पं. रविशंकर शुक्ल विश्यविद्यालय, रायपुर (छ. ग.)

-:निविदा सूचना:-

निविदा विज्ञापन क्र.PRSU/DST-PURSE/52 /2023 रायपुर, दिनांक, 08-08-2023

Tender for supply of Equipments/instruments under DST-PURSE (SR/PURSE/2022/145), SERB (CRG/2022/003926) and SERB (EEQ/2022/000967) PROJECTS

पं. रविशंकर शुक्ल विश्यविद्यालय, रायपुर की ओर से निर्माताओं तथा उनके अधिकृत विक्रताओ से Equipments/Instruments, fabricated technical set-ups for studies on removal of pollutants from smoke/wastewater, and associated accessories to ensure the operational conditions of all instruments/Equipments/Fabricated Set-Ups, immediately after installation for the target parameter analysis under the DST-PURSE (SR/PURSE/2022/145) and SERB (CRG/2022/003926) and SERB (EEQ/2022/000967) Projects सामग्री क्रय करने के लिए सीलबंद लिफाफे में स्पीड पोस्ट / रेजिस्टर्ड डाक के माध्यम से निविदा आमंत्रित किये जाते हैं |इच्छुक फर्म विकास विभाग से रु. 1000.00 (एक हज़ार मात्र) रुपये की रसीद जमा कर (आयकर प्रमाण पत्र सहित) निविदा प्रपत्र प्राप्त कर सकते हैं| वेबसाइट से प्राप्त निविदा प्रपत्र रु. 1000.00 का बैंक ड्राफ्ट Registrar, Pt. Ravishankar Shukla University, Raipur के नाम से संलग्न करने पर ही मान्य होगा |

निविदा प्रपत्र विक्रय की अंतिम तिथि	- 21/08/2023 को अपराह्न 03:00 बजे तक
निविदा प्रपत्र जमा करने की अंतिम तिथि	- 11/09/2023 को अपराह्न 03:00 बजे तक
निविदा प्रपत्र खोले जाने की तिथि	-12/09/2023 को अपराह्न 03:00 बजे तक
निविदा प्रपत्र खुलने का स्थान	रसायन अध्ययनशाला विभागध्यक्ष कक्ष, विज्ञान भवन, पं. रविशंकर शुक्ल विश्यविद्यालय, रायपुर, छ.ग.

टीप - निविदा का विस्तृत विवरण विश्यविद्यालय के website:- **www.prsu.ac.in** पर देखा जा सकता है |

8/8/23

कुलसचिव

कुलसचिव
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

08/08/2023

TENDER DOCUMENT

TENDER FOR SUPPLY & INSTALLATION OF

LAB EQUIPMENTS

UNDER

TWO BID SYSTEM

Pt. Ravishankar Shukla University

Amanaka, G.E.Road, Raipur (C.G.) 492010

Phone: 0771-2262540 , email registrarprsu@gmail.com

Dated: ----------

Notice Inviting Tender No. : ----------

Sealed tender invited on behalf of the Pt.Ravishankar Shukla University, Raipur from the Original Equipment Manufacturer or their authorized dealers for the **Supply & Installation of Lab Equipments** in two-bid format for the laboratory of the institute as per the specifications in ***Annexure-I*** in two bid system. The tender document can be downloaded from the Institute website at URL Link: http://www.prsu.ac.in

1. Schedule

Date of Issue/Publishing	
Last Date and Time for submission of Bids	
Date and Time of Opening of Technical Bids	
Tender Fee	Rs. 1000/- (For Tender Fee)
EMD	As specified in the Technical Specification
No. of Covers	01
Cover heading	The cover containing the quotation should be subscripted as Bid for **Supply & Installation of Lab Equipments.**
Bid validity days	90 days (From last date of opening of tender)
Address for communication	Registrar,Pt. Ravishankar Shukla University, Raipur (C.G.) Ph : 0771-2262540,Fax 0771-2262818 Email: registrarprsu@gmail.com

2. **Tender Fees and EMD:**

i. Tender Fees & EMD to be submitted in shape of DD from any commercial bank drawn in favour of the Registrar, Pt. Ravishankar Shukla University, Raipur (C.G.) as mentioned against the equipment together with the technical bid, in the absence of which the price bid, if any, will not be opened under any circumstances.

ii. No interest on EMD and security will be paid by the institute to the Bidder.

iii. The EMD shall be refunded to the unsuccessful bidders after finalisation of the quotation. In case of successful bidder it will be return against performance bank guarantee.

3. Two Bid System:

i. Technical bid consisting of all technical details alongwith commercial terms and conditions and EMD; and
ii. Financial bid indicating item-wise price for the items mentioned in the technical bid.
iii. Technical bid and financial bid should be sealed in separate covers duly superscribed and both these sealed covers are to be put in a bigger cover which should also be sealed and duly superscribed as **"Technical Bid for the supply of installation of Lab Equipments" due on** ----------. Technical bids shall be opened at the first instance and evaluated by technical committee. At the second stage financial bids of the only technically qualified bidders shall be opened for financial evaluation and ranking before awarding the contract. Mixing price bid with technical bid will disqualify your bid for further evaluation.

4. Submission of tender:

Offers addressed to the Registrar, Pt. Ravishankar Shukla University, Raipur (C.G.)' and valid for 90 days (From last date of opening of tender) should reach the office of Pt. Ravishankar Shukla University, Raipur (C.G.)',---------- on or before the last date and time. Tenders received late shall not be considered.

5. Bidding:

i. Either the Authorized Indian agent on behalf of the OEM or OEM itself can bid.

ii. If an agent submits bid on behalf of an OEM, the same agent shall not submit a bid on behalf of another OEM in the same tender for the same item/product.

iii. All offers other than those from the OEM should be supported by an authority letter from the manufacturer authorizing the supplier to tender on their behalf. In case of manufacturer a certificate or a copy thereof to the effect that the bidder is a manufacturer of the equipment must be accompanied with the technical bid prepared as per '***Annexure – II***'.

6. Opening of Bids:

Technical bids will be opened as per the schedule in the presence of bidders or their authorized representatives whosoever may wish to attend. In case the due date of receipt/opening of the quotation/s (technical/price) is declared a holiday in the Institute, then, the due date of receipt/opening of the quotations shall be the next working day at the same time.

7. Rejection of Bids:

Canvassing by the Bidder in any form, unsolicited letter and post-tender correction may invoke summary rejection with forfeiture of EMD. Conditional tenders will be rejected. Non- compliance of applicable General Information as well as compliance of Technical Specification in ***Annexure-I*** and Compliance Sheet in ***Annexure-VI*** will disqualify your Bid.

8. Bids of debarred/blacklisted firms will not be considered for evaluation. The firms must submit the declaration in format in ***Annexure-V.***

9. Price Bid:

Price bid should be prepared as per '***Annexure – IV***'.

10. Rates Comparison:

Bidders are requested to send their rates (inclusive of transportation, loading, unloading, GST etc, nothing extra will be paid and free delivery and installation) on FOR, Pt. Ravishankar Shukla University, Raipur (C.G.). Rates comparison will be made on Net Price (Including Freight/Insurance/Installation/Taxes/Duties etc.) .

AMC/CMC charges will not be included for the evaluation of the commercial bids.

11. Spares:

The spare parts/wear & tear consumables, if any, required for trouble free operation of equipment to be quoted separately giving the full nomenclature, rate, quantity and shelf life of each item.

12. Parts of Equipments:

Where the equipment is composed of several subunits/components, the rate should be quoted for each subunit/component. The Institute reserves the right to increase or decrease the number of subunits/ components and number of equipment according to its requirements. The rates in ambiguous terms will render the quotation liable to rejection. The words "Not quoting" should be clearly written against any item of equipment for which the tenderer is not quoting. EMD mentioned above should be enclosed for individual quoted item.

13. Award of Contract:

After due evaluation of the financial bid(s), the Institute will award the order to the lowest evaluated responsive tenderer/bidder (hereinafter referred to as the "Supplier"). Since all the equipments are to be used in research work on international parameters, irrespective of lowest rate the decision of committee in regard of selection of bidder shall be final and binding

14. Performance Security:

After the award of work, the supplier shall be required to submit the performance security in the form of irrevocable bank guarantee in the prescribed format (***Annexure-III)*** issued by any Nationalised or Scheduled Bank for an amount equal to the 10% of order value, within 60 days of issue of Purchase Order and **it will be kept valid for a period of 60 days beyond the date of completion of warranty period. Warranty Period will be commenced from the date of the satisfactory installation of the supplied item. Hence, be careful at the time of calculation of the validity date of Performance Bank Guarantee.**

15. Payment Terms:

Payment will be made to the supplier through following modes.

i. Indigenous goods: NEFT/Cheque/Demand Draft: 100% payment will be made within 30 days from satisfactory installation of the equipment at Pt.Ravishankar Shukla University, Raipur(C.G.) and on the submission of performance bank guarantee valid for warranty period + 2 months .

ii. Imported goods: Letter of credit/Telegraphic Transfer90% payment will be made through LC/TT/SD and balance 10% after satisfactory installation of the equipment and submission of performance bank guarantee for 10% of order value, either by the principal company or by their Indian agent valid for warranty period + 2 months. Bank charges occurred outside India will be borne by the beneficiary.

16. Delivery & Installation:

i. All the goods ordered shall be delivered and installed at Permanent Campus of Pt. Ravishankar Shukla University, Raipur (C.G.), within 6 weeks from the date of issue of the purchase order. All the aspects of safe delivery and commissioning shall be the exclusive responsibility of the supplier. If the supplier fails to deliver and commissioning of the equipments on or before the stipulated date, then a penalty at the rate of 2% of the total order value shall be levied subject to one time extension of the stipulated time for maximum 2 weeks on genuine grounds. The equipments are to be supplied within this stipulated period, failing which the supply order is liable to be cancelled and EMD will be forfeited.

ii. **Satisfactory Installation:** Satisfactory installation / commissioning and handing over of the equipment mean the faultless functioning of the equipment for a minimum period of 30 days after satisfactory installation.

17. Training of Personnel:

The supplier shall provide the technical training to the personnel involved in the use of the equipment at the Institute premises, immediately after completing the installation of the equipment at the company cost.

18. Site Preparation:

The supplier shall inform to the Institute about the site preparation, if any, needed for the installation of equipment, immediately after the receipt of the purchase order. The supplier must provide complete details regarding space and all the other infrastructural requirements needed for the equipment, which the Institute should arrange before the arrival of the equipment to ensure its timely installation and smooth operation thereafter.

The supplier shall visit the Institute and see the site whether the equipment is to be installed and may offer his advice and render assistance to the Institute in the preparation of the site and other pre-installation requirements.

19. Merger / Acquisition of Foreign Principal:

In case of merger of Foreign Principal with another Firm or acquisition of Foreign Principal by another firm, it shall be obligatory for the New Entity so formed after the merger of the Acquiring Firm, as the case may be, to take over all the duties and obligations / liabilities of the Foreign Principal and the New Entity / Acquiring Firm would *ipso facto* become liable for all acts of commission or omission on the part of original Foreign Principal as well as Indian Agent.

20. Change of Indian Agent:

In case the Foreign Principal changes in Indian Agent then it shall be obligatory for Foreign Principal to automatically transfers all the duties and obligations to the New Indian Agent, failing which the Foreign Principal would *ipso facto* become liable for all acts of commission or omission on the part of New Indian Agent.

21. Service Manual/Circuit Diagram

It is specifically required that the bidders will supply all the operating & service manuals and circuit diagrams alongwith the equipment.

22. Guarantee / Warranty:

i. Five year warranty has to be provided by the firm from the date of the satisfactory installation / commissioning of equipment against the defect of any manufacturing, workmanship and poor quality of components. In case, there is any variation in the warranty as per the specification of the item equipment, the warranty as specified in the specifications shall be final.

ii. In case, supplier fails to repair / or rectify the equipment during the warranty / guarantee period, Institute may employ or pay other person/company for repairing the equipment, and all such damages, loss and expenses shall be recovered from the supplier. Annual Maintenance Contract charges for **5** years after the expiry of warranty period should be quoted.

23. Country of origin:

Country of origin of the quoted item should be mentioned in the offer in case of imported item.

24. Taxes & duties:

i. **General –** As per applicable Government rules for GST.

ii. **Customs Duty:**

- The successful bidder would be issued a Customs Duty Exemption Certificate (CDEC) under the notification 51/96 (direct import) at the time of import clearance for the goods being imported against the Contract. Bidder would be required to submit a copy of their order to principal along with

principal's acceptance, proforma invoice and Air Waybill copy of the Consignment as soon as it generated from the suppliers end and sent to the office of Stores & Purchase through email at registrarprsu@gmail.com for issuance of CDEC.

- Subsequent to Ministry of Finance notification no. 14/2016 dated 1stMar 2016, the custom duty will be leviable in case of 3rd party import. Hence, **no Custom duty exemption certificate will be provided for 3rd party import**. Therefore, the vendor is requested to indicate separately the approximate amount of customs duty for stores being imported. Custom duty will be paid at actual against proof of payment and bill of entry.
- Institute is registered with DSIR, Govt. of India (Custom Duty Notification No. 51/96- Custom dt: 23 July, 1996 and Central Excise Duty Notification No. 10/97- Central Excise dt: 1 March, 1997) and is therefore, exempted from Excise Dutyand partial exempted from Custom Duty (CD applicable to IIT Jodhpur is 5.15%). Exemption Certificate of the same shall be issued. After GST Notification 2017 benefit of 51/96-Cus has been covered under 43/2017- Custom (Tariff) and the treatment of such imports is the same as earlier (BCD - 5%, IGST - exempted).

25. Service Facility:

Bidder should mention about the service set up in India and how capable they are to provide after sales services.

26. Banker's details:

Name and address of the banker of your company should be mentioned.

27. Reference of supply:

Name and contact details of the premier educational Institutes where the quoted equipment has been installed in India (only on NIT, IIT or Govt Universities within last 5years) should be enclosed. Copies of at least two purchase orders may be attached Pt. Ravishankar Shukla University, Raipur (C.G.) reserves the right to inspect the equipment for its actual performance in any of the listed Institute.

28. Undertaking from the Bidders:

An undertaking will be submitted by the Bidder/firm/company/vendor that in the past they have never been banned/debarred for doing business dealings with Ministry of Defence/Govt. of India/ any other Govt. organisation and that there is no enquiry going on by CBI/ED/any other Govt. agency against them.

29. Repeat Order Clause:

The Contract will have a Repeat Order Clause, wherein the Buyer can order up to 25% quantity of the original contracted quantity (rounded up to the next whole number) under the Contract within six months from the date of completion of supply under the original Contract/ PO. The Repeat Order will have rates on not exceeding basis while the terms and conditions will remain unchanged. It will be entirely the discretion of

the Buyer to exercise the Repeat order or not.

30 Acceptance of Terms & Conditions:

Bidders must confirm the acceptance of all the terms and conditions of this NIQ. Any non-acceptance or deviations from the terms and conditions must be clearly mentioned. However, tenderers must note carefully that any conditional offer or any deviation from the terms and conditions of this NIQ may render the quotation liable for rejection. PRSU Raipur does not bind itself to accept the lowest of any tender and reserves the right to reject any or all tenders without assigning any reason.Beside all theses above terms and conditions, other conditions given below the specification of each lab equipments has to be complied with respective equipments quoted.

Note: The Registrar,Pt. Ravishankar Shukla University, Raipur (C.G.) reserves the right to accept/reject any or all tenders without assigning any reasons thereof and also to reject.

31. Price should be quoted item wise and EMD should be enclosed respectively. Supplier should provide model and make of all accessories along with price and must supply at the time of installation. User training and technical support should be provided. Supplier should provide user's list along with manual.

32. Arbitration and Laws:

In case of any dispute or difference arising out of or in connection with the tender conditions / order and Contract, the Institute and the Supplier will address the dispute / difference for a mutual resolution and failing which, the matter shall be referred for arbitration to a sole Arbitrator to be appointed by the Institute. The Arbitration shall be held in accordance with the provisions of the Arbitration and Conciliation Act, 1996 and the venue of arbitration shall be at Raipur only. The resolution of the Arbitrator shall be final and binding on both the parties.

33 Jurisdiction:

The courts at Raipur alone will have the jurisdiction to try any matter, dispute or reference between parties arising out of this tender / contract. It is specifically agreed that no court outside and other than Raipur court shall have jurisdiction in the matter.

Pt. Ravishankar Shukla University, Raipur (C.G.)

