

Technical Specifications for 'Multi-target RF, DC Magnetron Sputtering Deposition System'

Sl. No.	Sub-components description
1	<p>Vacuum chamber design:</p> <ul style="list-style-type: none"> ○ Fully RF shielded, high grade stainless steel, SS304, electro-polished, non-magnetic, vertical cylindrical vacuum chamber should be less than 10 ltr capacity, having top lid opening with Viton 'O', hinge-support and a suitable view port fitted with chamber to monitor processing. ○ Additional 5 numbers of glasses for viewport should be provided. ○ A vacuum port for turbo-molecular pump at the backside of chamber with automatic valve operation. ○ To prevent deposition on chamber wall, a removable type thin sheet liner must be provided. ○ Base plate should have support for connecting minimum 3 no's of magnetron sources arranged in either co-planar or confocal arrangement; gas inlet port, power feed through ports, source shutter on top of three targets. ○ Top plate should have appropriate ports/feedthrough for substrate holder with rotation, heater, thermocouple etc. ○ The entire fabrication must adhere to international Vacuum Welding Standards, electrochemically polished chamber inner surface for low out gassing rate. All the components, sub-assemblies and final unit must be leak tested using Helium Mass Spectrometer Leak Detector to an individual leak rate of 3×10^{-9} m.bar ltrs/sec.
2	<p>System dimensions and support structure:</p> <ul style="list-style-type: none"> ○ System should be cleanroom compatible (ISO-5 class 100, cleanroom compatible), tabletop, portable sputter tool. ○ Low-foot print area less than 60 cm x 90 cm with powder coated rack to place power supplies, other electrical systems.
3	<p>Substrate holder with rotation and Z-shift:</p> <ul style="list-style-type: none"> ○ Substrate holder (SS-304) to position 6 to 8 nos. of 20x20 mm (holder 1) and 2-3 nos. of microscopic slides (holder 2). Two numbers of each type of substrate holder design. ○ The substrate holder capable to handle 4" wafer with rotation fixed at the center of top plate with variable speed (1–20 rpm). ○ Target to substrate distance should be variable ~ from 40 to 100 mm (z-shift)
4	<p>Substrate heating:</p> <ul style="list-style-type: none"> ○ Should have variable substrate temperature option from 25 °C to 500 °C, stable temperature with an accuracy of ± 1 °C, suitable thermocouple with Digital PID Controller. ○ Temperature on the substrate should be able to control to up to 500 °C during sputter deposition process. ○ All necessary support documents on precision and control of temperature on the substrate must be included in the technical bid.
5	<p>Magnetron sources:</p> <ul style="list-style-type: none"> ○ Minimum 3 numbers of reputed make, indirect water-cooled, RF/DC compatible, circular Magnetron Sources of 2 inch size, mounted on the base plate, sputter-up, co-planar arrangement capable to sputter from the target thickness of 6-8 mm. ○ Shutter assembly to fully shield the substrate from the source. ○ Cross contamination shields for isolation of each magnetron. ○ Capability to perform co-sputtering deposition between any two magnetrons. ○ Two sets of additional covers (both target clamp ring and outer shield of cathode) for each magnetron should be provided. ○ Shutter assembly to fully cover 4inch substrate, during pre-sputtering. ○ Magnetrons should have capability for a long deposition run at a given process

