it already contains the following tests or as separate demonstration.

1. Wafer Handling: Vendor to demonstrate the capability of wafer handler by running 200 Semi-Standard Silicon wafers. The handler shall be able to perform entire transfer cycles without any failures, alarms, warnings or human intervention except for cassette loading during 200 wafer cycles.

2. Particles: Vendor to demonstrate that the Contaminating Particles added (size 0.2 µm) shall be less than 10 per wafer in one run.

3. Vacuum performance: The system shall show a base vacuum level up to required levels in different regions of the Tool namely Vacuum specimen chamber, Electron gun chamber, Loader chamber etc.

4. Stage movement: Vendor to demonstrate full stage travel in both X and Y directions, Rotation and Tilt (if applicable).

5. Golden wafers and Calibration standard measurement:

5.1 Golden wafers measurement - The following are the Golden wafers of 180 nm technology. Each wafer will be measured 3 times and repeatability will be evaluated.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Wafer description</th>
<th>No of measurements</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GC wafer after Etch</td>
<td>1st Run</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>2nd Run</td>
<td></td>
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<td></td>
<td></td>
<td>3rd Run</td>
<td></td>
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<tr>
<td>2</td>
<td>CS wafer after Etch</td>
<td>1st Run</td>
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<td></td>
<td></td>
<td>2nd Run</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>3rd Run</td>
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<tr>
<td>3</td>
<td>M1 wafer after Etch</td>
<td>1st Run</td>
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<td></td>
<td></td>
<td>2nd Run</td>
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<td></td>
<td></td>
<td>3rd Run</td>
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<tr>
<td>4</td>
<td>V2 wafer after Etch</td>
<td>1st Run</td>
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<td></td>
<td></td>
<td>2nd Run</td>
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<td></td>
<td></td>
<td>3rd Run</td>
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<tr>
<td>5</td>
<td>M2 wafer after Etch</td>
<td>1st Run</td>
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<tr>
<td></td>
<td></td>
<td>2nd Run</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3rd Run</td>
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</tr>
</tbody>
</table>

5.2 Calibration standard measurement - Vendor has to bring calibration standard and demonstrate tool performance at its maximum resolution and measurement range.

6. Vendor to demonstrate throughput of the wafers at standard measurement conditions.
## Utility Requirements for Tool

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Utility</th>
<th>Specifications</th>
<th>End/ Final Connection Details (For Tool Hook-up)</th>
</tr>
</thead>
</table>
| 1      | Environmental Conditions | - Clean Room Class  
- Temp.  
- RH | | |
|        | UHP Water.  
(Please specify Hot Water reqmt., if any) | | |
| 3      | BULK Gases | - Process Nitrogen  
- General Nitrogen  
- Oxygen  
- Hydrogen  
- Argon  
- Helium | | |
| 4      | Specialty Process Gases | (Pl. specify reqmt for all the process gases) | | |
| 5      | Process Cooling Water | | | |
| 6      | Compressed Dry Air | | | |
| 7      | Process Vacuum | | | |
| 8      | Exhaust | - Acid Exhaust  
- Solvent Exhaust  
- General Exhaust | | |
| 9      | Drains for | - Acid/ Alkalies  
- Organic Solvent  
- CMP etc | | |
| 10     | City Water | | | |
| 11     | Special Flooring/ Foundation reqmts, if any (Anti Vibration pads etc.) | | | |
| 12     | Vacuum Wands/ 
N2 guns. | | | |
| 13     | Dimensions/Foot-Print & Weight. | - Tool Foot-Print.  
- Tool weight  
- Support Tools. | | |
| 14     | Electrical Supply (50 Hz) | (Load) (Voltage) (phase) | | |

Vendor to strike off whatever is not applicable and specify any other utility requirements.

* Specify Impurity levels in ppm/ppb.

# please mentions composition of effluent, if discharged from the Tool.

**NOTE: Power Mode Available at SCL:** 230V +/- 10%, 1 PHASE, 50Hz +/- 5% OR 415V +/- 10%/3 PHASE, 50 Hz +/- 5%.
### COMPLIANCE MATRIX

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<th>Description</th>
<th>Vendor’s Remarks</th>
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<td>1.03.00</td>
<td>Scope of Installation and commissioning</td>
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<td>3.01.00</td>
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<td>3.03.00</td>
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<td>9.00.00</td>
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