Essential documents to be enclosed

No.	Particulars	Yes/No	Remarks
01	Cost of Tender Documents: Rs. 1000.00 (non-refundable) by Demand draft in favor of Registrar, Pt. Ravishankar Shukla University, Raipur. Downloaded Tender documents must enclose Demand draft of the cost of Tender Document		
02	EMD Rs. 25000 by Demand draft in favor of Registrar, Pt. Ravishankar Shukla University, Raipur		
03	GST Registration Number		
04	PAN Card No.		
05	Bidder must have turnover of Rs 2500000 or more in last three financial years		
06	Bidder must have supplied Laboratory equipment (items) to the departments of state/central universities, PSUs/NITs/IITs/IISERs or to reputed academic institutes against a single purchase order .		
07	The bidder should be a OEM or authorized agent of OEM(Annexure II)		
08	Warranty declaration		
09	Bidders should not be associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by the University / to provide consulting services for the preparation of the design, specifications, and other documents to be set for the procurement of the goods under this Invitation of Bids		
10	Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices(Annexure v)		
11	The bidders should also enclose a statement on their letter head stating that “We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery”		

Annexure – II

FORMAT FOR MANUFACTURER'S AUTHORISATION LETTER TO AGENT (on letter head)

Ref. No. Date:

To,

The Registrar

Pt. Ravishankar Shukla University, Raipur (C.G.)

Sub.: Authorization Letter.

Dear Sir,

We,_____, who are established and reputed manufacturers of_____, having factory at_____, hereby authorize M/s._____ (name & address of Indian distributor /agent) to bid, negotiate and conclude the order with you for the above goods manufactured by us.

We shall remain responsible for the tender / contract / agreement negotiated by the said M/s. _____,jointly and severely.

We ensure that we would also support / facilitate the M/s _____on regular basis with technology / product updates for up-gradation / maintains / repairing / servicing of the supplied goods manufactured by us, during the warranty period.

In case duties of the Indian agent / distributor are changed or agent / distributor is changed it shall be obligatory on us to automatically transfer all the duties and obligations to the new Indian Agent failing which we will ipso-facto become liable for all acts of commission or omission on the part of new Indian Agent / distributor.

Yours faithfully,

[Name & Signature]
for and on behalf of M/s. _____ [N*ame of manufacturer*]

Note: This letter of authorisation should be on the letterhead of the manufacturing concern and should be signed by a person competent and having the power of attorney to bind the manufacturer. A copy of notarised power of attorney should also be furnished.

Annexure-III

BANK GUARANTEE FORM FOR PERFORMANCE SECURITY

To,

The Registrar

Pt. Ravishankar Shukla University, Raipur (C.G.)

WHEREAS……. (Name and address of the Supplier) (herein after called "the Supplier") has undertaken, in pursuance of contract no…… dated …… (herein after called "the contract") to supply

……
……

AND WHEREAS it has been stipulated by you in the said contract that the Supplier shall furnish you with a bank guarantee by a scheduled/nationalized bank recognized by you for the sum specified therein as security for compliance with its obligations in accordance with and due performance of the contract;

AND WHEREAS we have agreed to give the Supplier such a bank guarantee;

NOW THEREFORE we hereby affirm that we are guarantors and responsible to you, on behalf of the Supplier, up to a total of ……
…….(amount of the guarantee in words and figures), and we hereby irrevocably and absolutely undertake to pay you immediately, upon your first written demand declaring the Supplier to be in default under the contract and without cavil or argument, any sum or sums within the limits of(amount of guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Supplier before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract to be performed there under or of any of the contract documents which may be made between you and the Supplier shall in any way release us from any liability under this guarantee and we hereby waive notice of any such change, addition or modification.

The Bank guarantee shall be interpreted in accordance with the laws of India. The Guarantor Bank represents that this Bank Guarantee has been established in such form and with such content that is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

The Bank Guarantee shall not be affected in any manner by reason of merger, amalgamation, restructuring or any other change in the constitution of the Guarantor Bank or the Supplier. The Bank further undertakes not to revoke this Guarantee during its currency except with the previous express consent of the Buyer in writing.

The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorized and has full power to execute this Guarantee for an on behalf of the Bank.

This guarantee shall be valid up to and including the ……. day of ……, 20……

…….
(Signature with date of the authorised officer of the Bank)
…….
Name and designation of the officer
…….
Seal, name & address of the Bank and address of the Branch

Annexure – IV

FORMAT FOR THE SUBMISSION OF RATES – PRICE BID

(To be submitted on the letterhead of the company/firm)

Date:

Name of the Equipment: **SUPPLY & INSTALLATION OF LAB EQUIPMENTS**

Name of the Manufacturer _____
Make of the Equipment _____
Model Number _____
County of Origin _____

Subject: SUPPLY & INSTALLATION OF LAB EQUIPMENTS (Following format is used for imported items)

S. No.	Currency	Description and Specification of the Item	Qty. in Units	Unit Price (a)	Agency Commission (If applicable) (b)	Discount (c)	Ex-works price (d=a+b-c)	Packing + Handling + DOC + Inland Freight + FCA Charges (e)	FOB/FCA Airport Price (f=d+e)	Insurance + Freight (g)	CIF Price (f+g)
1											

Note: At any circumstances, it is the responsibility of the foreign supplier to hand over the material to our forwarder at the origin airport after completing all the inland clearing. No Ex-works consignment will be entertained.

For indigenous items please quote as per following format.

S. No.	Description and Specification of the Item	Qty. in Units	Unit Price in Rs.	GST %	GST AMOUNT	Total Price in Rs.

Note: The above financial template should be strictly followed. Any deviation from the above template (in terms of description and specification of the item) may lead to cancellation of the tender.

This is certified that the rates quoted above are not more than the rates charged from any other Institute/ Department/Organization.

Signature & Seal of the Tenderer

Annexure-V

FORMAT FOR NON BLACKLISTING OF SUPPLIER

I/ We _____Manufacturer/partner/Authorized Distributor/Agent (strike out which is not applicable) of (Supplier) _____ do hereby declare and solemnly affirm that the individual/firm/company is not black-listed by the Union/State Government/Autonomous body.

Deponent

Address _____

I/ We hereby solemnly declare and affirm that the above declaration is true and correct to the best of my knowledge and belief. No part of it is false and nothing has been concealed.

Deponent

Dated: _____

(Note: To be furnished on non-judicial stamp paper duly attested by the Oath Commissioner.)

Pt. Ravishankar shukla University

COMPLIANCE SHEET

IMPORTANT NOTE: THIS STATEMENT SHOULD BE DULY FILLED AND ENCLOSED WITH QUOTATION.NONRECEIPT OF THIS STATEMENT OR INCOMPLETE DETAILS PROVIDED WILL LEAD TO REJECTION OF TENDER

Tender Enquiry No:

S.no	**Commercial Aspects**	PRSU Terms	
1	Terms of Delievry	PRSU	
2	Terms of Payment	100% payment within 30 days after receipt, acceptance and satisfactory installation of stores/equipment in good condition or the date of receipt of the bill whichever is later against the submission of Performance cum warranty bond(if applicable)	
3	Mode of Payment	RTGS/NEFT	
4	Bank Details for making Payment	To be enclosed	
5	Validity of Quote	90 days from the date of opening of Tender	
6	Name of Manufacturer	Name &complete address of the Manufacturer	
7	Currency in which quoted	INR	
8	Delivery Period	06 weeks from effective date of Contract	
9	No. of Lots	01lot	

10	Installation/Supply	PRSU,Raipur	
11	Earnest Money Deposit		
12	Liquidated damages **(mandatory requirement, if not** **accepted quotation will not be** considered)	At the rate of 2% of the total order value shall be levied subject to one time extension of the stipulated time for maximum 2 weeks on genuine grounds.	
13	Order to be placed on	complete address with Contact details of the supplier	
14	Custom duty percentage(CDEC)		
15	Applicable GST as per Govt. rules	GST % should be mentioned Separately	
16	Performance cum Warranty Bond	(10 % of the order value) As per tender	
17	Name & Address of the Firm:		
18	Compliance(choose any one)	We hereby accept all the terms & conditions of the tender. Or We hereby accept all the terms & conditions of the tender except the one mentioned in separate sheet.(mention the non-compliance conditions in separate sheet)	
19	Signature &Name of the authorised signatory with stamp of the firm:		

TENDER NOTICE

For procurement of instruments under DST-PURSE (SR/PURSE/2022/145), SERB (CRG/2022/003926) and SERB (EEQ/2022/000967) PROJECTS

Tenders are invited from interested OEM/Dealers/Distributors for procurement of equipments, fabricated technical set ups for studies on removal of pollutants from smoke/wastewater, and associated accessories to ensure the operational conditions of all instruments immediately after installation for the target parameter analysis under the DST-PURSE (SR/PURSE/2022/145) and SERB (CRG/2022/003926) and SERB (EEQ/2022/000967) Projects.

1. General/Prerequisite Conditions: DST-PURSE (SR/PURSE/2022/145)

- The technical specifications for all the equipments and fabricated technical setup for the removal studies of pollutants are designed and planned to procure purely for the specific research objectives*, described in the DST-PURSE proposal.
- For only equipment No. 1. SEM, provision of 1 technical analyst/analytical instrument operator (for four years with year wise breakup) should also be quoted, **SEPARATELY**.
- All the supplies including local supplies (Computer, printer, UPS/Standards/Gases/Cylinders/UPS for the instrument) should be quoted/mentioned exclusively to ensure the operational conditions of the equipment immediately after the installation for target parameter analysis.
- Apart from the standard warranty as provided by the OEM/Dealer/Distributor, the extended warranty for a total period of upto 5 years should also be quoted "**SEPARATELY.**"
- **Atleast one week Technical/Analytical Traning by the Certified Professionals must be provided free of cost.**
- **All OEM/Dealer/Distributors must submit detials of installation done in different institutions in the last 5-10 years in India, separately for all equipments etc.**

**Objectives of the DST-PURSE Project:*

1) 2-year long environmental monitoring campaign (air, water, soils) in classified environmental receptors and major sources of emissions in Raipur-Durg-Bhilai region to address thermal, optical and molecular properties, source emission estimates, source apportionment, health risk assessment.
2) Design and Development of sensing-measurement devices for potentially toxic chemical species (ions, VOCs, CO, SO_2 and NO/NO_2) using nanocomposites by following the 2D, 3D printed colorimetric, fluorometric and electrochemical techniques, LED induced chemiluminescence radiation source and surface 03 sensor using thermoluminescence techniques.
3) Development of removal methods for ionic, organics (atmospheric VOCs & soluble organics in water) and inorganic gases (CO, SO_2, NO/NO_2) at source using engineered and functionalized carbon fibers.
4) Development of energy saving devices using waste derived carbon-based materials and composites.

Instrument Details for DST-PURSE (SR/PURSE/2022/145):

S No.	Name of the Instrument	Quantity
1.	Scanning Electron Microscope with EDX	1
2.	Multiwavelength Thermal/Optical Carbon OC/EC Analyzer	1
3.	FTIR/ Imaging Spectrometer	1
4.	Total VOCs PID Sensing monitors	2
5.	BET Surface Area Analyzer	1
6.	BTEX GC Based Monitor	1
7.	Gas Analyzer (SO_2, NO_x, CO etc)	1
8.	Steady State Fluorescence Spectrophotometer with Life measurement Facility	1
9.	Electrospinning Machine	1
10	TLD/OSL Reader	1
11	1400°C Muffle atmosphere furnace	1
12	Battery Analyzer 8-channels, 5Amps, 5Volts)	1
13	Potentiostate	1
14	3D Printer and screen printer	1
15	02 Port SP Glove Box	1
16	Laser Machine	1
17	Tube Furnace	1
18	PM2.5 High Volume Sampler	1
19	1 Fabrication of experimental setup for removal techniques for toxic gaseous pollutants at domestic sources; 2. Fabrication of experimental setup for developing removal methods for soluble organic/inorganic from wastewater matrices	1
20	Safety infrastructure for management of hazardous waste	1

1. General/Prerequisite Conditions: SERB (CRG/2022/003926)

- The technical specifications for all the equipments are designed and planned to procure purely for the specific research purposes
- All the supplies including local supplies (Computer, printer, UPS/Standards/Gases/Cylinders/UPS for the instrument) should be quoted/mentioned exclusively to ensure the operational conditions of the equipment immediately after the installation for target parameter analysis.
- Apart from the standard warranty as provided by the OEM/Dealer/Distributor, the extended warranty for a total period of upto 5 years should also be quoted "**SEPARATELY**."

Instrument Details for SERB (CRG/2022/003926):

- **Atleast one week Technical/Analytical Traning by the Certified Professionals must be provided free of cost.**
- **All OEM/Dealer/Distributors must submit detials of installation done in different institutions in the last 5-10 years in India, separately for all equipments etc.**

S No.	Name of the Instrument	Quantity
1.	FTIR/PID/EC/NDIR gas analyser/(s) for CO, CO2, NO, NO2, SO2, O3	1
2.	Hydrothermal Autoclave 200 mL	1
3.	Total VOCs PID Sensing monitors	1
4.	High temperature Horizontal Tubular Furnace	1

4/12/23

1. General/Prerequisite Conditions: SERB (EEQ/2022/000967)

- The technical specifications for all the equipments are designed and planned to procure purely for the specific research purposes
- All the supplies including local supplies (Computer, printer, UPS/Standards/Gases/Cylinders/UPS for the instrument) should be quoted/mentioned exclusively to ensure the operational conditions of the equipment immediately after the installation for target parameter analysis.
- Apart from the standard warranty as provided by the OEM/Dealer/Distributor, the extended warranty for a total period of upto 5 years should also be quoted "**SEPARATELY**."
- **Atleast one week Technical/Analytical Traning by the Certified Professionals must be provided free of cost.**
- **All OEM/Dealer/Distributors must submit detials of installation done in different institutions in the last 5-10 years in India, separately for all equipments etc.**

S No.	Name of the Instrument	Quantity
1.	Tunable Optical Source and Photoelectrochemical Cell	1

4/8/23

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(1) Scanning Electron Microscope (SEM) with EDS

The Scanning Electron microscope (SEM) with other accessories should be state-of-the art, latest in design & technology, suitable for analyzing all kinds of samples with micro to nano scale dimensions, which will be either coated/uncoated, conductive/non-conductive, while imaging and with elemental analysis by EDS which must be integrated & embedded in the same SEM user interface that gives live compositional information. The detailed technical specifications are given below.

System Technical Descriptions & Specifications in details:

S No	Technical Features	Technical Descriptions / Specifications
1	Resolution	**High Vacuum:** • 3 nm or better at 30 kV with Secondary Electron Detector (SED) • 8 nm or better at 3 kV with Secondary Electron Detector (SED) **Low Vacuum:** • 3 nm or better at 30 kV with Secondary Electron Detector (SED) • 10 nm or better at 3 kV with Secondary Electron Detector (SED) • 4 nm or better at 30 kV with **Back Scattered Electron Detector (BSED)**
2	Operational Modes	High Vacuum and Variable Pressure (Low Vacuum) modes
3	Accelerating Voltage	From 200 V to 30 kV, with incremental step of 10 volts.
4	Probe Current	Up to 2 µA or more.
5	Magnification	10x to 10,00,000x - continuous magnification.
6	Electron Source	• High performance pre-centered thermal emission Tungsten filament based on tetrode gun technology. • The filament exchange should be easy, and the alignment procedure should be fully automatic.
7	Electron Column /Gun	• High-performance thermal emission SEM column with Tungsten Electron Source. • Stable & fully electronically aligned column for ease of operation. • The system should have through-the-lens differential pumping technology to reduces beam skirting for the most accurate analysis and highest resolution at low accelerating voltage & in low vacuum.

