DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES,
QUAID-I-AZAM UNIVERSITY, ISLAMABAD
Standard Bidding Documents
For
Procurement of Hi-Tech Scientific Equipment
Under
National Competitive Bidding (NCB) Procedure

Location:	**Islamabad Capital Territory-Pakistan**
Authorities responsible for:	**Dr. A.Q. Khan Institute of Materials & Emerging Sciences**
Sponsoring Agency:	**Higher Education Commission (HEC)**
Execution Agency	**Quaid-i-Azam University, Islamabad**

Last Date of Submission: February 11, 2026

PROCUREMENT OF HI-TECH & SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES (DAKIMES) AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD"

REQUEST FOR QUOTATION (RFQ)

FOR

1. Quaid-I-Azam University, Islamabad requests for quotations for the ***"PROCUREMENT OF HI-TECH SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD".***
2. The Bidder(s), who meet the criteria specified in the Request for Quotation (RFQ), available at the office of the Project Director and on the **EPADS website www.eprocure.gov.pk,** are invited to apply.
3. The RFQ document is available for download from the **EPADS & PPRA website.** Companies/Bidders intending to participate must possess valid registration, listed as active Tax Payers with the Federal Board of Revenue and demonstrate relevant technical and financial capabilities to execute the specified task, ensuring the absence of any conflict of interest. Additionally, they must meet the detailed eligibility criteria specified in the RFQ document.
4. The interested Companies/Bidders are invited to submit their quotations, complete in all respects, to the office of **Project Director, Quaid-i-Azam University, Islamabad,** and the electronic bids must be submitted by using **EPADS at www.eprocure.gov.pk** on or before **February 11, 2026** at **2:00pm** The envelopes should be clearly marked with **"RFQ" "PROCUREMENT OF HI-TECH SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD, lot No……".**
5. The Technical proposal will be opened on the same date at **2:30pm**. The bid security for LOT- 1, LOT – 2, LOT – 3, LOT- 4 and LOT – 5 shall be 30.16 Million, 6.422 Million, 6.98 Million, 2.6604 Million and 2.448 Million respectively, must be submitted in the form of a **CDR on the name treasurer, Quaid-I -Azam University Islamabad** and should be enclosed within the technical envelope. Each lot should be separately packed according to the procedure described in RFQ. Any vender may participate in 0ne or more lots separately.
6. Procurement will be conducted utilizing the **"Single Stage Two Envelops"** bidding procedure in accordance with **Rule 36(b) of the Public Procurement Regulatory Authority-2004.** Each proposal must be accompanied by a tender processing fee of **Rs. 10,000/- (non-refundable for each lot),** in the form of a Pay order/ Demand Draft, and uploaded on **EPADS** in **PDF format,** made payable to the **Treasurer, Quaid-i-Azam University, Islamabad.**
7. A Pre-Bid Meeting will be held at Office of the Project Director on **January 29, 2026 at 2:00pm,** Alternatively, all bidders can submit their requests for clarification regarding bidding documents using **EPADS at www.eprocure.gov.pk** at least five calendar days prior to the technical proposal opening date.
8. Quaid-e-Azam University Islamabad reserves the right to cancel the bidding process before awarding the contract without assigning any reason.

Additional Registrar, Quaid-i-Azam University, Islamabad, Phone: 03319371153 (Project Director), Email: zrehman@qau.edu.pk

QUAID-I-AZAM UNIVERSITY, ISLAMABAD

PROCUREMENT OF HI-TECH & SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES (DAKIMES) AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD

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PID(I)5941/25

Additional Registrar

Quaid-i-Azam University, Islamabad, Phone: 03319371153 (Project Director), Email: zrehman@qau.edu.pk

The News 22-01-2026

GOVERNMENT OF PAKISTAN,

QUAID-I-AZAM UNIVERSITY, ISLAMABAD

PROCUREMENT OF HI-TECH & SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES (DAKIMES) AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD"

REQUEST FOR QUOTATION

BIDDING DOCUMENTS

DISCLAIMER

LETTER OF INVITATION

INSTRUCTIONS TO BIDDERS

TECHNICAL PROPOSAL FORMS

FINANCIAL PROPOSAL FORMS

STANDARD FORM OF CONTRACT AGREEMENT

SCHEDULE OF REQUIREMENTS

January, 2026

DISCLAIMER

1. The **Quaid-i-Azam University, Islamabad** (hereinafter referred to as **"QAU"** or **"Client"**) has prepared this **Request for Quotation (RFQ)** document to furnish information regarding the ***"Procurement of Hi-Tech Scientific Equipment for the Establishment of Dr. A. Q. Khan Institute of Materials & Emerging Sciences at Quaid-i-Azam University, Islamabad"*** (hereinafter referred to as **"Assignment"**). The information contained in this RFQ, or subsequently provided to **Bidder(s)**, whether verbally or in documentary or any other form by or on behalf of the Client **(QAU),** or any of their employees, is provided to **Bidder(s)** on the terms and conditions set out in this **RFQ.**

2. This RFQ does not constitute an agreement, nor does it represent an offer or invitation by the QAU to prospective bidders or any other individuals. The primary objective of this RFQ is to furnish interested parties with information that may assist them in formulating their technical and financial proposals in response to this RFQ **(the "Bid").** This document contains statements that reflect various assumptions and evaluations made by the QAU concerning the Project. These assumptions, evaluations, and statements do not claim to encompass all the information that each bidder may require. This RFQ may not be suitable for all individuals, and it is not feasible for the QAU or its employees to consider the investment objectives, financial circumstances, and specific needs of each party who reads or utilizes this RFQ. The assumptions, evaluations, statements, and information contained herein may not be exhaustive, accurate, adequate, or correct. Consequently, each bidder is advised to conduct its own investigations and analyses and to verify the accuracy, adequacy, correctness, reliability, and completeness of the assumptions, evaluations, statements, and information provided in this RFQ, seeking independent advice from appropriate sources.

3. The information provided in this RFQ to the Bidder(s) encompasses a broad array of topics, some of which are subject to legal interpretation. This information should not be considered an exhaustive account of statutory requirements, nor should it be regarded as a comprehensive or authoritative statement of law.

4. The QAU disclaims any responsibility for the accuracy or interpretation of any legal opinions expressed herein. Neither the client nor its employees make any representation or warranty, and they shall not be liable to any individual, including any applicant or bidder, under any law, statute, rules, regulations, tort, principles of restitution, or unjust enrichment, for any loss, damages, costs, or expenses that may arise from, or be incurred or suffered as a result of, anything contained in this RFQ or otherwise. This disclaimer also extends to the accuracy, adequacy, correctness, completeness, or reliability of the RFQ and any assessment, assumption, statement, or information contained therein, or deemed to form part of this RFQ, or arising in any way during this bidding stage.

5. The QAU also accepts no liability of any nature whether resulting from negligence or otherwise caused arising from reliance of any Bidder upon the statements contained in this RFQ.

6. The Client may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this RFQ. The issuance of this RFQ does not imply that the QAU is bound to select a Bidder or to appoint the Selected Bidder for the Project. The QAU reserves the right to reject all or any of the Bidders or Bids after giving reasons/justifications as per PPRA rules.

7. The Bidders shall be responsible for all costs associated with the preparation and submission of their Bid, including, but not limited to, preparation, copying, postage, delivery fees, and expenses

related to any demonstrations or presentations that may be required by the QAU, as well as any other costs incurred in connection with their Bid. All such costs and expenses shall remain the responsibility of the Bidder, and the QAU shall not be liable in any manner for these or any other costs or expenses incurred by a Bidder in the preparation or submission of the Bid, irrespective of the conduct or outcome of the Bidding Process.

QUAID-I-AZAM UNIVERSITY

(Office of the Project Director, Dr. A. Q. Khan Institute of Materials and Emerging Sciences)

No. QAU(DAQKIMES)/2025-13

Dated: 04-11- 2025

Minutes of the Meeting of the Procurement Committee, DAKIMES QAU, Islamabad

During a meeting between the Chairman of the Procurement Committee, Prof. Dr. Tariq Mahmood, and the Project Director, Prof. Dr. Zia-ur-Rehman, the Request for Quotation (RFQ) document pertaining to the equipment and the associated advertisement was deliberated. It was resolved that the document would be signed through circulation.

Decision:

The committee unanimously agreed to approve the draft Request for Quotation (RFQ) for equipments and the associated advertisement for the selection process.

Prof. Dr. Zia-ur-Rehman
Project Director (DAKIMES)
(Member/Secretary)

Director Works
(Member)

Purchase & Store Officer
(Member)

Treasurer
(Member)

Additional Registrar
(Member)

Prof. Dr. Tariq Mehmood
Department of Plant Sciences
(Chairman)

Confirmed by:
VICE CHANCELLOR

CONTENTS

SECTION 1 LETTER OF INVITATION

LETTER OF INVITATION

Date: _____February, 2026

Subject: **Invitation Letter for** ***"PROCUREMENT OF HI-TECH SCIENTIFIC EQUIPMENT FOR DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD"***

1- The Quaid-I-Azam University, Islamabad (hereinafter referred to as **"QAU"** or **"Client"**), has issued a request for Quotations, advertised on **January 20, 2026**, for ***"PROCUREMENT OF SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES (DAKIMES) AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD"*** under **National Competitive Bidding (NCB).** Bidders who meet the criteria specified in the RFQ are invited to apply.

2- RFQ can be collected from the office of Project Director, **DAKIMES** (Quaid-i-Azam University, Islamabad) during office hours and on EPADS at www.eprocure.gov.pk. It is important to note that no bids will be accepted after the designated closing time. Furthermore, manual submissions that are not accompanied by an electronic submission on EPADS will not be permitted.

3- The selection of Bidders will be conducted using the Quality-Cum-Cost (QCC) Based Selection method, employing a Single Stage - Two Envelope bidding procedure as outlined in this RFQ, in accordance with the Public Procurement Rules, 2004.

4- The RFQ includes the following documents:

i. **Disclaimer**
ii. **Letter of Invitation**
iii. **Instructions to Bidders**
iv. **Technical Proposal Forms**
v. **Financial Proposal Forms**
vi. **Standard Form of Contract Agreement**
vii. **Schedule of Requirements (SORs)**

5- The client Invites the submission of sealed Technical Proposals (one original and two copies) and Financial Proposals (in original), adhering to the standard format specified in the RFQ. Proposals must be submitted to the Project Director by **February 11, 2026, before 2:00pm**. The Technical Proposals will be opened on the same day at **2:30pm** in the presence of representatives from the firms who wish to attend. The Financial Proposal will be opened only for those Firms who are deemed technically responsive. Each envelope should be appropriately marked to distinguish between the Technical and Financial Proposals.

6- Proposals must be submitted using the Standard Forms of the RFQ. Proposals not adhering to the prescribed format may be rejected. If any required information is missing from the forms or provided elsewhere, it will be evaluated in the relevant section.

7- The evaluation criteria are outlined in the RFQ. Firms who are deemed technically responsive will be invited to participate in the financial proposal opening, provided they achieve a minimum score of seventy percent (70%) in the technical proposal. Following the opening of the financial proposals, a combined evaluation of both the technical and financial proposals will be conducted by assigning weights and aggregating the scores. The technical component will be weighted at eighty percent (80%), while the financial component will account for twenty percent (20%).

