

Detailed technical specification for  
**Supply, installation & commissioning of Dry Film Photoresist Developing Machine for High Density Interconnect Printed  
 Circuit Board fabrication**

**1 Purpose**

Dry film photoresist developing machine is intended to be used for developing the dry film photoresist after inner layer & outer layer photo mechanical imaging in PCBs during fabrication of printed circuit boards (PCBs) of high density interconnect (HDI) type.

**2 Scope**

- a. Party shall supply dry film photoresist developing machine with all necessary accessories meeting the specifications as per the tender document at VSSC
- b. The system shall be capable of developing the dry film uniformly from inner & outer layers for conventional as well as High Density Interconnect (HDI) PCBs on both sides of the panel in one cycle
- c. The system shall have process compatibility to handle glass epoxy (FR4), Glass-polyimide, Rigid-Flex PCBs with thickness ranging from 0.05 mm to 5.0 mm
- d. Installation, commissioning and training of personnel at VSSC by OEM for operation & maintenance of the complete equipment
- e. **Two-year comprehensive warranty** for the complete system from the date of commissioning at VSSC
- f. Onsite **non-comprehensive maintenance contract for 5 years** after two-year warranty period

**3 Technical specifications of the Dry Film Photo Resist Developing Machine**

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
1.	Model No.	As per vendor specification			
2.	Make & country of origin	As per vendor specification			
3.	Equipment	Dry Film photoresist			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		developing machine shall be capable of developing uniformly dry film photoresist from inner & outer layers of PCBs using sodium / potassium carbonate based developing solutions for conventional as well as high interconnect (HDI) PCBs.			
4.	Overall dimension of machine	Shall be < 5.0 m			
		Total width: 1400 mm (approx.)			
		Height : 1500 mm (approx.)			
		Conveyer height: 950 ± 50 mm			
5.	Panel width (Max)	≥ 610 mm			
6.	Panel width (Min)	≤150 mm			
7.	Panel length (Min)	150 mm (approx.)			
8.	Panel thickness (Min & Max)	0.05- 5 mm or better			
9.	PCB material	FR4, PTFE, Flex rigid			
10.	Conveyer direction	Left to Right			
11.	Conveyer speed	Adjustable to meet dwell time of 0.5 to 4.5 m / min, or better			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		Detachable type input conveyor			
12.	Conveyor system	AC Drive 1 HP. AC geared motor 1 x 0.5 HP for double conveyor drive shaft.			
		Fibre Conveyor Rods and SS316 Rod Main shaft to be provided			
		PP Conveyor Discs Ø40 mm (preferred)			
		PE Side Holders at 30 Pitch (to suit 50 micron thick laminates)			
		PVDF Spur Gears & Bevel Gears.			
		EPDM Rubber rollers at entry and exit of each chamber for controlling carry over.			
		Digital conveyor speed control. Maximum conveyor speed 4.5 mtr per minute, or higher			
13.	Process Modules	Input loading			
		Developing			
		Rinse – cascade rinse (3 or more)			
		Blowing &Drying, Output unloading			
14.	Thin layer handling system	The equipment shall be have capability to handle			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		thin layers upto 50 microns thickness of copper cladded laminates			
15.	Material of construction	PP, PVC, SS316, UHMW, Viton, EPDM ,12 mm Thick PP Grey Main frame 0.15 mm Thick PP Grey Conveyor Guide. All Metal parts shall be SS316.			
16.	Top cover of modules	All module except input & output shall be provided with suitable tempered glass cover			
17.	Hardware of control panel	MS Powder Coated Industrial Cabinet Type Control Panel.			
		Electrical console with electrical Relay Logic Controls from reputed brands like Omron, Alan Bradley etc., and display			
		All pumps shall be started in cascading mode based on PCB detection by input sensor			
		Shall have operating hour counter / panel counter			
18.	Electrical Control Systems Standards	CE Certified Switch Gear & Instruments. Safety			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		Features & Alarms shall be provided suitably.			
19.	Input module	With free loading length of 600 mm (approx.) & board sensors			
20.	Developing chambers	EPDM Rubber rollers at entry and exit of each chamber for controlling solution leakage			
		Single Developing Chamber with Spray Oscillation System			
		1 Top & 1 Bottom Oscillating Spray manifolds in the Developing chamber			
		8 Top & 8 Bottom Easy Removable Spray bars in the developing chamber			
		PP Flat Spray Detachable nozzle shall be provided in the Developing Chamber.			
		Seven Flat Spray Nozzles placed in each of the spray bar for uniform spray in Developing Chamber. Total 56 Nozzles Top + 56 Nozzles bottom spray system.			
		Two 3HP Vertical Glandless pump with SS316 main shaft & PP			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		Impeller for each of the developing spray manifold			
		One top & one bottom spray manifold Valve control shall be provided with max spray pressure up to 30 PSI			
		Separate ball valves shall be provided for upper and lower spray bars for controlling spray pressure and shall be provided with analog pressure gauges			
		Sump Capacity – 300 ltrs (approx.)			
		PP Low level float switches (or suitable) in the sump for pump & heater protection			
		Suitable foam cutter to be provided for controlling the foam in the chamber			
		Spray bars shall be in the direction of conveyor at an angle 15°.			
		21.	Developing Chamber Heating systems	4.5 kW x 2 SS316 heaters controlled by Digital temperature control.	
Temperature sensor shall be PT100 type, with alarm and shut-off in case of					

