

Specification Sheet cum Compliance Matrix

Sl.No	Detailed specifications /scope	Supplier's Compliance	
		Yes / No	Remarks
	TECHNICAL SPECIFICATION FOR DESIGN, FABRICATION, SUPPLY, , INSTALLATION AND COMMISSIONING OF HELIUM RECOVERY AND PURIFICATION FACILITY		
I.	<p>SCOPE OF SUPPLY</p> <p>1. Design, Fabrication, supply, erection and commissioning of Helium Recovery and Purification System.</p> <p>2. System shall consist of subsystems such as Helium storage tank, Helium recovery system, booster pump, Helium storage inflatable bag with level sensor, compressor, Filter elements, Membrane filter, Refrigerant Dryer, sensors, Cylinder bank etc.</p> <p>3. The unit should have helium production capacity of 2 m³/hr.@ purity ≥99.99 %.</p> <p>4. The unit should be capable of pressuring the Helium gas at minimum 150 bar (g).</p> <p>5. Party shall work out a detailed design of the unit based on the inputs provided by VSSC.</p>		

<ol style="list-style-type: none">6. Party shall submit the design documents (drawings and data sheets) including, equipment design details, utilities, instrumentation and control strategy, electrical requirements, wherever necessary to VSSC during submission of technical bid.7. Party shall submit the preliminary P&ID of proposed setup along with the offer.8. Fabrication of helium recovery & purification unit with necessary accessories are within the scope of the party, after approval of design drawings, data sheets by VSSC.9. Procurement of bought components such as valves & fittings, instrumentation sensors (like helium & pressure), compressors, pressure booster and process indicators etc. are within the scope of the party.10. Party shall submit the detailed design and make of bought-out components along with catalogue during the submission of technical offer.11. Supply, Installation & commissioning and demonstration of the complete unit at VSSC.		
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	<p>12. All the sub systems of Helium recovery and purification shall be compatible with Helium gas including seals/lubricant etc.</p> <p>13. Party shall provide the detailed electrical requirements including the power, load requirement for various motors connected with equipment and utilities.</p> <p>14. Party shall consider the dedicated cables for power supply and control signals.</p> <p>15. Party shall consider dedicated earthing for all the electrical motors. Two independent earthing shall be provided for all the electrical motors and equipment. Dedicated / independent earthing shall be provided for control panel.</p> <p>16. Party has to submit the detailed Process & Instrumentation Diagrams (P&ID) of the plant indicating pipes/hoses, all the valves (both manual and auto), instrumentations, safety accessories etc., to VSSC for review and approval.</p>		
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<p>17. Control & monitoring of process conditions pressure, flow, helium purity, valves etc. shall be provided in the HMI of control panel.</p> <p>18. In addition to the above, party shall submit the requirements which are essential for this setup in the quote. VSSC reserves the right to recommend modification in the design provided by the party and same shall be incorporated after mutual understanding between party and VSSC.</p> <p>19. Party has to provide warranty for the entire deliverables including all the equipment, bought out items for a period of twenty-four months from the date of commissioning. Necessary certificates shall be submitted after commissioning to process the final payment.</p> <p>20. Statutory approval from PESO for all applicable items under the scope of the party. Necessary approvals certificates shall be provided along with the supply of helium recovery and purification unit at VSSC, ISRO, Trivandrum, Kerala.</p>		
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II.	<p>Purpose:</p> <p>High purity helium is used in various test facilities of VSSC. Helium is vented to atmosphere once the test is completed. From the helium vent, a flexible hose shall be connected to helium recovery unit. Helium recovery unit consists of sub systems such as vacuum pump, Helium recovery bag, compressor, cylinder bank and instrumentation. Impure helium is compressed and stored in a 10 Nos x 50 L cylinder bank @ 50 bar pressure (min & Max 150 bar). Helium recovery unit shall be positioned in a mobile trailer with four wheels of size 3.3 m L x 2m W x 3 m H (Approx. Dimensions). The trailer platform shall be transported to a common helium purification facility where impure helium will be purified to $\geq 99.99\%$ purity. The purification system ($2\text{m}^3/\text{hr}$ capacity) shall be a standalone unit consists of sub systems such as filters, membrane filters, compressors, pressure booster, instrumentation, valves & fittings etc. The purified helium shall be</p>		
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	filled in a standard helium cylinder (50 L) to 6 m ³ @ 120-150 bar.		
SUBSYSTEMS OF HELIUM RECOVERY & PURIFICATION UNIT			
III.	Helium Storage Inflatable Balloon Bag Raw gas (Impure helium) shall be stored in an inflatable storage bag with cylindrical shape with inlet & outlet of suitable size as per design. The balloon should have the capability to withstand burst pressure of 2 bar (g)		
	Parameter	Value	
	MOC	Multi layered Polymeric bag suitable for Helium storage	
	Shape	Inflatable with Cylindrical	
	Capacity	Min. 2 m ³	
	Size (Dia and L)	To be designed by the party	
	Make	SEILER /MICRO EPSILON/Equivalent	
	Level Sensor measurement range	0 to 100 %	
	Level Sensor Make	Siemens/Emerson Electric Co/ABB/Vega Grieshaber KG/Endress+Hauser	
	Operating Pressure	0.5 bar (g)	
	Burst Pressure	2 bar (g)	