8	Lens Configurations	• The SEM should be equipped with suitable condenser lens and objective lenses. The system should have movable and adjustable aperture from outside for both imaging and analysis purpose.
9	Vacuum System	• Should give ultra-clean high vacuum using Turbo Molecular Pump and backed by rotary pump. • Should be able to operate under variable pressure in the chamber with at least 150 Pa or higher. • Safety measures for electron column against any vacuum failure should be present.
10	Specimen Chamber:	• Large specimen chamber with internal dimensions 270 mm or more inner width. • Minimum number of free ports available in the chamber should be 5 nos. for future upgradation of additional accessories. • IR-CCD camera should be integrated for viewing the samples and other components inside the chamber. • Software controlled integrated color optical navigation camera for better sample navigation in the chamber. • The system must include through-the-lens differential pumping to reduce beam skirting for accurate analysis and achieving the highest resolution imaging at low accelerating voltage in both high and low vacuum modes.
11	Stage Specification:	5-axis motorized stage with movement facility: • X = 120 mm or higher; Y =120 mm or higher; Z = 55 mm or higher • Tilt = –15° to 90°; Rotation = 360° - continuous. • Manual Joystick (or equivalent) device to adjust manual stage movements in all axis additionally should also be included. • Stage Should be able to accommodate samples of size up to 135 mm diameter or more and height 70 mm or more with full stage movements. • Facility to accommodate multiple specimens (at least 7 nos. or more, 12 mm dia stub) at a time.
12	Detectors	The SEM should be equipped with following detectors: • Secondary Electron Detector (ET-SED). • Retractable Back Scattered Electron Detector (BSED) • Secondary Electron detector for working in Low Vacuum or Variable Pressure mode. • Energy Dispersive Spectroscopy (EDS) Detector (details are given below) • The system must be capable to detects up to four signals simultaneously from any combination of the available detectors.
13	System control & Image processor	• High-end Computer system with high-capacity Hard disk and CD/DVD writer drive, high quality 24" TFT LCD color monitor, Keyboard, mouse, color printer. The PC should be equipped with latest licensed windows operating system (Windows 10). The system

		control should be with 64-bit GUI with Windows 10 OS, keyboard, optical mouse. • Customizable graphical user interface, with up to four simultaneously active views. • Up to 6k x 4k pixels image processor • File storage format: TIFF, JPEG, BMP • The image display should be single-frame or 4-view/quad display • Drift Compensated Frame Integration facility should be available
14	Automation and Computer Control	• Fully automated operation through latest and state-of-the art system software providing, various image processing and measurement features, safety measures, auto contrast, auto focus, auto stigma, auto gun alignment and biasing, maintenance videos, click centre zoom, frame step move, saving position coordinate, custom icon, seamless auto bias.
15	Standard Accessories / consumables for SEM:	• Control panel for manual user interface with keyboard, mouse, knobs etc. for operating various frequently used parameters like contrast, brightness, Magnification, etc., manually. • Suitable Sputter Coater Unit with pump for Gold/Gold-Palladium conductive coating for non-conducting samples to be analyzed in SEM with 1 additional gold target. • Double sided adessive Carbon conductive tapes- 5 nos. • Multiple sample holder - Standard specimen holder for holding at least 7 specimen stubs or more. • Standard Specimen Stub: 20 nos. • Tungsten Filament: 100 nos. • Sample preparation & starter kit: This should include a stereo microscope, handling tools, several types of tweezers, a range of sample stubs, different types of sample mounting glue or tape, gloves, storage boxes, and other tools and supplies.
16	Energy Dispersive X-Ray (EDS) Spectroscopy System:	• The EDS system should be integrated with SEM system (embedded) in single user interface to operate seamlessly with Liquid Nitrogen free SDD Detector (integrated with Peltier cooling arrangement) for elemental analysis bringing live quantitative elemental imaging accessing while imaging with one click. • Energy resolution of 129 eV or better. • The EDS should detect energy of element starting from Be (4) to Am (95). • Detector area 25 mm^2 or higher. • Detector window should be made by robust material to protect from physical damage and should have design to increase X ray transmissivity increased light element sensitivity. • A software package should be included and the same should be able to give live quantitative compositional imaging with automated elemental identification, including image coloring, user selectable coloring, and flexible element selection to easily highlight the relevant

		features of the sample; Standardless quantitative & qualitative analysis; quantification by point, multiple points, area and line scan; Conventional EDS element mappings are either directly collected or converted from the color image; EDS data collection and storage; generation of analysis reports; export of spectral EDS data to any easy format.
17	Warranty	As per **General/Prerequisite Conditions** (Page-1)
18	Pre-installation requirements	Please enclose the pre-installation details required for the offered system.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(2) Multiwavelength Thermal/ Optical Carbon Analyzer

The Multiwavelength Thermal/Optical Carbon Analyzer be designed to quantify organic carbon (OC) and elemental carbon (EC) and temperature-separated carbon fractions on aerosol filter deposits. Carbonate carbon should be analysed with acidification, and black carbon (BC) and brown carbon (BrC) should be estimated through the optical measurements.

1. The instrument should have the following outputs:
   a. Quantitative OC
   b. Quantitative EC and Carbonate carbon
   c. Reflectance (R) and transmittance (T) at seven wavelength ranging 405-980 nm or better
   d. Spectral light absorption and estimation of BC and BrC
2. The analyzer should have the autoloader with a provision to keep at least 40 sample filter punches. The autoloader should also have the appropriate cooling system to prevent sample loss.
3. The instrument should analyze OC/EC by different internationally used analytical protocols like IMPROVE-A and NIOSH with an option to create any customised analysis protocols as per user requirement.
4. High intensity light source and perpendicular measurement of reflectance and transmittance.
5. The instrument should have an injection port to permit analyzer calibration with gaseous standards. The same port be used for acidification of sample within the analyser during direct carbonate carbon (CC) analysis.
6. Automatic boat feeding system and protective locking of advancement of boat until the system is ready for the next sample analysis.
7. The sample oven and oxidation oven temperatures be controlled by temperature controllers. The thermocouple tip in the sample oven be located directly underneath the filter disc to monitor actual sample temperature during analysis.
8. Measurement range: 0.05 to 750 µg carbon/cm^2.
9. Detection limit: Total OC 0.43 µg/cm^2, Total EC 0.12 µg/cm^2 and Total carbon 0.49 µg/cm^2.
10. Sample oven temperature should be in the range of 60°C-900°C with heating rate of minimum 250°C/min. Temperature accuracy ±5 °C or 1%, whichever is greater.
11. Wavelengths: 405, 445, 532, 635, 780, 808 and 980 nm
12. The system should use Nondispersive infrared (NDIR) detector to measure CO_2 directly and does not use a methanator. The analyzer should use mass flow controllers (MFC) for precise flow control and measurements.
13. Analyzer operates at 220 V, 50 Hz.
14. The software should be user-friendly for IMPROVE-A protocol. The system should be designed to facility easy maintenance and repair.
15. The gases required to operate the analyzer are Ultra High Purity (UHP) helium (>99.999% purity), 10% oxygen in UHP helium, 5% Methane in UHP helium, and compressed air.
16. Installation requirements should be clearly mentioned & offered separately.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(3) Fourier Transform Infrared Spectroscopy and Microscopy System along with accessories

Instrument and Analysis Modes	A standalone computer controlled, fully integrated FTIR Microscope with built-in source, interferometer and detector. System should have Transmission, Reflectance and ATR analysis mode.
Detectors	FTIR Microscopy system should have one Room temperature DTGS/DLaTGS detector and one Liquid Nitrogen cooled MCT detector for doing microscopy and area imaging modes and system should hold both the detectors simultaneously and should be selected through software. It must be noted that low performance TE cooled MCT will not be acceptable. High Performance MCT with LN2 cooling must be offered.
Spectral range	FTIR Microscopy: With MCT detector it must cover 7800-650 cm-1 DTGS/DLaTGS- 7600-450 cm-1.
Optics	Gold coating of infrared optics is essential for better reflection/transmission analysis detectors and aperture mirrors. Superior sensitivity and maximum efficiency in an infrared sampling mode allows room temperature liquid-nitrogen free analysis
Signal to Noise Ratio	Better than 25000:1, @ 100 µm, 2100–2000 cm-1, 4 cm-1 Resolution, 2 mins scans.
Micro ATR	Germanium crystal with a minimum size of 350 micron should be quoted for microscopy applications and it should have Built-in pressure monitoring sensor device with custom adjustable maximum pressure. With the combination of MCT detector, motorized stage and Micro ATR, the system must analyses the particle upto 3 micrometers or lesser..
Objective:	15X with 0.7 NA or better.

Stage:	2.5" x 5" high precision motorized stage and joystick should be included. The stage must also Includes slide plate holder with built-in gold mirror and void position for automatic background collection in reflection and transmission.
Collection Speed	Interferometer : 10 scans/sec and Stage : 10 Steps/Sec.
Illumination:	Software controlled independent LED for Reflectance, Transmission and aperture.
Sample View:	User should have the facility to view the sample while doing FTIR measurement. High resolution color digital camera with at leat 1024 × 768 low-noise CCD. Real-time view must be 500 micron field of view. Instrument must have feature for real time/simultaneous view of sample aperture positioned, even during collection.
Interferometer:	Permanent/Dynamically aligned/ rotary high-speed interferometer with 10 years warranty.
Beamsplitter:	KBr beamsplitter, ZnSe beam Splitter will not be accepted as they will not cover the desired spectral range.
Laser:	He-Ne/Solid State laser source.
FTIR source:	Externally mountable air cooled source or equivalent.
Purge Facility	Purging Kit should be quoted.
Software	• Principle Component Application, Multivariate Curve Resolution, Image processing using different profiles like peak area, peak height etc. • Particle size analysis including counting number of particles along with IR spectra • Software should capable for microscopic analysis of microparticles with different size and shape. • The size and locations of identified regions should be used to position the specimen to align each region with an aperture and so to set the aperture to a size appropriate for collecting a spectrum from the region of interest. • Software should have automated mixture analysis software for chemical identification of unknown sample especially multiple component sample by a completely automated way and report best possible spectral matches using spectral libraries. • Software should have facility to perform analysis in Automated way

	• Identification of particles of different size and adjusting the aperture accordingly before spectral acquisition; • Identification of inclusions without spectral contribution from embedding material; • Self-extraction of distribution information of multiple materials within an area along with material identification, total area and distribution, for each material identified; Identification of identifies layers and calculates thicknesses by spectral match
Libraries	with over 30000 spectra including forensic libraries, Plasticizers and additives, polymer, white powders, Georgia state crime lab drug, common organic and inorganic compounds, Vapor phase library
FTIR Spectrophotometer	System must be offered with FTIR spectrophotometer with large sample compartment enough to accommodate 10cm transmission cell and third party FTIR accessory. 0.5cm-1 resolution and 35,000:1 SNR. Must have DTGS detector and 10 years warranty on source, interferometer and laser. System must have built in NIST traceable polystyrene film with 5 years validity.
Accessories	For FTIR Microscope : Micro Sampling tool kit with all the necessary things like pin vise, blades, roller knife, etc. must be supplied with the system. KBr, BaF2 disks, 5 gold coated reflectance slides should be quoted. For FTIR Spectrophotometer : Diamond ATR for FTIR system with 5 years warranty on optical base and ATR crystal. Transmission Kit for Making pellets. Demountable cells with ZnSe and KBr Windows.
Other Items	PC – 2Nos. with 21 Inch Monitor Printer UPS 5 KVA with 30 minutes back up – 2 Nos. Liquid Nitrogen transfer container and dewar flask.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(4) FIXED VOC MONITOR

Specification:

Wide Detection Range: 0.001 ppm to 20,000 ppm (Gas dependent)
Features:

- Fence Electrode
- Should have technology for best PID performance.
- Facility for easy change of mini PID detector, electrode stack and lamp
- Batteries are to be certified to be changed within hazardous areas.
- It is to have Intrinsically sage; ATEX; IECEx and CUL approvals.
- Loud audible sounders 95Dba or More
- Automatic Downloading option, 1,20,000 Data points or more

Intrinsically safe approvals as mentioned below:

- II 1G Ex ia IIC T4 Ga
- Tamb = 5°F ≤Ta ≤ +113°F (with lithium ion battery pack)
- Tamb = 5°F ≤Ta ≤ 104°F (with alkaline battery pack)
- ITS-I22ATEX35111X
- IECEx ITS 22.0025X
- ITS22UKEX0635X
- 3193491 conforms to UL
- Std. 913, 61010-1
- Certified to CAN/CSA Std.
- C22.2 No. 61010-1
- Class 1 Division 1. Approval for Groups A, B, C & D, T4
- Humidity: 0-99% RH (non-condensing)
- Lamps :10.6 eV Krypton PID lamp (standard.) Optionally available :10.0 eV and 11.7 eV lamps to
- Data logging: 120,000 points including date and time stamp.
- Communication: Direct USB 1.1 connection
- Calibration: 2- and 3-point calibration (via calibration kit accessory)

- Battery life: Li-ion: Typical battery life up to 24 hours, charge time typically 8 hours • Alkaline: 3 x AA, typically 8.5 hours life

Flow Rate: ≥ 220 ml/min (with blocked flow alarm)

Protection:

- Designed to IP65
- EMC tested to EN61326- 1:2013 & EN50270:2015 & CFR 47:2008 Class A

Alarm

- Flashing LEDs Amber (low alarm) Red (high alarm)
- Sounder 95 dBA at 300 mm (12")
- Vibration on alarm
- Pre-programmed TWA and STEL*

PERFORMANCE (Gas Dependent)	
Minimum Sensitivity (Specifications are based on isobutylene calibrations at 20 °C and 1000mBar)	1 ppb or 0.001 mg/m3
Maximum Reading (Range) -Maximum reading is achieved with certain analytes such as ethanol	20,000 ppm or 20,000 mg/m3 Specifications are based on isobutylene calibrations at 20 ° C & 1000mBar. All specifications quoted are at calibration point and under the same ambient conditions
Accuracy ((Specifications are based on isobutylene calibrations at 20 °C and 1000mBar)	± 5% or ± one digit
Response Time T90 (s)	< 2 seconds
Lamp Lifetime	10,000 hours
Temperature Rang	4 deg F to 140 deg C

Upgradeable Features to be available:

The System to be fully upgradeable to allow users to add further functionality if required. Upgradable features should include Health and Safety mode, PPB Sensitivity, Data Logging, Single Log Only (Push to Log) and Multi Log Only. The model to be fully upgradable without having to return the instrument to the factory.

Typical Applications

Typical applications to include Environmental Monitoring, Soil Contamination Detection, VOCs in Landfill, Confined Space Entry, Emergency Response, Wing Tank Entry, Medical Gases within Hospitals and Fugitive Emissions.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(5) Fully Automatic Gas Sorption (BET Surface Area) Analyser

A fully automatic, high resolution gas sorption analyzer for the determination surface area, mesopore size and micropore distributions from 0.35 to 500nm is required for high throughput micropore BET Measurements. The system should handle all types of sample like powder, pellet & monolith forms. The system should also be capable of upgrading for addition of Physisorption stations and for performing complete Chemisorption analysis for TPR, TPO, TPD job along with Pulse Chemisorption in the same system at a later date on site.

The Instrument is expected to have continuous Po measurement using a dedicated glass cell and transducer without interruption to the analysis. The instrument should have a fully integrated, built-in/external vacuum system using an oil-free turbo pump package. The Instrument should include four or more dedicated degassing stations with access to turbo vacuum via cold-trap. The Instrument should be able to use any non-corrosive gas such as nitrogen, argon, krypton, carbon dioxide, hydrogen, carbon monoxide, butane, etc. The system should have two physisorption analysis stations. Both the physisorption ports should work simultaneously and independently. One should be fitted with a set of transducers (1000 torr, 10 torr & 0.1 torr) and the other with 1000 torr transducer.

The Instrument should have the following Measurement criteria:

1. **Surface area:** BET, Langmuir, t-plot, BJH/DH, DR, DFT
2. **Mesopore size:** NLDFT, BJH/DH, Kr thin film
3. **Micropore Size:** NLDFT, QSDFT, SF, HK, MP method, DA, Monte Carlo
4. **Pore Volume:** Gurvich, α-s, BJH/DH, DFT, DR
5. **Adsorption energy:** Clausius-Clapeyron, DR
6. **Fractals:** FHH, NK

The Instrument should have following basic measurement specifications:

a) Surface area using nitrogen: 0.01 m2/g and above
b) Sensitivity: $<2 \times 10^{-9}$ moles adsorbed/desorbed gas with 0.1 torr tansducer
A. Maximum P/Po using nitrogen/argon: 0.999
B. Ultimate vacuum: 5×10^{-10} mbar

The Instrument should have Following Analysis Features:

I. A High-vacuum construction using metal-to-metal seals is expected for long life performance.
II. The system should have the smallest void volume.
III. The Instrument should use low cold zone technology to enhance sensitivity such that all of cell stem is not cooled.
IV. The System should constantly monitor measurement of manifold temperature and pressure.
V. The system should have multiple dosing modes using a target P/Po or fixed volumes in multiple ranges.
VI. A dosing intelligence feature to use prior analysis as template for dosing in subsequent runs.
VII. The Instrument should measure void volume automatically or re-use value already measured.
VIII. The saturation pressure should be constantly measured or user entered.
IX. The system should have atleast 3 liter or larger Dewar to extend uninterrupted analysis time to 90+ hours without refill.
X. The system should have automatic selection of analysis gas from five inputs.

