# REQUEST FOR PROPOSAL & SPECIFICATION DOCUMENT MEMS & NANOFABRICATION SEMICONDUCTOR CLEANROOM FACILITY



# **ANNEXURE 4**

# Matrix for Clean room and Utility Design as per the process equipment

## Annexure 4: Utility Matrix for MEMS & NanoFAB Semiconductor Cleanroom

#### • <u>Note</u>: The matrix provided for each area of the facility

- \*\*\* Equipment yet to be procured in future •
- \*\* Approximated values as per available database ٠
- # No need of central vacuum pump. Only lines to be provided for connecting dedicated tool vacuum pump (service corridor) to the tool in the cleanroom
- No need of including the chilled water requirement of process equipments for computing the main chiller plant capacity. It shall be considered only for heat load calculations etc. of HVAC •
- ##Selected Vendor shall also refer tool specific facility requirement provided by OEMs for existing equipment for additional information

#### LAB AREA 1: PHOTOLITHOGRAPHY LAB

			Gas U Nitrogen/otl	tility her gases##	Compresse (CD	ed dry air A)	DI v	vater	Vacuum	Special	Tool Exhaust	Power and its	
Sl no:	Cleanroom Area	Name of the Instrument	Flow rate Lpm/ cfm	Pressure	Flow rate Lpm/ cfm	Pressur e	Flow rate Lpm/ cfm	Pressure	Line requiremen t#	connection requirement ##	(Pump to exhaust)	related information (Annex 3)	Dimension (Annex 2 Layout)
1		Mask aligner	15 lpm with 1000W lamp	2-3 Bar	17 lpm	5-7 Bar	NA	NA	Dedicated vacuum Pump with the system	NA	Hot air: 43 m3/h - 1.5 m/s (25.30 CFM)	Annexure :3	Dimensions (H x W x D) 1570 x 1214 x 1300 mm with Anti Vibration Table
2		Optical Microscope	NA	NA	NA	NA	NA	NA	NA	NA	NA	Annexure :3	1000 x1000 mm (kept on anti vibration table)
3	PHOTOLITH	Solvent Bench + 2 Spinner, Hotplate	Bulk Nitrogen:3 lpm	3-5 Bar	5 lpm	10 bar	1 lpm	1 bar	Dedicated vacuum Pump with 2 spinners	NA	800 cfm	Annexure :3	
4	OGRAPHY LAB CLASS 100 (ISO5)	SEM/E beam lithography ***	Bulk Nitrogen: 2lpm	3-3.5 Bar	1 lpm	6 -8 Bar**	NA	NA	Dedicated vacuum Pump to be procured with the system	NA	NA	Annexure :3	Approximate equipment dimension provided in the cleanroom lab layout
5		Wafer Bonder***	Process Nitrogen : 15 lpm	Bulk Nitrogen: 2-3 Bar		5-7 Bar	NA	NA	Yes	NA	Hot air: 43 m3/h - 1.5 m/s (25.30CFM)	Annexure :3	Approximate equipment dimension provided in the cleanroom lab layout

### **LAB AREA 2: DEPOSITION ETCH LAB**

			Gas Ut Nitrogen/oth	tility er gases##	Compres (C	sed dry air DA)	DI	water	Vacuum		Tool Exhaust	Power and its related information	Dimension
Sl no:	Cleanroom Area	Name of the Instrument	Flow rate Lpm/ cfm	Pressure	Flow rate Lpm/ cfm	Pressure	Flow rate Lpm/ cfm	Pressure	Line requirement #	Special connection requirement##	Pump to exhaust		
6	DEPOSITIO N ETCH LAB CLASS 1000 (ISO 6)	ICP RIE System	Bulk Nitrogen: Flow rate:60 lpm Process Nitrogen: Flow rate: 0.1 lpm Argon: Flow rate: 0.2 lpm He: Flow rate: 0.2 lpm CF4: Flow rate: 0.05 lpm C4F8: Flow rate: 0.2 lpm SF6:	5 bar 3bar 3bar 3bar 3bar 3bar 3bar 3bar 3	200 lpm	6 bar	NA	NA	Dedicated vacuum Pumps with the system	Separate piping system for existing chiller procured as per the requirements of ICP RIE with temperature 21°C ± 2. equipment needs water pressure of 3-5 bar IMP: Detailed tool hookup document provided	Acidic: 100 lpm (3.53 CFM) Hot air: total 4 ports, Gas Pod 106 CFM, ICP Source 100 CFM, Pump Cabinet 100 CFM , Scrubber cabinet 106	Annexure :3	Dimensions (H x W x D) 1800 x 800x1800
			Flow rate: 0.5 lpm O2:	3bar	-					provided	CFM		
			Flow rate: 0.1 lpm	3bar									

