Specifications / Compliance Matrix of Inert atmosphere Glove box

I. No.	Detailed specifications	Party's compliance (YES/NO)	Remarks, If any
A	**Scope of supply**: Supply, installation and commissioning of glove box work station with four ports on a turnkey basis		
B	**Glove box application**: Supply, installation and commissioning of glove box work station with four inert atmosphere glove box workstation capable of maintaining oxygen and moisture atmosphere lesser than 1 ppm respectively during synthesis activities on TURN KEY basis. **Chemicals handled:** Lithium aluminum hydride, aluminum hydride, Lithium borohydride, aluminum chloride,3-Morpholinopropylamine, (2-Bromoethyl) ethyl ether.		

C	**Glove box requirements**			
S.No	**Parameters**	**Technical requirements**	**Party's compliance (YES/NO)**	**Remarks, If any**
Glove box main chamber requirements				
1	**Glove Box Workable dimensions (Internal)**	Internal dimensions (mm) : Approx. 900 ± 100 (Height) x 800± 10 % (Depth) x 1500 ± 10 % (Length)		
2	**Glove Box material**	**a.** SS304L , Bolted Side panels, Main body : Minimum 3 mm thickness		
		b. Inside surface of the box should be brush finished		
		c. Modular and upgradeable glove box, dismountable side panels.		
		d. Average bearable load capacity : 100-120 kg (A special reinforcement shall be provided accordingly)		

Specifications / Compliance Matrix of Inert atmosphere Glove box

3	**Working gas**	Argon , Nitrogen, Helium		
4	**Attainable purity**	H2O:<1 ppm , O2 : <1 ppm at complete pressure range		
5	**Box pressure operating range**	**a.** Should be adjustable from -15 mbar to +15 mbar (to atm. pressure)		
		b. Automatic box pressure adjustment with colour touch screen controlled PLC		
6	**Box Front view window**	**a.** Inclined panel ,Optically transparent Polycarbonate material (Lexan)		
		b. Minimum Thickness 10 mm, High impact resistant type		
		c. Shall be provided with sapphire protective coating for better scratch and chemical resistance		
7	**Box light**	**a.** External side of glove box mounted Fluorescent/LED lamp		
		b. Operatable by ON/OFF feature		
8	**Temperature monitoring**	**a.** Temperature sensor shall be provided for monitoring box temperature **b.** Temperature sensor mounted through thermowell		
9	**Glove ports**	**a.** 4 Glove port feed through, Front side mounted **b.** 1 ports top side,3 ports bottom side of front window		
		c. Diameter: 220 mm ± 5 % (approx)		
		d. Glove port material: Polyoxymethylene (Polymer type) or equivalent O ring sealed ports		
		e. Glove port closing lids should be available to protect box atmosphere during gloves replacement (1 No)		

Specifications / Compliance Matrix of Inert atmosphere Glove box

10	**Gloves**	**a.** Chemical resistant n-Butyl rubber material , Size: large		
		b. Glove Thickness : 0.4-0.5 mm,Ambidextrous type		
		c. Should be resistant to all solvents		
11	**Shelves**	**a.** 6 Numbers x Height adjustable modular shelves, SS304 L material, Thickness: 2 mm or better		
		b. Splitted , Mounted at the box back panel		
12	**Dust Filters**	**a.** 0.3 Micron HEPA filters, H13 Class or better		
		b. Each one for gas inlet and outlet inside box		
13	**Electrical Power inlets inside box**	One feed through with 230V , Single phase ,16 A (Cable length 3.5 m outside ,1.5 m inside)		
14	**Feed through/Flanges**	**a.** Vacuum tight DN 40 KF blank feed through (Total: 2 no's) for the purpose of Instrument cable connections. **b.** Feed through with ball valve for gas/liquid (6 no's) on the back panel.		
15	**Support stand**	A stand of 1000 ± 20 mm (height) including locking castor wheels, leveling foot.		
16	**Box leak rate**	Leak rate should be less than 0.05 Vol %/ h and compliant as per ISO 10648-2 and ISO 25412 standards		
Antechamber requirements				
17	**Main antechamber**			

