GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
VIKRAM SARABHAI SPACE CENTRE (VSSC)
THIRUVANANTHAPURAM

# Tender for Design, realization, installation, commissioning and performance demonstration of Thermo-Vacuum Chamber

**Bids to be submitted online**

## Tender No.: VSSC/PURCHASE UNIT III (SPRE)/VS202400598501 dated 13-12-2024

## A. Tender Details

| | |
|---|---|
| Tender No : | **VSSC/PURCHASE UNIT III (SPRE)/VS202400598501** |
| Tender Date : | **13-12-2024** |
| Tender Classification: | **GOODS** |
| Purchase Entity : | **PURCHASE UNIT III (SPRE)** |
| Centre : | **VIKRAM SARABHAI SPACE CENTRE (VSSC)** |

## Design, realization, installation, commissioning and performance demonstration of Thermo-Vacuum Chamber

This Tender is for the Design, realization, installation, commissioning and performance demonstration of Thermo-Vacuum Chamber
This tender is proposed as a DOMESTIC PUBLIC TENDER. This tender is restricted only to Class-I and Class-II Local Suppliers as defined under DPIIT Order dtd 04/06/2020- Preference to Make in India Order-2017 Revision. Non-Local Suppliers need not quote.
Foreign OEMs/Agents quoting on behalf of Foreign OEMs are not permitted to quote. High Sea Sales Quotes not permitted. The bids shall be in INR only.
Tenderers are advised NOT TO UPLOAD any documents revealing the price of the main equipment, accessories, spares or AMC. They are however, requested to upload UNPRICED BIDS (i.e. Price details masked) showing appropriate break-up of components of main equipment, individual accessories and spares as desired. And the price break-up (Main Equipment, Essential Spares, AMC Cost) shall be uploaded in PRICE BID RELATED column.
This is a TWO-PART tender i.e. Techno-Commercial Bid (Part-I) and Price Bid (Part-II) shall be submitted separately. All technical and commercial terms and conditions shall be furnished in the Techno-Commercial Bid while price shall be indicated only in the Price Bid. Uploading price details anywhere else other than the price-bid related document shall lead to unconditional rejection of the tender. Please make note of the same.
Purchase preference to eligible vendors are applicable as per extant notifications issued by the Government of India.
The Class-I/Class-II Local suppliers, at the time of submitting their offer, shall also indicate percentage of local content and provide self-certification that the item (s) offered meets the local content requirement for Class-I/Class-II Local Suppliers as the case may be. They shall also give details of location (s) at which the local value addition is made.
In cases if the item(s) offered exceed Rs. 10 Crores, the Class-I/Class-II Local Suppliers shall provide a Certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a

practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.
False Declarations will be in breach of the Code of Integrity under Rule 175 (1) (i) (h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.
Technical Bids will be opened at the scheduled due date & time. No further intimation will be sent in this regard. The schedule for price bid opening shown is only indicative. Price bids will only be opened in the case of parties who have been techno-commercially accepted, the details of which will be communicated at a later stage.

## A.1 Tender Schedule

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| Bid Submission Start Date : | **13-12-2024 13:00** |
| Bid Clarification Due Date : | **15-01-2025 17:02** |
| Bid Submission Due Date : | **27-01-2025 14:00** |
| Bid Opening Date : | **27-01-2025 14:01** |
| Price Bid Opening Date : | **10-02-2025 12:02** |

## B. Tender Attachments

### Technical Write-up/Drawings

**Document : Compliance matrix**

**Document : Layout of LN2 yard and SIV lines**

**Document : Commercial terms and conditions**

**Document : Technical Specifications**

### Instructions To Vendors

**5. Instructions to Vendors**

1. Last minute clarification on tenders will not be entertained.

2. This is an E Tender.  Hence Postal/Fax/Email tenders will not be accepted.

**6. PPP Make in India(Non- Divisible Items-Class I & II Local Suppliers Only)**

1. In line with Public Procurement (Preference to Make in India), Order 2017 & its amendments issued by Govt. of India from time to time with a view to support the Indian industries, ISRO has implemented "Purchase Preference Policy". The "Purchase Preference" is applicable for the "Class-I Local Supplier" for the goods/ services/ works covered in this tender, subject to the following terms & conditions:-

2. a) The subject item falls under Non-divisible category. b) The offers sought only from Class-I & Class-II local suppliers

3. Definitions: A supplier or service provider, whose goods, services or works offered for procurement, has local content: a)Equal to or more than 50% : Class-I local supplier. b)Minimum 20% but less than 50% : Class-II local supplier. c) Less than 20% : Non-local supplier.

4. 'Local content' means the amount of value added in India (i.e. indigenous  items/services added in the offered products/ services/ works) be the total value of the item offered (excluding net domestic indirect taxes) minus the value of imported content in the item (including all  customs duties/IGST) as a proportion of the total value (excluding  net  domestic indirect taxes), in percent.

5. The margin of Purchase Preference shall be up to 20%.

6. 'Margin of purchase preference' means the maximum extent to which the price quoted by the "Class-I local supplier" above the L1 (landed cost).

7. 'L1' means the lowest technically accepted tender / bid / quotation (i.e. lowest landed cost including duties, taxes and freight & Insurance).

8. Works means all works as per Rule 130 of GFR- 2017, and will also include 'turnkey works'. Works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.

9. Purchase Preference Policy:- Goods/Works which are not divisible (ie., required quantity is 1 or as a package) and Services:
a)If L1 is from a 'Class-I local supplier, the contract will be awarded to L1 bidder.
b) If L1 is not from a 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price subject to local supplier's quoted price falling within the margin of purchase preference (i.e. 20%) and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price (inclusive of duties, taxes and freight & insurance).
c) In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on, and order/contract shall be awarded accordingly. In case where none of the 'Class-I local supplier' within the margin of purchase preference agree to match the L1 price, then the order/contract shall be awarded to the original L1 Bidder.

10. The 'Class-I & II local supplier' should provide a "Self Certification" along with technical offer indicating that the item offered meets the minimum local content [as per SI. No.(3)] as called for in the tender and provide the percentage of local content along with details of the location(s) at which the local value addition is made. In case of two bid tenders, it is mandatory to indicate compliance to MLC(minimum Local Content) in technical bid zone.

11. The ink-signed certificate shall be provided on vendors letter head along with the offer (in case of online tender, copy of ink-signed certificate shall be uploaded along with your offer under concerned tab. Original in Hard copy shall be produced on request). In case of non-submission of certificate, the purchase preference shall not apply.

12. A committee (with an external expert from a practicing cost accountant or practicing chartered accountant, if required) constituted for independent verification shall verify the self-declarations & auditor's / accountant's certificates on random basis, as per the requirements.

13. In cases the quoted price is in excess of Rs.1000 Lakhs (including duties, taxes and freight & Insurance) the 'Class-I & II local supplier shall provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing

chartered accountant (in case of suppliers other than companies) giving the percentage of local content.

14. In case of a complaint received from any local supplier indicating a need for review / verification of Local content of successful vendor / awarded vendor, for accepting a complaint from such complainant (w.r.t the false declaration given by the successful vendor on the local content), a complaint fee of Rs.2Lakhs or 1% of the locally manufactured items being procured (subject to a maximum Rs. 5Lakhs), whichever was higher, to be paid by demand draft by the complainant. In case, the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, deposited fee of the complainant would be refunded without any interest.

15. False declarations will be in breach of code of the integrity for which a bidder or its successor's will not be eligible/debarred for purchase preference from further tenders / pending tenders for two years along with other actions as may be applicable.

16. The Public Procurement (Preference to Make in India), Order 2017 issued by Govt. of India indicates that if there are any general or specific restrictive clauses to restrict participation of Indian companies in those countries procurement tenders, reciprocity clause need to be invoked as per the order. Hence, if ISRO or Govt. of India come across that Indian suppliers of an item are not allowed to participate and / or compete in procurement by your government, the bid submitted by you will be not be considered and excluded from eligibility for procurement. Please note this point.

**7. Local Content Declaration Format (In your Letter Head)**

1. In line with the Government Public Procurement Order No. P/45021/2/2017-BE-II dtd . 15.06.2017 , as amended from time to time, and as applicable on the date of submission of tender, we hereby certify that , we M/s. _____ are local supplier meeting the requirement of minimum local content, _____%, as defined above in the orders for the material against Tender Enquiry No. ___ dtd. ___ . The HSN No. of the item supplied is _____

2. Percentage of Local value addition , involved in the item are:

_____

3. This is also certified that the following factors are excluded in the above percentage:
(strike out which are not applicable)
1. imported item sourced locally from resellers/distributors (value in ___% including tax, if applicable)
2. The license fee/royalties paid/technical charges paid out of india. (value in___% including tax, if applicable)
3. Repackaged/refurbished/rebranded imported products (value in ___% including tax, if applicable)

4. The details of location at which the value addition will be made is as follows :

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5. We also understand that , false declarations will be in breach of code of integrity, under rule 175 (1) (i) (h), of the General Financial Rules, for which a bidder, or its successors can be debarred for up to 3 years under Rule 151 (iii) of the GFR along with such other actions as may be permissible under law.