8- Bid securing declaration shall be submitted as per the prescribed form. Bid shall be summarily rejected, if it is not accompanied by bid securing declaration.

9- Client reserves the right to cancel or reject the proposals under Public Procurement Rules. Incomplete proposals or those without bid security shall not be entertained. All applicable taxes shall be charged as per relevant tax laws of the Government of Pakistan.

10- In the case of a joint venture (JV), proposals submitted shall bear the signature of the authorized signatory of the JV firms. A notarized declaration of JV agreement clearly defining scope of each JV partner shall be attached with Technical Proposal. All JV Partners in contract shall be jointly responsible for the execution of the contract signed between the bidder and the procuring agency.

11- The bid shall remain valid for a period of **180 days** from the date on which the technical bids are opened.

PROJECT DIRECTOR
Quaid-i-Azam University, Islamabad
Phone: 03319371153
Email: zrehman@qau.edu.pk

SECTION 2 INSTRUCTIONS TO BIDDERS

Section II: INSTRUCTIONS TO BIDDERS

1 Definitions

i. **"Procuring Agency (PA)"** means the department/QAU with which the selected Firm signs the Contract for the Supplies.

ii. **"Bidders"** refers to any legal entity that may submit, or has submitted, a Proposal for the goods mentioned in this RFQ by QAU.

iii. **"Contract"** refers to the agreement that will be signed between the QAU for the ***Purchase of Hi-Tech Scientific Equipment for A. Q. Khan Institute of Materials and Emerging Sciences, Quaid-i-Azam University, Islamabad,*** and the successful Bidder(s).

iv. the term **"Data Sheet"** pertains to a section within the Instructions to Bidders, which is utilized to delineate the specific conditions of the tendering process that are pertinent to the requirements of the Request for Quotation (RFQ).

v. **"Country"** refers to **Islamic Republic of Pakistan** & **ICT.**

vi. **"Day"** refers to calendar day.

vii. The term **"Government"** refers to the **Government of Pakistan,** which will be the recipient of the services provided or rendered as specified under the Contract.

viii. **"Applicable Law"** means the laws and any other instruments having the force of law in Pakistan, as those may be issued and in force from time to time.

ix. **"Instructions to Bidders"** denotes the comprehensive collection of documents that furnish Firms with all necessary information and outline the procedures to be adhered to during the preparation of their Proposals.

x. **"LOI"** refers to the Letter of Invitation sent by QAU to Bidders/Firms.

xi. **"Proposal"** refers to the Bidder's response to the Letter of Invitation & Request for Quotation, including the Proposal Submission Form, Technical and Financial Proposal, and all other documentation attached thereto as required by the LOI & RFQ.

xii. The term **"RFQ"** denotes the Request for Quotation, which comprises a set of instructions and references formulated by QAU. This document is intended to facilitate the selection of the most suitable Firms to provide the Hi-Tech Scientific Equipment.

xiii. **"Services"** refers to the entire scope of tasks and deliverables requested by QAU under the RFQ.

xiv. The **"Schedule of Requirements" (SORs)** is a document included in this RFQ that delineates the Technical Specifications of the

required equipements.

2 Introduction

2.1 Bidders are invited to submit both a technical and a financial proposal for the ***Procurement of Hi-Tech Scientific Equipment*** required in this RFQ and the accompanying Data Sheet (hereafter referred to as the "Data Sheet"). Your proposal may serve as the foundation for future negotiations, if necessary, and ultimately lead to a contract between your firm and the client identified in the Data Sheet.

2.2 The Data Sheet provides a concise overview of the assignment and its objectives.

2.3 The assignment will be executed in accordance with the work schedule specified in the Data Sheet.

2.4 The PA/QAU (referred to as the "Client" hereafter) has been entrusted the duty to implement the Projects as Executing Agency by The Quaid–i–Azam University, Islamabad, Government of Pakistan and funds for the project for Procurement of Hi-Tech Scientific Equipment have been approved and provided in the PC-I for utilization towards the cost of the Assignment, and the Client intends to apply part of the funds to eligible payments under the contract.

2.5 Bidders are encouraged to conduct an on-site visit to the proposed project location and engage in discussions with the Client prior to submitting a proposal. It is advisable for the Bidders to familiarize themselves with local conditions and consider these factors when preparing their proposal.

2.6 The Client is responsible for supplying the inputs delineated in the Data Sheet, facilitating the Bidders in acquiring the necessary licenses and permits for the execution of the services, and ensuring the availability of pertinent project data and reports.

2.7 Please note that:

i. The cost of preparing the proposal and of negotiating the Contract, including site visit to the project location and Client, are not reimbursable as a direct cost of the assignment, and

ii. The Client is not bound to accept any of the proposals submitted. The selection procedure for Bidders shall be Quality Cum Cost Based Selection (QCC) as detailed in Data Sheet.

3 Conflict of Interest

3.1 The Bidders are required to provide professional, objective, and impartial advice, holding the Procuring Agency's interest paramount. They must strictly avoid conflicts with other assignments or their own corporate interests. Bidders have an obligation to disclose any situation of actual or potential conflict that impacts their ability to serve the best interest of the Procuring Agency, or that may reasonably be perceived as having such an effect. Failure to disclose these situations may lead to the disqualification of the Bidders or the termination of its Contract.

3.2 Without limiting the generality of the aforementioned, Bidders and any of their affiliates shall be deemed to have a conflict of interest and shall not be engaged under any of the circumstances outlined below:

i. A Bidder or its affiliates engaged by a procuring agency to deliver goods, works, or other services—for a project is precluded from participating in the bidding process for the same project. Conversely, a firm or its affiliates contracted to provide consulting services for the preparation or implementation of a project is prohibited from subsequently supplying goods, works, or other non-consulting services that arise from or are directly associated with those initial consulting services.

ii. A Bidder, including its personnel and JV Partner, or any of its affiliates, shall not be engaged for any assignment that may inherently conflict with another assignment of the Bidder, whether for the same or a different Procuring Agency.

iii. A Bidder, including its Personnel and JV Partner, who maintains a business or familial relationship with a member of the Procuring Agency's staff directly or indirectly involved in any aspect of (i) the preparation of the PC-1 for the assignment, (ii) the selection process for said assignment, or (iii) the supervision of the Contract, shall not be awarded a Contract unless the conflict arising from this relationship has been resolved.

4 Fraud and Corruption

4.1 It is Government's policy that Bidders under the contract(s), observe. The highest standard of ethics during the procurement and execution of such contracts. "Corrupt and fraudulent practices are defined as the offering, giving, receiving, or soliciting of anything of value to influence another party for wrongful gain. This also includes any act or misrepresentation that knowingly or recklessly misleads a party to obtain a financial or other benefit or to avoid an obligation.

4.2 In the context of the provided text, a Procuring Agency (PA) has the power to blacklist bidders who are found to be engaging in such practices. The text explicitly states that this barring action must be made public. However, a crucial part of this process is that any supplier or contractor being considered for blacklisting must be given "adequate opportunity of being heard," which is a fundamental principle of due process.

5 Integrity Pact

5.1 The Bidders undertakes to sign an Integrity pact in accordance with prescribed format attached hereto for all the procurements estimated to exceed Rs. 2.5 million.

6 Eligible Bidders

6.1 The Bidders who fulfill and comply with the requirements of the proposal, laid down in the Data Sheet may submit their technical and financial proposals in response to this RFQ. Their technical proposals shall be scrutinized in accordance with the criteria and provisions laid down in the Data Sheet and other stipulations in this RFQ.

7 Eligibility of Sub-Contractor

7.1 A shortlisted/ A selected bidder is not allowed to associate with any other bidder who have failed to qualify during the evaluation process

8 Only one Proposal

8.1 The Bidders are limited to submitting only one proposal. If a bidder submits or takes part in more than one, all of their proposals will be disqualified. This rule also extends to JV Partners, who are not allowed to participate in more than one proposal.

9 Proposal Validity

9.1 The Data Sheet indicates **Proposal Validity** that shall not be more than **180 days.** The Procuring Agency may request the Bidders to extend the validity period of their proposals. Bidders who do not agree have the right to refuse to extend the validity of their Proposals.

10 Clarification and Amendment

10.1 The Bidders may request clarification regarding the contents of the bidding in the RFQ documents using the EPADS or in Pre-Bid Meeting, and the procuring agency is obligated to respond to such inquiries in writing within three calendar days, provided these inquiries are received at least five calendar days prior to the proposal opening date. The procuring agency shall respond the queries through EPADS. Should the procuring agency deem it necessary to amend the RFQ as a result of the clarification, it shall proceed accordingly.

10.2 Prior to the submission of proposals, the Procuring Agency reserves the right to amend the RFQ by issuing an addendum or corrigendum in writing. In order to provide bidders with sufficient time to incorporate the amendments into their proposals, the Procuring Agency may, if the amendment is substantial, extend the deadline for proposal submission.

11 Preparation of Proposals

11.1 In preparing their proposal, bidders are expected to thoroughly examine the documents comprising the RFQ. Significant deficiencies, such as deviations from the scope or inadequacies in the experience and qualifications of Firms, in the providing requested information may result in the rejection of a proposal.

12 Language

12.1 The Proposal as well as all related correspondence exchanged by the Bidders and the Procuring Agency shall be written in English. However, it is desirable that the firm's Personnel have a working knowledge of the national and regional languages of the Islamic Republic of Pakistan.

13 Mandatory Contents of Technical Proposal

all evaluation parameters defined below are mandatory for compliance

1- Valid NTN
2- Valid GST Registration
3- Valid Professional Tax Certificate
4- Valid Chamber of Commerce & Industries
5- Tax Returns
6- Audited Financials for Last 3 Years
7- Bidder's PEC Certificate at least C3 category
8- Bid Security (CDR)
9- Non- Blacklisting Declaration
10- Manufacturer's Authorization Certificate
11- Country of Origin and Port of Shipment
12- Engineering and Technical capabilities
13- Warranty
14- Spare parts Availability
15- Viz-á-Viz Compliance Sheet
16- Acceptance of the terms & conditions of RFQ.

14 Financial Proposals

14.1 The Financial Proposal shall be prepared using the attached Standard Forms on FOR basis.

15 Taxes

15.1 The Bidder will be subject to all admissible taxes including stamp duty and other charges at a rate prevailing on the date of contract/payment agreement unless exempted by relevant tax authority.

16 Submission, Receipt, and opening of Proposals

16.1 Proposal shall contain no interlineations or overwriting. Submission letters for both technical and financial proposal should respectively be in the format given in this RFQ. All pages of the original technical and financial proposals will be initialed by an authorized representative of the Bidder. The authorization shall be in the form of written power of attorney accompanying the proposal.

16.2 All required copies of the technical proposal are to be made from the original. If there are discrepancies between the original and copies of the technical proposal, the original governs.