The Instrument should have following sample degassing features:

i. The system should degas four or more sample simultaneously.
ii. The degassing should be able to program multiple heating ramps and hold times.
iii. The system should have programmable evacuation to avoid elutriation.
iv. The system should have smart degassing to monitor pressure and pause heating if requested.
v. The smart degassing should be able to automatically terminate heating according to programmable test.
vi. The system should automatic backfill from dedicated gas input or isolate under vacuum at end of degassing.
vii. The Degassing protocols should be able to be saved for later use.
viii. The Degassing protocols should be able to be stored along with analysis data.
ix. The Vacuum path should have refillable cold trap for best degas vacuum levels.
x. The Heating mantles should have dual, independent thermocouples for over-temperature safety.
xi. The Heating mantles should be supported by retractable tethers to eliminate hot metal clips for ease of use.
xii. The Heating mantle temperature should go upto 350^0 C.

Accessories to be supplied along with the system:

1. Compatible Computer with i5 configuration and b/w printer
2. Suitable standards for micropore & mesopore range should be quoted.
3. Gas cylinders must be 99.999% Ultra High Purity with two stage gas regulators. Nitrogen, CO2 & Helium gas should be supplied.
4. The system should have full capability for CO2 adsorption studies at different temperatures.
5. A LN2 container of 10L capacity to be supplied along with the system.
6. A 5 KVA UPS system with 30 min backup to be supplied along with the system.
7. The complete system should be compatible to 200-240 V, 50Hz, single phase power supply.
8. Vendor should provide installation details of atleast 10 similar installations in India.
9. The vendor should have full fledged 'Application Lab' in India to assist us for all our supports.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(6) GC based Portable BTEX ANALYZER

Fully Portable BTEX Analyzer based on GC PID technology (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) for continuously measures real time in ambient air, both indoors and outdoors.

Compliance and Certification: System should be complied with EN14662-3:2015.
System should be Light Weight, Compact, Battery operated for field operation.
System have stand alone and cabinet integration mounting.

System should be Integrated PC board.

It should use ambient air as carrier gas.

It should have MEMS pre concentrator and MEMS Column.

Column temperature range 45°C to 170°C (adjustable)
Sample Flow Rate 260 - 400 sccm
Detector: High-sensitivity PID - Photo Ionization Detector (10,6 eV)

System Analysed Gases: Benzene, Toluene, Ethylbenzene, Xylenes.

Analytical performance range: 0,10 – 40ppb µg/m3 benzene
with 15 min analysis cycles.

Lower Detection Limit: <0,04 µg/m3 of benzene
Communication interfaces: Ethernet, Wi-Fi, 4G

System have Data Storage Internal Flash Memory of continuous measurements.

Instrument control and data access: · Local WebServer, accessible with a common browser (IE, Firefox, Chrome) · MODBUS su TCP server, ·
Power: Input 100-240VAC, 50-60Hz.
Power consumption Maximum 25W.

Weight: approx. 20 kg with auto calib unit & battery.

Dimensions: 420X630X220 mm.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(7) Gas Analyzer

1. FTIR based Gas Analyser, spectrometer should be able to record the spectrum of a sample in the wavenumber region of 6000 - 650cm-1 or suitable range that can imply to quantify CO, CO2, NO, NO2, SO2 and other inorganic and organic gaseous components up to ppb levels most accurately and enough separated peaks for all gaseous components. The gas analyser should be most suitable for measurement of said gaseous components in smoke plume emitted from domestic heating activities at the inlet of reactor filled with gas adsorbent materials and at the outlet of the same reactor. **The details of required configuration also described in Item No. 19.**
2. Interferometer: Dynamically aligned or any equivalent interferometer. Permanently aligned interferometer will not be accepted as it's not field repairable **OR suitable to carryout measurement experiment as described in Item No. 19.**
3. Detector : high speed liquid nitrogen cooled MCT, **OR suitable to carryout measurement experiment as described in Item No. 19.**
4. Performance : Fast analysis, capable of collecting and analyzing spectra at 2 scans resolution and reproducibility on the market per second at 0.5 cm-1 **or resolution value that separate peaks for all gaseous components including CO, CO2, NO, NO2, SO2, O3 and other organic and inorganic gaseous components and also separate and minimize background noise peaks as required to carryout measurement experiment as described in Item No. 19**
5. Gas Cell : System must be supplied with 10 meter gas cell with temperature controller option to work from 40 – 180 deg. C. System must be capable of changing to different pathlength and type of cell **as per application as described in Item No. 19**
6. Pressure Gauge : System must include pressure transducer to measure the pressure inside the cell to address the requirement described in item-19.
7. Software : Chemometric Software for Method Development, Quantitative measurements: CLS, PLS, PCR, SMLR, Beer's Law, Qualitative measurement including: QC compare, Search Standards, Similarity Match, Distance Match, Discriminant Analysis; Measure only mode: peak height, peak location, area, ratio, signal-to noise, Automatic method, region, pathlength, standard selection; Variety of pathlength and baseline correction tools; Diagnostic tools including Principle Components, Variance spectrum, Pure Component Spectra, Correlation Spectra, Cross Validation (RMSECV) **OR suitable software to carryout measurement experiment as described in Item No. 19**
8. System must be supplied with purging system with necessary regulators and tubing.
9. Suitable PC and UPS must be supplied with the system. Liquid nitrogen container with 30 litre capacity and dewar flask to pour liquid nitrogen in the detector assembly must be quoted with the system if required to meetout the requirements as per measurement described in Item-19.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(8) Steady State Fluorescence Spectrophotometer with Accessories

Technical Specification

Research spectrofluorometer with ozone free xenon lamp and power supply. Capable of automatic acquisition of corrected emission and excitation spectra, polarization spectra, synchronous luminescence spectra, anisotropy and kinetic studies.

Optics

- All reflective optics for perfect focus at all wavelengths from UV to NIR

Excitation Source

- 150W or higher ozone free Xenon Arc lamp (continuous source)
- Xenon pulse lamp for longer lifetime (phosphorescence measurement)
- Automatic selection of lamp through software

Spectrometer

Excitation

Czerny-Turner monochromator, accuracy ±0.5 nm or better, range 200-900 nm (preferred), with software controlled continuously variable spectral band pass 0 to 20 nm or better.

Emission

Czerny-Turner monochromator with software controlled double grating turret, accuracy ±0.5 nm or better, range 200-950 nm (preferred) / 900-1600 nm (optional future upgrade), with software controlled continuously variable spectral band pass 0 to 20 nm or better

Detector

Photon counting detection technique.
Emission detector: Air cooled PMT, 200 - 850 nm or better.
Silicon photodiode reference detector (to monitor excitation source fluctuations)
Must be future upgradable for NIR Detection (up to 1550 nm)

Lifetime Measurement

- MCS or suitable technique based Longer lifetime from microseconds to seconds
- TCSPC technique based Shorter lifetime from picoseconds to microseconds
- Necessary detector in UV-Vis range for lifetime measurements must be offered

TCSPC Lifetime

- TCSPC Controller with timing electronics
- Repetition rate: 100 MHz or better
- Snap ON, snap OFF excitation sources with pre-focused optics
- Laser Diode, 375 nm, Pulse Width maximum 70 ps, Average power: minimum 1.8 mW
- Laser Diode, 415 nm, Pulse Width maximum 90 ps, Average power: minimum 1.7 mW

- Laser Diode, 508 nm, Pulse Width maximum 140 ps, Average power: minimum 1.4 mW
- Laser Diode, 560 nm, Pulse Width maximum 120 ps, Average power: minimum 1.2 mW
- All the Laser Diodes must be operated at 10 - 100 MHz

Sensitivity

Signal-to-Noise ratio for Raman band of water: 10,000:1 or better (FSD method). Water Raman signal must be minimum 500,000 cps (Ex: 350nm, BP: 5nm, Integration: 1sec, no averaging, room temperature PMT)

Sample Compartment and accessories

- Sample chamber with all reflective optics (mirror based, no lens based)
- Front face viewing Solid Sample Holder for thin films, powders, pellets, slides etc.

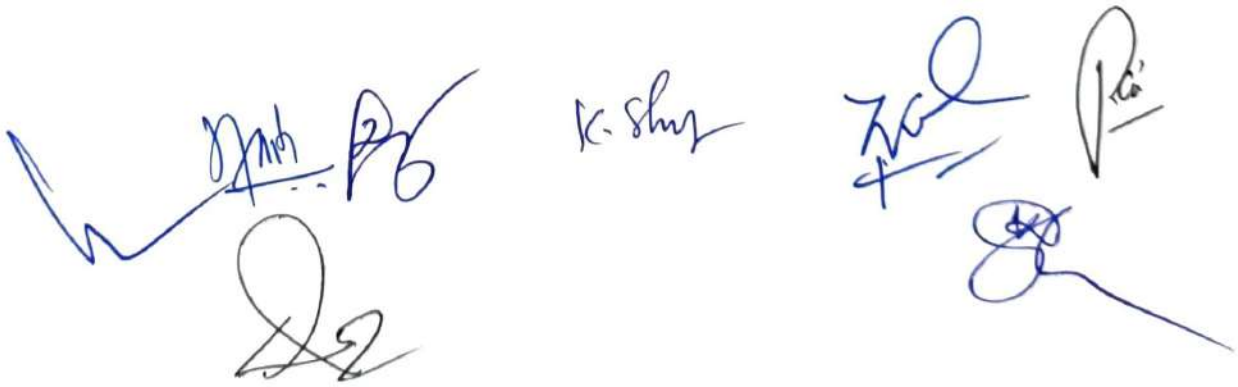
Computer hardware and software

Suitable computer workstation and all interfacing hardware and software (should be easily up-gradable) for instrument control, data control, data acquisition, data storage and data processing for steady-state and time resolved multi-user licence for data analysis software.

Suitable UPS for installation of the instrument . Please provide the details of Prerequisites.

Essential Accessories

1. Quartz Cuvette open top with lid, 10mm pathlength, volume 3ml & 1ml each --- 2 nos.
2. Set of five cut-on (longpass) filters with low fluorescence background: cut-on at 370, 399, 450,500, and 550nm (filter wavelength is 50% transmittance).



TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(9) Automated Electrospinning Machine

Plexiglass cabin HxWxD: 770mm x 800mm x 700mm
System overall dimensions: 850 x 1150 x 1250 mm
Should come with sheet metal enclosures
Should include tunable high voltage supply +30kV power supply
110-240V AC +/- 10% 50/60Hz single phase 0 to 30 KV continuously varying
Digital voltage and current monitoring and control using remote
control via PLC (Siemens Needed)
Line and load voltage regulation 50ppm or 5/100KV
Ripple voltage less than 0.1% peak-to-peak
Over voltage protection: Cut-off when voltage is 10% over max
Over current protection: High voltage cut off when current exceeds
10% of the max output current
Protection against output short circuit and arc discharge
Over temperature protection
Upgrade Option to expand to single +40kV tunable high voltage supply is required
7-inch HMI touchscreen- Siemens interface with computer PC with
data communication port needed
Controlled from touch panel Easy to use GUI, recipe functionality
Should be fitted with LED Lighting and Status Indicator
Should be fitted Safety Features
Should be fitted with illuminating light True white LED strips
Exhausted cabinet - Ventilation flange for the cabinet
High quality 10mm fully transparent plexiglass cabinet with sheet
metal foundation enclosure for electronics
Emergency stop is needed

Main Switch and Door-switch required

To included syringe pump

5 µl – 60 ml syringe compatible

Expansion or Upgrade Option for two separate syringe pumps with independent stepper motor and drive units, independent PLC control needed,

independent speed adjust

Infusion function and Volume, time and flow control included

Adjusting resolution 0.02 µl/min

Flow rate 0.001 ml/hr (1mL syringe) to 1.1 ml/sec (60mL

syringe) should be possible

Stationary flat plate collector-Electroplated Stainless Steel conductive plate

200mm x 200mm or custom size should be available for future

Drum Collector- Aluminium drum diameter Ø120mm Width 250mm

100-3000 rpm DRUM revolution speed

Revolution speed manual and automatic control needed

Collection area 376mm x 250mm (94000 mm2)

Start control and Stop control and Speed control in rpm

Connected to the electrical ground as desired

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(10) A. PC-CONTROLLED TL / OSL READER

I.TL / OSL Stimulation & Detection chamber

It is to be light leakage free, precisely fabricated mechanical assembly, housing photon counting module with detection filter basket, LED stimulation assemblies (four) diagonally placed around photon counting module cylindrical enclosure. TL/OSL sample holders with Kanthal heater strip & drawer arrangement are also to be built-into this chamber.

II. Optical Stimulation Assembly

Optical Stimulation System consisting of BLUE & GREEN LED cluster(s) with, each LED of 3-watt power. Either BLUE or GREEN LED cluster(s) each cluster containing two LEDs to be stimulated. These LEDS are to be placed diagonally 180^0 opposite, with suitable lens arrangement, to provide uniform luminous intensity onto the sample area.

Constant Current Driver:

Electronic circuits are to be built-in provide Constant current drive to each of the LED clusters with dimming control, to vary the luminous intensity.

Stimulation Filter:

Each of the LEDs assembly is to be provided with a long pass, stimulation filter of 420nm of 12.5mm dia to prevent the scattering of light below 420nm, entering the PMT directly.

Focusing Lense:

A suitable focusing Plano-concave lens is to be provided in front of the LEDs to focus the light on to the OSL samples placed in the planchet.

Heat Sink:

Each of the LED assembly to be provided with a specially designed Heat sink (cylindrical) to keep the LED at lower temperature to obtain uniform illumination, onto the sample holder.

III.TL-OSL READER-Light Detection System/Photon Counting Module

Photon counting module to be an integral part of the TL-OSL Reader. Photon counts received from the luminescence emission from the TL / OSL materials are to be counted in these module & the data counts are to be transferred to PC, thru RS232/USB interface. This module essentially is to be plugged-and play photo detector package, comprising of selected 25mm diameter end window PMT, a positive high voltage power supply, high speed amplifier- discriminator, counter & a microcontroller. All these are to be encapsulated with in a cylindrical mumetal case providing a high level of external magnetic shielding.

- PMT: 25 mm PMT with ultra-low dark counts.
- Count rate capacity: 100 MHz
- High Voltage: Built –in & set to optimum value.
- PC Interface: RS 232 / USB serial port.

IV.TL Heating System

Heating Element: (Heater Strip)

Kanthal strip (72% Fe, 23% Al and 2% Cr or Nichrome) is to be used as a heating element. Kanthal Strip with circular depression of 14mm to hold discs and powder samples to be provided. Additionally flat heater strips are to be provided on request.

Sample Heating Process:

Sample heating to be done in two modes:

"PROG MODE" of Temp. control through personal computer program.

"ISO MODE" (Internal mode) of Temperature Control, by varying the ten-turn dial.

Temperature range / Programmed plateau heating:

From room temperature up to 500^0C linear &plateau heating (Single / Two / Three plateau heating are to be possible).

Heating Rates:

Heater strip to be programmed to heat the sample from 1^0C/sec up to 40^0C/sec and a max set temperature allowed is 500^0C.

Nitrogen Flushing Nozzle:

Nitrogen gas flushing nozzle, to suppress spurious luminescence from oxidation effects & also for cooling is to be provided, on the rear panel.

V.PC Configuration

Branded computer system with Intel Core i3 @ 3.06Ghz, 2GB DDR2 RAM, 500GB SATA, DVD R/W, Keyboard, and Internal ready Optical scroll, 19" TFT Monitor, Laser jet printer, Windows licensed OS-Windows 7.0/10/11

VI. Software features

TL / OSL reader system to operate thru PC controlled user-friendly software. Software to perform Self diagnostics of the system & report faults. Software facilitates one is to choose TL or OSL mode for sample data acquisition should allow the user to configure for the required heating profile in TL mode & other parameters as required in OSL mode. Once data is acquired, acquired data to be saved or further processed depending upon the requirement.

B. CCD Spectrometer

- Detector should be linear silicon CCD array type
- Pixels 2048
- Wavelength response 200-850 nm
- Data transfer Speed Full scans to memory every 3 ms w/USB 2.0 port
- Dynamic range 1300:1 for a single acquisition, 8.5 x 10^7 (system)
- SNR (Single to Noise Ratio) 250:1 at full signal
- Integration Time 1ms – 65Seconds

C. Muffle Furnace

- Inner Size: 150 mm W X 200 mm Ht. X 450 mm depth.
- Outer Size: 600 mm W X 600 Ht. X 750 mm depth.
- Construction: The outer of the furnace construction is to be with Mild steel sheet of 18 SWG (1.2mm) adequately supported with angles for making the structure study. The casing shall also to be provided with a perforated cover for the terminals on the sides to

ensure that there is an air gap to keep the outer casing temperature at less than 40^0C above ambient at maximum operation temperature of 1400^0C.