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		overheating			
		PID based Temperature Control			
		Heating system: Shall have suitable heating system to heat the developing solution up to 60 °C. The system shall have an accuracy of ± 2 °C.			
22.	Cooling coil specifications & Materials	Suitable SS316 Cooling Coil shall be provided in the combined sump with solenoid valve control			
23.	Oscillation motor specifications	0.25 HP x 2 AC Geared Oscillation Motors of 30 RPM for two spray manifold set			
24.	Filter system	Residue collection system shall have <ul style="list-style-type: none"> <li>Removable Mesh Tray below the bottom spray manifold to be provided as additional safety for pump and nozzles.</li> <li>Online bag type filtration housed in PP Jar between pump outlet and before spray system for fine line/fine spacing PCB</li> </ul>			

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		developing down to 4MIL/4MIL.			
25.	Developing solution mixing tank	A suitable mixing tank with mixer motor and horizontal magnetic pump for transferring the chemical to developer tank to be provided outside			
26.	Auto dosing & PH measurement	PH measurement system with Autodosing controls the chemical PH to be provided			
27.	Rinse module	Shall have three or more chamber with cascade system with individual glandless centrifugal pumps			
		All chambers shall be fitted with two numbers of SS / PP upper and lower spray manifolds			
		6 or 7 Nozzles shall be made of SS / PP / PVC			
		0.5 HP x 3 Vertical Glandless Pump with SS316 shaft & PP Impeller for all the rinse chambers			
		One analogue pressure gauge shall be fitted to read back the water			



Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		pressure on outlet of each pump			
		The water inlet shall be controlled by solenoid valve with flow meter and shall be regulated based on the board sensor output			
		Online strainer filter (Y-Trap Strainers) between the pump and spray manifold for pump & nozzle safety			
		Level sensors shall be provided in all chambers.			
		Each of the sump Capacity – 100 L (approx.)			
		Fresh Water top up for the 3rd cascade Water rinse chamber with solenoid valve control & online Flow Meter			
28.	Squeegee rollers	2 Top & 2 Bottom PVA Sponge Rollers in Squeegee Chamber			
29.	Squeegee roller spray bar	1 Top perforated spray bar with manual ball valve adjustment for wetting of squeegee rollers to be provided			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
30.	Blowing chamber knives Construction Materials	1 Top & 1 Bottom SS air knives in Turbo Blowing chamber to be provided			
31.	Blowing chamber Blower Rating	3HP Turbo Blower			
32.	Drying module& output module	Shall consist of Drying with unloading			
		3 Top & 3 Bottom SS air knives in hot air drying chamber			
		3 HP x 1 Centrifugal Blower for Hot Air Drying.			
		1.5 kW X 6 SS316 heaters connected to digital temperature controller for hot air drying to be provided. The heating zone shall be controlled by PT 100 sensor with PID temperature controller.			
		Blind controller shall be provided as safety for drier heater			
		Output module shall be of SS / PP construction. Disk should be of PP / PEHD supported on SS shaft.			
33.	Sensor for panel	Entry & Exit modules			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
	movement	shall be mounted with sensor for detection of panel			
34.	Floor protection tray	Machine shall be placed on a floor protection tray made of 12 mm thick PP at bottom and 20 mm thick at all four sides upto a height of 50 mm.			
35.	Safety & security	All electrical and electronic controls shall be enclosed in corrosion & humidity proof housing			
36.	Control Panel Connecting Cable length	Cable from module to unit 5 m (minimum). MCCB & Emergency stops shall be provided in the panel & Machine			
37.	Machine Interlocks Safety	Conveyor, Pumps, Heaters, Cooling, Interlocks shall be provided in the Panel.			
38.	Emergency stop	Provision for stopping of the equipment during operation at emergency shall be provided.			
39.	Alarm	Equipment shall be provided with visible / audible alarm for any malfunctioning with			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		corresponding error			
40.	Warranty	Comprehensive warranty for the machine for <b>2 years from the date of commissioning</b> at VSSC.			
41.	Safety features	Tempered glass with safety switch shall be provided for Developing module, cascade rinse and drier			
42.	Personnel carrying out maintenance during warranty period	Only Engineers from OEM or Authorised dealers OEM trained engineers shall perform periodical / preventive maintenance (PM) during warranty period. Regarding training of dealers personnel, certificate from OEM shall be provided.			
43.	Maintenance during warranty period	PM as per OEM schedule and any number of breakdown calls shall be attended by the party during warranty period without commercial implications.			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		<p>Details of maintenance schedule, operations to be carried out, parts to be replaced, etc shall be detailed in the quote. Detailed service report after every PM and breakdown maintenance shall be generated by the Service Engineer. Satisfactory working of the machine after maintenance shall be demonstrated to the concerned VSSC engineer.</p>			
44.	AMC proposal	<p>Party shall provide detailed quotation for <b>non-comprehensive AMC for 5 years after two-year warranty period.</b> Details of service personal from Indian agent / OEM shall be mentioned in the proposal. Price list of spares also shall be provided with the quote. This is mandatory for</p>			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		considering your quotation for technical evaluation			
45.	Equipment life	Party shall ensure spares and technical service support for the quoted model till December 2035.			
46.	Accessories / consumables	Party shall quote for the equipment with necessary accessories / consumables required for operation at VSSC. All items for commissioning and operation during warranty period shall be supplied by the party.			
47.	Scope of supply	Party shall mention the detail scope of supply of hardware and software in the quote.			
48.	Optional accessories	Party shall quote for optional accessories with details of functions and features in the quote.			
49.	Service tools	Party shall provide one set of service tools for day to day maintenance			

Sl. No.	Parameter	Specification	Specification of the proposed machine	Complied / Not complied	Remarks
		of the equipment.			
50.	Authorisation bidding for	Quote shall be from either OEM or Authorised dealer of OEM for India. Dealer shall provide authorisation letter from OEM for bidding this enquiry.			
51.	Installation and commissioning	Shall be carried out by OEM engineers at VSSC			
52.	Delivery	Vendor shall submit the <b>design drawing</b> of the line within <b>two weeks</b> of receipt of confirmed purchase order.			
		Party shall specify the period required from the <b>date of receipt of PO</b> for delivery of equipment at VSSC			
		Party shall install and commission the line within <b>4 weeks</b> of site clearance by VSSC			

#### 4 Other Conditions

Sl. No.	Conditions	Party's reply	Complied / Not complied
1.	The offer shall be from Original Equipment Manufacturer (OEM) or authorised dealer. In case of authorised dealer, authorisation letter from OEM shall be attached		
2.	Vendor has to refer at-least one PCB facility where similar/other installation of equivalent or higher capacity (working) has been carried out by the parties in India. Order will be placed only after satisfactory evaluation of working of the plant at referred facility.		
3.	Live demonstration of working of the equipment in India to be carried out, if desired by VSSC		
4.	Details of agency carrying out preventive maintenance subsequent to installation of the equipment during warranty period shall be provided		
5.	The construction of machine shall be shock and vibration free		
6.	The entire system shall be dust proof and have rodent proof enclosure		
7.	Additional / supporting equipment required for operation at VSSC shall be supplied along with the system. Details of such requirements shall be explicitly provided.		
8.	Operator protection features and safety from electrical, thermal shocks, hydraulics, compressed air pressures etc. shall be provided		
9.	Emergency switches shall be provided at appropriate locations for immediate stoppage of the machine functioning in case of an emergency. Details of provisions shall be provided.		
10.	Machine shall meet all the international safety regulations in all respects of UL / CE or equivalent. The noise level generated by the equipment shall be within the human safety limits.		
11.	Original catalogues in English detailing specifications and technology and photographs of the systems should be attached along with technical bid		
12.	Party shall provide detailed application / feature notes of the proposed equipment, software, work station to understand the minute features of the equipment for technical evaluation		
13.	Recommended consumables and spares for at least 5-years continuous operation shall be indicated separately with optional quote		
14.	Two sets of documentation for Electronics schematics Electrical wiring diagrams,		