16.3 The original and all copies of the technical proposal shall be placed in sealed envelope clearly marked **"TECHNICAL PROPOSAL".** It is mandatory for bidders to quote each product of a given lot. In case, if any item missing in a given lot bidder will be considered disqualified for that lot or later if any single item of a lot is disqualified technically the bidder shall be considered disqualified for that lot. Similarly, the original Financial Proposals shall be placed in a sealed envelope clearly marked **"FINANCIAL PROPOSAL"** followed by name of the assignment, and with warning "**DO NOT OPEN WITH THE TECHNICAL PROPOSAL**". If the financial proposal is not submitted in a separate sealed envelope duly marked as indicated above, this will constitute grounds for declaring the proposal **non–responsive.**

16.4 The proposals must be sent to the address indicated in the Data Sheet and received by the PA no later than the time and the date indicated in the Data Sheet, or any extension to this date. Any proposal received by the PA after deadline for submission shall be returned unopened.

17 Proposal Evaluation

17.1 From the moment the Proposals are opened until the Contract is awarded, Bidders are advised to refrain from contacting the PA regarding any aspect of their Technical and/or Financial Proposal. Any attempt by bidders to exert influence on the PA during the examination, evaluation, ranking of Proposals, or the recommendation for the award of the Contract may lead to the rejection of the Bidders' Proposal.

17.2 Evaluators of Technical Proposals shall have no access to the Financial Proposals until the technical evaluation is concluded. Public Opening and Evaluation of Financial Proposals: **(Quality-cum-Cost Based Selection (QCC)** method only.

18 Evaluation of Technical Proposals

18.1 The evaluation committee shall assess the Technical Proposals based on their adherence to this RFQ, utilizing the evaluation criteria, sub-criteria, and point system outlined in the Data Sheet. Each Bidder shall complaint to the **"MANDATORY CRITERIA"**. Bidders failing to meet the Mandatory Criteria shall be disqualified immediately. After that each compliant Proposal will be assigned a technical score. A Proposal will be disqualified at this stage if it does not meet the minimum technical score specified in the Data Sheet.

18.2 Upon completion of the technical evaluation, the PA shall inform, in writing, the Bidders who have achieved the minimum qualifying marks of the date, time, and location for the opening of the Financial Proposals, allowing a reasonable period for preparation. Attendance at the opening of Financial Proposals is optional for Bidders.

18.3 The Financial Proposals of those Bidders who did not achieve the minimum qualifying marks will be returned unopened.

19 Evaluation of Financial Proposals

19.1 Financial Proposals shall be opened publicly in the presence of the Bidders' representatives who choose to attend. The name of the Bidders and the technical scores of the Bidders shall be read aloud. The Financial Proposal of the Bidders who met the minimum qualifying mark will then be inspected to confirm that they have remained sealed and unopened. These Financial Proposals shall be then opened, and the total prices read aloud and recorded. Copy of the record shall be sent to all Bidders.

19.2 The Evaluation Committee will correct any computational errors. When correcting computational errors, in case of discrepancy between a unit price and the total amount, or between word and figures the formers will prevail. In addition to the above corrections, activities and items described in the Technical Proposal but not priced, shall be assumed to be included in the prices of other activities or items.

20 Negotiations

20.1 Negotiations, if required, shall be conducted exclusively with the single bidder whose offer is evaluated as the most responsive and advantageous to conclude the contract.

21 Professional staff/experts

21.1 Company Trained Graduate Engineer for Quoted Items duly registered with Pakistan Engineering Council.

22 Award of Contract

22.1 After completing the Technical & Financial Evaluation Process, the Procuring Agency shall award the contract to the successful Bidder.

22.2 **10% Performance Security** shall be deducted from the payments to the Bidder and shall be kept by the PA for **ONE YEAR.**

22.3 The Bidder is expected to complete the supplies as per the contract.

23 Confidentiality

23.1 Information relating to evaluation of proposals and recommendations concerning awards shall not be disclosed to the Bidder who submitted the proposal or to other persons not officially concern with the process, until the publication of the award of Contact. The undue use by any Bidder of the confidential information related to the process may result in the rejection of its proposal.

DATA SHEET

No.	Particulars
1)	***Name Assignments:*** **PROCUREMENT OF SCIENTIFIC EQUIPMENT FOR DR. A. Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES AT QUAID-I-AZAM UNIVERSITY, ISLAMABAD** The Name of the Procuring Agency's Official (s): Project Director (Project Director, QAU) Address: Quaid-i- Azam University, Islamabad **Email address: zrehman@qau.edu.pk**
2)	The method of selections: **Quality-cum-Cost Based Selection (QCC) Method**
3)	Technical and Financial Proposal shall be submitted in separate envelopes for each complete lot.
4)	The successful bidder after award shall supply the goods as per contract agreement.
5)	The successful firm shall submit an affidavit declaring no conflict of interest.
6)	Bidders under takes to sign Integrity Pact for the procurement estimated to exceed Pak Rs.2.5 million
7)	Mandatory Eligibility Requirements for the Bidder.

S. #	Evaluation Parameters	Knockout (KO)	Relevant Document
1.	Valid NTN	Mandatory	NTN Certificate shall be on ATL as on date of the submission of bid.
2.	Valid GST Registration	Mandatory	GST Certificate shall be on ATL as on date of the submission of bid.
3.	Date of Incorporation of the Firm	Mandatory	At least **10 years** of incorporation, to be verified by NTN Number.
4.	Valid Professional Tax Certificate	Mandatory	Professional Tax Certificate with **(No Limit)**
5.	Valid Chamber of Commerce & Industries	Mandatory	Chamber of Commerce & Industries Certificate
6.	Tax Returns	Mandatory	**Last (3) Years** Income Tax and Sales Tax Returns
7.	The bidding firm shall provide audited financial statements for the last three **(03) years**	Mandatory	Audited Financial Statement for the year **2021-2022**, **2022-2023** and **2023-24.**

8.	Bidder's PEC Certificate at least C3 category	Mandatory	PEC License
9.	Bid Security (CDR)	Mandatory	Original bid Security **(CDR equivalent to "2% against each complete lot" with technical Proposal in separate envelop.** Bid security for LOT- 1, LOT – 2, LOT – 3, LOT- 4 and LOT – 5 shall be 30.16 Million, 6.422 Million, 6.98 Million, 2.6604 Million and 2.448 Million, respectively
10.	Non- Blacklisting Firm	Mandatory	An affidavit of Rs.100/- From bidder stating that their firm is not blacklisted by any of the Federal and Provincial Government or organizations of the State/ Central Government in Pakistan.
11.	Joint Venture (if Applicable)	Mandatory	JV Agreement shall be provided clearly indicating the scope of work of each JV Partner, furthermore each JV Partner shall be collectively responsible for the execution of the said contract.
12.	Manufacturer's Authorization Certificate	Mandatory	Manufacturer's Authorization Certificate should be printed on Manufacturer's Letter Head and duly signed and stamped by their authorized person. Clearly mentioning the contact details for further verification.
13.	Country of Origin and Port of Shipment	Mandatory	Other than India and Israel
14.	Engineering and Technical capabilities	Mandatory	At least 05 Engineers, CVs must be provided.
15.	Warranty	Mandatory	Warranty Certificate (Warranty Period should be from manufacturer/Bidder at least **(1) year** both with spare parts and services after Installation) with an Option of EXTENDABLE WARRANTY PERIOD
16.	Spare parts Availability	Mandatory	Bidder must provide declaration for the availability of Spare Parts for next 10

			Years after the Warranty Period.
17.	Viz-á-Viz Compliance Sheet	Mandatory	Bidder must provide Viz á Viz Compliance sheet for each quoted product.
18.	Acceptance of the terms & conditions of bidding document.	Mandatory	The original Bidding Documents must be submitted with sign and stamp on each page.
Eligibility for further evaluation:		• **Eligible** ☐ • **Not Eligible** ☐	

8)	Proposals must be valid for **180 days** after the submission date
9)	Clarifications may be requested not later than five days before the submission date through EPADS or during the Pre-Bid Meeting.
10)	The estimated time of delivery period shall be mentioned in the technical proposal.
11)	The Proposal as well as all related correspondence exchanged by the Bidder and the Procuring Agency shall be written in English. However, it is desirable that the firm's Personnel have working knowledge of the national and regional languages of Islamic Republic of Pakistan.
12)	The Format of the Technical Proposal to be submitted is: FTP
13)	Pre-inspection, specification check and training at Original Equipements Manufacturer (OEM) site (At least 3-persons) are specific components of this assignment: YES
14)	The quoted prices shall be on **FOR Basis.** Furthermore, prices shall not be liable to change after opening of Technical Proposal till the Validity of Bid.
15)	Amounts payable by the Procuring Agency to the Bidder under the contract to be subject to local taxation and stamp duty.
16)	The Proposal submission addresses: ***"Project Director, Procurement of Hi-Tech Scientific Equipment for the "Establishment of Dr. A.Q. Khan Institute of Materials & Emerging Sciences at Quaid-I-Azam University, Islamabad"*** Proposals must be submitted no later than the following date and time and at Address mentioned here above: On or before **February 11, 2026** by **Time: 2:00pm** accompanied by submission on EPADS. Bidders are encouraged to submit their respective Bids after considering applicable laws and regulations, and any other matter considered relevant by them. (i). The Bidding Documents, including this RFQ and all attached documents, are and shall remain the property of the Client and are transmitted to the Bidders solely for the purpose of preparation and submission of a Bid in accordance herewith. Bidders shall not use the information for any purpose other than for preparation and submission of their Bid. The CLIENT is not liable to return any Bid or any information provided along therewith except as specifically mentioned. (ii). It shall be deemed that by submitting a Bid, the Bidder has: a) made a complete and careful examination of the RFQ Document; b) received all relevant information;

c) acknowledged and accepted the risk of inadequacy, error, or mistake in the information provided in the **RFQ Documents** or furnished by or on behalf of the CLIENT relating to any of the matters referred to above in (1);

d) satisfied itself about all matters, things, and information contained in this RFQ herein above necessary and required for submitting an informed Bid, execution of the Project in accordance with the RFQ Document, and performance of all of its obligations there under;

e) acknowledged and agreed that inadequacy, lack of completeness, or incorrectness of information provided in the RFQ Document or ignorance shall not be a basis for any claim for compensation, damages, extension of time for performance of its obligations, loss of profits, etc., from the CLIENT, or a ground for termination of the Agreement.

(iii). The Bid shall be typed or written in indelible ink and signed by the authorized signatory of the Bidder, who shall also initial each page. All alterations, omissions, additions, or any other amendments made to the Bid shall be initialed by the authorized signatory.

(iv). Bids received by the CLIENT after the specified time on the Bid Due Date shall not be eligible for consideration and shall be summarily rejected.