	Safety Port	Suitable safety port shall be provided in case of over pressurization of inflatable bag		
	Breaking load in warp (kgf)	To meet the burst pressure requirement		
	Breaking load in weft (kgf)	To meet the burst pressure requirement		
	Elongation (%)	To meet the burst pressure requirement		
	Fabrication Drawing	Party should share the tentative drawing of raw helium storage bag during the submission of tender for evaluation.		
	Helium leak tightness of the joints	10^{-5} mbar/l.sec		
	Durability of the bag	Min 5 years		
IV.	Oil-Free Air Compressor Brushless oil-free compressor of suitable capacity for demanding for high feed consumption shall be provided after the Helium bag storage. Two numbers of Oil free air compressor are proposed for continuous operation. Both compressor has to run in sequential manner with cycling time of 10 -15 min.			
	Parameter	Value		
	Type of compressor	Screw or scroll		
	Flow rate (working pressure 6 -8 bar)	135 l.min^{-1}		

	Duty cycle	S1 - 100 %		
	Noise level (1 m away from the compressor)	≤ 51.5 dB (A)		
	Motor Power rating	1.2 kW		
	Nominal voltage / frequency	230 V / 50 Hz		
	Noise reduction cabinet	Yes		
	Quantity	Min 4 no's		
	Make	Seiler/ Atlas Copco/ ELGi		
V.	Helium concentration Sensor Helium gas purity should be measured at two different locations. Raw helium feed gas should be analysed for Helium gas concentration (purity) and purified helium product shall also be measured for Helium purity.			
	Parameter	Value		
	Measuring range	0 to 100 %		
	Make	Seiler/Bhoomi/ Honeywell/RKI		
	Quantity	2 no's		
	Resolution	0.01%		
	Accuracy	± 0.01 % of FSI		
	Response Time (T-90)	Fast		
VI.	Vacuum Pump Dual-stage, high-performance rotary vane pump with a pumping speed of 5 m ³ /h at 50Hz. The Vacuum pump shall be connected to main feed line			

for recovering the helium gas from line and testing chamber below sub atmospheric pressure. Suitable filter trap shall be provided at the outlet line of pump to remove any contamination.			
Parameter	Value		
Type	Rotary Vane pump		
Type	Rotary Vane pump		
Pumping speed at 50 Hz	5 m ³ /h		
Final Pressure	3x10 ⁻³ mbar		
Final pressure with gas ballast	3 x10 ⁻² mbar		
Exhaust pressure, min.	Atmospheric pressure		
Exhaust pressure, max.	1500 mbar		
Water vapour capacity 50 Hz	110 g/h		
Rotation speed at 50 Hz	3,000 rpm		
Cooling method	Air Fins		
Motor protection	3-phase motor		
Continuous gas input temperature, max.	40 °C		
Emission sound pressure level without gas ballast at 50 Hz	51 dB(A)		
Switch	No		
Input voltage(s)	230 V AC		
Mains cable	No		
Gas ballast flow	540 L/hr.		
Gas ballast pressure	≤ 1,500 mbar		