6. For (company name)

Authorised Signatory.

**8. Specific Terms and Conditions to Tender (MII Compliant)**

1. (I) Please quote applicable GST separately.

2. (II) Our standard delivery term is FOR, VSSC. In case any vendor offers delivery term of Ex-works, Packing and Forwarding charges if any should be indicated separately either as a percentage of the quoted rate or as a Lumpsum amount.

3. (III) Our standard payment term is 100% within 30 days after receipt and acceptance of the items at our site (after installation and commissioning in cases where installation and commissioning is required).

4. (IV) Liquidated Damages: The delivery period quoted should be realistic. The delivery period so quoted and mentioned in the order is the essence of the order/contract. In case of delay in delivery of material as per the delivery schedule, Liquidated Damage @ 0.5% per week or part thereof on the undelivered portion subject to a maximum of 10% of the contract value shall be levied. Wherever, installation and commissioning is also involved, the supply will be deemed to have been completed only when the entire Stores is supplied, installed and accepted.

5. (V) Performance Bank Guarantee: Wherever products offered carry warranty, the warranty should be for one year or as per manufacturers standard warranty term. Against such cases, please confirm submission of Performance Bank Guarantee. The Performance Bank Guarantee should be for 3% of the order value covering the warranty period obtained from any Scheduled Bank on Rs.200/- Non Judicial Stamp Paper and should be valid beyond 2 months from the completion of the warranty period. Alternately vendors can request for withholding 3% payment till completion of the warranty period.

6. (VI) Security Deposit: Wherever the offer value is Rs. 5.00 Lakhs or above, the successful tenderer should submit Security Deposit @ 3% of the order value by way of Bank Guarantee / FD Receipt. The Bank Guarantee shall be obtained from any Scheduled Bank on Rs.200/- Non Judicial Stamp Paper

and should be valid beyond 2 months from the completion of all contractual obligations. If the Contractor is called upon by the Purchaser to deposit, Security and the Contractor fails to provide the security within the period specified, such failure shall constitute a breach of the Contract, and the Purchaser shall be entitled to make other arrangements for the re-purchase of the stores Contracted at the risk of the Contractor. In case if Security Deposit is submitted and the contractor fails to execute the order, then the security deposit will be forfeited.

7. (VII) Note: SD, LD and PBG clauses are mandatory and offers of the vendors who have not agreed for the above conditions will be excluded from the procurement process. Micro and Small Vendors are not exempted from the submission of Security Deposit. Only Govt Departments/PSUs/PSEs can submit Indemnity Bond instead of Bank Guarantee towards SD/PBG.

8. (VIII) Please upload the Technical Details / Catalogue / Data Sheets (wherever applicable)

9. (IX) The offer should be valid for a  period of minimum 90 days from the date of opening of Tender and 180 Days for PT Two Part (120 Days for Technical Bid and 60 Days for Price Bid from the date of opening).

10. (X) In order to avail of the benefits extended to by Govt. of India to the Micro and Small Sectors, please submit attested copy of the valid Entrepreneur Memorandum Part-II signed by the General Manager, District Industries Centre / Udyog Adhar / NSIC Registration Certification along with your offer.

11. (XI) If any bidder submits forged / false document along with the tender, offer of such vendors will be summarily rejected and such bidders will be blacklisted for all future tenders.

12. (XII) Wherever samples are required to be submitted along with the quotation, offer without sample will not be considered.

13. (XIII)  The other attached forms are our standard terms and conditions, which are to be complied with. If any conflict arise between the specific terms and standard terms, then in those cases, the specific terms will prevail over the standard terms.

14. (XIX) Purchase preference to eligible vendors are applicable as per extant notifications issued by the Government of India.

15. (XV) Foreign OEMs/Agents quoting on behalf of Foreign OEMs are not permitted to quote. High Sea Sales Quotes not permitted. The bids shall be in INR only.

16. (XVI) Definitions: A supplier or service provider, whose goods, services or works offered for procurement, has local content: a)Equal to or more than 50% : Class-I local supplier. b)Minimum 20%

but less than 50% : Class-II local supplier. c) Less than 20% : Non-local supplier.

17. (XVII) Local content means the amount of value added in India (i.e. indigenous items/services added in the offered products/services/works) be the total value of the item offered (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties/IGST) as a proportion of the total value (excluding net domestic indirect taxes), in percent. Indicate extent of Minimum Local Content in offered product/service and location of such value additions.

18. (XVIII) The Class-l & II local supplier should provide a Self Certification along with your offer in PDF format indicating that the item offered meets the minimum local content as called for in the tender as mentioned above and provide the % of local content along with details of the location(s) at which the local value addition is made. In case of two part tenders, it is mandatory to indicate compliance to MLC(minimum local content) in technical bid itself.

19. (XIX) The Class-I/Class-II Local suppliers, at the time of submitting their offer, shall also indicate percentage of local content and provide self-certification that the item (s) offered meets the local content requirement for Class-I/Class-II Local Suppliers as the case may be. They shall also give details of location (s) at which the local value addition is made.

20. (XX) In cases if the item(s) offered exceed Rs. 10 Crores, the Class-I/Class-II Local Suppliers shall provide a Certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

21. (XXI) False Declarations will be in breach of the Code of Integrity under Rule 175 (1) (i) (h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

22. (XXII) Purchase Preference Policy:- Goods/Works which are divisible in nature (required quantity is greater than 1 or not a package basis): i. If L1 is 'Class-1 local supplier', the order/contract for full quantity shall be awarded to L1 bidder. ii. If L1 bid is not from a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference (i.e. 20%) and contract for that quantity shall be awarded to such Class-I local supplier subject to matching the L1 price (inclusive of duties, taxes and freight & insurance). iii. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase 'preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In cases where none of the 'Class-I local

supplier' within the margin of purchase agree to match L1 price, in such cases 100% quantity shall be ordered on original L1 bidder. iv. In case no offers are received from 'Class-I local supplier' or none of the 'Class-I local supplier' falls within the margin of purchase preference of 20%, the order shall be processed on L1 vendor. v. In case L1 bidder (not a 'Class-I local supplier') is not accepting splitting of order on 50:50 basis, in that case the order/contract shall be awarded to such 'Class-I local supplier' for full quantity subject to matching the L1 price. vi. Regarding MSEs (Indian vendors): a) The following additional aspect as indicated below would be applicable for procurement which are falls under divisible category (i.e., not applicable for indivisible category), in case of participation of MSEs in the tendering who are also complying to the Minimum Local Content (MLC) stipulated in the tender. b) If any Indian vendor satisfies the requirement of MSEs stipulation and also falls within the purchase preference margin as called for in MSME policy (in case of matching L1 price) will be considered for ordering 25% of tendered quantity, the balance quantity / works will be considered for distribution amongst all bidders (including MSEs) as per the purchase preference policy. c) In case no MSEs qualifies for purchase preference or do not match with L1 price then the total tendered quantity will be distributed amongst all bidders as per the purchase preference policy.

23. Purchase Preference Policy:- Goods/Works which are not divisible in nature (required quantity is 1 or on a package basis):
(i). If L1 is 'Class-1 local supplier', the order/contract for full quantity shall be awarded to L1 bidder. (ii). If L1 bid is not from a 'Class-I local supplier', then, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price subject to the Class-I local supplier's quoted price falling within the margin of purchase preference (i.e. 20%) and contract for that quantity shall be awarded to such Class-I local supplier subject to matching the L1 price (inclusive of duties, taxes and freight & insurance). (iii). In case such lowest eligible 'Class-I local supplier' fails to match the L1 price , the next higher 'Class-I local supplier' within the margin of purchase 'preference shall be invited to match the L1 price and so on, and contract shall be awarded accordingly. In cases where none of the 'Class-I local supplier' within the margin of purchase agree to match L1 price, in such cases the contract shall be placed on original L1 bidder. (iv). In case no offers are received from 'Class-I local supplier' or none of the 'Class-I local supplier' falls within the margin of purchase preference of 20%, the order shall be processed on L1 vendor.

9. This is a TWO-PART tender i.e. Techno-Commercial Bid (Part-I) and Price Bid (Part-II) shall be submitted separately. All technical and commercial terms and conditions shall be furnished in the Techno-Commercial Bid while price shall be indicated only in the Price Bid. Uploading price details anywhere else other than the price-bid shall lead to unconditional rejection of the tender. Please make note of the same.

10. Technical Bids will be opened at the scheduled due date & time. No further intimation will be sent in this regard. The schedule for price bid opening shown is only indicative. Price bids will only be opened in the case of parties who have been techno-commercially accepted, the details of which will be communicated at a later stage.

## 11. Conditions for BIDDER FROM A COUNTRY WHICH SHARES LAND BORDER WITH INDIA

1. Any bidder from a country which shares a land border with India will be eligible to bid in this tender, only if the bidder is registered with the Competent Authority. Competent Authority for the purpose of registration shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT).