17) Criteria, sub-criteria, and point system for the evaluation of Full Technical Proposals are:
Evaluation Criteria Method of selection: **Quality-cum-Cost Based Selection (QCC)**

18)

TECHNICAL EVALUATION CRITERIA FOR PURCHASE OF HI-TECH SCIENTIFIC EQUIPMENT		
S. #:	**Particulars and Descriptions**	**Maximum Marks**
1.	**Past Performance / Experience of the Bidder (Registered with GST/NTN)**	**10**
1.1.	4 – 8 Years' Experience	2
1.2.	9 – 15 Years' Experience	4
1.3.	Above 15 Years' Experience	10
2.	**Relevant Experience with the Manufacturer**	**10**
2.1.	4 – 8 Years' Experience	3
2.2.	9 – 15 Years' Experience	6
2.3.	Above 15 Years' Experience	10
3.	**Financial Soundness**	**10**
3.1.	Available Bank Credit Line above 1000 million Bank Letter is Mandatory	8
3.2.	**3 Years** Auditor Financials with Minimum Turnover of Rs. 1000million for each Year	2
4.	**Quality Assurance Certificate of Bidder**	**6**
4.1.	ISO Certificates of the bidders… 9001-2015 14001-2015 45001-2018	6
5.	**After Sale Service Availability**	**10**
5.1.	Pervious Service Reports for Similar Equipment At least to produce 2 reports	4

	5.2.	Customer Satisfactory Report of Similar Equipment At least to produce 2 Reports	4
	5.3.	Local Workshop Facility at Islamabad	2
	6.	**Technical Evaluation of Quoted Item(s)**	**54**
	6.1.	Compliance of Technical Specifications without Any deviation (Major/Minor)	40
	6.2.	Compliance of Technical Specifications with up to 5 Minor Deviation (2 Marks for each Deviation will be deducted)	30
	6.3.	Compliance of Technical Specifications with up to 1 Major Deviation or 5 Minor Deviations.	zero
	6.4.	Manufacturer's Authorization Certificate as per prescribed Format	4
	6.5.	List of Clients / Where such Equipment delivered	5
	6.6.	Foreign Trained Engineer by Manufacturer on Each Quoted Item "Training Certificate must be issued by Manufacturer"	5
		TOTAL MARKS	**100**

FINAL REMARKS: (Technically if score is 70 or more, that means **"Qualified"** and if score below 70 means **"Not Qualified"**

Weightage of the obtained marks shall be Calculated as per below formula.

Final Technical Score = Technical Score of Bidder ÷ Highest Technical Score x 80% = ?

19) The below formula is to calculate the marks for the price by the bidders other than lowest bidder

Final Financial Score = Lowest Cost of Bidder ÷ Cost of Bidder under consideration x 20% = ?

The below formula is to calculate the FINAL score of the advantageous Bidder at Quality Cum Cost Base (QCC)

Final Technical Score + Final Financial Score = Final Score of the Bidder

20) The CLIENT reserves the right to accept or reject any Bid and to annul the Bidding Process and reject all Bids at any time without any liability or any obligation for such acceptance, rejection or annulment, therefore as per PPRA rules 2004.

21) Expected date for Signing of Contract: **2026**

Section 3. TECHNICAL & FINANCIAL PROPOSAL SAMPLE FORMS

1. FINANCIAL BID FORM AND PRICE SCHEDULES

Date: _____

To:

Project Director
Dr. A.Q. Khan Institute of Materials & Emerging Sciences
At Quaid-i-Azam University, Islamabad

Dear Sir,

Having examined the bidding documents including Addenda No(s) **[insert numbers]**, the receipt of which is hereby duly acknowledged, we, the undersigned, offer to supply and deliver **[description of goods and services]** in conformity with the said bidding documents for the sum of **[total bid amount in words and figures]** or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

We undertake, if our Bid is accepted, to deliver the goods in accordance with the delivery schedule specified in the Contract.

We agree to abide by this Bid for a period of **[number] days** from the date fixed for Bid opening, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof and your notification of award, shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Dated this_____day of_____20_____

_____ _____

[Signature] **[In the capacity of]**

2. FIRM LEVEL ELIGIBILITY AND QUALIFICATION REQUIREMENTS FORM

A. MANDATORY REQUIREMENTS

S. #	Evaluation Parameters	Knockout (KO)	Relevant Document	Firm's Response "Yes / No"
1)	Valid NTN	Mandatory	NTN Certificate shall be on ATL as on date of the submission of bid.	
2)	Valid GST Registration	Mandatory	GST Certificate shall be on ATL as on date of the submission of bid.	
3)	Date of Incorporation of the Firm	Mandatory	At least 5 years of incorporation, to be verified by NTN Number.	
4)	Valid Professional Tax Certificate	Mandatory	Professional Tax Certificate with (No Limit)	
5)	Valid Chamber of Commerce & Industries	Mandatory	Chamber of Commerce & Industries Certificate	
6)	Tax Returns	Mandatory	**Last (3) Years** Income Tax and Sales Tax Returns	
7)	The bidding firm shall provide audited financial statements for the last three **(03) years**	Mandatory	Audited Financial Statement for the year **2021-2022**, **2022-2023** and **2023-24.**	
8)	Bidder's PEC Certificate at least C-3 category	Mandatory	PEC License	
9)	Bid Security (CDR)	Mandatory	LOT- 1, LOT – 2, LOT – 3, LOT- 4 and LOT – 5 shall be 30.16 Million, 6.422 Million, 6.98 Million, 2.6604 Million and 2.448 Million respectively	
10)	Non- Blacklisting Firm	Mandatory	An affidavit of Rs.100/- From bidder stating that their firm is not blacklisted by any of the Federal and Provincial Government or organizations of the State/ Central Government in Pakistan.	
11)	Joint Venture (if Applicable)	Mandatory	JV Agreement shall be provided clearly indicating the scope of work of each JV Partner, furthermore each JV Partner shall be collectively responsible for the execution of the said contract.	
12)	Manufacturer's Authorization Certificate	Mandatory	Manufacturer's Authorization Certificate should be printed on Manufacturer's Letter Head	

			and duly signed and stamped by their authorized person. Clearly mentioning the contact details for further verification.	
13)	Country of Origin and Port of Shipment	Mandatory	**Other than India and Israel**	
14)	Engineering and Technical capabilities	Mandatory	At least 05 Engineers, CVs must be provided.	
15)	Warranty	Mandatory	Warranty Certificate (Warranty Period should be from manufacturer/Bidder at least **(1) year** both with spare parts and services after Installation) with an Option of EXTENDABLE WARRANTY PERIOD	
16)	Spare parts Availability	Mandatory	Bidder must provide declaration for the availability of Spare Parts for next 10 Years after the Warranty Period.	
17)	Viz-á-Viz Compliance Sheet	Mandatory	Bidder must provide Viz á Viz Compliance sheet for each quoted product.	
18)	Acceptance of the terms & conditions of bidding document.	Mandatory	**The original Bidding Documents must be submitted with sign and stamp on each page.**	

3. TECHNICAL SPECIFICATION COMPLIANCE CERTIFICATE

[To be provided by the bidder on its letter head duly signed and stamped by the Authorized Representative]

The Project Director
DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES
QUAID-I-AZAM UNIVERSITY, ISLAMABAD

Subject:**TECHNICAL SPECIFICATION CERTIFICATE**

Dear Sir,

It is certified that our firm has quoted the following equipment in response to the **DR. A.Q. KHAN INSTITUTE OF MATERIAL & EMERGING SCIENCES**. titled **"Procurement of Hi-tech Scientific for DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES':**

1. _____

2. _____

3. _____

We certify that the above-mentioned equipment quoted by our firm completely fulfills the specification for required equipment. We further certify that the equipment is complete in all respects (Hardware, Software, Accessories etc.). The quoted equipment is complete in all aspects and does not require any additional Hardware/ Software/ Accessories to perform its functions/tests. In case the equipment does not work properly or lacked any specification/ hardware/ software/accessory etc., we will be bound to provide the said hardware/software/accessory etc.

Name of Authorized Representative: _____

Name of Bidder: _____

Stamp and Signature: _____

4. TECHNICAL COMPLIANCE SHEET "VIZ á VIZ"

(To be filled by "BIDDER" on their Letter Head for each Quoted Item)

Serial Number of the Item in SORs:	
Name of Item:	
Model:	
Make:	
Country of Origin:	
Technical Specifications of the Department	**Technical Specifications of the Bidder**

Signed: _____

Official Stamp: _____

Dated: _____

5. PRICE SCHEDULE IN PAK. RUPEES

Name of Bidder_____

1	2	3	4	5	6	5 x 6 = 7
S. #:	**Equipment Name**	**Make and Country of Origin**	**Model no. and Year in which Principal has commenced manufacturing of this specific model**	**Unit Price DDP/FOR (Inclusive of Incidental Services) [with 1 (one) Year mandatory warranty]**	**Qty**	**Total Price DDP/FOR**
Total Quoted Value in Figure:						**Rs.**
Total Quoted Value in Words:						

Prices with One-Year Warranty: Will be considered by the Procuring Agency for the purpose of Procurement subject to available of funds

_____

Signature of Bidder

For equipment, that the bidder will supply/ provide from within Pakistan, the bid currency shall be Pakistani Rupee (PKR);

6. CONTRACT FORM

THIS AGREEMENT made the_____day of _____20_____ between ***[Name of Procuring Agency]*** **(hereinafter called "the Procuring Agency")** of the one part and ***[name of Supplier]*** **of** ***[city and country of Supplier]*** **(hereinafter called "the Supplier")** of the other part:

WHEREAS the Procuring Agency invited bids for certain goods and ancillary services, viz., ***[brief description of goods and services]*** and has accepted a bid by the Supplier for the supply of those goods and services in the sum of ***[contract price in words and figures]*** **(hereinafter called "the Contract Price").**

NOW THIS AGREEMENT WITNESSED AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned in the Request for Quotation referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
    a. The Bid Form and the Price Schedule submitted by the Bidder;
    b. The Schedule of Requirements;
    c. The Technical Specifications;
    d. The Procuring Agency's Notification of Award;
    e. Other Documents submitted along with technical proposal of the successful Bidder;
3. In consideration of the payments to be made by the Procuring Agency to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Procuring agency to provide the goods and services **[INSERT DELIVERY PERIOD]** and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Procuring agency hereby covenants to pay the Supplier in consideration of the provision of the goods and services and the remedying of defects therein **[AFTER DEDUCTION 10% PERFORMANCE SECURITY]**, the Contract Price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the contract.

IN WITNESS; whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, sealed, delivered by _____the _____(for the Procuring Agency)

Signed, sealed, delivered by _____the _____(for the Supplier)

7. MANUFACTURER'S AUTHORIZATION[1] FORM

To:

Project Director
Dr. A.Q. Khan Institute of Materials & Emerging Sciences
At Quaid-i-Azam University, Islamabad

WHEREAS ***[name of the Manufacturer]*** who are established and reputable manufacturers of ***[name and/or description of the goods]*** having factories at ***[address of factory].***

Do hereby authorize ***[name and address of Agent]*** to submit a bid, and subsequently negotiate and sign the Contract with you ***FOR DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES, QUAID-i-AZAM UNIVERSITY, ISLAMABAD*** for the above goods manufactured by us.

We hereby extend our full guarantee and warranty for the goods offered for supply by the above firm against this Invitation for Bids.

[Signature for and on behalf of Manufacturer]

[1] ***Note:*** *This letter of authority should be on the letterhead of the Manufacturer and should be signed by a person competent and having the power of attorney to bind the Manufacturer. It should be included by the Bidder in its bid.*

8. INTEGRITY PACT

(To be submitted on legal stamp paper)

DECLARATION OF FEES, COMMISSION AND BROKERAGE etc.
PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN CONTRACTS WORTH RS. 2.5 MILLION OR MORE

Contract No._____ Dated _____Contract Value:

[To be filled in at the time of signing of Contract] Contract Title: _____

_____

[Name of Supplier] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from **DR. A.Q. KHAN INSTITUTE OF MATERIALS & EMERGING SCIENCES, QUAID-E-AZAM UNIVERSITY, ISLAMABAD)** or any administrative subdivision or agency thereof or any other entity owned or controlled by Quaid-e-Azam University through any corrupt business practice.

