

## Specifications for Table Top Magnetron Sputter System

| Specifications |  |   |
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| <b>1.0</b>     | <b>Introduction</b>  |   |
| 1.1            | Laboratory for Electro-Optics Systems (LEOS) requires a magnetron sputter coating system for the purpose of development of optical coatings on optical components. The coating plant is required to be fabricated at manufacturer site and tested for its performance both at manufacturer's site before shipment as well as at LEOS after installation / commissioning. LEOS is inviting competitive tenders from manufacturers of vacuum coating chambers. |   |
| <b>2.0</b>     | <b>Applications Requirement</b>  |   |
| 2.1            | The system shall be capable of loading 3 or more substrates, diameter up to 50 mm (minimum) in a single run, with planetary rotation mechanism.  |   |
| 2.2            | The coating plant should be capable of depositing multilayer (> 50) layers in single run without any break in vacuum/ deposition cycle.  |   |
| 2.3            | Co-sputtering facility for creating Graded Index Optical Layers. Configuration of cathodes should allow sequential as well as co-sputtering of layers. Equipment shall be capable of depositing metals, metal alloys, dielectric and multilayers by Magnetron Sputtering and Reactive Sputtering Technology.   |   |
| 2.4            | Coating thickness uniformity: Metals: < 3 % (absolute), Dielectrics: 0.5 % (absolute)  |   |
| <b>3.0</b>     | <b>Vacuum Chamber</b>  |   |
| 3.1            | Chamber Type/ Size   | Box coater with front door opening. Minimum dimension 300 X 300 X 300mm. Chamber should accommodate the sample requirement as per the section 2.1 |
| 3.2            | Ultimate Pressure  | Better than 5E-6 mbar   |
| 3.3            | Operating Pressure   | 1E-3 to 2E-4 mbar   |
| 3.4            | Pump Down Time   | Pump down time to reach 5E-2 mbar from ambient pressure: ≤30 minutes<br>Pump down time to reach 5E-6 mbar: ≤120 min.                              |
| 3.5            | Material   | Stainless Steel 304, Buffed/ electro-polished/ sand or glass bead blasted, High Vacuum cleaned  |
| 3.6            | Cooling  | Water cooling line on the outside wall  |
| 3.7            | View Port  | One (01) number with shutter  |
| 3.8            | Leak Rate  | Better than 5E-9 mbar l/sec Helium  |
| <b>4.0</b>     | <b>Substrate Assembly and inside chamber</b>   |   |
| 4.1            | Substrate Holder   | Minimum Three (03) planetary holders  |
| 4.2            | Substrate Rotation   | 1 to 10 RPM   |
| 4.3            | Substrate Heater and controller  | Capable of reaching 250 °C with an accuracy of ± 2 °C.<br>PID controller  |
| 4.4            | Shutter  | Stainless steel electro-pneumatic/rotary shutters   |

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| 4.5         | Shielding/ liners   | Removable SS shields (liners) shall be provided for inside wall of chamber.   |
| 4.6         | Temperature Sensor  | The sensor (thermocouple) shall be mounted to measure temperature   |
| <b>5.0</b>  | <b>Ports</b>  |   |
| 5.1         | The chamber shall be provided with necessary feed through/ports for Vacuum gauges, Substrate rotation |   |
| <b>6.0</b>  | <b>Sputtering Assembly</b>  |   |
| 6.1         | Source  | Water Cooled Magnetron Cathodes with Unbalancing Facility. Two sources shall be provided  |
| 6.2         | Targets<br>Target size<br>Target materials  | Dual targets<br>50 mm or 2 Inch diameter<br>Silicon [Si], Aluminium[Al], Silver[Ag], Tantalum[Ta]   |
| 6.3         | Configuration   | Sputter down Configuration with confocal geometry   |
| <b>7.0</b>  | <b>Source Controllers</b>   |   |
| 7.1         | Pulsed DC<br>Magnetron<br>Sputtering Power<br>Supply  | Pulse Frequency, 2kW 100- 300 K Hz, 2kW (typical)<br>Active Arc Suppression<br>Voltage, Current and Power Control Modes   |
| 7.2         | RF Generator  | 300 Watt with Matching Network  |
| 7.3         | Pulsed Bias and Ion<br>Etching Power<br>Supply  | Pulse Frequency 100- 300 K Hz, 2kW (typical)<br>Active Arc Suppression<br>Voltage, Current and Power Control Modes  |
| 7.4         | Timer   | Delay Timer (0 - 30 sec) to provide delay in stabilization of Plasma from Argon flow inlet prior to sputtering<br>Process Timer (100 min typical) on Front Panel with visual indication of process completion |
| <b>8.0</b>  | <b>Pressure monitoring system</b>   |   |
| 8.1         | Vacuum Gauge<br>Controller  | Combined controller shall be provided for high and low vacuum control and measurements.   |
| <b>9.0</b>  | <b>Pumping System</b>   |   |
| 9.1         | High vacuum   | Turbo pumping system to meet the requirement of vacuum performance<br>Make: Leybold/ Pfeiffer/ Agilent  |
| 9.2         | Low Vacuum<br>Pumping System  | Rotary Pump of suitable capacity to meet the specified vacuum levels as per 3.4 shall be provided.<br>Make: Leybold/ Pfeiffer/ Agilent  |
| <b>10.0</b> | <b>Process Control</b>  |   |
| 10.1        | PLC   | Programmable Logic Control shall be provided all the interlock and process automation control interface with remote I/O modules.<br>PLC make: Allen Bradley/ Siemens/ Beckhoff/ Renu                          |
| 10.2        | Thickness control   | Quartz Crystal Sensor based online thickness control system shall be provided (Crystal thickness controller Inficon make). Dual sensor head shall be provided. Thickness monitoring accuracy shall be better  |