2. Any false declaration and non-compliance of the above would be a ground for immediate rejection of offer or termination of the contract and further legal action in accordance with the laws.

3.
Validity of Registration: Registration should be valid at the time of submission of bids and should be valid at the time of placement of order.

## C. Bid Templates

### C.1 Technical Bid - Design, realization, installation, commissioning and performance demonstration of Thermo-Vacuum Chamber

**1. Thermo-Vacuum System : Fully automated Thermo Vacuum Chamber as per attached specification document**

**Item specifications for Thermo-Vacuum System : Fully automated Thermo Vacuum Chamber as per attached specification document**

| Sl No | Specification | Value | Compliance | Offered Specification | Remark |
|---|---|---|---|---|---|
| 1 | 1. Scope of work | Scope of work includes design, realization, installation, commissioning and performance demonstration of a thermo-vacuum chamber at VSSC/ ISRO, Thiruvananthapuram as per trailing specifications. Scope of supply also includes supply of auxiliary subsystems listed in the tender and routing of all lines for the passage of LN2, GN2 and other fluids. Supplier shall obtain license from PESO for design, realization & installation of LN2 tank. | Yes / No / Explain | | |
| 2 | 2. General description of equipment | - | Yes / No / Explain | | |
| 3 | 2.1 Range of testing | Temperature range of 153 K to 423 K at 5x10-7 mbar vacuum level. | Yes / No / Explain | | |
| 4 | 2.2 Major subsystems | Vacuum pumping system, thermal system (including Thermal Conditioning Unit) and PLC based SCADA system | Yes / No / Explain | | |

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| 5 | 2.3 Auxiliary systems | Liquid nitrogen tanks, gaseous nitrogen tanks, super-insulated vacuum jacketed lines, air compressor and chiller | Yes / No / Explain | | |
| 6 | 3. Vacuum chamber details | - | Yes / No / Explain | | |
| 7 | 3.1 Vacuum Chamber design | - | Yes / No / Explain | | |
| 8 | a. Chamber configuration | The chamber shall be cylindrical with a tori-spherical end dish. | Yes / No / Explain | | |
| 9 | b. Chamber design | It shall be designed for external pressure operation (internal pressure of 5 x 10-7 mbar absolute and external pressure of 1.01325 bar absolute at 35 degC) | Yes / No / Explain | | |
| 10 | c. Material | The vacuum chamber and all vacuum chamber subsystems inside the chamber (except the thermal shroud) shall be constructed using stainless steel (AISI 304L). The vendor shall provide a material test certificate from NABL certified laboratory, stating mechanical and chemical properties of material used with traceability. | Yes / No / Explain | | |
| 11 | d. Vacuum flanges | Flanges of vacuum system shall be CF type with metallic gaskets for all vacuum pumps, vacuum gauges and instrumentation feedthrough. | Yes / No / Explain | | |

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| 12 | e. Internal configuration | The internal dimensions of the chamber shall be arrived at considering test space dimensions and clearances required to accommodate thermal shroud, fluid lines, water vapour panel and instrumentation cables. | Yes / No / Explain | | |
| 13 | f. Clamps | The chamber front dish shall be clamped using manual clamps (4 Nos.). There shall be an open/ close status indication in the control console. | Yes / No / Explain | | |
| 14 | g. Welding | All joints shall be TIG welded, using certified filler rods and high-purity argon/ helium shield gas. | Yes / No / Explain | | |
| 15 | h. Weld joint leak rate | All welded joints shall be leak tested with a Helium Mass Spectrometer Leak Detector to an Individual leak rate of better than1x10-9 mbar L/s of Helium. | Yes / No / Explain | | |
| 16 | i. Handling | Necessary provisions shall be provided for the handling of the chamber. | Yes / No / Explain | | |
| 17 | j. Chamber door | The chamber door shall be a tori-spherical dished door with flange and the opening stroke shall allow complete access to the thermal plate | Yes / No / Explain | | |
| 18 | k. Rear dish | Rear dish shall be welded to the chamber. | Yes / No / Explain | | |
| 19 | l. O-ring | O-ring on the chamber door shall be moulded type and uniform compression of the O-ring shall be ensured. | Yes / No / Explain | | |

| | | | | | |
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| 20 | 3.2 Vacuum chamber dimension | - | Yes / No / Explain | | |
| 21 | a. Diameter and depth | Chamber dimensions (1m diameter x 1.2m depth approx.) shall house the mouse trap thermal shroud and test article resting on the thermal plate. | Yes / No / Explain | | |
| 22 | b. Chamber axis height | The Chamber axis height from ground level shall be 1200 mm. | Yes / No / Explain | | |
| 23 | 3.3 Vacuum chamber orientation | The chamber shall be oriented horizontally and mounted on a stainless-steel structure meeting all structural requirements. | Yes / No / Explain | | |
| 24 | 3.4 Test space requirement | - | Yes / No / Explain | | |
| 25 | a. Thermal shroud | The thermal shroud shall be mouse trap shaped, with a flat thermal plate of width 600 mm - 620 mm and depth 1000 mm - 1100 mm on which the test article will be placed. | Yes / No / Explain | | |
| 26 | B. Thermal plate | The thickness of the thermal plate shall be designed to ensure temperature uniformity across the thermal plate. | Yes / No / Explain | | |
| 27 | 3.5 Internal surface finish details | - | Yes / No / Explain | | |
| 28 | a. Internal surface | 3Δ (three triangle) finish for chamber internal surfaces and all hardware exposed to vacuum. | Yes / No / Explain | | |
| 29 | b. Emissivity | The infrared emissivity of the internal surfaces of the chamber shall be within 0.10. | Yes / No / Explain | | |

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| 30 | 3.6 Painting | Surfaces of hardware exposed to outside environment shall be first coated with zinc chromate primer followed by two coats of polyurethane paint. | Yes / No / Explain | | |
| 31 | 3.7 Vacuum chamber ports | All ports shall have metallic gaskets and shall be fitted with specified feed-through. Dummy flanges shall be provided for all ports, including feed-through ports. Details of vacuum chamber ports are shown in Table No. 1 & Fig No. 2. | Yes / No / Explain | | |
| 32 | 4. Vacuum pumping system | The offered vacuum system shall have a roughing skid (Rotary and Roots pump connected in series), turbomolecular pumps (TMP), cryo pumps, air admittance system, electro-pneumatic gate valves & angle valves, vacuum monitoring & control system. Roughing skid shall also be used as a backing pump for TMPs and the Cryo pump shall be provided with a dedicated backing pump. A single chain consists of one roughing skid, one TMP and a cryo pumping chain. | Yes / No / Explain | | |
| 33 | 4.1 Vacuum system design | - | Yes / No / Explain | | |

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| 34 | a. Time to achieve vacuum level | Vacuum pumping system shall be designed to achieve a vacuum of 1x10-6 mbar from ambient within 90 minutes for double chain and within 180 minutes for single chain respectively, without using water vapour panel. | Yes / No / Explain | | |
| 35 | b. Vacuum level at 380K | Vacuum pumping system shall be capable of achieving 1x10-6 mbar within 180 minutes when the thermal shroud temperature is 380 K, without using water vapour panel. | Yes / No / Explain | | |
| 36 | c. Vacuum demonstration | Ultimate vacuum shall be demonstrated with vacuum chamber backfilled with GN2 gas. | Yes / No / Explain | | |
| 37 | d. Vacuum pump connection | Vacuum pump shall be connected to the vacuum chamber through vacuum isolation gate valves, SS piping of suitable size and flexible bellows. | Yes / No / Explain | | |
| 38 | e. Continous opeartion | Pumping system shall have adequate pumping capacity and redundancy for continuous operation up to 400 hours at a stretch. | Yes / No / Explain | | |
| 39 | f. Vacuum level control | The vacuum level in the chamber shall be controlled by PLC. It shall be fully automatic and provided with interlocks for safe operation, including in the manual mode. | Yes / No / Explain | | |
| 40 | 4.2 Rough Vacuum system configuration (Qty.- 2 Nos.) | - | Yes / No / Explain | | |
| 41 | a. Roughing skid vacuum level | Roughing skids shall be capable of achieving a vacuum level of 5x10-3 mbar. | Yes / No / Explain | | |

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| 42 | b. Roots pump integration | Roots pumps shall be integrated with an overflow valve to enable switch on together with the backing pump even at atmospheric pressure. | Yes / No / Explain | | |
| 43 | c. Vacumm gauge between roots and rotary | A vacuum gauge shall be provided between roots pump and rotary vane pump. | Yes / No / Explain | | |
| 44 | 4.3 Turbo Molecular Pump (TMP) configuration (Qty.- 2 Nos.) | - | Yes / No / Explain | | |
| 45 | a. Minimum pumping speed | The minimum pumping speed for TMP shall be 1200 Litre/sec | Yes / No / Explain | | |
| 46 | b. Backing pump | The backing line of each TMPs shall be connected to rouging skid with isolation valves as shown in fig 3. | Yes / No / Explain | | |
| 47 | c. vacuum level | TMP shall be capable of achieving a vacuum level of less than 1x10-7 mbar. | Yes / No / Explain | | |
| 48 | d. TMP body | TMP body shall be of stainless steel and connected to cylindrical chamber body through CF type flange and shall have an appropriate cooling system. | Yes / No / Explain | | |
| 49 | e. Controller | Each TMP shall have a standalone controller mounted in a rack, which shall be provided with a voltage stabilizer and spike arrestor. | Yes / No / Explain | | |
| 50 | 4.4 Cryo pumping system configuration (Qty.- 1 No.) | - | Yes / No / Explain | | |