Sl. No.	Conditions	Party's reply	Complied / Not complied
	Mechanical drawings, PLC ladder diagrams, as applicable, Installation manuals, Operation/User manuals, Maintenance / Service / troubleshooting Manuals to be provided (in English only) along with equipment		
15.	Party shall provide detailed technical features of the system for all technical features mentioned in table at sl. no.3. Yes / No / Okay as reply for the table is not acceptable.		
16.	List of deliverables shall be specified in the bids		
17.	Quotation shall include separately auxiliary/additional systems required for operating the system at VSSC. Eg., any isolation transformer / UPS required to power the system.		
18.	Party shall offer quote as per the matrix provided for the system and optional accessories		

## 5 Requirements for System Operation at VSSC

Party shall explicitly specify the requirements to be made available at VSSC for installation, commissioning and normal working of the machine.

Sl. No.	Conditions	Party's reply
1.	Electrical supply (single phase 230 V, 50 Hz or three phase 415 V, 50 Hz preferred) with power & current rating	
2.	Air supply with pressure, flow rate, moisture content	
3.	Water supply with temperature and flow rate	
4.	Clean Room Class	
5.	Safe Light	
6.	Operating Temperature	
7.	Humidity in RH	
8.	Foot print of the proposed equipment/s, work station and auxiliary systems	
9.	Electrical earthing	
10.	Exhaust system	
11.	Any other requirements other than above	

## 6 Maintenance / terms & conditions during AMC period

SI. No.	Conditions	Partys reply
1.	OEM/dealer has to carry out quarterly Preventive Maintenance (PM) at site and attend unlimited breakdown calls during AMC period. After maintenance / rectification, service report and PM report has to be prepared and signed by service engineer and duly countersigned by the engineer-in-charge and competent authority at VSSC. Service report should contain nature of fault, details of work carried out and components/boards and assemblies replaced.	
2.	Only OEM personnel or OEM trained personnel shall carry out maintenance and attend breakdown calls	
3.	AMC service engineer should attend / rectify the breakdown calls within 48 hours. On completion of job a service report has to be prepared and submitted to the concerned engineer.	
4.	AMC charges will be paid once in 3 months at the end of each quarter, subject to satisfactory completion of services and also verification of PM and service report.	

## 7 Evaluation of Tenders

- 7.1. Technical bid shall be evaluated by VSSC and if necessary, clarification / confirmation for deviations (if any) shall be taken from the eligible bidders to evaluate their bids as per terms and conditions of the tender document to decide the technical suitability. Satisfactory evaluation of the proposed equipment at customers place (in India) will be one of the criterion for technical qualification.
- 7.2. Quote separately for non-comprehensive post warranty maintenance for 5 years
- 7.3. Price bids of only the technically suitable offers shall be considered for further evaluation and ranking before awarding the contract
- 7.4. Tenders will be evaluated on the total cost including basic Machine cost, installation, commissioning, training, two-year warranty and the non-comprehensive annual maintenance service contract charges for a period of 5 years after expiry of warranty period of two years
- 7.5. Bidders are not allowed to revise / modify the price bid / quoted prices after tender due date

## 8 Acceptance of the System

VSSC engineers will verify the complete system, which includes the sub-assemblies, safety aspects and quality of the overall system and performance as per specifications after installation. VSSC will carry out tests with various specimens and also as per

the test matrix provided by the vendor (if any). Acceptance will be subject to successful testing and approval by the concerned VSSC engineers.

### 9 Quote Matrix

This is two-part tender, bidders shall submit Technical bid (Part-1) and Price bid (Part-2) separately. **No price element including AMC cost shall be mentioned in the technical bid. Price masked quote matrix shall be provided in the technical bid.** Details of price breakup for all the items offered including optional accessories shall be submitted.

SI. No.	Item Description	Qty	Unit rate (Currency)	Total price (Currency)
1.	Supply of Dry Film photo resist developing machine per specifications with make & model number to be clearly specified in the quote including two year comprehensive on-site warranty			
2.	Supporting equipment / accessories. If any			
3.	Taxes, if any			
4.	Freight charges, if any			
5.	Packing, documentation charges, if any			
6.	Non-comprehensive AMC cost for five years after warranty period			
<b>Grand total (Currency)</b>				

### 10 Quote for optional items

SI. No.	Item Description	Qty	Unit rate (Currency)	Total price (Currency)
1.	Option 1			
2.	Option 2			
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n.	Option n			
				<b>Grand total (Currency)</b>