	Make	Pfeiffer /Edwards /Leybold		
	Buffer Tank Buffer tank of 5 L capacity should be provided before the helium collection bag for smooth and continuous feed flow to the bag and thereafter. Buffer tank should have the pressure sensor.			
	Parameter	Value		
	MOC	SS-316 L /SS-304 L		
	ASME Standard	Section VIII Div 1		
	Capacity	5 L		
	Operating Pressure	1 to 2 bar (HRU)		
	Operating Pressure	5 to 10 bar (HPU)		
	Design Pressure	15 Bar		
	Pressure Sensor Measurement range	0 to 150 PSI/10 bar		
	Pressure gauge	0 to 150 PSI/10 bar		
	Quantity	2 no.s (one in HRU & HPU)		
VII.	Helium Membrane Specifications Helium membranes shall be used for purification of raw feed to desired purity.			
	Parameter	Value		
	Material of Membrane Tube	SS-304		
	Make	EVONIK/ Generon/Linde		
	Material of end caps	SS-304		

	Max. Operating Pressure	Max 25 bar(a)		
	Permeate Pressure	Min 0.4 Bar(a)		
	Operating Temperature	Min 2°C and Max 70 °C		
	Total length of module, including end caps	632.0 mm		
	Module tube outer diameter	48.3 mm		
	Module end caps outer diameter	78.0 mm		
	Connections	3 connectors type G 3/8"		
	Separation capacity He	Min 545		
	Selectivity He / N ₂	Min 90		
	Quantity	Min. 2 no.s		
VIII.	Storage Tank: Storage tank of 10 L capacity should be connected to cylinder bank. Storage tank out let shall be connected through line to refrigerant air dryer for controlled temperature operations.			
	Parameter	Value		
	MOC	SS-316 L /SS-304 L		
	Capacity	Min. 10 L		
	Operating pressure	5 to 10 bar (HRU)		
		1 to 4 bar (HPU)		

	Design Pressure	15 bar		
	Pressure Sensor Measurement range	0 to 150 PSI		
	Accuracy	≤ 0.5 % of FSI		
	Pressure gauge	0 to 10 bar / 0 to 150 PSI		
	Design code	ASME Standard Section VIII Div 1		
	Quantity	2 nos.(one in HRU & HPU)		
IX.	Refrigerant Air Dryer Specifications : Refrigerant Air dryer should be attached before the membrane line for temperature controlled air and moisture free feed supply to the membrane: Refrigerant Air Dryer Specifications			
	Parameter	Value		
	Make	SMC/FESTO/ ATLAS COPCO/BEKO/ PNEUMATECH/H ONEYWELL/ HITACHI/ Chicago pneumatics/ Ingersoll Rand/ Elgi		
	Capacity (L/Min)	100		
	Power (kW)	0.75		
	Refrigerant type	R134a		

	Inlet Feed Max Temperature	40 °C		
	Voltage	100 VAC (50Hz)		
	Inlet Air Pressure	1.5 to 10 bar		
	Drain Tube diameter (mm)	10		
	Operating Pressure	4 to 7 bar		
	Ambient Temperature	2 to 40 °C		
	Auto drain	Yes		
	Coating	Epoxy Coated MS		
X.	Filter (Water/Oil/Mist Separator			
	<p>Suitable filter shall be provided suitable as per finalized P& ID. The water/oil/mist separator cum air dryer should be highly efficient two stage air filtration and drying system using the principle of Coalescent Filtering and Micro-Vortex Motion. Compressed air leaving the first stage shall contain only trace quantities of moisture, oil vapors and particles of size lesser than 10 microns. This shall result in 100% elimination of liquid water content. Oil droplets coalesce in the first stage, while oil vapor is absorbed by the second stage elements, effectively removing 99% of oil content. Cum Air Dryer)</p>			
	Parameter	Value		
	Make	Standard		

	Purpose	To remove any contamination present in feed line		
XI.	Pressure Indicator: Pressure indicator shall be provided as per finalized P& ID			
	Parameter	Value		
	Pressure Range	Min 6 bar to Max 300 bar		
	Dial Size	90 mm		
	Connection Size	¼” NPT		
	Mounting	Direct		
	Case & Bazel	Polished Stainless Steel Case with positive Seal against , weather, moisture and dust		
	Accuracy	≤ 1 % FSI		
	Dial Type	White background, black graduation scale with dual reading in bar and PSI .		