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| 51 | a. Working | Cryo pump shall be based on G-M cycle for its two stages along with the Helium compressor. The Cryo pump shall be connected to the chamber through electro pneumatic gate valve. | Yes / No / Explain | | |
| 52 | b. Vacuum level | The Cryo pump shall be capable of achieving a vacuum level of less than 1 x10-7 mbar. | Yes / No / Explain | | |
| 53 | c. Cryo pump control system | The control system shall control the cryogenic pump at its cooling, heating and regeneration & vacuum pumping stages. | Yes / No / Explain | | |
| 54 | d. Cryo pump regeneration | The Cryogenic pump shall be regenerated using a dedicated dry vacuum pump with adequate water vapour capacity. | Yes / No / Explain | | |
| 55 | e. Cryo compressor | Cryo compressor shall have an appropriate cooling mechanism (If water cooling is selected, necessary plumbing lines also shall be in the Supplier’s scope). | Yes / No / Explain | | |
| 56 | 4.5 Vacuum Isolation valve | Based on the system design, vendor shall provide appropriately sized vacuum valves.The vendor has to provide additional gate valves, if necessary.Stainless steel body valves with CF interfaces to be provided for pumps having CF flanges. | Yes / No / Explain | | |

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| 57 | 4.6 Water vapour panel | Removable water vapour panel shall be located between the thermal shroud and the vacuum chamber. It shall be provided with necessary electro-pneumatic valves, temperature sensors with flexible inlet & outlet tubing and a heating system for removing the condensate after the operation. | Yes / No / Explain | | |
| 58 | 4.7 Material for vacuum pipeline | Seamless pipes shall be made of SS 304L whereas flexible bellows shall be made of 316 L. It shall be suitably sized for the highest conductance. | Yes / No / Explain | | |
| 59 | 4.8 Re-pressurization System | For re-pressurizing the chamber after the test/ process, an air admittance valve EPV7 with 10 µm inlet filters shall be provided. It shall be designed such that the chamber is brought to atmospheric pressure in 10 minutes. Provision for admitting nitrogen gas through EPV 9 to be provided as redundant re-pressurisation system. | Yes / No / Explain | | |
| 60 | 5. Thermal system | When the vacuum chamber is maintained in operational vacuum (5.0 x 10-7 mbar), the thermal shroud & thermal plate shall be heated or cooled by circulating GN2 to achieve set temperature. | Yes / No / Explain | | |
| 61 | 5.1 General specifications of Thermal system | - | Yes / No / Explain | | |
| 62 | a. Operating temperature | 153 K to 423 K | Yes / No / Explain | | |

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| 63 | b. Temperature uniformity on end closure and thermal plate | Better than ±2 K at steady state and better than ±15 K at transient state | Yes / No / Explain | | |
| 64 | c. Control accuracy(difference between set temperature and average of 3 temperatures measured at centre plane of the cylindrical shroud). | ±1 K | Yes / No / Explain | | |
| 65 | d. Ramp rate (hot & cold) | Up to 3 K / minute. Provision for set 1 K/ min, 2 K / minute and 3 K / minute (increment of 1 K / minute). | Yes / No / Explain | | |
| 66 | e. Measurement sensor | 3 wire film type RTD as per IEC 60751 class B. | Yes / No / Explain | | |
| 67 | f. Cooling / heating fluid | Low pressure closed loop GN2 (153 K to 423 K). | Yes / No / Explain | | |
| 68 | g. Heat load expected from test article | Total heat load 1 kW (active and passive) | Yes / No / Explain | | |
| 69 | h. Mounting of the thermal shroud and thermal plate | Thermal plate and thermal shroud shall be with demountable circulating fluid inlet/outlet feed lines to enable easy removal from the chamber for maintenance & cleaning purposes. Joints to be easily accessible for the operator. | Yes / No / Explain | | |
| 70 | i. Temperature profile | The thermal system shall be capable to follow any set linear temperature profile in the range of 153 K to 423 K (with multiple cycles over the entire range) without manual intervention. | Yes / No / Explain | | |
| 71 | j. There shall be an interlock to prevent the operation of thermal system when chamber pressure is higher than 1x10-3 mbar. | Yes | Yes / No / Explain | | |

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| 72 | k. Super-insulated vacuum jacketed lines (SIV) to be used in the thermal conditioning unit to maximum possible extent to prevent heat-in-leak. For certain cases where super-insulated vacuum jacketed lines are not feasible inside the unit (to be decided in consultation with the Purchaser), such lines shall be properly insulated with Aerogel insulation having water vapour barrier. | Yes | Yes / No / Explain | | |
| 73 | l. Thermal shroud and thermal plate with parts such as liquid feedthrough shall be designed for thermal cycling in the range of 77 K to 423 K. | Yes | Yes / No / Explain | | |
| 74 | m. Necessary bellows / flexible joints shall be provided for preventing thermal stresses during long-duration thermal cycling operations. | Yes | Yes / No / Explain | | |
| 75 | n. There shall be provision to use a temperature sensor on the test article as a control sensor (selectable from consoles). | Yes | Yes / No / Explain | | |
| 76 | 5.2 Specifications of thermal shroud | - | Yes / No / Explain | | |
| 77 | a. Shroud shall be inflated to form annular gap and to be laser welded/ resistance spot welded. TIG welding at the edges of the shroud. | Yes | Yes / No / Explain | | |

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| 78 | b. Shroud panels shall be designed for thermal cycling from 77 K to 423 K and internal pressure of at least 2 times the pressure of circulating GN2. | Yes | Yes / No / Explain | | |
| 79 | c. The thermal plate shall have an internal channel for circulating GN2 for cooling / heating the test article. | Yes | Yes / No / Explain | | |
| 80 | d. The thermal plate shall be capable of carrying a test article weighing at least 15 kg. It shall have an array (4 rows x 4 columns of 50 mm x 50 mm) of threaded holes (M6 x1x 10 deep) to mount the test article. | Yes | Yes / No / Explain | | |
| 81 | e. Shape and construction | Mouse trap shape, double embossed type, laser welded & inflated/ resistance spot welded & moulded. Each sheet shall be at least 1.5 mm thick. | Yes / No / Explain | | |
| 82 | f. Size | The shroud shall be able to house a test article with a maximum envelope of 600-620 mm (width) x 1000-1100 mm (depth) x 450 mm (height) on the thermal plate. | Yes / No / Explain | | |
| 83 | g. End shrouds | Two separate active shroud panels to be attached with the front and rear dish of chamber. | Yes / No / Explain | | |
| 84 | h. Material of construction | SS316L | Yes / No / Explain | | |

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| 85 | i. Leak tightness | Leak tightness of the welded joints in the shroud, thermal plate, and feedthrough shall be better than 5x10-9 mbar L/s of Helium. It will be demonstrated again after thermal cycling at VSSC site | Yes / No / Explain | | |
| 86 | j. Painting | a) Test space environment including the inner surface of shroud, both active end shrouds and top surface of thermal plate shall be coated with appropriate paint (such as Aeroglaze Z306) with an infrared emissivity of 0.9 meeting the out-gassing requirements for space environment (TML:< 1%). b) Outside the main shroud, active end shrouds and thermal plate shall be electro-polished. | Yes / No / Explain | | |

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| 87 | 6. Auxiliary system details | The auxiliary system consists of Liquid Nitrogen Storage tank, a gaseous Nitrogen Storage tank (as per the design of TCU), an air compressor, and coolant water circulator. The scope includes obtaining the necessary license from PESO according to prevailing SMPV (U) rules. Super-insulated lines of adequate size shall be used for transferring Liquid Nitrogen from the storage tank to TCU. Adequate pressure sensors shall be provided in the LN2 transfer lines. Safety relief valves shall be provided on the LN2 transfer lines where there is chance for trapping LN2 by the closing of upstream and downstream valves. A tentative layout of the LN2 storage yard is shown in Fig.8 for obtaining PESO License. Space for installing one more LN2 tank of 6 kL capacity shall be provided inside the yard (additional LN2 tank not in the present scope of work). The fencing and foundation/ civil works for the tank is in the scope of VSSC. The design drawings/inputs shall be given by the vendor well in advance for civil works. The specifications for various sub-systems are given below: | Yes / No / Explain | | |
| 88 | 6.1 Liquid Nitrogen tank (1 no.) | - | Yes / No / Explain | | |