17.1	No. of chambers	1 No.		
17.2	Type and Position	**a.** Cylindrical type **b.** Preferably positioned at right end panel of glove box		
17.3	Inside dimensions	**a.** Diameter: 400 ± 5 % mm and length 600 ± 5 % mm **b.** SS 304 L , Thickness :2.5 mm (Minimum) **c.** Inside surface should be brush finished		
17.4	Sliding tray	**a.** Sliding tray for material handling , SS304 L grade **b.** Length wise it should be 1/3 inside and 2/3 outside		
17.5	Door	Aluminum anodized door, Thickness : 10 mm minimumwith vertical lifting on both ends with gas piston mechanism		
17.6	Door lock	Easy to operate from inside and outside , Spindle lock mechanism		
17.7	Vacuum /Refill operation	Both manual as well as PLC controlled		
17.8	Sealing O rings	Shall be of Viton make O rings		
17.9	Leak rate	10^{-5} mbar l/s or lesser		
17.10	Vacuum pressure gauge	Analog vacuum gauge		
18	**Mini antechamber**			
18.1	Quantity	1 No.		
18.2	Type and Position	a. Cylindrical type b. Preferably mounted at right end panel of glove box		

Specifications / Compliance Matrix of Inert atmosphere Glove box

18.3	Inside dimensions	a. Diameter : 150± 5 % mm and Length : 400± 5 % mm b. Material stainless steel,SS 304 L /Aluminum steel c. Inside should be brush finished		
18.4	Sliding tray	a. Sliding tray for material handling , SS304 L grade b. Length wise it should be 1/3 inside and 2/3 outside		
18.5	Door	Hinged door for both inside and outside with locking		
18.6	Vacuum /Refill operation	Manual operated by 3 way valve , Manual operation		
18.7	Sealing O rings	Shall be of Viton make O rings		
18.8	Leak rate	< 10-5 mbar l/s or lesser		
18.9	Vacuum pressure gauge	Analog vacuum gauge		
19	**Gas Purification system and Regeneration**			
19.1	No of purifier columns	Single H_2O/O_2 purifier Column		
19.2	Material	SS304 L		
19.3	Location	Shall be located below the antechamber		
19.4	Purification column and desired purity	a. Purity Levels : Moisture < 1 ppm , Oxygen <1 ppm at complete pressure range b. Purifier column should be regenerable c. Integrated heater and water cooling provision		
19.5	Purification column capacity	Oxygen removal capacity: 45 L (Minimum), Moisture removal: 1000-1300 g (Minimum)		

19.6	Leak rate	<0.05 Vol %/ h or better		
19.7	Purification material	a. Oxygen removal materials: Copper catalyst b. Moisture removal materials: Molecular sieves		
19.8	Purification material quantity	Total load of purification material is 10 Kg Copper catalyst: 5 kg &molecular sieves:5 kgminimum.		
19.9	Purifier regeneration	**a.** Automated PLC controlled regeneration program		
		b. Regeneration gas shall be Nitrogen + H2 (4-10%) or Argon +H2 (4-10%) mixture gas		
20	**Gas circulation system**			
20.1	Recirculation blower	**a.** Closed loop gas circulation		
		b. Integrated variable speed blower with vacuum tight and oil free , hermetically sealed type		
20.2	Blower capacity	Flow rate shall be greater than 90 m^3/h with variable speed through frequency control in line with H_2O/O_2 level in glove box.		
20.3	Low noise level	< 50 dB(A) under purification and pressure regulation		
21	**Control Valves**	**a.** Material: SS304 L or better.		
		b. All main Purifier valves, gas inlet/Outlet valves should be electro pneumatic type with PLC control		
		c. Manual Valves should be Swagelok make or better reputed makes only.		
22	**Piping / Plumbing lines fittings**	Main Piping and side piping shall be SS304 Pipe fittings		

Specifications / Compliance Matrix of Inert atmosphere Glove box

23	**Vacuum Pump**	**a.** Dry type scroll/rotary vane vacuum Pump with dual stage for antechamber , box pressure control operations		
		b. Vacuum level : 10-2 mbar or lesser		
		c. Displacement capacity 18 m3/hr or better		
		d. Vacuum pump make: Edwards / Leybold or equivalent		
		e. Noise level during operation shall be <50 dB or better		
24	**Solvent trap**	**a.** Principle: Adsorption		
		b. Adsorber medium : Activated carbon or better		
		c. Activated carbon Loading : 1.5 kg		
		d. Provision shall be provided for augmentation of the solvent trap in future, in case of any requirement.		
25	**Moisture and oxygen analyzers**			
25.1	Moisture trace analyzer	**a.** Ceramic Moisture sensor **b.** Range : 0-500 ppm **c.** Accuracy: +/- 1 ppm **d.** Service life > 5 years **e.** PLC interfaced **f.** CE Marked and from Global Reputed Brand **g.** Quantity :1 set		
25.2	Oxygen trace analyzer	**a.** Galvanic cell oxygen sensor **b.** Range : 0-1000 ppm		