			Bulk Nitrogen:	Bulk									
			Flow rate:60	Nitrogen: 5									
			lpm	Bar									
			Process										
			Nitrogen:	21									
			Flow rate:	3bar						Separate piping			
			0.21pm							system for existing			
			Ar:							chiller procured as	Acidic: 100 lpm		
		ICP CVD	Flow rate:	2h or						per the requirements (3) of ICP CVD with	(3.53 CFM)		
		System	ThreeAr lines	SDar									
			0.21pm							temperature $21^{\circ}C \pm$	Hot air:		Dimensions
			He:						Dedicated	2. equipment needs	total 3 ports,		Dimensions
			Flow	3bar		6Don		NT A	vacuum	water pressure of 3-5	Gas Pod 106		$(\mathbf{H} \mathbf{X} \mathbf{W} \mathbf{X} \mathbf{D})$
7			rate:0.11pm		2001pm	oBar	NA	NA	Pump with	bar	CFM, , Pump	Annexure :3	1800 X
			CF4:						the system	Location for the	Cabinet 100		000x1000
			Flow rate: 0.1	3bar						chiller is provided	CFM , IF		
			lpm		-					in the clean room	SUPPLIED		
			N2O:							layout	Scrubber cabinet		
			Flow rate:	3bar						IMP: Detailed tool	100 CFM		
			0.21pm							hookup document			
			H2:							provided			
			Flow rate:	3bar									
			0.11pm										
			SiH4:										
			Flow rate:	3bar									
			0.11pm										
			B2H6	3bar									
	-		Ar:							Dedicated chiller is			
			Flow rate:	2-3bar					Dedicated	available to be kept			Dimensions (H
0		Plasma	0.21pm		ΝA	NA	ΝA	ΝA	vacuum	in service corridor.	5.89 CFM/166.6	Appoyuro ·2	x W x D)
0		Etch system	CF4:		INA	INA	INA	INA	Pump with	Chiller connection to	7 lpm/10 m³/h	Annexule .5	(1600x1200x12
		for MoS2	Flow rate:	2-3bar					the system	be provided.			00)
			0.21pm							Location is provided			

			O2:							in the clean room			
			Flow rate:	2-3bar						layout)			
			0.21pm										
	-		Ar:										
			Flow rate:	2-3bar									
			0.51pm										
			02:		-								
			Elow rate:	2 Shar									Dimensions
			0.51pm	2-30ai									Approx 1200 x
			H2·		-				Dedicated				450 x 500
9			Flow rate:	2-3bar	NΔ	NΔ	NΔ	NΔ	vacuum	Provision for chiller	3.5CFM	$\Delta$ nnevure ·3	without panel
			0.51pm		1 1 1	147 1	1471	147 1	Pump with	connection in future	(100lpm)		Approx 1900 x
		Annealing	Ar+H2 mix :		-				the system				600 x 1200
		Furnace	0.21pm										with panel
			(Ar +H2 mix										
			cylinders to be	2-3bar									
			used directly)										
			CH4 300 SCCM		-								
			C114 500 SCCIVI	2-3bar									
	-		Bulk Nitrogen:										
			(Dry Pump	1.7 Bor							Acidic		
			Purge),	I-/ Dal					Dedicated		17 657CEM(Pu		Dimensions (H
			flow rate: 30-40						Vacuum		mn Outline)		x W x D)
10			SLM			5-7 Bar	NA	NA	Pump to be	NA	1.766	Annexure :3	
		XeF2							procured with		CFM(main		Approx (1300 x
		Silicon etch	Process						the system		system)		800 x 800)
		system***	Nitrogen:	3-5 bar									,
			5SLM										