	Make	LIFECO/WIKA/E MERSON		
	Quantity	As per the requirement		
XII.	Manual Pressure Regulator			
	Description Details	Value		
	Outlet Pressure	0 to 15 Bar		
	Temperature range	-10 to 60 °C		
	Regulating Gas composition	Mixture of He, N ₂ , O ₂		
	Body	SS304/SS316		
	Bonnet	Zn/Al alloy Die Cast		
	Stems, nuts and fittings	Brass		
	Diaphragm	EPDM		
	Seat sealing	PA		
	Make	GCE/ Swagelok/ Honeywell/ Pressure Tech/ CONCOA/Tescom /BuTech		

	Quantity	As per the requirement & approved P&ID		
XIII.	Pressure Transmitter			
	Measurement Range	0 to 20 bar (HRU before booster)		
		0 to 100 bar (HRU after booster)		
		0 to 20 bar (HPU before booster)		
		0 to 300 bar (HPU after booster)		
	Accuracy	≤ 0.5 % FSI		
	Response time	≤ 3 ms		
	Make	BD/ WIKA/EMERSON		
	MOC of Sensing Material	Ceramic		
	Operating Temperature range	-10 °C to 60 °C		
	Pressure port	G 1/2"		
Electrical o/p	4-20 mA / 0-10V / 0-5V			

	Quantity	As per the requirement & approved P&ID		
XIV.	Pressure Booster for Recovery Unit			
	Description Details	Value		
	Make	Haskel/Maximator/HiP		
	Type of booster	Single stage double acting air driven gas booster.		
	Rated gas Outlet pressure	70 bar (minimum)		
	Gas booster accessories	Outlet air pilot switch (to stop the gas booster when the outlet pressure reaches to adjusted set point), inlet gas filter, air filter, pressure gauges (to indicate drive air, gas inlet and outlet		

		pressures), Safety relief valves to protect the system from over pressurization.		
XV.	Helium Pressure Booster for filling Unit			
	Description Details	Value		
	Maximum Outlet Pressure for He	Minimum 150 Bar		
	Type	Double acting		
	Inlet suction Pressure He gas	0.5 to 6 bar		
	Make	Haskel/Maximator/ HiP		
	Inlet	¼” NPT		
	Outlet	¼” NPT		
	Air Drive	¼” NPT		
	Maximum operating temperature	333 K		
	Outlet pressure gauge (SS construction)	0-300 bar		
Adaptor	Suitable			

	Pressure gauge make	Wika / Baurmer / Reotemp		
	Gas booster accessories	Outlet air pilot switch (to stop the gas booster when the outlet pressure reaches to adjusted set point), inlet gas filter, air filter, pressure gauges (to indicate drive air, gas inlet and outlet pressures), Safety relief valves to protect the system from over pressurization.		
XVI.	Ball Valve Ball valves shall be provided suitable as per finalized P& ID. The valve should be electric actuated and ISO type actuator mounting design. The valve design should be in such a way that it is compatible with Helium and air mixture and also effective for controlling the same.			

	Description Details	Value		
	MOC	Stainless Steel		
	Seat Materials	Reinforced PTFE/PEEK		
	Seals Materials	Nitrile Rubber /Fluorocarbon rubber/ PTFE/Grafoil		
	Pressure Rating	172 bar		
	Temperature Rating	-20 to 300 °C		
	Make	Parker/Swagelok/D K lok		
	Quantity	Suitable No. s as per the approved P& ID by VSSC.		
XVII.	Check Valve Check valve shall be provided suitable as per finalized P& ID			
	Particular	Value		
	Make	SMC/KSB/Oswal		
	Quantity	Suitable No. s as per the approved P& ID by VSSC.		

	End connections	Suitable to the line sizing as per P&ID		
XVIII.	Solenoid Valve Solenoid valve shall be provided suitable as per finalized P& ID			
	Description Details	Value		
	Flow rate	0 to 200 LPM		
	Make	SMC/ROTEX/DA NFOSS		
	Voltage	12 VDC		
	Coil insulation type	Class B		
	Applicable gas or ignition temperature of steam and explosion class	IIC T5		
	Weather proof	IP 56		
	Quantity	As per the requirement & approved P&ID by VSSC		
XIX.	Pressure Relive Valve Pressure relive Valve shall be provided suitable as per finalized P& ID.			
	Type	Spring loaded		

	Sizes	Suitable Size as per the design		
	Make	Foust /Emerson/Swagelok/BuTech/ Parker/HiP		
	Pressure Relief Standard	ASME/VIII, API526/527, EN4126 and PED/CE		
	Set Pressure	as applicable		
XX.	Mass Flow Meter Mass flow meter shall be provided suitable as per finalized P& ID.			
	Particular	Value		
	Mass flow Measuring Range (kg/hr)	0 to 5		
	Make	SIEMENS/ABB/B ADGER		
	Quantity	2 No.s		
	Accuracy	± 0.2 FSI %		
XXI.	Piping and Ermeto Fitting ▪ Stainless steel (SS 304/SS316) pipelines.			