		c. Accuracy: +/- 1 ppm **d.** Service life >= 3 years **e.** PLC interfaced **f.** CE Marked and from Global Reputed Brand **g.** Quantity :1 set		
26	**Freezer/inert gas compartment left side panel**			
26.1	Freezer/inert gas compartment	**a.** Freezer -35°C/+5°C **b.** Inert gas recirculation or blanketing **c.** Volume 20 liters **d.** Internal dimensions LHD : 260x432x184 mm **e.** 3 modular shelves **f.** MOC: SS **g.** Solderless seal and Pt100 type temperature sensor		
27	**Programmable logic control with (PLC) with HMI touch panel**	**a.** 7'' Multicolour touch panel for HMI interface (English language)		
		b. PLC shall be a reputed make (Siemens/GE/ Allen Bradly/Eaton)		
		c. All the functions and process parameters to be clearly displayed on touch panel with Mimic diagram		
		d. Remote monitoring and data logging of functional parameters with graphical trend display for 24 hour operation (such as Moisture and oxygen levels, Box pressure etc.)		
		e. Data Recording – The unit has capability to record upto 02 months history of oxygen, moisture and pressure		
		f. Help Videos to be available on the Human Machine Interface (HMI) of Glove box which can be easily accessible to user for any routine maintenance if required		
		g. Screen monitor shall be provided for all glove box components (pressure setting, oxygen & moisture reading, display trends, upper limit settings and visual indication)		

		h. Built in safety interlocks with Audio/Visual alarm for fault condition is required		
		i. Alerts when parameter set value limit exceeds should be provided		
		j. Alarm limits for parameters should be settable for Moisture, oxygen , box pressure , safety interlocks etc		
		k. Moisture and Oxygen Sensor maintenance schedule alerts should be available in PLC display		
		l. Entire cycle of the regeneration process shall be completed in auto mode and resume back to normal operation mode		
		m. Automatic restart to be provided after power failure		
28	**Gas regulation fittings**	**a.** Gas Circulation / Regeneration: Two stage gas regulators and pressure gauges for Argon -hydrogen mixture gas and Argon gas cylinders shall be supplied along with One number each		
		b. Regulators shall be standard make as part of the system		
		c. Regeneration gas connection accessories: Necessary tubing's, adapters, ferrules for connecting the cylinder shall be provided.		
29	**Safety interlocks / features**	**a.** The instrument and accessories must be designed with all necessary safety interlocks and proper earthing for operators' safety and also to avoid possibility of any electrostatic discharge on solvents / chemicals.		
		b. All power lines shall have fuse protection		
		c. The system shall be designed to CE complaint standard		
		d. The blower motor shall be provided with overload protection switch.		

		e. All necessary safety interlocks are to be in built in PLC controller and featured with fault alarm display.		
		f. It should display the temperature inside the Glove box with 0.1°C and able to give the alarm output in case the temperature exceeds the set points.		
		g. Supplier should provide the details of additional safety features/interlocks incorporated in the system other than above mentioned.		
		h. Fixture of the gloves shall be designed in such a way that glove will be dismounted in case of box uncontrolled pressure rise due to valve failure scenario.		
		i. Vacuum Pump shuts off automatically in case it exhausts the Inert Gas inside the Glove box due to wrong vacuum cycle of antechambers		
		j. Other safety features: • Adjustable automatic glove box flushing depending on H2O / O2-values. • Alarm Inert gas missing/failure. • Glove box tightness self-test • Vacuum Chamber with interlocked doors Diameter 400mm (i.e. it will not allow simultaneous of opening of both inside and outside doors)		
30	**Upgradation provision**	**a.** System shall have the provision for future upgradation of vacuum oven type antechamber with provision for heatingup to 200˚C or better. **b.** Supplier shall ensure the compliance of upgradation for the quoted model **c.** Provide feasibility of solvent trap extension in future, in case of requirements, if any.		
31	**Additional consumables to be supplied with equipment**	**a.** Below consumable items shall be supplied along with the equipment		
		b. Activated carbon for solvent trap : Quantity required for single charge		
		c. Spare gloves : 2 pairs of ambidextrous n- butyl rubber		
		d. O rings spares for hand port gloves (2 pairs)		

