TECHNICAL SPECIFICATION – E-Beam Metal Deposition System

System Description

The system will be used for the deposition of high-purity metal and dielectric thin films under vacuum for semiconductor, microsystem, and optoelectronic applications. The system shall operate fully automatically, have high vacuum capability, and provide precise thin film thickness control.

1. GENERAL REQUIREMENTS

- The system shall be compatible with wafers of at least 4" diameter.
- During deposition, the sample temperature shall be controllable up to 500°C.
- The material crucible assembly shall be multi-pocket type (minimum 6 pockets, each 7 cc capacity) and water-cooled.
- The system shall be fully automatic, with the option for manual operation.
- Installation, commissioning, and training shall be provided by the supplier.

2. TECHNICAL SPECIFICATIONS

2.1 Vacuum Chamber and Body

- Fabricated from stainless steel with a large front door.
- Equipped with a viewing port (minimum Ø100 mm) and protective shutters.
- Interior lined with a protective liner.
- Temperature control shall be provided by water circulation.

2.2 Vacuum System

- Turbo molecular pump capacity: minimum 900 l/s.
- Fore pump shall be a dry type with a minimum capacity of 30 m^3/h.
- Delivered fully installed and tested with appropriate valves and hose connections.
- Ultimate vacuum shall be better than 5×10^{-7} mbar.

2.3 Electron Beam Source and Power Control

- Power capacity: minimum 6 kW, accelerating voltage: 4–10 kV.
- Multi-pocket source: 6 pockets, each 7 cm^3 capacity, motorized indexer.

- Safety systems shall include at least one door interlock and a grounding stick.
- Kontrol unit and remote control device shall be included.

2.4 Thin Film Thickness Measurement

- Quartz crystal-based thickness monitoring system (QMB6 or equivalent).
- Frequency resolution ≤ 0.1 Hz, dual sensor input, PID-controlled deposition, thickness accuracy at least ±0.05 Å.
- Gold-coated quartz crystals and sensor heads shall be supplied.

2.5 Substrate Handling and Heating Unit

- Substrate holder shall support up to 4" diameter wafers, water-cooled and heated.
- Heating temperature capability: up to 500°C with PID control.
- Rotational speed: adjustable between 0–20 rpm.
- Automatic shutter system shall be included; manual shutter operation shall also be possible.

2.6 Electrical and Software Control Cabinet

- Touchscreen interface, PLC system, Windows-based control software.
- Recipe definition and data logging system with user authorization levels.
- Software shall include automatic pumping, venting, thickness monitoring, temperature, and rotation speed control.
- Emergency stop button shall be located within the operator area.

3. PERFORMANCE CRITERIA

- Base vacuum: ≤ 5×10^{-7} mbar.
- Film thickness control accuracy: ±2% over a 4" wafer.
- Heating temperature deviation: maximum ±1°C.

4. WARRANTY AND SERVICE

- The system shall have a minimum warranty period of 24 months.
- Technical support shall be provided for a minimum of 10 years.
- In case of failure, intervention shall be guaranteed within a maximum of 10 days.

- Training and installation shall be included in the offer.

5. DELIVERY AND TRAINING

- Installation, testing, and initial user training shall be provided by the supplier. On-site training shall last at least 2 days after installation.
- Delivery period shall not exceed 10 months.
- Training documents, user manuals, and maintenance documentation shall be provided in Turkish and/or English.