

**Technical Specifications of
'RF 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 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 five 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 one magnetron in a co-planar arrangement and up to three magnetrons in confocal arrangement; gas inlet port, power feed through ports, source shutter on top of three targets. ○ Top plate should have 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 20x20mm (holder 1) and 2 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 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"> ○ 1 No. of reputed make, indirect water-cooled, RF/DC compatible, circular Magnetron Source of 2 Inch size, mounted on the base plate, sputter-up, confocal/co-planar arrangement capable to sputter from target thickness of 6-8 mm. ○ Capability to upgrade up to 3 Magnetrons in confocal arrangement (within the provided system) with cross-contamination shield to perform co-sputtering using any two magnetrons. ○ Shutter assembly to fully shield between source and substrate. ○ Two sets of additional covers (both target clamp ring and outer shield of cathode) for the magnetron should be provided.

	<ul style="list-style-type: none"> ○ Shutter assembly to cover the 4" substrate from the source, during pre-sputtering. ○ Magnetrons should have capability for a long deposition run at a given process pressure under a constant power over a defined time and guarantee a uniformity figure of 30 nm TiO₂ at 0.1 A/s, Ar gas at a process pressure of 1.5 mbar, 2" wafer, within +/- 2% non-uniformity. Support data must be included in the technical bid as well as should be demonstrated at the installation site.
6	<p>RF Power supply:</p> <ul style="list-style-type: none"> ○ 1 no. RF Power Generator of 150 Watts, of reputed make, nominal frequency of 13.56 M Hz with auto matching network load impedance of 50Ω. ○ Provision to upgrade with 1 no. DC power supply within the provided system, 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. ○ Capability to upgrade (within the provided system) with one 2 IN: 3 OUT RF selector switch for changing 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 2-50 sccm with filter, valves and inlet solenoid valve for Ar gas. Provision for additional 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 rotary backing pump having displacement capacity of 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, Pirani Gauge with two Nos. of Pirani gauge heads and 1 No. penning gauge with set point controller, motorized throttle valve of suitable size 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 < 5 x 10⁻⁷ 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>Automatic pressure control (provision for upgradation):</p> <ul style="list-style-type: none"> ○ Capability for upgrade (within the provided system) to automatic pressure control via PID feedback loop operated in response to chamber pressure measurements from a high-accuracy 0.1 mbar fullscale capacitance manometer. ○ All necessary support documents for high-resolution of +/-0.1mbar pressure control during the deposition must be included in the technical bid. ○ Capability for upgrade (within the provided system) to automatic adjustment of MFC flow rates through system software (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 mTorr. ○ Upstream pressure control, which should be able to control the process pressure to +/-0.1mbar 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 ±1 atomic % variation in composition, <2.0 % variation in film thickness on edge-to-edge substrate size of 4" wafers. ○ Recipe for standard metals and metal-oxides.

	<ul style="list-style-type: none"> ○ Must have capability of low vacuum thin film deposition of minimum 1.5 mbar 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 manual. High resolution color 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 datalogging/download during use from PC/laptop.
12	<p>Safety interlocks: 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 (optional). ○ 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"> ○ Reputed make dry scroll pump (displacement capacity of 30 m³/hr) ○ Chiller ○ 2 additional nos. of reputed make, indirect water-cooled, RF/DC compatible, circular Magnetron Sources of 2 Inch size, mounted on the base plate, sputter-up, confocal arrangement capable to sputter from target thickness of 6-8 mm. ○ Cross-contamination shield to allow co-sputtering using any two magnetrons ○ 1 no. 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. ○ one 2 IN: 3 OUT RF selector switch for changing power between any two magnetrons. ○ 2 additional MFCs for N₂ and O₂

	<ul style="list-style-type: none">○ Automatic pressure control system via PID feedback loop operated in response to chamber pressure measurements from a high-accuracy 0.1 mbar fullscale capacitance manometer.○ Automatic adjustment of MFC flow rates through system software (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 mTorr.○ Upstream pressure control, which should be able to control the process pressure to +/-0.1mbar from the set process pressure throughout the sputtering cycle and temperature ramps for a minimum of 5 hrs.○ Quick venting accessories
--	--

Additional Requirements:

- OEM should have authorized service centres 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.