Specifications / Compliance Matrix of Inert atmosphere Glove box

		e. O rings spares mini and main antechamber (2 pairs each)		
		f. Oxygen trace analyzer (1 pair)& moisture trace analyzer (1 pair)		
32	**Electrical requirement**	The equipment and accessories should work on single phase, 230V, 50 Hz, AC power supply		
33	**Warranty**	**a.** Minimum 3 years of comprehensive warranty after installation and acceptance of the system. **b.** The vendors shall also specify extended warranty support, if any beyond the standard warranty period, on yearly basis		
34	**AMC Support**	Supplier shall ensure the AMC support for minimum 5 years after expiry of warranty period		
35	**AMC charges**	Quotation for non-comprehensive AMC of the equipment by authorized service personnel / OEM for 5 years after the expiry of warranty period shall be provided.		
36	**Essential Spares and consumables**	**a.** List of essential spares and consumables required for 3 years of trouble free operation and same shall be quoted separately. **b.** The list should also mention expected lifetime for each item.		
37	**Spares / Consumables availability**	Accessories/spares for the model should be available for minimum 8 years after installation.		
General terms and Conditions				
1	Party has to install , commission the system and demonstrate the performance as per the specification on turnkey basis satisfactorily			
2	Complete training should be provided to VSSC personnel regarding the operation of glove box, change in accessories, basic service, fixing trouble shooting etc. after successful commissioning			
3	Party shall submit relevant printed catalogue clearly specifying the required specifications against the model offered along with offer.			

4	The quoted item shall be a standard model of the manufacturer. Considering the criticality associated with the application, item shall be of standard model with proven performance track record		
5	Vendor shall be original manufacturer/authorized representative of the system. Vendor shall provide the authorization certificate from the principals for the offered glove box system along with the cost quote.		
6	Party has to duly fill and submit the compliance matrix provided along with the offer, without any fail. Party has to bring out deviations if any, in the compliance matrix strictly.		
7	List of customers to whom similar units were supplied elsewhere shall be given along with the offer. End user details should includes model no , year of supply , end user full contact details (Telephone/Email) to be furnished (Minimum 2 end users) along with offer		
8	Supplier should furnish the performance certificate from the minimum 3 customers certifying the satisfactory performance of the system along with offer		
9	Pre-requisites, if any, for installation of equipment at site should be clearly indicated in party's offer.		
10	Vendor shall provide the dimensions, weight, electrical requirements, additional utility requirement (if any) along with offer.		
11	During installation and guarantee period spares taken from our stock, if any, should be replaced by the party free of cost		
12	Full technical details in English language should be provided and supported by well documented catalogues/ leaflets of the model.		
13	Documents on manuals of installation , operation and service, trouble shooting flow chart, detailed wiring diagrams/ circuit, details of PLC systems , OEM parts manual and maintenance tool kits are to be supplied along with the unit		
14	Supplier to provide both hard and soft copy (in a DVD) of these manuals.		
15	certifications (ISO and calibration/traceability certificate for any standards used for calibration) – For moisture and oxygen analyzer		
16	Party should attend the breakdown calls if any within 5 working days during warranty as well as AMC period.		

Specifications / Compliance Matrix of Inert atmosphere Glove box

17	Pre-delivery inspection: Party has to arrange for pre-delivery inspection in offline / online as per the prevailing conditions at time of the supply of the item. As part of pre-delivery inspection, the documents mentioned below along with the performance demonstration of achieving (<1ppm of moisture & oxygen) shall be carried out with necessary test certificates.		
18	**Performance demonstration:** **1.** Party has to assemble the entire system at our site and demonstrate the performance by conducting one trial of water heating. **2.** Party has to duly fill and submit the compliance matrix provided along with the offer, without any fail. Party has to bring out deviations if any, in the compliance matrix strictly.		
19	**Documents:** The following documents shall be submitted along with the supply **1.** GAD / design drawings with actual dimensions. **2.** Electrical circuit drawings **3.** Operation manual detailing safety interlocks and troubleshooting operations. **4.** Test certificates of all bought out items. **5.** Detailed parts list and bill of materials. **6.** Test and final inspection reports. **7.** Manual and warranty certificates for the entire system and associated accessories.		
20	• **Delivery Schedule: Party shall adhere to the schedule as below.** **1.** Submission of the design documents for approval of fabrication from date of the release of the P.O **2.** Pre-delivery inspection from the date of approval of the design drawings. **3.** Dispatch: Schedule for dispatch of the item after final dispatch clearance from VSSC **4.** Installation and commissioning from the date of intimation of the site readiness. **5.** Party has to adhere to the time schedule given in the offer strictly.		