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| 89 | a) Orientation | Vertical | Yes / No / Explain | | |
| 90 | b) Storage capacity | 6,000 litre (Water capacity) | Yes / No / Explain | | |
| 91 | c) Design Standard tank and piping | ASME SEC. VIII Division I, ASME B31.3 or equivalent | Yes / No / Explain | | |
| 92 | d) The outer diameter of Dewar | 2 meters (max.) | Yes / No / Explain | | |
| 93 | e) Insulation | Multilayer, super insulation with vacuum | Yes / No / Explain | | |
| 94 | f) evaporation loss rate | better than 0.25% of gross volume/day. | Yes / No / Explain | | |
| 95 | g) Maximum working pressure | As required for TCU operation (with adequate margin to take care of pressure drop etc.). | Yes / No / Explain | | |
| 96 | h) Design pressure | With standard margin over maximum working pressure as per applicable codes. | Yes / No / Explain | | |
| 97 | i) Material of construction of valves, devices, valve handles, tags | SS316L/ bronze | Yes / No / Explain | | |
| 98 | j) Automated operation | Provision for automated operation of LN2 tank from GUI/ SCADA console (Pressurization, Filling, Draining & venting) shall be included. Additional manual isolation valves shall be provided for all these operations. | Yes / No / Explain | | |
| 99 | k) Suitable drain points with blow-down valves shall be provided on LN2 / circuits at suitable locations for initial purging to drive out any resident moisture due to the stoppage of the system for a long duration. | Yes | Yes / No / Explain | | |

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| 100 | l) Safety provisions | Two Safety relief valves and two burst discs shall be provided for the inner vessel, and one Safety Device for outer vessel. Safety relief valves shall be provided for the lines in LN2 tank circuit where there is a chance for trapping LN2 during operation (by closing upstream and downstream valves). | Yes / No / Explain | | |
| 101 | m) Filling and drawing lines | Permanently connected to thermal conditioning unit with SIV lines. Additional drain points shall be provided with necessary isolation valve for drawing LN2 for purposes other than the Thermal conditioning system. | Yes / No / Explain | | |
| 102 | n) Pressure, level, and flow indications | Digital readout of level, flow, and pressure gauges with necessary redundancy and facility for automatic logging of data with respect to time shall be provided. This is in addition to mechanical differential pressure gauges and pressure gauges fitted on the tank. | Yes / No / Explain | | |
| 103 | o) Instruments/ control valves | Instruments/ control valves positioned outdoors shall have an adequate ingress protection rating. | Yes / No / Explain | | |
| 104 | p) Outside surfaces of hardware exposed to ambient environment shall be first coated with zinc chromate primer followed by two coats of polyurethane paint. | Yes | Yes / No / Explain | | |
| 105 | 6.2 Air compressor to actuate electro pneumatic valves (1 no.) | - | Yes / No / Explain | | |

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| 106 | a) A rotary screw air compressor of adequate capacity shall be provided. | Yes | Yes / No / Explain | | |
| 107 | b) A compressed air reservoir of adequate capacity and a refrigerated air dryer compatible for the selected air compressor shall be provided. | Yes | Yes / No / Explain | | |
| 108 | c) A FRL unit shall be provided at the outlet of the dryer. | Yes | Yes / No / Explain | | |
| 109 | d) An automated drain valve with a timer shall be provided for the reservoir and dryer. | Yes | Yes / No / Explain | | |
| 110 | e) Compressed air lines shall be of stainless steel. Flexible PU tubes shall be used for short lengths near to actuators & valves. | Yes | Yes / No / Explain | | |
| 111 | 6.3 Chiller for cryo pump compressor (1 no.) | - | Yes / No / Explain | | |
| 112 | a) A closed-circuit water chiller unit of adequate capacity shall be provided. | Yes | Yes / No / Explain | | |
| 113 | b) Chiller capacity shall be worked out based on all service requirements in extreme test conditions. Detailed breakup of the cooling requirement shall be submitted. | Yes | Yes / No / Explain | | |
| 114 | c) There shall be a margin of 50% over the required cooling capacity. | Yes | Yes / No / Explain | | |
| 115 | d) The chiller shall operate efficiently in the extreme environment at the VSSC site (40°C& 90% RH). | Yes | Yes / No / Explain | | |
| 116 | e) Necessary additives shall be used for preventing corrosion in pump cooling paths/ channels. | Yes | Yes / No / Explain | | |

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| 117 | 7. Control and instrumentation system | - | Yes / No / Explain | | |
| 118 | 7.1 PLC modules with its execution software | PLC (Programmable Logic Controller) with associated software shall be used for real time monitoring and control of all equipment in the system. | Yes / No / Explain | | |
| 119 | 7.2 Electrical Power distribution and switching panel | Electrical Power distribution and switching panel is in the scope of the supplier. Hence supplier shall install it to facilitate power distribution for all the electrical equipment through appropriately sized starters/relays, switches etc. to ensure proper switching of all equipment and safety of personnel and equipment. | Yes / No / Explain | | |
| 120 | a) Special earthing | Special earthing& routing shall be in the scope of the supplier. Earthing pit alone will be in the scope of VSSC. | Yes / No / Explain | | |
| 121 | 7.3 Control and instrumentation panel | - | Yes / No / Explain | | |
| 122 | a) Control of vacuum and temperature | Vacuum and temperature shall be controlled from the control and instrumentation panel located close (3 to 5m) to the chamber facilitating the operators to control and monitor the operation of the chamber. | Yes / No / Explain | | |

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| 123 | b) Electrical cabling | The electrical cabling to and from the panels shall be done professionally as per industry standards and shall be ensured that the routing and clamping doesn't interfere with routine operations and facilitate periodic maintenance and repair works | Yes / No / Explain | | |
| 124 | c) Identification tag for cables | Every input and output cable shall be properly identified and tagged. Detailed documentation of the electrical wiring and interconnections shall be provided. | Yes / No / Explain | | |
| 125 | d) PLC | PLC (Programmable Logic Controller) for real time monitoring and control of all equipment in the system. | Yes / No / Explain | | |
| 126 | e) Instrumentation related requirements | All instrumentation related to vacuum gauges, temperature sensors, gate valve position indicator, LN2 consumption status monitoring etc shall be positioned in a rack. All instruments shall have provision for automation through an instrument interface like Ethernet/USB etc. The output from all these instruments shall be acquired in a PC through Ethernet/USB interface for monitoring and storage. | Yes / No / Explain | | |

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| 127 | f) Temperature profile | There shall be provision for generating different temperature test profiles (Time vs Temperature) using graphical user interface (GUI) in the control PC. There shall be provision for storing a minimum of 20 such test profiles. | Yes / No / Explain | | |
| 128 | g) PC software | The PC/computer system in the console shall be provided with suitable PLC/ GUI software along with license in the name of ISRO to fulfil the following tasks: | Yes / No / Explain | | |
| 129 | Mimic diagrams | Mimic diagrams displaying functional status of all system components and safety interlocks. Mimic diagram shall display the state of main process regulation loops such as shroud and thermal plate temperature control. | Yes / No / Explain | | |
| 130 | Display and storage | Display and storage of all test facility functional data, alarm condition, messages etc. | Yes / No / Explain | | |
| 131 | Display of temperature profile | Display of temperature profiles on shroud and test article with proper scaling of temperature profiles. | Yes / No / Explain | | |
| 132 | Program generation | Customizable program for vacuum and temperature profiles for its generation, storage and execution. | Yes / No / Explain | | |

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| 133 | 7.4 PC based Data Acquisition System | A PC based Data Acquisition System (DAS) shall monitor and display the temperature data from all the thermocouples/RTDs fixed on the test article and the thermal shroud & thermal plate inside the chamber and also the vacuum parameters of the system. The control and data acquisition PC can be the same. | Yes / No / Explain | | |
| 134 | a) Data logging | The data logging system shall have a fail-safe mechanism not to lose any test data during electrical power failure/system failure condition. | Yes / No / Explain | | |
| 135 | b) A PC based data logging system | Supply of a PC based data logging system with following specifications is in the scope of supply of party. | Yes / No / Explain | | |
| 136 | Processer | Intel core i5, 12th gen. or latest | Yes / No / Explain | | |
| 137 | RAM | 8 GB or higher | Yes / No / Explain | | |
| 138 | Hard disk | 2 TB (SSD) | Yes / No / Explain | | |
| 139 | Monitor | LED 26” with wide angle view | Yes / No / Explain | | |
| 140 | Operating System | Windows 11 | Yes / No / Explain | | |
| 141 | c) On screen display feature | On screen displays shall include real time plot of vacuum system, thermal system and auxiliary systems data. | Yes / No / Explain | | |
| 142 | 7.5 Control software | - | Yes / No / Explain | | |
| 143 | a) Operation modes | There shall be provision for 3 modes of operations - Auto mode, Semi auto mode and manual mode. | Yes / No / Explain | | |