- Heating elements: Silicone carbide rods (1400^0C) (18 nos) of 14 mm dia. (cold zone) X 200 mm heating length X 550mm total Length to be provided on the sides of the furnace and to be placed vertically on both the sides (9 on each side).

- Insulation: The furnace shall be provided with 6" insulation all around comprising of 25 mm M 1600 board of Murugappan Make , 2" innermost insulation of Ceramic Board of 400 kg/cu.mt density, 2" of middle layer insulation of Ceramic Board of 280 kg/cu.mt density , and outermost 1.25" layer of ceramic wool blanket of 128 kg/cu.mt. density. There shall be an air gap of 1" all around the furnace which ensure that the wall temperature does not exceed 40^0C above ambient at maximum operation temperature of 1500^0C.

- Operation temp.: 1400^0C.

- Max. Temp.: 1450^0C.

- Control Panel: A control panel in fully wired condition with the following Components shall be provided below the furnace:

  - **1 no.s Programmable temperature controller (NIPPON Make) with 18 programs of 8 segments each, with input 90-240V, output : DC 24V; Input sensor configurable.**

  - **1 No. phase / pulse width operated thyristor.**

  - **1 No.s contactor of adequate capacity for the furnace.**

  - **1 no.s Pt./ Pt. Rh 13% (Type R) thermocouples of adequate length.**

  - **Ammeter and Voltmeter.**

  - **On / Off switches with indication lamps.**

<u>The following prerequisites are to be arranged.</u>

1. UPS: 2 KVA
2. Table 6' L X 3' W X 2.5' H Feet
3. Split Air Conditioner: 1.5 Ton
4. Proper Ducting for Fume Exhaust – to be used with Muffle Furnace

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(11) Muffle Furnaces with Fiber Insulation and Lift Door with Controller

- Heating elements on support tubes radiating freely into the furnace chamber to provide for particularly short heating times and a maximum temperature of 1400 °C.
- Tmax 1400 °C
- Heating from two sides
- Heating elements on support tubes ensure free heat radiation and a long service life.
- Only fibre materials be used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- Dual shell housing for low external temperatures and high stability
- Adjustable air inlet integrated in door.
- Exhaust air outlet in rear wall of furnace
- Solid state relays provide for low noise operation.
- Defined applications within the constraints of the operating instructions.
- NTLog Basic for controller: recording of process data with USB-flash drive Intuitive touch screen user interface.
- Easily understandable symbols for many functions
- High-contrast, colorful display of functions and temperature curves
- Precise and accurate temperature control
- Easy program entry and control of furnace functions
- Graphic display of temperature curves (program sequence)
- User levels
- Program status display with estimated end time and date
- Wlan-capable
- Documentation of the firing curves on USB storage medium in .csv file format
- Service information can be read out via USB stick.

- Clear presentation
- Modern layout
- Consistent, attractive design (controller landscape, controller portrait and app)
- 24 languages
- Plain text display
- Help menu for all important functions
- Configurable for all furnace families
- Can be parameterized for the different processes.
- 5 programs/ 4 steps
- Upto 2 settable functions
- Calibration option (10 base points)
- Touch panel
- NTLog (Real-time clock)
- USB interface
- Languages
(DE/EN/FR/IT/ES/RU/DK/NL/PL/PT/SE/CZ/HU/TR/RO/NO/EE/FI/HR/LV/LT/SK/SI/CN)

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

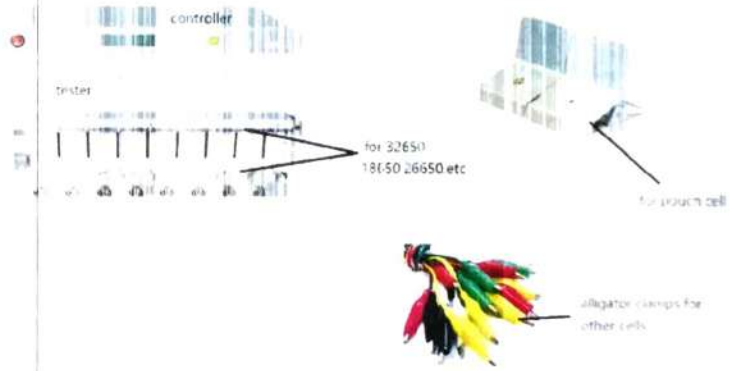
(12) 16 Channel Battery Testing Equipment with Communication Device and Compatible Computer

Project index		Parameter index
Input Power		AC220V ±10% / 50Hz
resolution		AD: 16bit; DA: 16bit
Input Resistance		≥1MΩ
Input Power		425W
Channel Features		Constant Current Source and Constant Voltage Source with Independent pairs of Closed-loop Structure
Channel Control Mode		Independent Control
Voltage	Constant voltage control range	25mV-5V
	DischargeMin Voltage	1.0V(with cylinder spring clamp)
	Accuracy	± 0.05% of FS
	Stability	± 0.05% of FS
Current	Output of per channel	Range1: 0.5mA~0.1A; Range2: 0.1A~6A
	Accuracy	± 0.05% of FS
	Cut-off current of CV	Range1: 0.2mA; Range2: 12mA
	Stability	± 0.05% of FS
Power	Per Channel Output Power	30W
	Stability	± 0.1% of FS
Time	Rise Time	The Current 10%-90% Hardware Response Time is 1ms
	Step Time Range	Single Step Time Range≤365*24 h, Time Form Support 00: 00: 00.000(h、min、s、ms)
		TimeΔt: 100ms

Project index		Parameter index
Data Recording	Record Condition	Voltage△U：10mV
		Current△I：Range1：0.2mA；Range2：12mA
	Record Frequency	10Hz
Charge	Charge Mode	Constant Current Charge、Constant Voltage Charge、Constant Current and Constant Voltage、ChargeConstant Power Charge
	End Conditon	Voltage、Current、Relative Time、Capacity、-△V
Discharge	Discharge Mode	Constant Current Discharge、Constant Power Discharge、Constant Resistance discharge
	End Condition	Voltage、Current、Relative Time、Capacity
Pulse	Charge	CCC,CPC
	Discharge	CCD,CPD
	Minimum Pulse Width	500ms
	Pulse	32 pulse setting in one step
	Automated Switch	Automated switch from charge to discharge for each pulse
Cycle	Loop Measure Range	1~65535 times
	Max Steps Per Loop	254
	Nested Loop	Nested loop Function，Max Support 3 Layers
Protection	Software Protection	● Power-down Data Protection
		● Setting Protection Condition，Setting Parameter：Low Voltage limit、Upper Voltage limit、Low Current limit、Upper Current limit、Delay Time
Voltage and Current Testing Sample		4-wire connecting
Noise		<85dB
Data Management		MYSQL Database
Communication Means		TCP/IP Protocol
Data Output		EXCEL、TXT
Communication Interface		Ethernet Port
Per Unit Main Channels No.		8

Project index	Parameter index
Dimensions	3U，W*D*H：480*330*130(mm)

Equipment Working Environment

Project index	Parameter index
Working Temperature Range	0°C~40°C
Storage Temperature Range	0°C~45°C
Working Environment Relative Humidity Range	30% ~ 80% RH
Storage Environment Relative Humidity Range	30% ~ 90% RH
Equipment Picture	
	Picture for Reference Only, take the material object as the standard.

5V10mA with another 8 channels for coin cells		
Description	Product Specification	
AC Input	AC 220V±10% 50Hz	
Power	25	W

Resolution		AD: 16bit; DA: 16bit	
Input Impedance		≥10GΩ	
Voltage	Measuring Range	Charge:25mV~5V	Discharge: 0mV~5V
	Discharge Min	0mV	
	Accuracy	± 0.05% of FS	
	Stability	± 0.05% of FS	
Current	Each channel output Range	1st range: 5uA~1mA	2nd range: 1mA~10mA
	Accuracy	± 0.05% of FS	
	Constant voltage cut-off current	0.02mA	
	Stability	± 0.05% of FS	
Power	Output Power Per Channel	50mW	
	Stability	± 0.1% of FS	
Time	Rise Time	1ms (0~Full Range)	
	Step Time	≤ (365*24)hour/step Time Format 00:00:00.000	
Data Acquisition	Intervals	Min. Time interval Δt:100ms	
		Min. Voltage interval ΔU: 10mV	
		Min. Current interval ΔI: 0.02mA	
	Frequency	10Hz	
Charge	Mode of Operation	CCC, CVC, CC & CVC,CPC	
	End Conditions	Voltage, Current, Test Time, Capacity,-ΔV	
Discharge	Mode of Operation	CCD, CPD,CRD	
	End Conditions	Voltage, Current, Test Time, Capacity,-ΔV	
Pulse	Charge	CCC,CPC	
	Discharge	CCD,CPC	
	Min Pulse Width	500ms	

	Pulse no.	Single pulse step support 32 different pulse
	Automated Switch	Automated switch from charge to discharge for each pulse
	End Condition	Voltage, Test Time
DCIR test	Support custom getting point then DCIR calculate	
Cycle	Cycles	65535
	Steps	254
	Nested Function	Max three levels of loops
Protective Function	Software	• Power-off data protection
		• Off-line Operating
		• User-defined safety(upper and lower)tolerance of current, voltage and delay time
IP Protection level	IP 20 protection level	
Channel Features		Independent pairs of closed loop for constant current source and constant voltage source
Channels		Independent control
Detection and Sampling		4-wire Connecting
Noise Density		<85dB
Data Management		MYSQL Database
Communication Means		TCP/IP Protocol
SOS		Windows 7
Export Formats		EXCEL2003, 2010,TXT
Communication Interface		Internet
Number of Channels Per Cabinet		8
Current leakage		0.0000005mA
Operating Environment		
Description		Product Specification
Operating Temperature		0°C~40°C
Storage Temperature		-10°C~50°C

Operating Humidity	≤70% RH
Storage Humidity	≤80% RH
Description	Product Specification
Project index	Parameter index
Working Temperature Range	0°C~40°C
Storage Temperature Range	-10°C~50°C
Working Environment Relative Humidity Range	≤70% RH
Storage Environment Relative Humidity Range	≤80% RH
Equipment Picture	(8CH) 8 channel per tester
	Picture for Reference Only, take the material object as the standard.
Clamp picture for Coin cell	

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

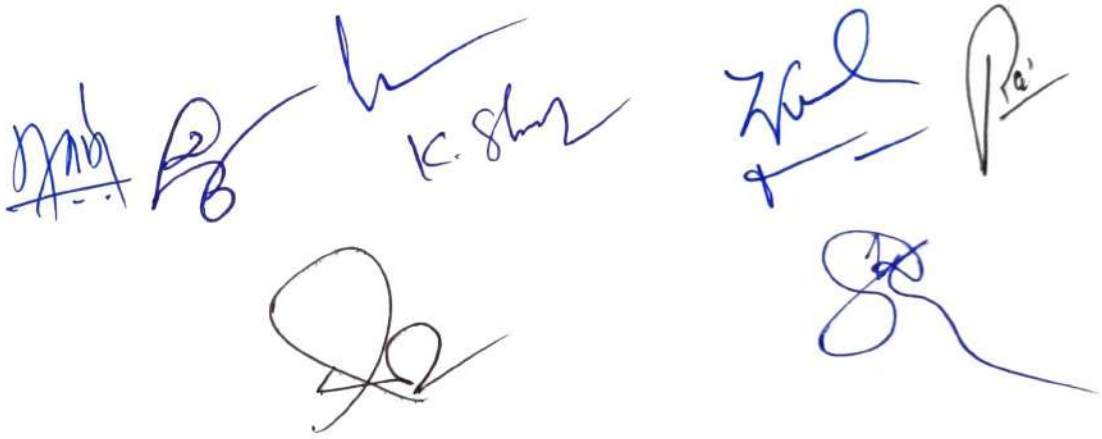
(13) Multichannel Electrochemical Workstation with 2 Channels or more

Configuration Design	Multichannel Electrochemical Workstation with 2 channels or more
General Description	• Multi-channel Electrochemical work station for testing and evaluating General electrochemistry, Battery, Corrosion, super capacitor, solar cell , Fuel cell and All Battery components in single/multiple unit cells simultaneously with high accuracy and precision • Chassis: Multichannel Single Chassis • High Precision Columbic Efficiency Determination upto 10 ppm • **All channels should have** Electrochemical Impedance Spectroscopy (EIS) measurements with Equivalent Circuit Modelling • Internal Resistance Determination • Software Controlled Data Acquisition with Minimum Sampling rate. • Floating mode and Ground mode both be available. • **EIS quality Indicator for measuring Total harmonic distortion and Noise to Signal ratio should be available.** • **Options for measuring Ewe Vs ref and Ece Vs Ref both** • **CE to Ground and WE to Ground both modes should be available.** • **Onsite hardware calibration should be available.**
Specification for Channels	• Cell Connection: 2, 3, 4, 5 electrodes (+ ground) or more and atleast1.5m Cell cable • Compliance voltage: 12 V or better per channel • Applied Voltage: ±10 V or better per channel • Maximum Output Current: ± 500 mA or better at ± 10 V per channel • Current Ranges: 10n to 500mA , • Accuracy of applied and measured current: 0.1% of FSR • Current resolutions: 800fA range • Resolution of applied potential: 1μV on 60mV range • Voltage accuracy: 0.1 % of Full scale range • Potentiostat Rise/fall Time: <500nS • Frequency range: 10μHz to 7 MHz

	• Impedance accuracy of 1% & 1° at 3MHz • Input Impedance: 1TΩ • Gain bandwidth range of amplifier: 1 MHz • Bandwidth of electrometer: 1 MHz • Input bias current: 20pA • Acquisition rate: 100000 samples/second • Cyclic Voltammetry with scan rates 10 mV/Sec to 200V/Sec or better • Ac Amplitude: 0.5mV – 2.5 V ☐ Interface for connection with PC: Ethernet LAN and USB ☐ Local Area Network to access Multiple Computers ☐ Possibility to upgrade to high current up to 30 A using booster
Complete software with following specification	• Galvanostatic Charge / Discharge (Including C rate control) with voltage vs. time Graph plots • Multigraph window capable of displaying up to 10 graphs within a single window • Customize variables graph plot for each axis • Voltage vs. Capacity plot during Charge/Discharge Cycles • Atleast 3 limits and 3 recording conditions per sequence/cycle (ability to limit a cycle or changeover to next sequence with Time, • Voltage/Current, Charge/Power all simultaneously) Multiple • recording conditions · Industrial CC-CV Method (Constant Current – • Constant Voltage) • Cyclic Voltammetry, Current Scan (Current/Galvano Dynamic), Voltage Scan (Potentio Dynamic) Constant Power / Constant Resistance

	• GITT and PITT Techniques • Columbic Efficiency Determination with fitting tool • Current Interrupt • Rest Time • Multiple loops • Provision to connect and control External devices like Furnace, Thermal chambers. • Monitoring status of each Channel using Global Table/Summary Table • Option to update the experimental setting parameters on current running experiment without pausing /stopping the channel/experiment. • Profile Importation to study Urban Life Cycle Tests • Modifying the parameter while running the experiment should be possible. • Analysis tools like Integral, Circular or linear fit and Electro chemical EIS -Z fit should be available.

Electrochemical Impedance Spectroscopy (EIS)	At least one channel should have EIS measurement facility with frequency range 10µHz to 7 MHz Real-time fit and simulation analysis as well as live data plotting option for simulation plot must be available as default software protocol. Real time needed for Lissajous curve, Nyquist, Bode, Admittance and Dielectric & Mott-Schottky. The fit and simulation software should include basic options such as find circle, element subtraction and an equivalent circuit library with all the modern EIS equivalent circuit models. Minimum visible plots in real time should be 8 or more. EIS Modelling with Equivalent Circuit Fits. Simultaneous impedance measurement at counter electrode and working electrode.
Accessories:	• Glassy carbon working electrode- 1no • Ag/AgCl reference electrode- 1no • Hg/HgSO4 Reference electrode-1no • Platinum Counter Electrode- 1no • Electrochemical cell with PTFE Cap at leat 20ml(5 nos)- 1no
Maintenance	The channels be plug & play type and easy to install or to be removed.
Dummy Cell	Dummy cell to be provided for internal validation.



TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(14) 3D PRINTER

- Big Build Volume: 400X300X300mm
- High Resolution: 0.04mm
- Reliable Enough: to run 24/7
- Compatible Filament
- Consumer-grade: PLA, ABS, PET-G, HIPS, PVA,etc
- High Performance: Metal Fill, PEEK, etc
- Heat Control System: Hotend 260°C+420°C, Hot Bed 140°C, Hot Chamber, 70°C, Support 420°C Hotend
- To be equipped with dual extruders, the left 260°C hotend is to be able to print with PLA, ABS, PC, Nylon, Carbon fiber, Flexible, etc. The right 420°C hotend is to be made of martensite steel, which will be able to print High performance material like PEEK, ULTEM, etc.
- The dual hotend is to be replaceable, which will provide more possibility on application.
- Direct Drive
- Precision up to: 0.04mm
- Speed up to: 120 mm/s
- The whole-steel body to ensure the stability when printing, but also to extend the usage period. Optimization and cooperation of overall structure to ensure the sustainable and efficient operation.
- Metal Chassis
- Fully Enclosed+Hot Chamber 70°C
- Fully enclosed chamber to block all external interference and reduce noise.
- Hot chamber device to provide constant room temperature 70°C, which will be able to prevent prints from warping and deform.
- Fully Enclosed
- Hot Air System
- Outage Restored & Filament Detection
- The printer will automatically memorize the current position and save print data.
- It will lower the platform and withdraw filament in case of power off suddenly & It should continue to print from the last stopped point after power's on.
- The printer will be able to avoid invalid printing by stopping print and warning when filament runs out.
- Outage Restored
- Filament Detection
- Touch Screen

- The printer should have all-english-menu touch screen

Product Specification

Industry	Automotive
Material	PLA, ABS, Carbon Fiber, Wood, Nylon, PC, PETG, HIPS, PP, Flexible, TPU, PVA, PEEK
Color	Black
Technology	FDM
Software Supporting	CreatWare, Simplify 3D, Cura, Slic3r
Connectivity	USB
Display	4.3" Touch Screen
File Format Supported	STL, OBJ, AMF
Build Size	Single Extrusion: 400*300*300 mm - Dual Extrusion: 320*300*300 mm
Filament Diameter	1.75 mm
Weight	48 kg
Extruder Quantity	Dual Extrusion
Heated Bed	70-140 degree C
Nozzle Temperature	420 Degree C
Operating System	Win7/8/10, macOS
Printing Technology	FDM
XY axis positioning accuracy	12.7 micrometer
Z Positioning Precision	1.25 micrometer
Print Head Travel Speed	55 mm/s
Frame And Body	Aluminum Casting for Motion Components

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(15) Glove Box 2 Port Inert Gas Workstation

Parameter	Required Specification
Glove box	• Box Material: Stainless steel • Internal Dimension: 900mm x 1150-1250mm x 775-800mm [H x L x D] • Leak rate of glove box should be less than 0.05V%/h and monitoring • Box Windows thickness of 10mm safety glass • Special coated for chemical and scratch resistance is required • Should include 1 x 0.3 micron, dust filter, and class H13 • Should include two gloveport round, diameter =220 mm, should be O ringsealed. • Material of glove ports should be aluminum with anticorrosion coating. • Gloves should be Butyl, Thickness 0.4mm. • Box should include 3 Nos Height Adjustable, Modular Shelves, L1000mm, depth 220 mm. • Should have 2 DN 40KF flanges (Electrical feedthrough 1 piece + 1 blank) • Automatic Box Pressure Control in adjustable range between (+15 mbar to-15mbar) with oil free pressure relief mechanism • Operation in negative and / or positive pressure range is required • Positive pressure regulation without vacuum pump • Apart from automatic box pressure additionally Foot pedal is needed. • Fluorescent lighting should be front side mounted. with auto off • Stand with height 1000mm with castors and levelling feet for height Adjustment
Main **Antechamber**	• Cylindrical design with stainless steel sliding tray • Size (internal dimension) 390mm diameter x 600mm length • Vacuum/Refill process with Manual operation • Pressure gauge, Manometer analogue display • Upgrade needed for heated 150C tray

Vacuum/ Refill process	• Manual operation by hand valves Vacuum line DN 40 and RefillDN10
Gas purification	• Closed loop gas re-circulation • Should provide inert atmosphere oxygen and moisture<1 ppm all the time • Attainable Oxygen and Moisture purity less than one ppm at complete +/-15mbar at all times • Located under the glove box • Working gas Argon, Nitrogen or Helium should be possible.
Regeneration of Purifier	• Fully Automatic PLC controlled regeneration with nitrogen N2 or Argon &Hydrogen (5-10%)
Circulation unit	• Integrated blower, vacuum tight, • Oil free Circulation • Flow rate up to 90m3/h with automatic variation of speed based on oxygen/moisture levels
Vacuum pump	• Rotary vane pump, 10-2 mbar • Should include Oil mist filter, • Oil re-circulation • Automatic gas ballast control, • Capacity more than 15 m3/h, dual stage • Auto off facility
Valves and Piping	• Main valves should be Electro-pneumatically controlled • Control Piping should be DN 4/10 • Main piping and Side Piping should be Stainless steel DN 40 KF
System control	• Glove box should be PLC controlled with Color touch panel operation ofglove box parameters with features of circulation control, pressure control, regeneration control and monitoring of pressure, oxygen and moisture. Each function should be clearly displayed on touch panel. Alarm and reminders required for maintenance and parts. With ready upgrade facility for 24/7 remote monitoring of glove box parameters and provision for sending alerts and notifications about upcoming service schedule. Must be freely downloadable from google play store /app store.
Mini Ante chamber – On right side	• Material: Cylindrical, stainless steel with sliding tray • Inside dimensions: 150 mm diameter x length 300 mm (approx) • Integral leak rate:<10-3 mbar L/s
Sensor set	• Inline positioned PLC controlled Solid State Oxygen Analyzer with Measuring Range 0- 1000ppm • Inline positioned PLC controlled Solid State Moisture Analyzer with measuring Range 0-500ppm

Solvent vapour removal -	• Inline charcoal filter with inline and bypass valve • Ready upgrade provision for standalone independent re-generable solvent trap and .inline plc solvent sensor 0 to 2000ppm
Purge	• Purging to be automatically activated, when the Oxygen in the glove box is exceeds the set • limit, able to set between (10-999ppm) and continuously purging till the set point is reached and • automatically start the circulation of the gas purifier. Automatic and adjustable mechanism • for regular gas purge with time, duration and the day. Glove box purging to be operated by the • operational panel of the purifier up to 200l/min with PLC control as well as manual regulation • valve.
Heat Exchanger	• Integrated below glove box water cooling between 2-3L/min

Terms & Conditions :

Glove box, Purification System and all Sensors should be from single manufacturer

Vendors are required to provide brochures / literature while complying the specifications.

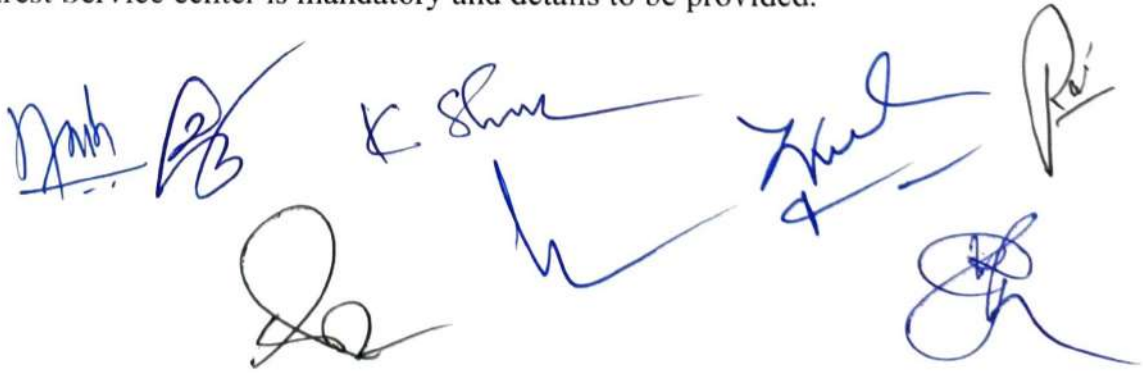
The technical and price bid should indicate the model and part numbers of items

This system should have the facility for the upgrades and therefore options should be readily available and should be quoted with full information

Manufacturer should have a minimum 5 years manufacturing experience of glove boxes, purifiers, sensors, accessories.

Should submit minimum 5 satisfied certificates from users

Mention of nearest Service center is mandatory and details to be provided.



TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(16) Laser Machine

- Air-Cooled Laser Source -to avoid complicated liquid cooling systems are required.
- High Reliability, Excellent Power Stability -for predictably excellent processing results.
- Laser Fan Control (to reduce noise) – to have all air cooled by computer-controlled fans. Fan speed is to be reduced or increased as a function of laser temperature, reducing noise levels when the lasers are being used on lower power settings.
- Laser Pointer -A red laser pointer is to be installed for easy material alignment.
- Cross-Platform Compatibility -Laser sources should be freely interchangeable between laser platforms.
- Free-Space Gas Slab Laser Design – The laser sources should use free-space gas slab resonators to produce an excellent quality beam with even power distribution and good near and far field characteristics.
- Patented Pre-Aligned Laser Sources -Laser sources are to be pre-aligned at the factory need not to be internally realigned.
- Smart Laser Source Technology - It should communicate to the laser system CPU, allowing the laser system to automatically choose the right settings for a particular material based on available laser power.
- Intelligent Laser Energy Management Engine -to maintain consistent energy density at any processing speed producing uniform marks and constant depth when cutting, marking and engraving.
- Laminated Safety Glass - safe enclosure for laser processing.
- Manual Air Assist (with Optics Protection) -Air Assist with Optics Protection to create positive air pressure around all optics and directs compressed air onto the surface of the material being processed. This compressed air should keep debris and particulate and fumes away from the optics, suppresses combustion of fumes, reduces accumulation of particulate on material surface, and increases cut quality on most materials.

- Over-Temp Alarm (for fire safety) -An over temperature alarm to be installed in laser system to monitor the temperature of the work area. In case of unusually high temperature the system to turn off the laser and trigger an audible alarm.

- Permanently Sealed Bearings - sealed, self-lubricating motion system bearings to keep dust and debris out, resulting in a longer bearing life.
- Stretch-Free Belts -Durable belts to be provided a long life of reliable processing.

- System Features to include the followings:
- Laminated Safety Glass
- Over-temp Alarm (for fire safety)
- Multiple Automatic Focusing Modes
- Precision Digital Motors
- Multiple Language Support
- Permanently Sealed Bearings
- Proportional Pulse Control
- Stretch-Free Belts
- Laser Features to include the followings:
- Laser Fan Control (to reduce noise)
- Smart Lasers
- Laser Pointer
- Wide Selection of Power Levels
- Air-Cooled Laser Cartridge
- No Optical Beam Alignment to be Required
- Cross-Platform Compatibility
- Free-Space Gas Slab Laser Design

- Laser Material Processing Area (W x H) : 16 x 12 in (406 x 305 mm)
- Maximum Part Size (W x H x D) : 18.75 x 14.6 x 4.0 in (476 x 370 x 102 mm)
- Overall Dimension (W x H x D) : 26 x 14 x 25 in (661 x 356 x 635 mm)
- Rotary Capacity: Max Diameter: 4.0 in (102 mm), Min Diameter: 1.0 in (25.4 mm)
- Motorized Z Axis Lifting Capacity: 20 lbs (9 kg)
- Available Focus Lenses: 2.0 in (50 mm). HPDFO™ (High Power Density Focusing Optics)
- Laser Platform Interface Panel: Five button keypad
- Computer Requirements: Requires dedicated PC with Windows® 7/8/10 32/64 bit and one available USB port (2.0 or higher
- Optics Protection: Integrated with included gas assist.
- Cabinet Style: Desktop
- Laser Options: 10 and 30 Watts
- Power Requirements: 220V-240V/5A
- Exhaust Requirements: One 3 in (76 mm) port 150 CFM @ 6 in static pressure (255 m^3/hr at 1.5 kPa)

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(17) 1600 Degree C TUBULAR FURNACE

Features:

- Double wall chamber.
- Hot Zone dimension 150 mm-ID X 400 mm length.
- Mass flow controller – 3 nos.
- Electrical operation.
- Low Thermal mass.
- High temperature insulation Board -schupp ceramics Germany.
- 1600˚C Tubular Furnace Horizontal both end opening.
- Furnace holding stand is required
- Furnace Heating Element Details:- L-Type or U-type heating element MoSi2 super kanthal heating element.
- Sensor Type:- B-Type Thermo Couple Sensors.
- Phase Control Panel:- 3 Phase Thyristor PCB (Power Control Board).
- Microprocessor PID Programmable Controller. 16 segment 2 pattern.
- PLC and HMI based Gas control system
- 24 volts solenoid valves.
- 20Amps Safety Fuse.
- Ammeter and Voltmeter.
- Heavy step down Transformer input 230V,Output 32V ,Cooling fan
- Heating element connecting copper bus par
- All connecting wires, B-Type Thermocouple sensor wire.

DETAILED TECHNICAL SPECIFICATIONS

Type of Furnace	Horizontal Type Tubular Furnace
Maximum Design Temp	1650°C
Cont. Operating temp	1600°C for long duration
Temperature Resolution	+/- 1°C
Process Tubular Material	Quartz
Tube Size	150 mm OD x 140 mm ID x 1200 mm length
No. of Hot Zones	1, 150 mm ID x 400 mm long
Insulation	Complete insulation made of Imported High Temperature Insulation boards. Features: Low heat conductivity, Low shrinkage, and Low dust quality
Instrument Outer dimension	Furnace size : ≈ 750 width x 500 height x 450 depth mm, Double walled fabrication
Instrument Body	Powder Coated Dual Structure, Rust resistant, Mild Steel body. The chamber placed horizontally on a stable rigid steel platform which will be used as the Control panel. 4" size cooling fan is provided for cooling the control panel.
Type of Heating Elements	Name of the element : $MoSi_2$ Type of element : U type Hot zone length : le -100mm
Heating rate	Programmable up to 0.5 TO 10°C/min
Power supply	1.Furnace operation : single phase / 230 volts AC /20 amps

	2. Power : 8.8 kW 3 MCB requirement : single phase 32 MCB
Type of Thermocouple	**B** type thermocouple Along with alumina tube & aluminum head, Length-6" with adequate length of compensation cable. Sensor kept at outside of the type for furnace temperature controller.
Automated Gas Supply	Gas feed system should be provided with Mass flow controller, smc solenoid Valves, 316 steel corrosion resistance tubing and safety
MFC	Mass flow Controllers 3 Precision MFCs MFCs should be calibrated for, Ar, H2, C2H4, CH4, N2 Control Range : 1-1000 sccm Accuracy: $\leq \pm$ 0.02% of Full Scale Material: Stainless Steel (316L), Non Magnetic. Control Stability: $\leq \pm$ 0.1% of Full Scale Control Valve: Closed Solenoid
Gas Pipe Line fittings	Swagelok ¼" 316 steel corrosion resistance tubing with Fittings
Purge Gas valve	DC operated solenoid valves
Type of temperature control: TAEI Digital PID Controller. The controller is a versatile, high stability temperature or process controller, with self and adaptive tuning, in. 1/16 DIN size (48 x 48mm).	
Safety	1. semiconductor Fuse,

	2. Input MCB
KW rating	9 Kw
Voltage Rating	230 V AC, 50 Hz, 1 Phase 3 wire System
Current Rating	20 A
Control panel Unit	a. Micro Processor Based Programmable Temperature Controller , & Safety Controller b. Phase Angle Fired Thyristor Power Control Unit. c. Delta PLC with 3.5 Inch HMI D. Ammeter , d. Load and Line Indicators. e. Input and Output Switches. f. Fuse Units. f. Thermocouple break protection device incorporated in the Controller, etc. h. Input, Output, Earth and Thermocouple connecting leads.
PLC control system	The system should have a PLC control display which should control the following parameter. Set temperature and process temperature-colored graph- Process tube Pressure MFC inlet pressure MFC flow setpoint and actual flow Real-time plots–Flush and flow shut-off status Gas Purge control
Surface temperature	Surface Temperature 50°C Maximum @ 1600°C
Warranty	As per **General/Prerequisite Conditions** (Page-1)

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(18) PM2.5 High Volume Air Sampler

- The System should incorporate advanced programming functions and electronic volumetric flow control to maintain a consistent flow and collect a truly representative sample of particulate matter. Optional attachments should be available to allow the sampler to measure wind speed and direction which can then be used to trigger sector-selectable sampling.