	<ul style="list-style-type: none"> ▪ Valves shall be electrically interlocked to avoid accidental opening by operators. ▪ Electromagnetically operated normal solenoid valves ▪ All the gas fittings and tubing's shall be of non-corrosive stainless steel (SS-304/SS316). 		
	Particular	Value	
	Piping Size	½ inch	
	MOC	SS-304	
	Make	Parker/Fitok/Swage lock/ DK-Lok/ Hy-Lok	
XXII.	Cascade of Cylinders All cylinder shall be connected through a common manifold for filling. Manufacturer shall be PESO license certified.		
	Particular	Value	
	Capacity	50 L	
	Volume	Min 7.5 m ³	
	Pressure rating	200 bar	
	Outer diameter (mm)	225 ±10 mm	
	Height (mm)	1415 ± 20 mm	

	Working Pressure	150 Bar		
	Wall thickness	Min 5.7 mm		
	Standard	ISO 9809-3		
	Quantity	10 Cylinder		
XXIII.	Trailer for Helium Recovery Unit Party shall design the suitable trailer for smooth transport of helium recovery unit from recovery place to purification area. Trailer should have 4 number of wheels along with anchoring connector to pilot vehicle & stopper for easy movement of the trailer. Trailer to be connected with jeep.			
	Particular	Value		
	MOC	Epoxy coated MS		
	Dimensions (LXWXH)	3.3 m L x 2 m W x 3.2 m H (Approx. outer dimensions)		
	Height from ground to base of Platform	~ 850 ± 10 mm		
	No. of wheels	4		
	Wheels Make	Standard		
	Tyre Dia	720 ± 10 mm		
	Standard fabrication	Trailer shall be fabricated with structural support of channels & platform of aluminum plate as per the standards		

	Doors	Openable metal doors for operation & maintenance		
	Positioning of Inflatable balloon	On top of Trailer		
	Balloon Cabin cover	Should be foldable by doors		
	Sheet Thickness	Min 6 mm		
	Drawings	Party shall provide the details of trailer, its subsystems, V shaped Anchoring and its fastening mechanism with pilot vehicle.		
	Interface Drawing connections	To be provided by the party		
	Trailer movement	By Jeep		
XXIV.	Electrical Controls with HMI <ul style="list-style-type: none"> ▪ The control and instrumentations shall be mounted in a standard housing. ▪ Control Panel shall be a separate cabinet with standard 19 inch panels. ▪ Panel shall have necessary instrumentation, pressure gauges, Helium sensor, meters, switches, push buttons, indicators for carrying out the operations in both HRU & HPU. ▪ The panel shall have HMI with mimic diagram indicating various functions of the plant separately for both HRU and HPU. 			

	<ul style="list-style-type: none"> ▪ The Control Panel shall be equipped with HMI for process control with mimic diagram indicating various functions of the plant. ▪ The controls shall be suitably inter-locked for a fail-safe process control. ▪ The wires and contactor's & MCB's / MCCB's, overload relays shall be used from reputable companies L&T/ SCHNEIDER ELECTRIC/ NUTRONICS/Seimens. ▪ All electrical cables shall have adequate current carrying capacity as per IS standards. ▪ The control panel shall be of standard make (RITTAL) with seven tank treated material having vermin proof doors. ▪ All the equipment motors including the electrical panel shall be suitably earthed as per IS standard. ▪ General arrangement drawing and line diagram of the entire control panel shall be submitted to VSSC for approval before fabrication. 										
	<table border="1"> <thead> <tr> <th data-bbox="247 1076 663 1117">Particular</th> <th data-bbox="663 1076 940 1117">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="247 1117 663 1243">Make</td> <td data-bbox="663 1117 940 1243">Schneider Electric/Siemens/ Honeywell</td> </tr> <tr> <td data-bbox="247 1243 663 1328">Total height of control panel</td> <td data-bbox="663 1243 940 1328">To be designed by the party</td> </tr> <tr> <td data-bbox="247 1328 663 1409">Indications required</td> <td data-bbox="663 1328 940 1409">To be designed by the party</td> </tr> </tbody> </table>	Particular	Value	Make	Schneider Electric/Siemens/ Honeywell	Total height of control panel	To be designed by the party	Indications required	To be designed by the party		
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	HMI	For process control with touch interface and provision to collect the process data including Helium purity, pressure, etc., through an USB & ETHERNET interface for transferring to a PC/laptop.		
	Data acquisition	Parameters logging and data back up		
	Total height of control panel	To be designed by the party		
XXV.	Safety Systems <ul style="list-style-type: none"> ▪ Redundant sensors/instruments for measurement of all critical parameters ▪ The designer shall consider SS316 L or suitable material of construction to avoid stress corrosion cracking and longer service life of equipment's. ▪ Instrumentation shall be designed to meet all the safety standards. ▪ The pipe line inter-connections shall be with leak proof joints. 			