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| 144 | b) Auto mode | The temperature and vacuum shall be controlled based on a predefined test profile without any manual intervention. | Yes / No / Explain | | |
| 145 | c) Semi auto mode | It shall allow the generation of a new test profile, edit (change parameters and set points) an existing one and save in its memory. | Yes / No / Explain | | |
| 146 | d) Manual mode (Expert mode) | Each sub system shall be operated in manual mode (expert mode) and shall be protected with necessary passwords. | Yes / No / Explain | | |
| 147 | e) Provision for switching over of mode | There shall be provision for switching over to manual mode from the current mode (Auto /Semi auto mode) without any interference in the process of the test. | Yes / No / Explain | | |
| 148 | 7.6 Data acquisition software | - | Yes / No / Explain | | |
| 149 | a) Real time Data acquisition of temperature and pressure with respect to time | Yes | Yes / No / Explain | | |
| 150 | b) All functions selectable by menus and icons | Yes | Yes / No / Explain | | |
| 151 | c) Real time graphics and numerical data presentation of selected channels | Yes | Yes / No / Explain | | |
| 152 | d) Data shall be stored in hard disk periodically for later retrieval | Yes | Yes / No / Explain | | |
| 153 | e) Data file generation, management and storage | Yes | Yes / No / Explain | | |

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| 154 | f) Report generation (in MS Word format) | All the data generated during the testing shall be updated in a standard templet provided by VSSC. An extra copy of software(s) developed for this system shall be provided in installable form to take care of any exigency arising due to software corruption/ malfunction. | Yes / No / Explain | | |
| 155 | 7.7 Vacuum sensors and instrumentation | The pressure / vacuum at various locations including inside the chamber has to be measured using vacuum gauges. | Yes / No / Explain | | |
| 156 | a) Vacuum gauge | Adequate numbers of vacuum gauge (Bayard-Alpert Pirani Capacitance Diaphragm Gauge) shall be intrgrated with the vacuum system for monitoring the chamber pressure and controling the entire pumping chain. | Yes / No / Explain | | |
| 157 | B) Vacuum readout | Suitable monitoring/display units having standard PC interfaces shall be provided along with the vacuum gauges. | Yes / No / Explain | | |
| 158 | 7.8 Temperature sensors and Instrumentation: | - | Yes / No / Explain | | |

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| 159 | a) Type of thermocouple | T-type thermocouples (24AWG), 6 Numbers each to be placed on the shroud and Thermal plate for temperature monitoring. T type thermocouples for shroud temperature monitoring to be located on the shroud surface inside the chamber and connections taken through thermocouple feedthrough with miniature T/C connectors at both ends of the feed through harness. Thermocouple and suitable accessories for installing the thermocouples and other sensor shall be sourced from reputed internationals brands | Yes / No / Explain | | |
| 160 | b) Thermocouple feed through | T-Type Thermocouple Feed through(3 Nos.) and K-Type Thermocouple feed through (2 Nos.) with connectors on both sides are to be provided for test article temperature monitoring. | Yes / No / Explain | | |
| 161 | c) Connector and feed through leak rate | The connectors and feed through shall be compact and sealed (maximum admissible leak rate per feed through: 1x10-9 mbar l/s) and shall be thermal vacuum compatible. | Yes / No / Explain | | |
| 162 | d) Sensor location | All the temperature sensors located on the shroud surface shall be installed in such a way that they can be removed for calibration and can be replaced after calibration without affecting the performance. | Yes / No / Explain | | |

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| 163 | e) Temperature control | The thermal plate/ test article temperature shall be controlled by precise heating or cooling using PLC controller. | Yes / No / Explain | | |
| 164 | 8. Online UPS system | The system shall have minimum 30 min. backup. Within this time all systems like PLCs, control system equipment etc shall be switched to safe mode, in case of power failure. | Yes / No / Explain | | |
| 165 | 9. Electrical feed through: | The chambers need to be provided with electrical feed through of suitable rating for routing signals and power to and from the device under test.120 channels electric feed through for device testing, 10 A rating (for each pin), with mating connectors on both sides shall be provided. Each feedthrough shall be identified by a unique number and tag. Each wire in the harness shall also be tagged. At both the ends the harness of each feed through shall be terminated on to 32 pin ITT D type gold plated connectors. | Yes / No / Explain | | |
| 166 | 10. Sources details | Vendor shall select the equipment/system from the suppliers given below. Equivalent brands are not permitted without prior approval from VSSC. | Yes / No / Explain | | |

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| 167 | 10.1 Thermal shrouds | M/s. Tranter USA ,M/s. VG UK, M/s. Bemco inc, USA, M/s. Ziemannsecathen, France, M/s. Magod Laser machining (P) Ltd., Banglore , India ,M/s. FIC spa , Italy & M/s. Angelantoni test technologies , Italy. | Yes / No / Explain | | |
| 168 | 10.2 Thermal plate | M/s. Bemco, USA ,M/s. Ziemannsecathen, France ,M/s. FIC spa , Italy, M/s. Telstar, Spain & M/s. Angelantoni test technologies, Italy | Yes / No / Explain | | |
| 169 | 10.3 Thermal Conditioning system | M/s CSL, Leige,Belgium M/s Telstar , Spain ,M/s Intespace , France ,M/s Angelantoni test technologies, Italy & M/s. Dynavac, USA | Yes / No / Explain | | |
| 170 | 10.4 Cryo pumps and Turbo molecular pump | M/s. Leybold vacuum Germany ,M/s. HSR , Germany ,M/s. CTI cryogenics, Japan &.M/s. Pfeiffer vacuum GmbH, Germany | Yes / No / Explain | | |
| 171 | 10.5 Roughing and roots pump | M/s. Pfeiffer vacuum GmbH, Germany, M/s. Leybold vacuum Germany& M/s. Agilent technologies USA | Yes / No / Explain | | |
| 172 | 10.6 Vacuum gate valves | M/s.VAT Vakuumventile AG, Switzerland., M/s. Pfeiffer vacuum GmbH, M/s. Leybold vacuum Germany& M/s.GNB corporation,USA | Yes / No / Explain | | |
| 173 | 10.7 Electrical panel / Instruments | 1.19" Racks: Rittal<br>2. Electrical Power panel and switch gear: ABB, L&T, Siemens<br>3. The PLC/GUI: Siemens, Allen Bradley, Fanuc or L&T. | Yes / No / Explain | | |

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| 174 | 10.8 Data Acquisition system | Keithley, Siemens, Allen Bradley, ABB, Yokogawa, Schneider, National Instruments | Yes / No / Explain | | |
| 175 | 10.9 PLC | Siemens, Allen Bradley, ABB, Schneider | Yes / No / Explain | | |
| 176 | 10.10 Vacuum gauges and monitors | M/s. Pfeiffer vacuum GmbH, Germany ,M/s. Leybold vacuum Germany ,M/s.Inficon, USA & M/s.MKS, UK | Yes / No / Explain | | |
| 177 | 10.11 Hermetic thermocouples, heater and power feedthrough | M/s.Douglas Electrical components inc,USA ,M/s.PLUGin,France, M/s.MDC Vacuum products,USA& M/s. Pfeiffer vacuum GmbH, Germany | Yes / No / Explain | | |
| 178 | 10.12 Thermocouples, thermocouple connector, RTDs and thermistors | M/s.Omega, USA & M/s.TC,UK, Minco | Yes / No / Explain | | |
| 179 | 10.13 cartridge heater | M/s. Electricfor , M/s.Kamenev & M/s.Thermocoax, Minco | Yes / No / Explain | | |
| 180 | 10.14 Temperature controller & power controllers | M/s.EurothermLtd. | Yes / No / Explain | | |
| 181 | 10.15 Thermal paint | M/s.Aeroglaze (Z306) & M/s Spefun paintings &coatings | Yes / No / Explain | | |
| 182 | 10.16 view port (as an assembly only) | M/s. Pfeiffer vacuum GmbH, M/s. Leybold vacuum M/s. Agilent technologies , , MDC Vacuum | Yes / No / Explain | | |
| 183 | 10.17 Sources of supply for compact air compressor | M/s.Atlascopco, M/s Elgi compressor,M/s Chicago Pneumatics, & M/s. Ingersoll Rand, | Yes / No / Explain | | |
| 184 | 10.18 water chiller | M/s Eurodifroid, France, M/s Werner Finley, M/s Huber, M/s Julabo | Yes / No / Explain | | |
| 185 | 10.19 LN2 Dewar | M/s Inox ,India ,M/s Shell n tube,India ,M/s VRV ,India, M/s Super cryogenics System(P) Limited,India& M/s Cryostartanks and vessel Pvt Ltd India | Yes / No / Explain | | |