	<p>pressure under a constant power over a defined time and guarantee a uniformity figure of 300 nm Al at 0.5 Å/s, Ar gas at a process pressure of 1.5 m.bar, 2” wafer, within ± 2% non-uniformity. All support data must be included in the technical bid as well as should be demonstrated at the installation site.</p>
6	<p>RF and DC Power supplies:</p> <ul style="list-style-type: none"> ○ 1 number of DC power supply, of reputed make, 500 W or above, having tight regulation ≤0.2 %, variable ramp and 0.1% resolution with digital displays or interfaced with control panel. ○ 1 number of RF Power Generator of 150 W or above, of reputed make, nominal frequency of 13.56 MHz with auto matching network load impedance of 50 Ω. ○ One 2-way RF selector switch for changing RF power between any two magnetrons.
7	<p>Gas distribution system:</p> <ul style="list-style-type: none"> ○ A Gas Manifold fabricated out of SS, 1 Nos. of reputed make MFC 2-100 sccm with filter, valves and inlet solenoid valve for Ar gas. Provision for 2 Nos. of MFCs. ○ A solenoid operated isolation Valve for N₂ gas for venting the chamber.
8	<p>Vacuum pumping system:</p> <ul style="list-style-type: none"> ○ Reputed make dry scroll pump having displacement capacity of minimum 30 m³/hr. ○ Forline trap with heater at the inlet, reputed make, water/air cooled turbo molecular pump having the pumping speed of at least 85 ltrs/sec or above for a chamber volume of ~10 litres, vent valve and connecting cables, a fully automated PLC Controlled high vacuum system with necessary valve. ○ Vacuum pumping lines made out of SS-304 with bellow adaptors, reputed make one wide range suitable gauge or Microvac Gauge, motorized throttle valve of suitable size with controller taking its input the fast response capacitance manometer at suitable position to maintain quickly the required partial pressure of Argon inside the chamber to carry out the Sputtering operation. ○ Base pressure: ultimate vacuum of at least <math>5 \times 10^{-7}</math> m.bar within two hours of start of system, in clean, cold, empty degassed chamber after back filling the chamber with pure and dry Nitrogen. ○ All the components, sub-assemblies and final unit must be leak tested.
9	<p>High resolution pressure control:</p> <ul style="list-style-type: none"> ○ Automatic pressure control via PID feedback loop operated in response to high-resolution chamber pressure measurements from a high-accuracy 0.1 m.bar full-scale capacitance manometer. ○ All necessary support documents for high-resolution of ±0.1 m.bar pressure control during the deposition must be included in the technical bid. ○ System software must automatically adjust MFC flow rates (including to a fixed, user-defined ratio, if more than one MFC is being operated simultaneously) to achieve the desired chamber pressure. Pressure control resolution to 0.1 m.bar. ○ Upstream pressure control, which should be able to control the process pressure to ±0.1 m.bar from the set process pressure throughout the sputtering cycle and temperature ramps for a minimum of 5 hrs.
10	<p>Thin film deposition and quality:</p> <ul style="list-style-type: none"> ○ High precision control on growth of thin film deposition using high-resolution pressure control from ~2 nm to few 100s of nm sputtering from single target or co-sputtering from two different targets. ○ Film should have uniformity within ±2 atomic % variation in composition, ≤2 % variation in film thickness on edge-to-edge substrate size of above 20x20 mm. ○ Recipe for standard metals and semi-metal deposition. ○ Must have capability of low vacuum thin film deposition of minimum 1.5 m.bar for standard metals such as Al, Cu and Ti. Support data must be provided in the technical bid.

11	<p>Auto/manual thin film deposition:</p> <ul style="list-style-type: none"> ○ PLC based vacuum controller for complete automation of vacuum pumping with fully automatic and a provision for manual control. High resolution colour touchscreen HMI with purpose-designed easy-to-use, powerful software to enable deposition in either manual or automatic (i.e., per user-defined recipes) control modes. System control via industrial-grade, high-stability PLC electronics. ○ System should have USB and/or Ethernet connections for servicing/diagnostics and data logging/download during use from PC/laptop.
12	<p>Safety interlocks:</p> <p>Water, low vacuum, high-vacuum, power supply connections and all necessary safety interlocks must be provided.</p>
13	<p>Warranty:</p> <ul style="list-style-type: none"> ○ Standard warranty for one year and extendable for two years. ○ On-site periodic checking/maintenance of the system after installation at least twice in a year during the warranty period. ○ Vendor shall commit to provide spares and support for 05 years after expiry of warranty period.
14	<p>Operating manual:</p> <ul style="list-style-type: none"> ○ Both electronic and hardcopy ○ The documentation/manual shall include all drawings, schematics, spares parts catalogues and also sub-vendor's manuals.
15	<p>Installation/commission:</p> <ul style="list-style-type: none"> ○ The system shall be installed / commissioned at customer site. The quotation shall be inclusive of all charges, if any, for installation and commissioning of the equipment by the vendor. ○ Extensive operation and maintenance training of at least three persons for one week at the customer site after the installation should be included. ○ Vendor to provide complete cleanroom compatible documentation/manuals soft copy/ hard copy for the systems. ○ The system shall conform to the Indian power supply standards, i.e. 230V ± 5%, 50Hz, Single Phase. ○ Vendor shall provide list of at least five customers (India and abroad) along with email addresses, where the similar system including the model number that has already been installed. ○ Only reputed original equipment manufacturer (OEM) should submit the tender. ○ Warranty Certificates from manufacturer for bought out items like Power Supplies, Vacuum Pumps with Serial Numbers will have to be provided along with system documentation.
16	<p>Optional items:</p> <ul style="list-style-type: none"> ○ Chiller unit ○ 1 Additional MFC for N₂ ○ Quick venting accessories

Additional Requirements:

- OEM should have authorized service centre in India, functioning minimum for 10 years to provide repair, maintenance, calibration and upgradation facility (OEM should provide necessary service of operation certificate).
- The rate should be quoted for C.I.P Chennai.