	<ul style="list-style-type: none"> ▪ Suitable Pressure Relief valves and Burst diaphragms shall be considered in the design. The outlet from PRV & Burst diaphragm shall be routed safely to atmosphere. ▪ Party shall provide the test certificate for pressure relief valve , Pressure sensors, helium sensor, gauges, indicator , Cylinder, storage tank etc. ▪ Party shall consider the safety interlocks if pressure exceeds set conditions, leak in the lines, Recovery bag etc. ▪ Electrical control panel shall be provided with suitable earthing arrangement. ▪ Emergency stop button shall be provided in the control panel available in HRU & HPU 		
XXVI.	Mandatory requirements		
	Warranty including (parts+ service etc.)	The supplier should guarantee that the entire works carried out by them is free from fault in design, material and workmanship for a minimum period of 24 months from the date of satisfactory installation and commissioning and	

		<p>supplier should agree to make all necessary or desirable alterations, repairs and replacements of defective parts supplied by them free of charge including transportation charges if any. Necessary certificate should be furnished by the selected firm/company/vendor.</p>		
	<p>AMC (Optional)</p>	<p>3 years Non comprehensive AMC after warranty period <i>This shall be quoted separately.</i> Visits: <ul style="list-style-type: none"> • 3 Preventive maintenance visits per year </p>		

		<ul style="list-style-type: none"> • 1 breakdown visit (free of cost) • More than one breakdown visit (chargeable) 		
	Spares & Consumables (Optional)	Vendor shall <i>quote separately</i> for cost of spares and consumables required for 2 years of trouble-free operation.		
	Vendor eligibility criteria	<i>Vendor has to submit the documentary evidence performance letter or purchase order proof from the client having supplied at least one similar system. Vendor shall be Original</i>		

		<p><i>Equipment Manufacturer (OEM) of similar systems preferably handling Helium gas. This is an essential requirement for vendor to participate in the bid.</i></p>		
	<p>Technical data sheet and drawings for submission in tender</p>	<p>Party shall share the tentative drawings for the followings</p> <ul style="list-style-type: none"> • Plant layout indicating all sub system and their arrangement • Tentative Electrical drawing • Technical data sheet for Instrumentation 		

		<ul style="list-style-type: none"> • Technical data sheet for Vacuum pump, Oil free air compressor, booster pump, pressure transmitter, Helium purity sensor, valves, fitting etc. • Tentative P & ID for both Helium recovery and purifications system generated by party. 		
	Pre-fabrication approval	<ul style="list-style-type: none"> • Party shall submit the fabrication drawing of the sub-systems, and electrical drawing etc., to VSSC for approval after 		

		<p>release of purchase order.</p> <ul style="list-style-type: none"> • Party shall be ready for any modification with regard to components configuration and operational ergonomics. 		
	Pre Delivery Inspection	<ul style="list-style-type: none"> • Party shall demonstrate the Performance of Helium Recovery & Purification unit including the purity level, leak check in the recovery bag , joints etc. in the presence of VSSC engineer. 		
	Installations and commissioning	<ul style="list-style-type: none"> • Party shall demonstrate performance of the equipment for total 		

		duration of 24 hrs. at VSSC after installation & commissioning		
XXVII.	General conditions <ol style="list-style-type: none"> 1. Operation/ Maintenance manual of the instrument in English shall be provided along with the supply. 2. Party shall install and commission the unit at VSSC premises and demonstrate the performance. 3. List of spares should be specified for periodic maintenance. This shall be quoted as optional separately. 4. Minimum warranty period shall be TWO YEAR from the date of satisfactory installation & commissioning of the unit. 5. Party shall ensure listing of all the items and packing shall be done with utmost care to ensure that there is no damage during transportation. 6. Party has to supply the total system in packed conditions in a dedicated van through authorized transport carrier. 7. All the cartons / boxes shall be numbered and directions for positioning shall be clearly mentioned, without fail. 8. VSSC will provide only the incoming power supply to the control panel. Total power required 			