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| 186 | 10.20 Flexibl bellows,clamps,claw clamps,centeringring ,O ring | M/s Mawasa, M/s Pfeiffer Vacuum GmBH, M/s Leybold Vacuum, Parker | Yes / No / Explain | | |
| 187 | 10.21 Blowers | M/s Fima & M/s Barber-Nichols AS PART OF TCU | Yes / No / Explain | | |
| 188 | 10.22 Cryo valves | M/s Herose ,Germany, M/s Burkert ,Germany , UAS M/s Habonium,Israel | Yes / No / Explain | | |
| 189 | 10.23 Pressure gauges | M/s Wika& M/s Emerson, M/s Ashcroft | Yes / No / Explain | | |
| 190 | 10.24 safety relief valves | M/s Herose ,Germany &Rego , USA | Yes / No / Explain | | |
| 191 | 10.25 Differential gauges | M/s Wika, M/S Dwyer, M/s Ashcroft | Yes / No / Explain | | |
| 192 | 10.26 level transmitter /Pressure Transmitter | M/s Yokogawa Japan, M/s Hioki,Japan& M/s GE, USA | Yes / No / Explain | | |
| 193 | 9.27 process control valve | M/s flowserve,USA& M/s Burkert Germany | Yes / No / Explain | | |
| 194 | 10.28 burst disc | M/s BS & B | Yes / No / Explain | | |
| 195 | 10.29 Super insulated vacuum jacketed lines | M/s cryodiffusion, France, Cryopal, France, M/s Cryo Fab ,USA ,M/s Inox, India & M/s shell N tube, India | Yes / No / Explain | | |
| 196 | 10.30 Switch gears and circuit breakers | M/s Siemens, Germany, M/s Schneider Germany ,M/s ABB & M/s ALLEN Bradley | Yes / No / Explain | | |
| 197 | 10.31 online UPS | M/s Schneider,Germany, M/s Reilo, M/s Pillar ,Germany &M/s. APC | Yes / No / Explain | | |
| 198 | 10.32 Computer | M/s Hewlett packard HP & M/s Siemens Germany, M/s DELL,M/s IBM | Yes / No / Explain | | |
| 199 | 10.33 Actuators | M/s Schubert and salzer ,M/s Festo,Germany& M/s Bosch Rexroth, Germany | Yes / No / Explain | | |
| 200 | 10.34 cryo solenoid valves | M/s Weka& M/s Burkert Germany | Yes / No / Explain | | |

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| 201 | 10.35 Pneumatic solenoid valves | M/s Festo ,Germany& M/s Rockwell Automation, USA | Yes / No / Explain | | |
| 202 | 10.36 Pneumatic PU tubes | M/s Festo ,Germany & M/s Legris ,France | Yes / No / Explain | | |
| 203 | 10.37 Needle valves/Manual valves | M/s Festo ,Germany ,M/s Legris France &M/s Swagelok | Yes / No / Explain | | |
| 204 | 10.38 Ball Valves/Manual valves | M/s Festo ,Germany & M/s Legris France | Yes / No / Explain | | |
| 205 | 10.39 Air admittance valves | M/s VAT,Switzerland, M/s GNB,USA ,M/s Pfeiffer Vacuum GmbH& M/s Leybold Vacuum Germany | Yes / No / Explain | | |
| 206 | 11. General terms & conditions | - | Yes / No / Explain | | |
| 207 | 11.1 Bidding process | The quote shall be presented in TWO parts namely, Techno – Commercial bid and Price bid. Each bid shall be separately sealed and clearly identified. | Yes / No / Explain | | |

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| 208 | 11.2 Techno-commercial bid | Techno-commercial Bid shal contain the following - (a) The design methodology and specific details of calculations, (b) Schematic of the proposed vacuum pumping system, thermal system, LN2 storage tanks & supply lines. Details shall be given including rating , make of each components / valves / sub systems, (c) Materials used and the standards followed in design, (d) Details on previous experience in realizing and supplying similar automatic thermo vacuum chambers along with its thermal system to ISRO/DRDO or other reputed firms. (e) List of essential spares which are provided along with the chamber. (f) details of schedule, milestones & Gantt chart depicting all important stages and time required for each | Yes / No / Explain | | |
| 209 | 11.3 Supplid item manufacuring location | Vendor shall specify whether the previously supplied systems were (a) fully designed and manufactured at vendor’s works, or (b) Integrated from outsourced subsystems, if so, provide details. | Yes / No / Explain | | |

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| 210 | 11.4 Documentary evidence | Vendor shall submit the documentary evidence from the concerned customers' for the satisfactory performance of the 1000 mm dia X 800 mm depth or higher capacity Thermovacuum chambers without any major breakdown over the past 5 years. | Yes / No / Explain | | |
| 211 | 11.5 Right to Visit | VSSC reserves the right to visit vendor's or his customers' premises where the systems have been supplied, for verification of the information provided by the vendor in the technical bid and other infrastructure facilities claimed. Incomplete technical bid of the vendor, which does not meet technical requirements mentioned in this tender is liable to be rejected. | Yes / No / Explain | | |
| 212 | 11.6 Price bid | Price bid shall contain the following - (a) Price for the complete system, (b) Cost breakup of all subsystems, (c) Cost breakup of the essential spare parts proposed for the trouble-free operation of the chamber for a period of 10 years (minimum), (d) List & Cost of the items sourced within India, (e) Annual Maintenance Contract (AMC) charges for a period of 7 years after warranty period. This amount will also be taken into consideration for determining the lowest quote. | Yes / No / Explain | | |

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| 213 | 11.7 Offer details | The offer shall be for the complete design, fabrication, demonstration of main parameters / specifications at vendor's site, transportation to site, handling at site, integrating, testing & demonstrating all sub system & total performance,installation, final acceptance testing and commissioning of the Thermo vacuum chamber. Mutually agreed third party certification from BVQI / LLOYDS is required at design and at all stages of fabrication from raw material identification till testing at pre delivery inspection stage. All equipment and consumables required (except for the exclusions stated in the scope of VSSC) will be in the scope of the supplier. | Yes / No / Explain | | |
| 214 | 11.8 Complete Offer of Total system | Offer shall be for the total system and incomplete/ partial offers will not be considered. | Yes / No / Explain | | |
| 215 | 11.9 Layout diagram | Vendor shall provide a layout diagram of the proposed system showing major equipment with the minimum floor area / space required for installation along with the offer. | Yes / No / Explain | | |
| 216 | 11.10 Technical cataloge,Literature & Data sheet | Vendor shall attach technical catalogs, literature and detailed data sheets of all items offered by the vendor in support of their technical offer. | Yes / No / Explain | | |

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| 217 | 11.11 Service centre | Vendor shall have Service Centre in India for pre/post guarantee/warranty service back up. Vendor shall submit detailed list of Service Centre/s. | Yes / No / Explain | | |
| 218 | 11.12 Technical Presentation | Vendor shall be ready to give a technical presentation to the Technical Committee formed for the purpose of finalizing the procurement at VSSC Thiruvananthapuram . The vendor shall be intimated 15 days in advance for this presentation. This intimation will be sent to the vendor only after the technical evaluation of the proposal and examining its technical suitability. | Yes / No / Explain | | |
| 219 | 11.13 Acceptance Test Plan & schedule | Vendor shall give full details of his proposed Acceptance Test Plan & schedule of activities at vendor's site and at VSSC site, Thiruvananthapuram | Yes / No / Explain | | |
| 220 | 11.14 Third party inspection | Vendor shall confirm compliance to all the specifications witnessed by mutually agreed Third Party Inspection Agency (TPIA) and the inspection / tests reports thus generated and vouched by TPIA shall be provided to VSSC well in advance for scrutiny before proceeding for witnessing tests at vendor's site. | Yes / No / Explain | | |

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| 221 | 11.15 Vendor responsibilties detail | (a) Safe transportation of total system; warehouse to warehouse insurance to be provided by vendor, (b) Supervise unloading and handling of the system at VSSC site, Thiruvananthapuram , (c) Installation and commissioning of total system at VSSC site at Thiruvananthapuram adhering to all safety regulations, (d)Installation and commissioning of total system at VSSC site at Thiruvananthapuram adhering to all safety regulations. | Yes / No / Explain | | |
| 222 | 11.16 Prior approval for fabrication drawingsApproval | After placement of order, vendor shall submit the fabrication drawing for the vacuum chamber and thermal system and shall get prior approval from VSSC before starting the fabrication works. | Yes / No / Explain | | |
| 223 | 11.17 QA/QC Plan | Necessary QA / QC plan shall be prepared by the vendor and the same shall be approved before start of fabrication. | Yes / No / Explain | | |
| 224 | 11.18 Pre-dispatch inspection | Pre-dispatch inspection shall be carried out by VSSC Engineers at vendor's site. As part of pre-dispatch acceptance, Vendor shall carry out and demonstrate salient specifications as per Factory Acceptance Test Plan in presence of VSSC Engineers at their works/site. | Yes / No / Explain | | |
| 225 | 11.19 Inspection and factory acceptance test plan | - | Yes / No / Explain | | |

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| 226 | a) Performance demonstration of system | Six thermal cycles as per the system qualification test profile at extreme temperature levels shall be performed on a dummy test article of rated mass and heat dissipation and the results shall comply with the performance specifications provided. Provision shall be available at supplier's site for repeated cooling & heating of thermal shroud and demonstrating the performance of the total system | Yes / No / Explain | | |
| 227 | b) Leak tightness demonstration | Leak tightness of chamber shall be demonstrated. Demonstration of leak tightness on the already proof pressure tested (witnessed by TPIA) thermal shroud & thermal plate after ensuring that it is subjected to a minimum of three cycles of thermal cycling. | Yes / No / Explain | | |
| 228 | Inspection & Acceptance Test Plan | - | Yes / No / Explain | | |
| 229 | a) Chamber Leak Tightness | Demonstration of Chamber leak tightness | Yes / No / Explain | | |
| 230 | b) Thermal shroud & thermal plate leak tightness | Demonstration of thermal shroud & thermal plate leak tightness after ensuring that it is subjected to a minimum of three cycles of thermal cycling. | Yes / No / Explain | | |