It should be as per US EPA Manual Reference Method: RFPS-0706-162 approval

RELIABLE SAMPLING

- Volumetric flow control automatically corrected to the standard reference temperature
- Programmable reference temperatures
- Industrial brushless motor (100,000 hours continuous field operation)
- Weather-proof marine quality anodized aluminium cabinet
- Automatic supply voltage monitoring and shut-down facility reduces damage to instruments.

DIRECTIONAL SAMPLING

- Wind direction and speed to activate/de-activate sampler
- External trigger (0 - 5 VDC) to use for activating the sampling program.

ENHANCED COMMUNICATION

- RS232 output for data collection and remote communication
- Filter blocked and instrument error alarms
- Total control of instrument remotely from PC

- Simple programming of sampling periods, including daily and weekly programs, with in-built "1-in-X day" sampling capability.
- Flow controller: Variable frequency drive
- Volumetric flow range: Nominal 45 - 96 m3/hr
- Vacuum capability: 140 mBar max
- Flow accuracy: Better than ± 1 m3/hr
- Flow repeatability: ± 1 % of reading
- Filter size: 250 x 200 mm rectangular element

- Temp measurement range: 0 - 50 °C
- Barometric pressure: 600 - 900 mmHg ± 4 mmHg

COMMUNICATION & DATA LOGGING

• No. of readings: 150 (user selectable averaging period, e.g. 75 hrs of 30 min averages)

• **Field Calibration Kit**

• **Wind Direction Sampling Options**

Wind Speed/Wind Direction Option includes

1. Met One Model 034B Wind Sensor
2. 3m Cable for 034B Sensor
3. Mounting Arm for 034B Sensor - mounts directly to HiVol chassis

- **Muffler for High Volume Air Sampler (Silencer)**
- **Spare Filter Cassette**

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(19) Technical setup for conducting removal studies on toxic gaseous components in domestic heating smoke and removal studies of water/wastewater contaminants using newly synthesized solid adsorbents

1. **Technical Specifications**

(A) Specifications for reactors and associated accessories for smoke/gas mixture capture, flow, pass through reactor/(s)

High pressure fixed bed micro reactor& associated accessories for 1) capture of smoke from real-world burning activities, 2) cleaning & retaining filter for particles in smoke, 3) provisions of passing particle free smoke/gas mixture through experimental adsorbent filled reactor (having facility of variable flow rate, pressure, temperature and humidity), 4) provision of sending thereactor's outlet smoke/gases to the suitable gas analyzer having capability to determine concentrations of CO2, CO, SO2, NO, NO2, TVOCs & other toxic gaseous components).

SN	Technical Description/Specification
01	**"High Pressure Fixed Bed Micro Reactor"** **High Pressure Fixed Bed Micro Reactor** should be designed for 30 Barg pressure & Ambient to 700°C temperature. **Reactor unit should include:** 1 Gas Flow Control section with 05 MFCs along with all necessary hardware viz. BHU,Filter, ball valve, Pressure Gauge, MFC, check valve. 2 Pre-heating section should be provided for gas with static mix. 3 Reactor Section includes down flow reactor tube with SS316 MOC, single zone furnace, and necessary check valves to avoid back-mixing. 4 Line from Gas Pre-Heater outlet to Reactor inlet should be maintained with 200 °C, should be passed through high pressure GLS, BPR should be installed at gas vent line of GLS. Manual BPR should be provided. 5 PID based Control System to control and monitor all process parameters.

6 Heavy Duty Aluminum Structure should be provided.

7 Automatic Feed analysis after Preheater and product analysis after reactor using sampling valves.

8 It should be compatible to: 1) fill and remove solid adsorbent materials (activated carbon/carbon fibers etc), 2) provide variable pressure, variable temperature, variable humidity inside the reactor; 3) receive pure gas mixtures/real-world smoke at inlet and after passing through the adsorbents inside the reaction, same should come out from the outlet of the reactor and pass to gas analyzer. Feeding smoke with controller flow

Technical Specifications of Thermal Mass Flow Controller:

- Make : Brooks
- Process Gas Name : CO, CO2, NOx, SOx,CH4, VOCs, real-world domestic heating smoke from burning of solid fuels (dung, fuel wood, coal balls etc
- Maximum Inlet Pressure : 48 Barg for CO2
- Maximum Operating Conditions : 46 Barg for CO2
- Maximum Inlet Pressure : 0.5 bar for NOx, SOx
- Maximum Operating Conditions : Atmospheric for NOx, SOx
- Maximum Inlet Pressure : 91 Barg for Air, CO
- Maximum Operating Conditions : 90 Barg for Air, CO
- Contact Part M.O.C. : SS 316
- Gas Flow Range : 4 to 200 mL/min
- Control Range : 50: 1
- Accuracy : +0.9% of S.P. (20-100% F.S.)
  : +0.18% of F.S. (2-20% F.S.)
- Inline Filter size : 07 Micron(Make-Swagelok)
- Inline Pressure Gauge Range : 0 to 100 Barg (Make-Wika)
- Inline Check Valve Rating : 10 psi cracking pressure(Make-Swagelok)
- Inline Check Valve Rating : 1/3 psi cracking pressure for SOx and NOx(Make-Swagelok)
- Inline Manual Valves : Ball valve (Make-Swagelok) (Qty : 01 No)
- Qty : 01 No for each gas mentioned above

Smoke system is provision of Stove to burn wood/coal and collect the smoke at 5 bars with 5 lit capacity tank for actual studies of smoke.

Technical Specifications for Gas Pre-Heater with Static Mixer

Pre-Heater

- Design Pressure : 90 Barg
- Operating Pressure : 80 Barg
- Design Temperature : 260 °C
- Operating Temperature : 250 °C

Automatic feed analysis sent to Analyzer.

Insulation and line heating

- Operating temperature : 250°C
- Make : HTS Amptek

Technical Specifications of Reactor:

Reactor

- Type : Metal to metal seal
- Flow Mode : Fixed Bed Down Flow
- M.O.C. : SS 316
- Design Pressure : 95 Barg
- Operating Pressure :90 Barg
- Design Temperature : 700 °C
- Operating Temperature : 600 °C
- Reactor Dimension : Approx. 15-20 mm ID X 641mm Long (15 inch total heated length) with adjustable length, if possible. (02 more spare reactors)
- Catalyst : 1-25 g of catalyst
- Heating Media : Split Type Electric Furnace 700 ^{0}C
- Temperature control : Skin Based
- Rupture Disc : (Make: BS&B)
- Thermowell :Inside temperature measurement
- Temperature control : Skin Based
- Temperature controller upto 250 °C

Thermocouple

- Make : Watlow
- Type : K

Product Separation Section

Technical Specifications of Condenser

- Type : Coil type
- Capacity : 150-200 cc
- Max. Operating Pressure : 90 Bar
- Operating Temperature : -20 to +20 °C

Technical Specifications for High Pressure Separator with Back Pressure regulator

- Capacity : 100 cc
- Type : with high pressure sight glass
- Max. Operating Pressure : 90 Bar
- MOC : SS 316
- Product draining under pressure condition without affecting steady state operation and avoiding gas release on manual collection.

Technical Specifications of Liquid Product Receiver tank (LRV)

- Capacity : 500 mL
- Max Pressure : Atmospheric
- Max temperature : Ambient

Technical Specifications of Pressure Control Valve:

- Make : TESCOM OR EQUIVALENT
- Operation : Manually
- Contact part M.O.C. : SS 316
- Operating pressure range : 0.7 to 100 Barg
- End connection : 1/4" NPT
- Qty : 01 No

Pressure Gauge

- Make : Wika
- Pressure range : 0-100 Barg
- Qty : 01 No

SS316 Valves, Fittings & Tubing

- Make : Swagelok/ Sandvik/ Autoclave Engineers
- Qty : As per Requirement

Technical Specifications of Control System:

Control Panel

- Make : Rittal/ Eldon
- Type : PID based controller
- Operation : Manual
- Classification : IP41

Control panel should be designed which allows customer to control and monitor the temperature, pressure, flow & safety limits. Alarm conditions should be provided for safe operations.
Control panel is designed which allows customer to :

- To control and monitor the temperature, and flow. Monitor the pressure.
- Safety limits to ensure power stop to resistive load.
- Safety for sensor break alarms.
- Safety limit to stop the flow over pressure second level

Over Temperature Safety:

PID based PID temperature control system should be provided with MCBs for over current protection. Alarm system with hooter to control unit provided.

Temperature Control:
Temperature measured by Thermocouples should be displayed and controlled by PID.
Pressure Indication:

Pressure measured by Pressure transmitter should be displayed on PID based Microcontroller

Safety:

All heating modules should be provided with individual MCB along with main MCB on control unit.

(B) Specifications for gas analyzer for the detection and quantification of toxic gases in smoke/ standard gas mixture

Toxic gases CO2, CO, NO, NOx, SO2, TVOCs etc will be primarily investigated for the removal studies in smoke plume/standard gas mixtures in the experiment. Suitable and appropriate gas analyzer should be provided and should be attached to the setup designed as per specifications (A). Expected concentrations of said gaseous components in smoke plume/ standard gas mixtures will be: CO2- >5000 ppm; CO- > 50 ppm; SO2- > 50 ppm, NO- > 150 ppm, NO2- > 150ppm, TVOCs- > 500 ppm; whereas expected concentrations of said gaseous components in smoke plume/ standard gas mixtures after passing through the experimental adsorbent filled reactor may be less than 1-5 ppm for SO2, NO, NO2, CO and less than 100 ppm for CO2 and TVOCs. Appropriate and compatible outlet of the reactor should be for gas analyzer. The selection of gas measurement technique should ensure the high accuracy and compatibility for the concentrations of target gases as described above. Preferred technologies are FTIR based with temperature controlled 10 meter gas cell, a pressure gauge and LN2 cooled MCT detector.

2. Technical Specification for technical setup to carryout removal studies on Water/ wastewater contaminants

Technical Section

Techno commercial offer includes supply of below listed items:

SN	Technical Description/Specification
01	**"Water Treatment Setup"** **Water Treatment Setup** is to be designed for Atmospheric pressure & Ambient temperature.

Technical Specifications of Liquid Feed tanks

- Capacity : 10 L for Liquid feed pump I,II
- Capacity : 100 L for Liquid feed pump III
- Max Pressure : Atmospheric
- Max temperature : Ambient
- Qty : 03 Nos

Technical Specifications of Liquid Feed Pump I:

- Flow Rate range : 6 LPH
- Designed Pressure : 10 Bar
- Turndown ration : 1:1000
- Approvals : CE,CSA-US,NSF61,EAC,RCM
- Operation mode : Analog control 0/4-20 mA
- End Connections : 1/8"OD
- Inline Filter size : 60-100 micron
- Inline Pressure Gauge Range : 0 to 4 Barg (Make-Wika)
- Inline pressure safety valve : (Make-Swagelok)
- Inline Check Valve rating : 1/3 psi cracking pressure(Make-Swagelok)
- Inline manual valve : Three way valve (Make : Swagelok)
- Qty : 01 No

Technical Specifications of Liquid Feed Pump II:

- Flow Rate range : 18 LPH
- Designed Pressure : 10 Bar
- Turndown ration : 1:800
- Approvals : CE,CSA-US,NSF61,EAC,RCM
- Operation mode : Analog control 0/4-20 mA

- End Connections : 1/8"OD
- Inline Filter size : 60 micron
- Inline Pressure Gauge Range : 0 to 4 Barg (Make-Wika)
- Inline pressure safety valve : (Make-Swagelok)
- Inline Check Valve rating : 1/3 psi cracking pressure(Make-Swagelok)
- Inline manual valve : Three way valve (Make : Swagelok)
- Qty : 01 No

Technical Specifications of Liquid Feed Pump III:

- Flow Rate range : 60 LPH
- Designed Pressure : 10 Bar
- Turndown ration : 1:800
- Approvals : CE,CSA-US,NSF61,EAC,RCM
- Operation mode : Analog control 0/4-20 mA
- End Connections : 1/8"OD
- Inline Filter size : 60 micron
- Inline Pressure Gauge Range : 0 to 4 Barg (Make-Wika)
- Inline pressure safety valve : (Make-Swagelok)
- Inline Check Valve rating : 1/3 psi cracking pressure(Make-Swagelok)
- Inline manual valve : Three way valve (Make : Swagelok)
- Qty : 01 No

**Note: As the type of pumps considered are not compatible to liquids with immiscible particulate solid particles, the liquid used as feed shall be free from immiscible particulate solid particles **

Provision to connect each pump line to the reactor should be given, user has to connect the required pump line manually

Technical Specifications of Reactor:

Reactor

- Flow Mode : Fixed Bed Up Flow
- M.O.C. : SS 316
- Design Pressure : 10 Barg
- Operating Pressure : Atmospheric
- Design Temperature : 50 °C
- Operating Temperature : Ambient
- Reactor Dimension : Around 52.5mm ID x 400mm Heated Length.
- Qty : 01 No
- Temperature control : Skin Based
- Qty : 01 No

Sampling Point: Two sampling points (One before and after the reactor will be provided)

- Type : Needle Valve

• Make	: Swagelok
• Qty	: 02 nos

Technical Specifications of Liquid Product Receiver tank (LRV)

• Capacity	: 10 L for Liquid feed pump I,II
• Capacity	: 100 L for Liquid feed pump III
• Max Pressure	: Atmospheric
• Max temperature	: Ambient
• Manual Switchover Valve	: Ball Valve (Make: Swagelok)
• Drain Valve	: Ball Valve (Make: Swagelok)
• Qty	: 03 Nos

SS316 Valves, Fittings & Tubing

• Make	: Swagelok/ Sandvik/ Autoclave Engineers
• Qty	: As per Requirement

Structure

Entire Reactor Unit be designed to fix on skid mounted structure, should be made up of heavy duty Aluminium strut profile.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(20) Technical specifications for the setup of safety infrastructure for management of hazardous waste

SPECIFICATIONS FOR EFFLUENT TREATMENT PLANT

TREATMENT PROCESS

The plant is to be designed on updated technology incorporating FBBR/AMB/MBBR (Fluidized Bed Bio Reactor / Aerated Moving bed/Moving Bed Bio reactor)

Technology as under:

Physical Treatment:

Physical treatment should consist of separation of heavy suspended and floating matter and to remove oil and grease (if any) by physical process, like passing through screen chamber and oil and grease trap.

Equalization

Equalization consists of holding the wastewater for some time in a basin/tank, to have wastewater of uniform nature. Such an arrangement will, of course be necessary when the wastewater produced by the industry varies in characteristics and quantity over the entire day.

CHEMICAL TREATMENT

The wastewater is to be passed through reaction tank where provision is to be given to add chemicals and to coagulate them and passed through sedimentation tank to precipitate the impurities. The alum, or ferric salts like ferric chloride or ferric sulphate and lime or sodium hydroxide may be used to neutralize and precipitate the impurities. The impurities are to be allowed to settle down by the gravity and overflow clear water is taken for further treatment and the sludge is to be removed from the bottom and dried in sludge drying beds

Biological treatment

The overflow of chemical treatment to be given treatment in Aerobic Bio reactor where the air is to be diffused from the bottom through diffusers/nozzles by the compressor / blowers. The organic load is to be reduced with the help of attached growth on FBBR/AMB media and growth in suspension with the help of dissolved oxygen. The BOD/COD load needs to be reduced considerably in bioreactor.

From the bio reactor the effluent should flow into the secondary clarifier. The sludge must settle down and the clear supernatant be collected at the top launders. The sludge has to be recycled to the reactor to maintain required level of MLSS, and excessive sludge is to be removed from bottom onto the sludge drying beds for drying before disposal. The overflow from secondary clarifier is to be discharged into the filter feed tank for final treatment.

Tertiary treatment

The effluent coming from biological treatment is to be passed through the sand and carbon filter (containing sand and carbon bed) with the help of filter feed pumps to remove the suspended and dissolved impurities and to further polish the effluent before final discharge. Treated effluent is to be discharged for plantation within the unit.

The basic principle of the moving bed process is the growth of the biomass on the plastic supports that move in the biological reactor via agitation generated by aeration systems (aerobic reactors).

The FBBR/MBBR system is to be an advanced high-rate wastewater treatment process utilizing free-floating media which houses active biological cells. Essentially, FBBR system is to be a hybrid process were attached growth and suspended growth treatment processes functions simultaneously.

The most important part of the FBBR/MBBR process is the specially designed floating media, which provides large surface area for bacterial growth. Hence these carrier elements (media) are in continuous movement, available surface area is constantly exposed to the wastewater, and hence uniform biological growth takes place over entire area of the media. 'Continuous Movement' of this carrier element is to be driven by air bubbles supplied inside the reactor by means on air diffusers.