Without limiting the generality of the foregoing, ***[Name of Supplier]*** represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside **Pakistan** either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from **QAU,** except that which has been expressly declared pursuant hereto.

[Name of Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with **QAU** and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[Name of Supplier] accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to **QAU** under any law, contract or other instrument, be voidable at the option of **QAU.**

Notwithstanding any rights and remedies exercised by **QAU** in this regard, *[Name of Supplier]* agrees to indemnify **QAU** for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to **QAU** in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given by *[Name of Supplier]* as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form **QAU**.

Name of Buyer:_____ **Name of Seller/Supplier:**_____

Signature: _____ **[Seal]** **Signature:** _____**[Seal]**

Section 4. TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS FOR THE PROCURMENT OF HI-TECH SCIENTIFIC EQUIPMENT FOR DR. A.Q. KHAN INSTITUTE OF MATERIALs & EMERGING SCIENCES

Lot – 1				
S. #:	**NAME OF ITEMS**	**TECHNICAL SPECIFICATIONS**		**Quantity**
1.	PXRD (Powder X-Ray Diffraction)	***Goniometer & Motion System***	Type: Theta/Theta Vertical Goniometer Drive: Direct Drive Torque Motors, encoder-controlled Angular resolution: 0.0001° Angular reproducibility: 0.0001° Scanning diameter: 400–600 mm Measuring range: -65° to +168° Scanning speed: 0.0001 – 2°/sec, Slewing speed: ≥1000°/min	**1**
		Optics & Slits	Variable anti-divergence slits: 0–4° Variable receiving slits: 0–6 mm Soller slits: 2.3° Knife Edge Collimator	
		Sample Holders (Standard)	Flat aluminum front and back loading holders (2 each), 20 mm × 20 mm Depths: 1.0 mm (front), 1.9 mm (back)	
		Detector	ADVACAM MiniPix-TPX3 (Timepix3) Resolution: 256 × 256 pixels, pixel size: 55 × 55 µm Sensitive area: 14 × 14 mm Frame rate: ≥16 fps, Dark current: None Energy resolution: 1.3–2.7 keV, Min threshold: 2.0–2.7 keV	

		X-Ray Generation System	Maximum Output Power: 3 kW Max Output voltage: 60 kV Max Output current: 60 mA Voltage Step width: 0.1 kV Current Step width: 0.1 mA Ceramic Cu-anode tube, long fine focus (0.4 × 12mm), 2200W High Voltage Supply: 10–60 kV, 5–60 mA Safety interlocks: Overvoltage, Overcurrent, Water flow, Cabinet open Tube shield: Rotatable 2F-LP (line/point focus) Filter: Ni filter for Cu source		
		Cooling System	Cooling capacity: ≥3600W Water tank: ≥40 L Flow rate: ≥101 L/min Power: Single-phase 230V ±10%, 50/60 Hz		
		Control and Analysis Software	Modern SAX Acquisition & Analysis software for Windows 11 Batch programming Background subtraction, α2 stripping, auto peak search Rietveld refinement via FullProf Match! Software: search-match, pattern overlay, database integration		
		Crystallographic Database Computer System	ICDD PDF-5+ 2024 (Single-user license, 5 year) Specs: Intel Core i5, 16GB RAM, 512GB SSD, 24” Monitor with Windows 11		
		Attachments & Accessories	Thin Film Analysis Configuration (XRR, GID)		
			Parabolic Ni/C	Beam width: 0.84 mm	

			Monochromator	Deviation from curvature: < 0.3 arcmin	
			Thin Film Soller Slit:	Length: 116 mm, Divergence: 0.2° Knife Edge Collimator	
			Open Eulerian Cradle	Diameter: 150 mm Chi: -55° to +100°, Resolution: 0.005° Phi: 0–360°, Resolution: 0.001° Z: 25 mm travel, Res. < 0.005 mm XY: ±12 mm, Res. < 0.005 mm Max sample: Dia 40 mm, Height 20 mm, Weight 1 kg	
			Stress and Texture Analysis Configuration Cr-anode X-ray tube, normal focus, 1800W V filter for Cr radiation Capillary Collimators: 0.5, 1.0, 2.0 mm		
			Stress Analysis Software	Supports centroid, chord, parabola fit, pVoigt, Pearson VII LPA correction, database support	
			Certified Stress Reference Samples (-400 MPa, -800 MPa)		

			TEX Texture Software	ODF, PF, IPF analysis 2D/3D visualization, EBSD/OIM data compatibility Wide range of grid cells (1x1° to 10x10°)	
2.	Transmission Electron Microscope	This specification includes the supply and installation of a 200kV Multi-Purpose Transmission Electron Microscope (TEM) capable of the following functions: Conventional transmission mode bright field and dark field imaging *Electron Diffraction *Nano Beam Diffraction and Convergent Beam Electron Diffraction *Scanning Transmission Electron imaging (STEM) *Energy Dispersive X-ray Analysis * Bottom Mount CMOS Digital camera with 19Megapixels or higher resolution * 500 Grids Suitable for Powder samples. * Dry Pumping Multi station for sample holders The microscope must be fully self-contained with all necessary support systems such as vacuum systems, cooling systems, high tension power supply system, computer hardware and software. Lattice and point resolution of the 200kV TEM should be better than 0.14 nm and 0.194 nm respectively. The magnification range of the TEM should at least cover from x30 to x1,500,000 times **Technical Specifications** The range of accelerating voltage should be available as 80, 100, 120, 160 and 200kV. The emitter must be Lanthanum Hexaboride (LaB_6) cathode or better. Beam stopper facility should be included. **Illumination System:** Configuration of illumination system should at least consist of the following lens systems: Condenser Lens, Objective Lens and Intermediate Lens. Condenser lens should have at least four apertures. Objective lens should have at least four apertures.		**1**

		For dark field imaging, the beam tilt angle should be variable in the range of ±5 degrees in both the X and Y axes. Four illumination modes, namely TEM mode, EDS mode, Nano Beam mode and Convergent Diffraction mode must be available. **Specimen Chamber:** The 4-specimen single tilt holder is to be provided as standard and the double-tilt Beryllium holder for EDS analysis should be quoted as standard. The specimen stage must be a eucentric side entry stage with a tilt angle of at least ±25 degrees in all X, Y and Z positions of the sample holder. The X, Y, Z movements and tilt must be motor driven and linked with magnification. Maximum travel in the X and Y directions must be at least 2.0 mm. Maximum travel in the Z directions must be at least 0.1 mm. The X and Y coordinates of the specimen stage should be graphically displayed on the display LCD. There should be at least 100 positions memory for both the X and Y coordinates. Specimen insertion must be through an automatic airlock system. The exchange chamber must be evacuated by an automatic double-stage rough pumping system to eliminate contamination of specimen chamber from surrounding. There should be a bake-out heater built-in for the specimen stage. The Liquid Nitrogen anti-contamination device for the specimen chamber should be provided. **Vacuum System:** The electron source chamber and specimen chamber should be pumped by sputter ion pump. The pressure level in the specimen chamber should be better than 2×10^{-5} Pa. The vacuum system must have a built-in monitor and the control must be fully automatic and sequential. Bakeout systems must also be provided. **Imaging System:** Rotation-free and distortion-free image is essential during switch-over from image to diffraction pattern and when the magnification is changed. The difference between image rotation and diffraction pattern during magnification change should be less than ±5 degrees. TEM imaging system must allow user to operate the CMOS camera and save image by one-click. Various auto functions such as auto save, auto exposure time, auto focus must be available. **Stage Navigation** Clicking on a saved image automatically moves the stage to the indicated location, allowing the operator to	

		navigate to the area of interest without changing the magnification even at high magnification. Drift correction by image integration The system should come with a function to perform image integration while correcting image drift, thus a sharp image with no image blur is acquired. **Diffraction System** Selected area diffraction must be possible from low to mid-range magnification. The selected area aperture must accept four apertures which can be selected by a click-stop mechanism. For dark field imaging, the beam tilt angle should be variable in the range of ±5 degrees in both the X and Y axes. A selector for different convergent beam diffraction angle (〈 angle) must be built-in as standard. **Viewing Chamber** The main viewing screen should be provided with a small focusing screen, which should be automatically retractable. High quality binoculars should be provided for the focusing screen. **STEM Attachment** The STEM system should be quoted as standard. The STEM system should be fully integrated into the basic operation of the TEM. It should be controlled by the same PC system of the TEM. The guaranteed resolution of the STEM bright field image should be 1.0 nm or better at 200kV. The magnification range should at least cover the range of 100x to 2,000,000x. Detectors must be available for both bright-field and dark-field imaging and HAADF (high angle angular dark field) detection. **Energy Dispersive X-ray Spectrometer (EDS)** Hardware Silicon Drift Detector (SDD) type TEM Detecting Unit with detection element range from at least Be(4) to U(92). Incorporates at least either beryllium or polymer window for low energy performance. Active area at least 100mm² or bigger. No liquid nitrogen or other cooling agents needed. No detector warm-up necessary during venting or sample changing. Energy Resolution: at least 129 eV or better for Manganese (Mn) K-alpha peak at 5,000cps. Capable to perform automatic peak identification and labelling during spectrum acquisition without the need for user intervention	

		Capable to perform accurate element quantification during acquisition. Display of quantitative results as atomic, weight or oxide percentage. Interactive software tool to determine any missing or overlapping peaks Mixed standardized/Standardless quantitative algorithm, the customized K-factor, and the standardized XPP quantitative algorithm are preferred. Must show the sigma level of each element in the quantitative result Must allow the un-normalized quantitative analysis and the fixed concentration to the defined element in a quantitative result Ability to overlay a spectrum for live real-time comparison whilst acquiring X-Ray Mapping and Linescan Ability to acquire 4Kx4K spectral maps during mapping data acquisition, ability to choose lines of X-ray and to edit the energy window of the mapping elements Must be able to reconstruct spectra from a stored Spectral map Multiple Linescan must be included by defining a series of lincescans on the features of interest, which can give the average line distribution of elements Relocate to the original stage position where Mapping or LineScan was performed by choosing the mapping/linescan data Workstation: The computer system should be a reputable brand. Operation should be at least Windows 11 compatiable with Intel® Xeon® 6 Core Processor, 32 GB DDR5 SDRAM, 1 TB HP Z Turbo Drive G2 and NVIDIA® T400 4 GB. Branded 27" Full HD LED Monitor or better. Must supply complete with keyboard, mouse **Fully integrated High Sensitivity CMOS Camera System** Nineteen (19) Megapixel CMOS On -Axis mounted camera with the following specification must be provided. Mounting position: Under the image viewing chamber Total number of effective pixels: 19M pixels (5,688 x 3,336 pixels) Pixel size: 6.4 µm x 6.4 µm Effective pixel area size: 36.40 mm x 21.35 mm Frame rate: 58 fps / All pixel mode Recording modes: Image, Video (Stack frame) Image formats: L size (5,688 x 3,336 pixels), M size (2,880 x 1,680 pixels), S size (1,248 x 1,200 pixels) Dynamic range: 16 bit File formats: TIFF (Image, Video), BMP (Image), JPG (Image) Shutter type: Global shutter	