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| 231 | c) Demonstration of all specifications & performance | Demonstration of all specifications & performance shall be done during site acceptance test for a typical full duration test profile as given in figure 2 in specification document. | Yes / No / Explain | | |
| 232 | d) Functioning of all interlocks | Functioning of all interlocks shall be demonstrated. | Yes / No / Explain | | |
| 233 | e) Safe shut down | Safe shut down & revival in the event of electrical power failure shall be demonstrated. | Yes / No / Explain | | |
| 234 | f) Safety alarms | All Safety alarms & its acknowledgment shall be demonstrated. | Yes / No / Explain | | |
| 235 | g) Software re-installation | Software re-installation shall be demonstrated (if is transported to VSSC in Pre-installed condition). Necessary passwords shall be given to VSSC during commissioning of the facility. | Yes / No / Explain | | |
| 236 | 11.20 Installation, operation and maintenance documentation | Installation, operation and maintenance manuals of all systems shall be supplied with the system. CAD drawings and circuit diagrams relevant to maintenance shall also be included. | Yes / No / Explain | | |
| 237 | 11.21 Details of consumbles | Vendor shall provide the details of the consumables, such as liquid nitrogen, helium gas required to demonstrate the performance of the chamber at VSSC, Thiruvananthapuram at the time of installation and commissioning. | Yes / No / Explain | | |

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| 238 | 11.22 Delivery Period | Vendor shall deliver and commission the Thermovacuum Chamber at VSSC meeting the abovementioned specifications and interface requirements within a period of twelve months from the date of release of purchase order. | Yes / No / Explain | | |
| 239 | 11.23 Warranty | The supplier shall provide a performance warranty of minimum 3 years, from the date of installation, commissioning and acceptance at VSSC, for the entire system against any failure or any failure in meeting the overall performance specifications of the system. | Yes / No / Explain | | |
| 240 | 11.24 Training | Vendor shall impart detailed training for operation, trouble shooting and maintenance of the system to Engineers & Technicians at VSSC, Thiruvananthapuram at no extra cost. | Yes / No / Explain | | |
| 241 | 11.25 Guarantee | All the equipment offered by the vendor shall have free guarantee support of at least one year from the date of installation and acceptance of total system at VSSC, Thiruvananthapuram . | Yes / No / Explain | | |
| 242 | 11.26 Maintenance | All maintenance related issues shall be addressed within 3 days from the date of intimation from VSSC. | Yes / No / Explain | | |
| 243 | 11.27 Online support | There shall be provision for carrying out diagnostics remotely through VPN. | Yes / No / Explain | | |

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| 244 | 11.28 Liquidated Damages (LD) | LD shall be levied beyond the date of delivery mentioned in this order @ 0.5% per week or part thereof on the undelivered portion subject to a maximum of 10% of the contract value. | Yes / No / Explain | | |
| 245 | 11.29 Security Deposit | Upon receipt of this order, part shall submit a Bank Guarantee towards Security Deposit within 2 weeks along with order acknowledgement, equivalent to 10% of the order value in Rs.200/- NJ Stamp Paper (as per format attached). This shall be valid up to a period of 60 days from the date of supply and shall be returned upon completion of all contractual obligations. | Yes / No / Explain | | |

**Supporting Documents required from Vendor**

**1. Detailed cost splitup including foreign components (Price Bid Related)**

**2. Overall equipment layout including all systems**

**3. Product catalog**

**4. Detailed Techno commercial offer (without price details)**

**5. Declaration regarding the percentage of local content (or value addition) in the item offered.**

**6. Detailed Compliance Matrix vis-a-vis the item specification in tenders.**

**7. Unpriced Bid showing the split up of main equipment, accessories, essential spares as applicable**

**8. Additional Documents from Vendor.**

5 additional documents can be uploaded by the vendor

## C.2 Commercial Terms / Bid

| Sl. No. | Description | Compliance | Vendor Terms |
|---|---|---|---|
| 1 | As per attached tender specification document | Yes / No / Explain | |
| 2 | Taxes and other costs, | Yes / No / Explain | |
| 3 | Security Deposit (Applicable if Offer Value is Rs. 5 Lakhs or above. MSME/NSIC Units are NOT EXEMPTED from the payment of SD. Bank Guarantee @ 3% of Order Value valid till 60 days from the date of supply to be submitted. Mandatory compliance required. Only Government Bodies/PSUs/PSEs can submit Indenity Bond in lieu of BG. In the event of non-performance of contractual obligations, SD will be forfeited). | Yes / No / Explain | |
| 4 | Delivery Terms. | Yes / No / Explain | |
| 5 | Mention the time required for readiness of the item for PDI on receipt of the PO | Yes / No / Explain | |
| 6 | Mention the time required for supply of the the item at our site after PDI clearance | Yes / No / Explain | |
| 7 | Mention the time required for installation & commissioning of the item after receipt of intimation of site readiness | Yes / No / Explain | |
| 8 | Liquidated Damages (Applicable beyond the delivery period mentioned in this tender @ 0.5% per week or part thereof on the undelivered portion subject to a maximum of 10% of the contract value. Mandatory compliance required). | Yes / No / Explain | |
| 9 | Warranty (Confirm acceptance for a period of 3 years) | Yes / No / Explain | |

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| 10 | Performance Bank Guarantee (PBG) Bank Guarantee @ 3% of Order Value valid till the completion of warranty period plus 2 months claim period to be submitted. Mandatory compliance required. Only Government Bodies/PSUs/PSEs can submit Indemnity Bond in lieu of BG. In the event of non-performance of warranty obligations, PBG will be forfeited). | Yes / No / Explain | |
| 11 | Confirm acceptance of AMC for a period of 7 years. Mention the scope of AMC - No. of visits for Break down & Maintenance per year. (AMC cost shall only be mentioned in the specific slot in the price bid.) | Yes / No / Explain | |
| 12 | List of essential spares for the trouble free operation of the equipment to be uploaded (Without price details). Price of the essential spares shall be uploaded only in the "price bid related " column. (The price of essential spare will not be considered for arriving at L1) | Yes / No / Explain | |
| 13 | Payment Term: (Our Default payment term: For indigenous orders: 100% within 30 days after receipt and acceptance of item at our site. NOTE: CONSEQUENT TO COVID 19 PANDEMIC AND AS PER EXTANT GUIDELINES FROM DEPARTMENT OF SPACE, NO ADVANCE PAYMENT IS PAYABLE TO THIS TENDER). | Yes / No / Explain | |
| 14 | Definitions: A supplier or service provider, whose goods, services or works offered for procurement, has local content:<br>a)Equal to or more than 50% : Class-I local supplier.<br>b)More than 20% but less than 50% : Class-II local supplier.<br>c)Less than or equal to 20% : Non-local supplier.<br>Mention your category. | Yes / No / Explain | |
| 15 | Local content means the amount of value added in India (i.e. indigenous items/services added in the offered products/services/works) be the total value of the item offered (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties/IGST) as a proportion of the total value (excluding net domestic indirect taxes), in percent. Indicate extent of Minimum Local Content in offered product/service and location of such value additions. | Yes / No / Explain | |

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| 16 | The Class-I & II local supplier should provide a Self Certification along with your offer in PDF format indicating that the item offered meets the minimum local content as called for in the tender as mentioned above and provide the % of local content along with details of the location(s) at which the local value addition is made. In case of two part tenders, it is mandatory to indicate compliance to MLC(minimum local content) in technical bid itself.Confirm attachment of Self declaration along with the offer. | Yes / No / Explain | |
| 17 | PO Placement Address (with Name and Contact Details of sales person concerned). | Yes / No / Explain | |
| 18 | Currency of Quote and Country of Origin should be mentioned here. | Yes / No / Explain | |
| 19 | Any Other Terms | Yes / No / Explain | |
| 20 | Offer Validity | Yes / No / Explain | |

## C.3 Price Bid

| Sl. No. | Item | Quantity | Unit Price | Currency | Total Price | Remark |
|---|---|---|---|---|---|---|
| 1 | Thermo-Vacuum System : Fully automated Thermo Vacuum Chamber as per attached specification document | 1.00 Nos. | | - | | |

**Common charges (Applicable for all items)**

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| **Freight charge** | |
| **P&F Charges** | |
| **Installation Charges** | |
| **AMC Charges for 1st Year after warranty period** | |

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| **AMC Charges for 2nd Year after warranty period** | |
| **AMC Charges for 3rd Year after warranty period** | |
| **AMC Charges for 4th Year after warranty period** | |
| **AMC Charges for 5th Year after warranty period** | |
| **AMC Charges for 6th Year after warranty period** | |
| **AMC Charges for 7th Year after warranty period** | |