11	Parylene Deposition system with Chiller	NA	NA	NA	NA	NA	NA	Dedicated vacuum pumps with the system	Dedicated chiller is available to be kept near the system	12 CFM max.(20.4m/h) @0.1"wc w/1"	Annexure :3	Dimensions System: 495.3 X 603.25 mm Chiller: 508 x 254 mm
12	Sputtering System	Bulk Nitrogen: flow rate:5-71pm Process Nitrogen: Flow rate: 0.1 1pm Ar: Flow rate: 0.1 1pm O2: Flow rate: 0.1 1pm	2-3 bar 2-3bar 2-3bar 2-3bar	-	6Bar	NA	NA	Dedicated vacuum pumps with the system	<ol> <li>Dedicated chiller         <ul> <li>is available and to be             kept in service             corridor. Chiller             connection to be             provided. ( location             is provided in the             clean room layout)             2. Required 1/4"             stainless steel gas             lines to tool</li> </ul> </li> </ol>	17.6 CFM (500lpm) at 50Hz	Annexure :3	Approximate equipment dimension provided in the cleanroom lab layout
13	E beam evaporator* **	Bulk Nitrogen: flow rate: 5-7lpm Process Nitrogen: 0.1lpm O <sub>2</sub> : Flow rate: 0.1lpm	2 bar 2-3bar 2-3bar		6Bar	NA	NA	Dedicated vacuum pumps to be procured with the system	Provision for connection of chiller for equipments to be procured in future.		Annexure :3	Approximate equipment dimension provided in the cleanroom lab layout
14	RTA***	Bulk Nitrogen: flow rate:51pm Process Nitrogen: Flow rate: 21pm	1Bar 2-3bar	2lpm	6Bar	NA	NA	Dedicated vacuum pumps to be procured with the system	NA	Hot air: 210 CFM	Annexure :3	Approximate equipment dimension provided in the

		Ar:	2-3bar									cleanroom lab
		Flow rate: 2lpm										layout
15		GN2	6 bar		6 bar							
		Process N2 50-100 sccm During process	2-4 bar						Water connection for plasma source (2-3 lpm) and main			
		Ar 30 sccm Required 24X7	2 bar						system turbo pump Te (2-4 lpm). E For Each gas, a 2 purifier is installed exl in the gas line before the tool	Tool General Exhaust. At present it is connected to 2000 CFM exhaust blower		Approximate equipment dimension provided in the cleanroom lab
	ALD***	Ar 100-150 sccm during process	2 bar								Annexure :3	
		NH3 (if required) 50 sccm	10-15 psi									layout
		O2 100-200 sccm during process	2 bar									
	ALD Pump	Dry GN2 for pump purge 20-40 slpm	1 bar						Water cooling 4-6 slpm	Exhaust for the pump is connected to scrubber exhaust		
16	Critical point dry (CPD)	Liquid CO2 Cylinders	min 99.8% purity,800 psi @ room temp,1 kg/hour**	***	6 - 8 Bar	NA	NA	NA	NA	ALCOHOL IPA+CO <sub>2</sub> to exhaust hood	Annexure :3	Approximate equipment dimension provided in the cleanroom lab layout

17	Chemical Storage***										
	Wet Benches 2 numbers*** + Hotplate	Nitrogen: 2 lpm	2-5 Bar	54 lpm	10 bar**	NA	NA	NA	Nitrogen is required for GUN	2X900 cfm**	

### LAB AREA 3: SEVICE CORRIDOOR

• This area houses dedicated portable chillers, pumps, gas distribution and exhaust for process equipments

Dedicated chillers available and chillers to be kept in service corridor. Need chiller connection for the existing equipments.	Plasma Etch system for MoS2,Sputtering sy
	Small dedicated chiller for ICPRIE & ICPC
Vendor is to install separate piping system for existing big chiller procured for the equipments. Existing big Chiller for to be	ICPCVD,ICPRIE
installed	
Provision for connection of chiller for equipments to be procured in future. No need of including the chilled water requirement of	E Beam Evaporator, RTP, ALD etc.
process equipments for computing the main chiller plant capacity. It shall be considered only for heat load calculations etc. of	
HVAC.	
POCs to be provided for future hook up of equipments to be procured later	Equipments indicated with *** in the utility

# ystem, Anneal Furnace,

y matrix table