		Mounting position: Bottom mount (below viewing chamber), non-retractable Network interface: 10 gigabit ethernet True on-line UPS, Sample Preparation equipment will be for generalized application	
3.	X-Ray Photoelectron Spectrophotometer (XPS)	**General** Photoelectron Spectrometer shall include a Sample chamber, a Sample stage, a Ion-Etching device, Energy Analyzer, Operation computer and associated electronics. **Basic Equipment** XPS shall consist of an analyzing chamber and separate chamber for sample preparation (etching). Magnesium (Mg) / Aluminum (Al) twin anode shall be equipped for the purpose not to overlap with Photoelectron peak and Auger peak. Maximum acceleration voltage shall be 12 kV or higher. Maximum emission current shall be 50mA or more. Output power: For Magnesium (Mg) target: 500W or more. For Aluminum (Al) target: 600W or more. Multi-channel plate shall be equipped in order to reduce the integrated frame number and to analyze in a short time. Depth profile function: Specimen under the depth profile function shall be transferred automatically to the sample preparation chamber for ion etching, and shall be etched in the sample preparation chamber. After ion etching, the specimen must be transferred automatically again to the analyzing chamber for measurements. **Energy Analyzer** Energy analyzer shall be equipped with three (3) steps cylindrical electrostatic lens in order to analyze specimens on the condition at high sensitivity and high resolution. Tilt angle to detect the photoelectron shall be vertical (90 degree) against the specimen surface. Energy Analyzer shall be hemispherical type equipped with variable functions on the analyzer energy pass by five (5) steps or more. Angle-Resolved XPS (ARXPS) with specimen stage capable of maximum Tilting angle of 90 degree or more.	**1**

		Photoelectron intensity (cps) and Energy Resolution (eV) of the photoelectron spectrum Ag3d5/2 from a smooth and clean silver shall be as followings. - Standard X-ray source (Mg-Kα) - Photoelectron intensity (at 300W): 1,000,000 cps or more - Energy Resolution (FWMH): **1.00 eV** or better **Specimen chamber** Vacuum pressure of the specimen chamber shall be Ultimate pressure: 7 x10-8 or better. Four Axis or more motorized Specimen stage. Argon Ion Etching Device (Kauffman type with acceleration voltage variable from 150 to 1000 eV) should be able to work under low accelerating voltage and must be installed on the sample preparation chamber to protect contamination to the analyzing chamber, and with capability of Etching rate (as SiO2): from few nm/min to more than 90nm/min for SiO2 and 10 to 12 mm Diameter area should be possible to etch. Multi-Specimen holder which can accommodate: Six specimens having size of maximum or less 10 mm × 10 mm with 5 mm thickness and also alternatively can accommodate One specimen having size of maximum or less 10 mm × 60 mm with 5 mm thickness Large sample holder for 85 mm Diameter or larger samples and 5 mm or less in thickness. Holder for Depth profiling purpose High performance Optical microscope for sample positioning should be included. Charge compensation system (Electron flood) for charge neutralization, in order to protect charge up specimen surface, which works electron beam irradiation under low accelerating should have: Irradiation area: 10mmϕ or more Sample movement range shall meet the following requirements. X-axis (left/right direction) 0 to 50 mm or more Y-axis (front/back direction) - 3.0 mm to 3.0 mm or more Z-axis (vertical direction) - 3.0 mm to 2.0 mm or more T-axis (sample tilt) - 30° to 90° or more **Evacuation system**	

		Evacuation system for Sample preparation chamber shall consist of: a penning gauge, a turbo molecular pump as a main pump Evacuation system for Analyzing chamber shall consist of: Ion gauge, Ion pump as a main pump and Titanium sublimation pump as supplement pump Bakeout system shall operate function automatically by the way of the incorporated heater without removing wiring and pipe arrangement from the main unit. **Operation system** Shall include spectrum acquisition and data processing through a dedicated computer (Windows operating system). Data acquisition software should have wide spectrum, narrow spectrum, sample tilt multiple spectrum and automatic spectrum measurement. Data processing software should have background subtraction, satellite removal, smoothing, differentiation, spectrum addition and subtraction, spike noise removal, spectrum comparison. Spectrum analysis software should have curve fitting (constrained non-liner least squares method), quantitative analysis by peak library, quantitative analysis, peak-shape calculation (intensity, FWHM, peak position, other). Sample preparation equipment will be for generalized application	
4.	Scanning Electron Microscope + EDX	**General Description** Installation, commissioning and instruction in the use of a Scanning Electron Microscope, with an operating voltage of 30 kV or higher, capable of the following functions: Formation of secondary, topographic, compositional and the mixture of both topographic and compositional (shadow) images of the surface of the samples using secondary and back-scattered electron imaging. Low vacuum capability. The microscope must be fully self-contained with all necessary support systems such as vacuum systems, high tension power supply system, computer hardware and software. **Technical Specifications** Resolution requirements must be met, on-site: **1.0 nm** resolution at 20 kV in High Vacuum mode; **1.8 nm** resolution at 15 kV in Low Vacuum mode with BED.	**1**

		Manual-knobs operation box that will implement on the mouse control operation should be provided as standard. **Electron Source** The accelerating voltage should be variable from 0.5 kV to 30 kV. The emitter should be **Field Emission In-Lens Schottky Type**. Electron Source should be Guaranteed for Three (3) years **Electron Optical System** The microscope column must be fully pre-aligned, including all apertures. The objective lens aperture should be mechanically aligned to the rotation center. Automatic focus wobbler through software control must be built-in to assist the centering of the objective aperture. The condenser lens should be self-corrective in a way that the image will remain focused even when the probe current is adjusted. Automatic focusing and Automatic astigmatism correction is essential. **Scanning System** Scanning modes required are: full frame fast scan, full frame slow scan reduced scan for exposure monitor Beam blanking feature and scan rotation function should be built-in as standard. **Specimen Chamber** A multi-specimen holder must be provided. The specimen stage must be a eucentric goniometer stage at all working distance. The tilt angle should be covering from -10 to 90 degrees. Maximum travel range in the X and Y directions must be at least 125 and 100 millimeters respectively. The Z axis should be variable from 5 to 80 millimeters continuously. The X, Y Z, Rotation and Tilt movements of the specimen stage should be motorized, CPU control. For the motorized stage, there should be a built-in memory for at least 100 specimen positions or more. Large Specimen Chamber with allowable specimen size of at least 200 millimeters in Diameter and 75mm or more in height. **Vacuum System** The microscope column must be evacuated by a turbomolecular pump backed up by rotary pumps. The vacuum system must have a built-in monitor and the control must be fully automatic and sequential. The microscope must be able to support low vacuum capability where non-conducting specimens will not charge up even under high accelerating voltage. To isolate the high vacuum portion in the gun chamber from the low vacuum portion in the specimen chamber, an	

		orifice must be used in the electron column. The orifice should be placed below the objective lens aperture to prevent objective lens contamination. When switching between high vacuum and low vacuum modes, the orifice should be permanently in place and need not be removed at all. The time required to switch between high vacuum and low vacuum mode and vice versa should be less than 2 minutes. The vacuum system should be able to make the SEM chamber works like a freeze-drying system, where wet samples like bacteria, leaves, sea planktons etc can be freeze dried without any shrinkage and observe under SEM. **Signal Detection** Imaging with Secondary electrons (SE) and back-scattered electrons (BSE) are required. The changeover among the two detectors must be quick and easy. For the BSE detector, the following imaging modes should be available: compositional, topographical, compo/topo mixed signals. It should be possible to display two kinds of images (SEI and BEI) simultaneously on main display area. The contrast and brightness of each signal should be independently adjustable. It should be possible to mix two kinds of images (SEI and BEI) and displayed as one image on the main image area. The mixing ratio of each kind of image should be adjustable. There should be a CCD camera attached at the chamber, and it will take photo of the specimen stage for the purpose of sample position navigation. On top of that, the system should have a function where when we zoom up from the CCD image, it will continue seamlessly to the SEM image. In this way, users can change the magnification from 0.4x to 5x by using CCD image. There should be live 3D function, where it uses the 4 quadrants of the BSE detector to capture 4 images of the sample, and re-construct to form one 3D image. With this feature, users can immediately figure out if the area is a depression or a protrusion. **Energy Dispersive Spectrometer (EDS)** Dry (LN2 Free) type 30 mm2 EDS detector with Energy resolution 129 eV or better. For heavily overlapping elements, Quant Map or TruMap feature for accurate mapping results should be available. For EDS: Point Analysis, Selected Area Analysis, Line Analysis/Profile, Playback Analysis software package should be available. For sample drift compensation/correction during EDS analysis/mapping, Probe Tracking function should be available.	

		Large Area SEI imaging and Large Area EDS mapping (at least 8 mm or more area) should be available. The system should be equipped with software that will stitch as many as 30 x 30 SEM images to create a large area image and also Large Area EDS. **Computer System** The computer system shall be of a reputable brand and have a minimum configuration of Intel i5 Quad Core processor, 16 GBytes RAM, 1000 GByte SSD, 32 speed DVD-RW drive. The LCD display should be at least 27" or larger, The software should operate under Microsoft Windows 10 Professional 64-bit operating system **Image Processing Software** Operation of SEM is through touch screen, including changing of condition, focusing etc. The digital images should have resolution better than 5,120 x 3,840 pixels and should be saved in either BMP, TIFF or JPEG format. Some basic image processing functions such as image averaging, noise reduction, pseudo color etc should be included. Two-division image display and image addition between SEI and BEI signals should also be possible. Automatic acquisition of SEM images should be possible. Users can select multiple areas on the low mag SEM image or optical navigation image, then set the acquisition conditions such as accelerating voltage, detector type and magnification, and the program should be able to capture the images automatically over the multiple areas. **Large Area SEM Imaging** Large area SEM montage image should be obtained by computer controlled motorized specimen stage automatically. The system should be equipped with software that will stitch as many as 30 x 30 SEM images to create a large area image. **Other Requirements** Carbon tape (Qty:05). Carbon Paste (Qty:01) A sputter coating system with platinum target. For In-Situ cooling the sample, Peltier cooling stage Or any other alternate accessory. The system must operate on the main electric power supply available in Singapore which is 240V, 50 Hz for single phase. **Safety Features** Protection features against vacuum and power must be provided. **Training and installation** The supplier shall install and commission the system immediately after delivery. System installation shall be carried out by factory trained engineers (preference would be manufacturer's engineer) .	