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|             |  | than 1% of the nominal value of deposited thickness and deposition rate better than 0.1 nm/ sec and also shall provide simultaneous display of deposition rate and coating thickness. The online thickness and deposition rate evaluation program should take Z-match ratio, tooling factor, density and other critical parameters required for numerical evaluation of thickness and deposition rate into account               |
| 10.3        | Coating Process Control System   | The entire coating process shall be automatic with a provision for manual control.   |
| 10.4        | Gas Distribution System  | MFCs shall be provided for precise control of gas distribution during the coating process.<br>Qty- 2Nos [one each for Ar and O <sub>2</sub> ]<br>MFC Make: Apex/ MKS/ Buhler/ Bronkhorst   |
| 10.5        | Computerized Operation   | Microsoft Windows based user friendly software shall be provided to run manual or fully automatic operation. All the safety interlocks shall be preprogrammed for operation safety.<br>Remote Access: Provision for remote access from computer to computer monitoring and navigating, and remote access for service monitoring shall be provided.   |
| 10.6        | Computer   | PC with latest processor, 8GB RAM, 1TB HDD shall be provided. operating System (OS): Windows 10 or above. The OS software CD/ USB drive with necessary License shall be provided. Monitor: 21" (typical)<br><b>Note:</b> Vendor may also provide HMI interface with LCD (color) touchscreen option to control the coating plant. However, computer shall be included along with necessary software to control the coating system |
| 10.7        | Safety Interlocks  | All necessary interlocks shall be included for safety of operator and safety of instruments. Water, Air, pressure, chamber door and frame door shall be interlocked accordingly.   |
| <b>11.0</b> | <b>Other supporting systems</b>  |  |
| 11.1        | Water Distribution System  | LEOS will make the arrangement for Cold water circulation unit, however, the technical offer shall specify the requirement of cold water circulation parameters.   |
| 11.2        | Compressed Air Distribution System   | Compressed air distribution system shall be installed for controlling all the pneumatic valves.<br>Note: Compressed air will be provided by LEOS   |
| 11.3        | High Vacuum Valve  | VAT Make Gate Valve <b>or</b> equivalent   |
| <b>12.0</b> | <b>Spare Parts</b>   |  |
| 12.1        | Basic spare parts  | Essentially required spare parts shall be by the vendor for the smooth running of the plant during warranty period.  |
| <b>13.0</b> | <b>Acceptance Criteria</b>   |  |
| 13.1        | Vacuum demonstration as per Section 3.5 and thickness uniformity as per section 2.4. |  |
| 13.2        | The vendor shall demonstrate Graded index films and Co-sputtering                    |  |

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| <b>14.0</b> | <b>Factory Acceptance Test (FAT):</b>  |  |
| 14.1        | The vendor shall generate a report on the results of the process demonstration as per section 13.0 and only after the clearance from LEOS representative, the coating plant shall be dispatched. LEOS reserves the rights to depute its personnel for factory acceptance test.   |  |
| <b>15.0</b> | <b>Installation and Demonstration</b>  |  |
| 15.1        | The system shall be installed by the vendor at LEOS premises. All the necessary accessories required for the installation shall be provided by the vendor. LEOS will make arrangements for all necessary civil and electrical input requirements. After installation at LEOS the vendor shall demonstrate as per the acceptance criteria (Section 13.0). |  |
| <b>16.0</b> | <b>Electrical Power Distribution Requirements</b>  |  |
| 16.1        | (Desirable) Single phase, 220 ± 10 % Volts AC, 50 ± 3% Hz  |  |
| 16.2        | Suitable capacity power backup (Uninterrupted Power Supply) system shall be supplied with a backup up to a minimum of 30 minutes even during the deposition process.   |  |
| <b>17.0</b> | <b>General Requirements</b>  |  |
| 17.1        | <b>Warranty</b>  | <b>Two years from the date of installation and acceptance at LEOS.</b>   |
| 17.2        | Documentation  | Operation and troubleshoot Manual and Electric drawings shall be provided  |
| 17.3        | <b>Delivery and Installation Schedule</b>  | Desirable delivery of the system within 6 months from the date of purchase order.<br>The installation and demonstration shall be completed within 15 days after site readiness and intimation.   |
| 17.4        | <b>Delivery Terms</b>  | Items shall be delivered to Stores, LEOS. The necessary insurance shall be borne by the vendor. Ex-works not acceptable.   |
| 17.5        | <b>Price Quote Format</b>  | <b>This is a TWO PART tender. The vendors shall submit Technical and Price bids separately.</b> Disclosure of any price information, either partially or fully, along with technical bid will disqualify the vendor from Tender evaluation process. <b>Price shall be quoted in Indian Rupees only</b> |
| 17.6        | <b>Pre-Qualification Criteria of the Bidder</b>  | Manufacturers who have the heritage in manufacturing and supply of Coating Systems with similar configuration shall only participate in the tender.  |
| 17.7        | <b>Technical Bid Evaluation Criteria</b>   | The vendor should provide one-to-one compliance matrix, without which offer will not be considered for evaluation.   |