Salient features of Media are to be as follows:

- Void ratio of more than 90% - to ensure minimal or no clog of biomass inside the individual media element.
- Higher ratio of PSA/TSA (protected surface area / total surface area) – to ensure maximum active surface area for biological activity.
- Configuration of media should permit lower air quantity by encouraging fine bubble diffused aeration system.
- Media configuration to ensure thinner and active biofilm over it.
- Higher values of PSA/TSA ratio : indicator of lesser area is exposure for wear tear.

TREATMENT SCHEME

Stage 1: Primary Treatment (1 KLD Effluent)

1.1. Bar Screen Chamber (If required)
1.2. Oil and Grease Chamber (If required)
1.3. Collection tank
1.4. Primary Settler

Stage 2: Secondary or biological treatment (for 1 KLD)

a) MBBR Reactor
b) Secondary Settler

Stage 3: Tertiary treatment (for 1 KLD)

a) Filter Feed Tank
b) Sand Filter
c) Carbon Filter
d) Hypo Dosing Tank

Stage 4: Sludge Treatment (for 1 KLD)

a) Sludge Drying Beds

FEATURES OF BIO CARRIER TO BE AS FOLLOWS:

- It is to be All-in-one completely Packaged Sewage Treatment Plant.
- Minimal Maintenance & Civil Work for treatment.
- Very low running Cost.
- High Quality Effluent.
- It is to be on Skid Mounted Unit which ensures easy transportation and relocation if required at any stage.
- A modular single piece system that incorporates both extended aeration unit and Secondary Settlement Compartment built at our Workshop including in-built Front Centralized Control Panel and offers an easy to operate system even employing semiskilled workers.
- Modular Skid based manufacturing to ensure that little preparation is required on site for installation including minimum civil works.
- MBBR - high-rate biological aerobic system . It needs to be specially designed cross fluted PVC fixed film media to provide lot of surface area (400-500 m2/m3) for active bacteria to grow and treat the sewage within the same volume of the aeration tank.
- Higher surface of Biodek for higher organic loading rates, reduction of overall size required for the aeration tank.
- Supplier should have their **own in house** under the supervision of highly qualified professionals to check the stage wise performance parameters of the plant as well as to help in proper monitoring of the complete system.

SCOPE OF SUPPLY

Primary Treatment:

BAR SCREEN -2 Nos

- Application- Screening of floating matters
- Size of spacing –20 mm (01 No), Size of spacing –10 mm (01 No)
- MOC: MSEP
- Make: Reputed Brand

LIFT PUMP SET -2 Nos

- Application- To feed Mixer tank.
- Type- Centrifugal, Monobloc, horizontal, Self-priming
- Capacity- 0.2 – 0.5 m3/hr, Head- 08 m, MOC – CI, Make: Reputed Brand

REACTION AND FLOCULTAION TANK -1 Set

- Application: For dosing and mixing of chemicals
- Capacity- 0.2 m3/hr flow
- Accessories: Supporting Structure, Ladder etc.
- MOC – MS FRP coated. Make: Reputed Brand

CHEMICAL DOSING SYSTEM (for Lime, Alum, Poly)

DOSING TANK – 3 Nos

- Application - Storage of chemicals
- Type- Vertical Capacity-20 Ltr., MOC – LDPE

PRIMARY SETTLER TANK -1 Lot

- Capacity- 0.2 m3/hr flow
- MOC – MS FRP coated. Make: Reputed Brand

SECONDARY TREATMENT FOR SEWAGE

MBBR TANK -1 No

Capacity- Suitable for 1 KLD, MOC – MS FRP coated. Make: SS Enviro or any Reputed Brand

MBBR MEDIA FOR MBBR TANK -1Lot

Application - For reduction of organic load in MBBR tank
Sp. Surface Area –350- 400 m2/m3, MOC- PVC UV Stabilized

AERATION GRID FOR FINE DIFFUSION (MBBR TANK) -1 Lot

Application - For providing air to MBBR Tank

AIR BLOWER WITH ACCESSORIES -2 Nos

- Application - Supply of air for mixing, Capacity- 20 m3/hr
- MOC – CI, Pressure - 0.35 kg/cm2, Accessories- MS base plate, V belt, Drive and driven pulleys.
- Make: Airvacc/ SGN/ Equivalent

SECONDARY SETTLER TANK: 1 Lot

- Capacity :0.2m3/hr flow
- MOC:MS FRP Coated
- Make: Reputed Brand

SLUDGE RECIRCULATION / REMOVAL PUMP -1 No

- Application- For recycle / disposal of sludge.
- Type- Centrifugal, Monobloc, horizontal, Self-priming, Capacity- 0.2 – 0.5 m3/hr, Head- 08 m,
- MOC – CI
- Make: Kirloskar or Equivalent

TERTIARY TREATMENT FOR SEWAGE & EFFLUENT

FILTER FEED PUMP -2 Nos

- Application- To feed the treated Sewage to filter.
- Type- Centrifugal, Monobloc, horizontal, Self-priming
- Capacity- 0.2 – 0.5 m3/hr, Head- 25 m, MOC – CI, Make: Kirloskar or Equivalent

SELF SUPPORTING MULTI GRADE SAND FILTER – 1 No

- Application –Removal of fine suspended solids.
- Capacity- 0.1 m^3/ hr, Filtration Rate: 14 m^3 / m^2/ hr, Media- under bed withgraded silica sand & Activated Carbon granules, MOC –MS/FRP

CARBON FILTER -1 No

- Application –Removal of fine suspended solids, Colour & Odour Capacity- 0.1 m^3/ hr, Filtration Rate: 14 m^3 / m^2/ hr., Media- under bedwith graded silica sand & Activated Carbon granules, MOC –MS/FRP

HYPO DOSING TANK -1 No

- Application - Storage of chemicals
- Type- Vertical Capacity-20 Ltr., MOC – LDPE

FLOW METER AT OUTLET -1No

- Turbine Type, Make: Kranti/Eqt

INTERCONNECTING PIPING, FITTING & VALVES -1 Lot

- MOC: uPVC

CENTRALIZED CONTROL PANEL (Wit automation for blowers & Pumps) -1 Lot

- Fabricated in 14 SWG/ 16 SWG CRCA sheet.
- Make: Internal Parts L&T/ Schneider/ABB/Eql

ERECTION AND COMMISSIONING -1 Lot

OUR SCOPE

Civil work, Screen Chamber cum collection tank, Filter feed tank, Sludgedrying beds and Foundation for Electromechanical equipment's and electrical connection to panel etc.

Additional offers on: Annual maintenance and Running cost

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(1) Portable FTIR/PID/EC/NDIR gas analyser/(s) for CO, CO2, NO, NO2, SO2, O3 etc under SERB Project (CRG/2022/003926). Primarily FTIR based gas analyser will be preferred. If the cost of FTIR gas analyser will be beyond the approved grant for instruments, then other technique(s) viz PID/EC/NDIR etc., in combination or separately suitable for specified target gaseous components with concentrations at sub-ppm or ppb levels may be considered

(A) In case of FTIR based techniques

1. FTIR based Gas Analyser, spectrometer should be able to record the spectrum of a sample in the wavenumber region of 6000 - 650cm-1 **or** suitable range that can imply to quantify CO, CO2, NO, NO2, SO2 and other inorganic and organic gaseous components up to ppb levels most accurately and enough separated peaks for all gaseous components
2. Performance: Fast analysis, capable of collecting and analyzing spectra resolution and reproducibility on the market per second at 0.5 cm-1 **or** resolution value that separate peaks for all gaseous components including CO, CO2, NO, NO2, SO2, O3 and other organic and inorganic gaseous components and also separate and minimize background noise peaks
3. Gas Cell : System must be supplied with 10 meter gas cell with temperature controller option to work from 40 – 180 deg. C or better.
4. Software should be user-friendly licensed software, System must be supplied with all necessary attachments and accessories with warranty of 3-years

(B) In case of PID/Electrochemical/NDIR detection technique

1. Separate or combined instrument for measurement of CO, CO2, NO, NO2, SO2, O3, VOCs with measurement concentration levels upto ppb levels precisely and accurately
2. For measurement of said gaseous components in smoke plume emitted from domestic heating activities and in ambient/indoor air, separate system or combined system may be provided.
3. Suitable calibration system for all said gaseous components should also be provided. Instrument should be equipped with data storage, transfer facility to laptop and data analysis and interpretation software. Calibration system should also be quoted separately.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

2) Hydrothermal Autoclave 200 mL

3) Fixed TVOCs monitor:

It should have measurement capabilities accurately and precisely in ambient air and as well as in smoke plume emitted from domestic heating activities. Calibration system for the sensors should also be quoted, **SEPARATELY**.

Specification:

Wide Detection Range: 0.001 ppm to 20,000 ppm (Gas dependent)

Features:

- Fence Electrode
- Should have technology for best PID performance.
- Facility for easy change of mini PID detector, electrode stack and lamp
- Batteries are to be certified to be changed within hazardous areas.
- It is to have Intrinsically sage; ATEX; IECEx and CUL approvals.
- Loud audible sounders 95Dba or More
- Automatic Downloading option, 1,20,000 Data points or more

Intrinsically safe approvals as mentioned below:

- II 1G Ex ia IIC T4 Ga
- Tamb = 5°F ≤Ta ≤ +113°F (with lithium ion battery pack)
- Tamb = 5°F ≤Ta ≤ 104°F (with alkaline battery pack)
- ITS-I22ATEX35111X
- IECEx ITS 22.0025X
- ITS22UKEX0635X
- 3193491 conforms to UL
- Std. 913, 61010-1
- Certified to CAN/CSA Std.
- C22.2 No. 61010-1
- Class 1 Division 1. Approval for Groups A, B, C & D, T4
- Humidity: 0-99% RH (non-condensing)
- Lamps :10.6 eV Krypton PID lamp (standard.) Optionally available :10.0 eV and 11.7 eV lamps to
- Data logging: 120,000 points including date and time stamp.

- Communication: Direct USB 1.1 connection
- Calibration: 2- and 3-point calibration (via calibration kit accessory)
- Battery life: Li-ion: Typical battery life up to 24 hours, charge time typically 8 hours • Alkaline: 3 x AA, typically 8.5 hours life

Flow Rate: ≥ 220 ml/min (with blocked flow alarm)

Protection:

- Designed to IP65
- EMC tested to EN61326- 1:2013 & EN50270:2015 & CFR 47:2008 Class A

Alarm

- Flashing LEDs Amber (low alarm) Red (high alarm)
- Sounder 95 dBA at 300 mm (12")
- Vibration on alarm
- Pre-programmed TWA and STEL*

PERFORMANCE (Gas Dependent)	
Minimum Sensitivity (Specifications are based on isobutylene calibrations at 20 °C and 1000mBar)	1 ppb or 0.001 mg/m3
Maximum Reading (Range) -Maximum reading is achieved with certain analytes such as ethanol	20,000 ppm or 20,000 mg/m3 Specifications are based on isobutylene calibrations at 20 ° C & 1000mBar. All specifications quoted are at calibration point and under the same ambient conditions
Accuracy ((Specifications are based on isobutylene calibrations at 20 °C and 1000mBar)	± 5% or ± one digit
Response Time T90 (s)	< 2 seconds
Lamp Lifetime	10,000 hours
Temperature Range	4 deg F to 140 deg C

Upgradeable Features to be available:

The System to be fully upgradeable to allow users to add further functionality if required. Upgradable features should include Health and Safety mode, PPB Sensitivity, Data Logging, Single Log Only (Push to Log) and Multi Log Only. The model to be fully upgradable without having to return the instrument to the factory.

Typical Applications

Typical applications to include Environmental Monitoring, Soil Contamination Detection, VOCs in Landfill, Confined Space Entry, Emergency Response, Wing Tank Entry, Medical Gases within Hospitals and Fugitive Emissions.

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

4) **High temperature Horizontal Tubular Furnace** with available different volume/capacity

Type of Furnace	Horizontal Type Tubular Furnace
Maximum Design Temp	1650°C
Cont. Operating temp	1600°C for long duration
Temperature Resolution	+/- 1°C
Process Tubular Material	Quartz
Tube Size	150 mm OD x 140 mm ID x 1200 mm length
No. of Hot Zones	1, 150 mm ID x 400 mm long
Insulation	Complete insulation made of Imported High Temperature Insulation boards. Features: Low heat conductivity, Low shrinkage, and Low dust quality
Instrument Outer dimension	Furnace size : ≈ 750 width x 500 height x 450 depth mm, Double walled fabrication
Instrument Body	Powder Coated Dual Structure, Rust resistant, Mild Steel body. The chamber placed horizontally on a stable rigid steel platform which will be used as the Control panel. 4" size cooling fan is provided for cooling the control panel.
Type of Heating Elements	Name of the element : $MoSi_2$ Type of element : U type Hot zone length : le -100mm
Heating rate	Programmable up to 0.5 TO 10°C/min
Power supply	1.Furnace operation : single phase / 230 volts AC /20 amps 2. Power : 8.8 kW 3 MCB requirement : single phase 32 MCB
Type of Thermocouple	**B** type thermocouple Along with alumina tube & aluminum head, Length-6" with adequate length of compensation cable. Sensor kept at outside of the type for furnace temperature controller.
Automated Gas Supply	Gas feed system will be provided with Mass flow controller, smc solenoid Valves, 316 steel corrosion resistance tubing and safety

MFC	Mass flow Controllers 3 Precision MFCs MFCs will be calibrated for, Ar, H2, C2H4, CH4, N2 Control Range : 1-1000 sccm Accuracy: ≤ ± 0.02% of Full Scale Material: Stainless Steel (316L), Non Magnetic. Control Stability: ≤ ± 0.1% of Full Scale Control Valve: Closed Solenoid
Gas Pipe Line fittings	Swagelok ¼" 316 steel corrosion resistance tubing with Fittings
Purge Gas valve	DC operated solenoid valves
Type of temperature control: TAEI Digital PID Controller. The controller is a versatile, high stability temperature or process controller, with self and adaptive tuning, in. 1/16 DIN size (48 x 48mm).	
Safety	1. semiconductor Fuse, 2. Input MCB
Thyristor Make & Rating	Semikron & 59A Module
KW rating	9 Kw
Voltage Rating	230 V AC, 50 Hz, 1 Phase 3 wire System
Current Rating	20 A
Control panel Unit	a. Micro Processor Based Programmable Temperature Controller , & Safety Controller b. Phase Angle Fired Thyristor Power Control Unit. c. Delta PLC with 3.5 Inch HMI D. Ammeter , d. Load and Line Indicators. e. Input and Output Switches. f. Fuse Units. f. Thermocouple break protection device incorporated in the Controller, etc. h. Input, Output, Earth and Thermocouple connecting leads.
PLC control system	The system should have a PLC control display which controls the following parameter Set temperature and process temperature-colored graph– Process tube Pressure MFC inlet pressure MFC flow setpoint and actual flow Real-time plots–Flush and flow shut-off status Gas Purge control
Surface temperature	Surface Temperature 50°C Maximum @ 1600°C
Warranty	As per **General/Prerequisite Conditions** (Page-1)

TENDER SPECIFICATION FOR SUPPLY OF EQUIPMENT/ LAB SETUP

(1) Tunable Optical Source and Photoelectrochemical Cell

Specification

Sr.No	Description	Qty
1.	Continuous wave source illuminator including Xenon arc lamp with power supply,lamp mount, focusing optics and monochromator. All the components, with the exception of the lamp's power supply, are solidly mounted onto a base-plate that can be positioned on any laboratory bench top. The unit features a current controlled power supply. Wavelength selection is through a high-sensitivity, single grating monochromator. The unit includes: a. Continuous wave Xenon arc lamp (230-900 nm; or ozone-free: 350-850 nm); 300W power. b. Linear power supply, with current control (10-23 A) and time meter. c. Manually-driven, high-sensitivity, single-grating monochromator, (100 mm focal length, 0-900 nm wavelength range, F/3.5 aperture) is equipped with 32x32 mm, aberration corrected, concave, holographic grating.	1
2.	Fused silica fiber bundle w/ a 11mm ferrule on one end and a rectangular slit (0.8 x	1

	9.7 mm) at the other end. Wavelength range: 260-900 nm; F/# 2.3. NA=0.22. length: 90 mm.	
3.	Collimator to be mounted at the exit of the fiber bundle. fused silica lens.	1
4.	Collimating optics to be mounted at the exit of the monochromator. Inclusive of quartz lens. f=60mm. diameter=20 mm.	1
5.	Ozone scavanger	1
6.	Photo-electrochemical cell	1