		Comprehensive training on the operation and maintenance of the system (for both the hardware and software) by experienced and qualified engineer must be provided on-site. One set of operator instruction manual in CD shall be included. Track records of the availability of a strong, competent technical supports team locally. The supplier shall give information on his local technical support and maintenance capabilities in terms of experience, personnel and facilities and also technical support details from the Manufacturer's engineers. **Warranty and Service Contract** Period of warranty and part guarantee should be at least one year. Tenderers are to quote the annual service contract for both SEM and EDX for the period after warranty. The contract should include One times preventive maintenance (PM) and unlimited service calls. PM parts should be included while emergency parts are not included. Delivery of the system should be clearly indicated. Sample preparation equipment will be for generalized application	

Lot – 2			
S. #:	**NAME OF ITEMS**	**TECHNICAL SPECIFICATIONS**	**Quantity**
1.	Solar Simulator for Photo Electrochemistry	Specifications: Type: Steady-State solar simulator Lamp source: Single 1000W Xenon lamp based solar simulator light source Solar Simulator Classification: Class AAA simulator with Testing report to meet ASTM E927-19. Spectral wavelength range: 300-1800nm UHE-NL-150 is designed to meet the following standards: ASTM E 927 IEC 60904-9 JIS C 8912 Working Distance: 500 mm Target size: 150mm x150mm (square) Irradiance: 1 Sun over 150mm x150mm Vertical Illumination Collimation Angle: 3.95º half angle Fully reflective aluminum homogenizing light tube with square cross-section for creating a uniform beam Integrated touch screen control unit RS232 interface and software for remote operation included Includes air mass filter AM1.5G and computer-controlled shutter. Safety: Internal baffling is used to minimize stray light and protect the user. Safety of this equipment comply with all applicable CE directives and harmonized standards	**1**
2.	GC (Gas Chromatograph) MS with TCD / FID Detector	Gas chromatograph (GC) with detachable touchscreen interface. The detachable touchscreen should be able to connect with GC through wireless network. Optionally should be able to connect with GC through cable The GC should include detachable touch screen should provide real-time information on the status of analysis. The GC should provide retention time (RT) repeatability of 0.008% for C14 and The Autosampler should be field upgradeable with high capacity after installation The Autosampler should provide < 0.1% RSD for capillary columns with 1 µL PSS and SSL injected on FID The GC should provide smart gas management to optimize gas consumption. The GC system must accept two injectors and three detectors plus MS simultaneously installed. The GC shall have programmable pneumatic control (PPC) for all	**1**

		pneumatics parameters or equivalent. Fast oven-temperature-program steps to allow quicker analysis and improved detection limits with maximum settable rate of 115°C\minute. Maximum oven temperature 450°C The GC column oven should be able to cool down from 450 ˚C to 50 ˚C is less than 4.0 The capillary injector must be programmable in pneumatics (Carrier flow, split flow etc.) and in temperature. It must support hot split\slitless, programmable temperature split\splitless, cool on column and Large Volume injection mode. Max. Temperature 500°C MS transfer line heatable up to 350°C Mass spectrometer detector specifications: The mass spectrometer shall have an operating mass range not less than 1.0-1200 u. Sensitivity: · Electron ionization full scan mode of 1500:1 (RMS) for 1 pg of octafluoronaphthalene. 1 · Positive chemical ionization full scan mode of 1.200:1 (RMS) for 100 pg of benzophenone. · Negative chemical ionization full scan mode of 10.000:1 (RMS) for 1 pg of octafluoronaphthalene. The mass spectrometer must come standard with a single, wide-range vacuum gauge covering the range of atmosphere down to 1x10-7 torr. The mass spectrometer must be capable of acquiring 65 scans/sec in full scan and 100 scans/sec in SIM (single ion monitoring) mode with scanning speed up to 12.500 Da\second. The mass spectrometer must come standard with RF-only prefilter rods to prevent contamination on the analytical quadrupole. The quadrupole must be solid metal to allow cleaning of any contaminants; thin film mentalizations over nonconductive materials are not acceptable. The quadrupole analyzer must not require heating to prevent loss of performance upon injection of samples containing water (both liquids and head space). The mass spectrometer must allow the user to remove the ion source without removing quadrupole assembly. Changing the ion source and Assembly/de-mounting must be easy and a tools-free operation. Electrical connections to the ion source must be made automatically on inserting the ion source – without any wires needing individual connections which might slip off or possibly get misconnected. The mass spectrometer must allow both the transfer line and ion source to be independently heated to 350 °C The mass spectrometer must allow the user to remove the ion source and filament from the front of the instrument to reduce bench space requirements. The mass spectrometer must allow the user to change	

		the filament without removing the quadrupole assembly. Filament must be made with latest generation coated material and suitable for EI and CI. Filaments with low resistance to oxidation materials like tungsten are not acceptable. The mass spectrometer must be capable of performing) both positive chemical ionization (CI+) and negative chemical ionization (CI-). The mass spectrometer must be capable of acquiring EI spectra using the CI ion source. The mass spectrometer must allow the user to change from electron ionization (EI) to chemical ionization (CI) without removing the quadrupole assembly. The mass spectrometer detector shall be a discrete dynode electron multiplier. The mass spectrometer shall have a 270° off-axis detector to prevent photons, x-rays, and metastable-created ions from raising the spectrum background noise level. The mass spectrometer analyzer must be a linear quadrupole mass filter. 2 The mass spectrometer must be able to accept gas chromatographic column flow rates up to 5 mL/min Helium using a direct capillary interface (i.e., without using an open split or jet separator interface) The mass spectrometer software must operate under Windows 10. The mass spectrometer software must include multiple industry-standard (environmental and forensic) reports. The mass spectrometer software must be capable of customized reporting. The mass spectrometer system software must be capable of acquiring data simultaneously from both the mass spec and up to two standard GC detectors (e.g., FID) on the same gas chromatograph. The mass spectrometer system software must be capable of acquiring intermixed and time-overlapping full scan and SIM data for maximum sensitivity. The mass spectrometer must be able to maintain a mass accuracy of ±0.1 m/z over 48 hours. The MS should be supplied with the OPTIONAL NIST 2020 mass spectral database and use NIST MS Search v2.4 software. The system should be supplied with adequate Win 10 PC and Printer Installation and training should be done by certified experts from the manufacturer. True on line UPS should be supplied. Also quote H2 and N2 Generators in Options and Cylinders as required.	
3.	Photoluminescence Spectrometer with UV, VI and IR Laser	**Principle** Double beam, double monochromator, ratio recording UV/Vis/NIR spectrophotometer. **Optical System**: All reflecting optical system (SiO2 coated) with holographic grating monochromator with 1440 lines/mm UV/Vis blazed at 240 nm and 360 lines/mm NIR	**1**

		blazed at 1100 nm, Littrow mounting, sample thickness compensated detector optics. Detector: Photomultiplier for high energy in the entire UV/Vis wavelength range. Source: Pre-aligned tungsten-halogen and deuterium. Utilizes a source doubling mirror for improved UV/Vis/NIR energy. **Wavelength Range:** 180 nm - 3200 nm **UV/Vis Resolution**: ≤ 0.05 nm NIR Resolution: ≤ 0.20 nm **Stray Light:** At 200 nm: 12 g/l KCl USP/DAP method > 2 A At 220 nm: 10 g/l NaI ASTM method ≤ 0.00007%T At 340 nm: 50 mg/l NaNO2 ASTM method ≤ 0.00007%T At 370 nm: 50 mg/l NaNO2 ASTM method ≤ 0.00007%T At 1420 nm: H20 1 cm path length ≤ 0.00040 %T At 2365 nm: CHCl3 1 cm path length ≤ 0.00050 %T Wavelength Accuracy: UV/Vis ± 0.080 nm NIR ± 0.300 nm Wavelength Reproducibility: UV/Vis (Deuterium lamp lines) ≤ 0.010 nm NIR (Deuterium lamp lines) ≤ 0.040 nm Standard deviation of 10 measurements UV/Vis: ≤ 0.005 nm Standard deviation of 10 measurements NIR: ≤ 0.020 nm Photometric Accuracy Double Aperture Method 1 A ± 0.0003 A Double Aperture Method 0.5 A ± 0.0003 A NIST 1930D Filters 2 A ± 0.0030A NIST 930D Filters 1 A ± 0.0030A NIST 930D Filters 0.5 A ± 0.0020A K2Cr2O7-Solution USP/DAP method ± 0.0080 A Photometric Range: UV/Vis: 8 A, NIR: 8 A Band pass: 0.05 nm - 5.00 nm in 0.01 nm increments UV/Vis range 0.20 nm - 20.00 nm in 0.04 nm increments NIR range Photometric Stability: After warm-up at 500 nm, 0 A, 2 nm slit, 2 second integration time, peak to peak: ≤ 0.0002 A/h Baseline Flatness: 190 nm - 3100 nm, 2 nm slit 0.20 second integration time UV/Vis, no smoothing applied 0.24 second integration time NIR, no smoothing applied: ± 0.0008 A Light Beam: 90 mm above the base plate, 120 mm beam separation, 3 mm - 12 mm beam height Computer: Branded Computer with 19" LED Monitor with Printer (Preferred HP laser jet)	
4.	Cyclic Voltammetry (CV)	Cell connections 2, 3 or 4 terminals plus ground Data acquisition Data acquisition 3 x 16-bit ADCs synchronized - voltage / current / auxiliary Time base resolution (minimum) 10 µs (100 k samples / second) Automatic noise filters Enabled / disabled Power amplifier (CE) Voltage compliance ± 12 V Current compliance ± 650 mA (standard) ± 2 A (with 2 A option) Potentiostat bandwidth 1 MHz Stability settings high-speed, high-stability	**1**

		Slew rate ≥ 8 V per µs typical (no load) Rise time (-1.0 V to +1.0 V) <350 ns (no load) Voltage control (potentiostat mode) Applied voltage range ± 10 V Applied voltage resolution for ±10 mV signal = 300 nV for ±100 mV signal = 3 µV for ±1 V signal = 30 µV for ±10 V signal = 300 µV Applied voltage accuracy ±0.2% of value ± 2 mV Maximum scan rate 5000 Vs-1 (50 mV step) Maximum scan range / resolution ± 10 V / 300 µV Current control (galvanostat mode) Applied current range ± full scale (depends on range selected) ± 650 mA (standard), ± 2 A (with option) Applied current resolution ±1/32,000 x full scale Applied current accuracy ±0.2% of reading, ±0.2 % of range Maximum current range / resolution ± 650 mA / 60 µA Minimum current range / resolution ± 200 nA / 60 pA Electrometer Max input range ±10 V Bandwidth ≥ 10 MHz (-3 dB) Input impedance ≥ 1012 Ω in parallel with ≤ 5 pF (typical) Leakage current ≤ 5 pA at less than 25°C CMRR 60 dB at 100 kHz (typical) Voltage Measurement Voltage range ± 10 V Minimum resolution 6 µV Voltage accuracy ±0.2% of reading, ±2 mv. Current ranges Auto-ranging (8 ranges) 650 mA to 200nA (8 ranges) - standard Up to 20 A (with booster option) Down to 4 pA with low current option Current resolution 6 pA (200 nA range) Current accuracy (DC) ±0.2% of reading, ±0.2% of range Bandwidth 1 MHz (signal ≥2 mA range typical) Bandwidth limit filter Yes IR Compensation Positive feedback Yes Dynamic IR Yes Impedance (EIS) option Mode Potentiostatic / Gavanostatic Frequency range 10 µHz to 1 MHz Minimum AC voltage amplitude 0.1 mV RMS Sweep Linear or Logarithmic Interfaces (included as standard) Digital inputs / outputs 5 TTL logic outputs, 2 TTL logic inputs Auxiliary voltage input Measurement synchronized to V and I ±10 V range, input impedance 10 kΩ Filter: off, 1 kHz, 200 kHz BNC connector DAC voltage output (standard) ±10 V range, output impedance 1 kΩ BNC connector (for stirrers, rotating disk electrode etc.) PC / Software Communications interface Universal Serial Bus (USB) Operating system Windows 7 / 8 (64-bit & 32-bit)	