	<p>for operation of entire unit and its associated sub-systems shall be clearly specified to arrange for the incoming power supply.</p> <p>9. Trolley shall be designed as per standards & safety guidelines</p> <p>10. Routing of cables between the control panel and the unit is within the scope of the party. Necessary cable ducts, pipes shall be considered accordingly.</p>		
XXVIII.	<p>Items not in our scope</p> <p>a. All the civil works necessary (like foundation, supports, covering, patching up) are in the scope of the supplier.</p> <p>b. Party shall provide the overall equipment layout and civil foundation requirements indicating the structural load (static & dynamic) for each of the sub-systems.</p> <p>c. Materials wherever mentioned clearly will be supplied by us and all other items are in the scope of the party. If there are minor variations in our scope of supply due to the unexpected problems emerging in the site, this is to be absorbed by the party and they have to provide it free of cost. The supplier has to give provisions for contingencies for accommodating unpredicted works, shortage in supply of materials falling in our scope, extra works based on site conditions, reworks, etc. which are expected in the site. These are to be done free of cost.</p>		

	<p>d. All the tools and equipment required for the work are to be brought by the supplier.</p>		
<p>XXIX.</p>	<p>Inspection & Testing On receipt of VSSC purchase order, the following documents shall be submitted by the supplier within four weeks:</p> <ol style="list-style-type: none"> 1. Three sets of design, fabrication drawings and details of functional tests. 2. Fabrication Process plan giving details of all the processes involved. 3. Quality Control Plan including dimensional inspection, 100% Dye Penetrant Testing & radiography of all butt weld joints, stage inspection plan, final inspection plan, acceptance & pressure testing, packing & dispatch, etc. where ever required 4. Based on the tentative drawing provided by VSSC, party shall provide the detailed general arrangement drawing, weld configuration, welding details, sub assembly, final machining etc., wherever applicable. 5. The same shall be submitted to VSSC for review and approval for starting the work. 6. All units shall be offered for inspection by VSSC Engineers at various mandatory stages of 		

	<p>fabrication as identified in the approved Process plan.</p> <ol style="list-style-type: none">7. Inspection of materials & bought out items used for fabrication.8. Acceptance tests as specified in the QC & Acceptance plan including pressure testing using hydraulic media at the specified pressures9. Any minor modifications suggested by VSSC engineers during fabrication work shall be undertaken by the party at no extra cost10. Supplier shall intimate well in advance to VSSC, the readiness for inspection at different stages. All the necessary facilities, tools, equipment and other arrangements required for the inspection including DP & Radiography, dimensional inspection, pressure tests, etc. will have to be arranged by the supplier.11. The integrated setup shall be dispatched only after final inspection and clearance in writing from VSSC.12. All weld joints are to be inspected by 100% DP test13. After Installation at VSSC, party has to demonstrate the operation of entire unit along		
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	<p>with its sub-systems. All the components, sub-assemblies and final unit shall be leak tested.</p> <p>14. Party shall also provide adequate training to VSSC staff.</p> <p>15. Conceptual drawing is provided for reference only. The supplier is free to suggest modification wherever he feels it is essential.</p> <p>16. Lack of clarity in the figures/configuration drawing given by VSSC, if any, shall be communicated to VSSC for review prior to making detailed fabrication drawing.</p>		
XXX.	<p>List of Spares and consumables for three years of trouble free operation after warranty period shall be provided in separate list with cost</p>		
XXXI.	<p>Delivery Schedule :</p>		
Time	Description	Schedule	
T0	Placement of Purchase Order	T0	
T1	Submission of design details, fabrication drawings and quality plan for all subcomponents & total system by the party	T0 + 6 weeks	
T2	Review and approval of fabrication drawing by VSSC	T1 + 4 weeks	
T3	Procurement of brought out components and fabrication and readiness for pre-delivery inspection	T2 +4 months	
T4	Pre-delivery inspection (By VSSC)	T4 + 3 weeks	

T5	Supply of the Helium Recovery and purification system at VSSC after successful completion of the pre-delivery inspection	T5+ 2 weeks		
T6	Erection, Commissioning & Demonstration at VSSC Trivandrum	T5 + 4 weeks		
T7	Training to VSSC	T6+1 week		