		Windows XP PC specification (minimum) Pentium 4 (1 GHz) / 1 GB memory High data rates may require additional memory Software.	
5.	FTIR Spectrometer with UATR	Must have a scan range of 8300 - 350cm-1 Should have High-Linearity Room Temperature Mid-Infrared detector (RT-MIR) Should have rotary Michelson interferometer for fast scanning, self-compensating for dynamic alignment changes due to a tilt and shear Long-life sealed and desiccated optical unit incorporating special design for extended desiccant life, Vibration isolated base-plate The source should be Long-life source with hot-spot stabilization; user replaceable. The system should have a Typical desiccant lifetime of 5 years at 25° C temperature and 90% relative humidity A real-time atmospheric vapour correction (AVC) utility must be available. This should not require the collection of reference or calibration spectra. The system should at least have a signal to noise ratio of 9,300:1 peak-peak, 5 seconds and 32,000:1 peak-peak, 1 minute The system should have a spectral resolution of 0.5 cm-1 Wavelength accuracy at least 0.1 cm-1 at 3000 cm-1 is essential Wavelength precision of at least 0.01 cm-1 at 3000 cm-1 The instrument must use USB, wireless and TCP/IP interface allows direct connection with LAN. Instruments should have facility to be configured with wireless router communication. The instrument should have optional rechargeable battery pack for remote operation, chargeable from mains or car battery and with power pack to serve as an Uninterrupted Power Supply (UPS) Along with the main instrument, Universal ATR (UATR) for the analysis of solids and liquids. Should be able to produce high quality spectra through the use of a pressure arm allowing good contact of the sample with the diamond crystal. The pressure arm force indicator must be present s a software feature to ensure first-class sample-	**1**

		to-sample and operator-to-operator reproducibility – should have facility for auto-recognition, auto-alignment plug & play design Instrument should supply with variable pathlength liquid transmission cell. Software: The software should have feature to enable the user real time update of spectral information plus results to provide faster feedback of information data status A single software platform to incorporate all of the functions required for infrared analyses; instrument control, data manipulation and analysis, and flexible report utilities Password-protected user login function. Access to methods, menu, toolbar and toolbox functions can be controlled Software processing should include extensive suite of spectral processing functions with simple user interface, examples include 1st-4th derivative with a variable filter, smooth, difference, normalization, A, %T, LOG, ordinate modes, cm-1, nm and micron abscissa modes, +,-,*,/, baseline correction, interpolate, peak find. Custom arithmetic, processing chains, and automatic data tune feature Single frequency, method development software including Beer's Law and chemometrics-based quantitative prediction Macro Editor and Equations Editor must be present in the software Must include a wide spectral database contain at least more than 6000 spectra. Must have software for functional group identification. Latest Computer with LED and True on Line UPS.	
6.	TGA (Thermogravimetc Analyzer)	Modular design with interchangeable furnaces – TGA system can easily reconfigured to a STA model, this offers great flexibility and versatility. Easy changeable Sensor without Service interaction – Sensor can be easily removed, replaced, and cleaned by customer – no service is needed. Compact system with smallest footprint - the instrument should have a footprint less than 1300 cm2.	**1**

		Includes mass flow controller - an integrated mass flow controller for monitoring and controlling purge flow rates must be included as standard. Control on both sample and balance purge Designed for Hyphenation - designed to be easily linked to other PerkinElmer family of instruments (Hyphenation) with manual or automated loading. Hyphenation with automatic loading Balance to be of top-loading design to allow ease of sample loading and operation. The furnace must be made of a material which is corrosion resistant. The instrument should be designed so that the furnace and balance are isolated from operators. Must be able to heat at up to 300°C/min controlled and 450oC/min ballistic. The temperature range needs to cover 15°C to 1050°C. The balance should be protected from the reactive sample purge gas as well as materials evolved by the sample. Temperature precision needs to be ±0.4°C (under specific lab conditions) Calibrating via either melting or curie points Balance measurement range up to 1500mg. Balance Accuracy to be better than 0.005% of total sample mass. Balance drift less than 2µg/hour The following cooling times are necessary: 1000 to 100°C in less than 8 minutes and 1000 to 30°C in under 15 mins. Must have an inert cooling gas – for faster cooling of your gas choice. Comprehensive accessory kit to be included as standard. Atmosphere can be static or dynamic, including nitrogen, helium, carbon dioxide, air, oxygen, argon or other inert or active gases over full temp range. Small furnace (3.1mL) improved balance housing design for reduce gas consumption. Intuitive Touchscreen - Touch interface simplifies instrument operation, significantly enhancing productivity. Includes software suite which is easy to use and feature rich for maximum application flexibility. Fully automated autosampler with a minimum of 40 positions to be available as an option.	

		Data can be collected without PC connections (via USB) as long as calibration is completed through the wizard on the PC desktop True on-Line UPS.	
7.	BET Surface area Analyzer	***General Specifications:*** Gas adsorption analyzer is suitable to performing analyses for determining BET specific surface area, total pore volume and pore size distribution. It relies on a volumetric technique and it is distinguished by the following operational feature The gas adsorption analyzer should rely on the so-called balance or twin technique, The instrument should have an empty tube able to work as a reference next to the analysis tube containing the sample, The instrument should be equipped with differential pressure transducers for reading simultaneously the equilibrium pressure in either the reference and the sample tube, The analyzer should have a reference and an analysis-reservoirs physically identical and initially filled up to the same pressure of gas, It should be possible to determine the free space using He and express it as differential free space, The gas adsorption analyzer should have two differential pressure transducers Surface Area: from 0.1m^2 absolute - from 0.01m^2/g specific. No upper limit Pore volume: 4 * 10^{-6} cm^3/g **Pressure Measurement:** Pressure Measurement Range: 0 to 950 mm Hg P/Po Resolution: < 10^{-4} Relative Pressure Range: 0 to 1.0 P/P0 (Adsorption only) Pressure Resolution: < 0.1mmHg Accuracy and Linearity: Better than ± 0.5% full Scale (transducer manufacturer's specification) **Environment:** Temperature: 10 to 35 °C (50 to 96 °F) operating - 0 to 50 °C (32 to 122 °F) non-operating Humidity: 20% to 80% relative, non-condensing **Gases:** Adsorbate: Optimized for nitrogen in a liquid nitrogen sample bath. Gemini may be used with non-corrosive	**1**

		adsorbate gases having vapor pressures at both room and bath temperatures that are acceptably high relative to the resolution of the 1000-mmHg pressure transducer. Typically, oxygen, argon, carbon dioxide, butane, methane, and other light hydrocarbons will produce useful data above absolute pressures of a few mmHg. Helium inlet also provided **Vacuum system:** vacuum source achieving $20*10^{-3}$ mmHg (or better) at the instrument inlet; having a device to reduce oil vapor back streaming is recommended The system must have an anti-suck back valve to prevent oil from being admitted into the instrument should there be a power failure. **Sample Tube/ Dewar:** Standard tube: 0.95cm (3/8in.) outside diameter by 20.5cm (8.1 in.) with $8.9cm^3$ of volume. Sample capacity is approximately $2.0cm^3$ Dewar: 2.75 L **Electrical:** Voltage: 85 to 265 VAC Frequency: 50/60Hz Power: 150VA, operating, max. plus vacuum pump Computer hardware and software: **Minimum requirements:** Operating system: Windows Vista® Business or Ultimate, Windows XP Professional Memory: 512 megabytes of RAM Hard Disk Space: 20 Gbytes One CD ROM drive Monitor: 1024 x 768 display capability Ethernet port(capable of communicating with a 10 base –T card		
8.	Particle size analyzer	***Measuring range***	dry measurement: 20 µm - 20 mm wet measurement: 5 µm - 3 mm	**1**
		Method of analysis	Dynamic Image Analysis	
		Type of analysis	dry measurement of free-flowing powders and bulk solids	

		Measurement values	wet measurement of suspensions and emulsions particle shape and particle size	
		Standard Lenses for Dry Measurement	ISO 13322-2 Telecentric lens 0.157x incl. feeder 50 mm funnel 2000 ml measuring range: 90µm - 20 mm Telecentric lens 0,243x incl. feeder 50 mm measuring range: 60 µm - 14,5 mm Telecentric lens 0.35x with feeder 20 mm and funnel 250 ml measuring range: 40 µm - 9 mm Telecentric lens 0.735x with feeder 20 mm and funnel 250 ml measuring range: 20 µm - 4.5 mm.	
		Lenses for Wet Measurement	Telecentric lens cpl. enlargement 0.35x measuring range: 20 µm - 3000 µm Telecentric lens cpl. enlargement 0.735x measuring range: 10 µm - 2000 µm Telecentric lens 1.333x measuring range: 5 µm - 1000 µm	
		Camera	5 megapixels, 2/3"-CMOS-(b/w)-Camera, 8 bit per pixel, GigE	
		Typical measuring time	< 5 min (depending on the desired measuring statistics)	
		Typical sample quantity	dry measurement: 10 - 100 g	

			wet measureme t: 0.1 - 1 g	
		Measuring rate	up to 75 fps	
		Evaluation	fast image analysis for morphology description and particle size determination	
		Software	Comprehensive morphological analysis in the cloud e.g. sphericity in regards to the minimum Feret diameter, the aspect ratio applied on the porosity, or the convexity as a function of the particle cross section. - Comparison of several measurements - Automatic display of the results, clearly arranged on the monitor, either as a cloud, as a cumulative curve, as a bar chart or in a table form. - Self-defined layouts (according to the stipulations of the sieve analysis). - Versatile report generator	
		Computer	A powerful computer (incl. keyboard, mouse and display) with installed software ISS is included	
		Electrical details	100 – 240 V/1~, 50 – 60 Hz, 60 Watt	
		Net weight	dry measurement: 42 kg wet measurement: 22 kg	
		Ultrasonic box	For dispersion with ultrasonic with max. 50 Watt ultrasonic output, variably adjustable for	

			200-240 V/1~, 50-60 Hz, 60 Watt	
9.	Differential Scanning Calorimetry (DSC)	Compact system with smallest footprint - the instrument should have a footprint less than 1300 cm2. Includes Mass flow controller - an integrated mass flow controller for monitoring and controlling purge flow rates must be included as standard. Must have the ability to switch easily between cooling accessories; Chiller, Intracooler and portable cooling device Intuitive Touchscreen - Touch interface simplifies instrument operation, significantly enhancing productivity. Includes software suite which is easy to use and feature rich for maximum application flexibility. Must have a temperature range of -70 to 750 ˚C Temperature accuracy of ±0.05 oC Temperature precision less than 0.02% Should have a stainless-steel furnace with t sample plate copper base Calorimetric accuracy of ± 0.2 % Calorimetric precision less than 0.02% Must have an indium response ratio of >19 mW/oC Must have an indium melting time of 3.3 seconds Must have required controlled heating and cooling rates are of 0.1 to 100 ˚C/min Between sample cooling times (100 to 0 ˚C with intracooler accessory) to be under 4 minutes Isothermal Kinetics, Scanning Kinetics, Specific Heat and Purity software packages to be included as standard Comprehensive accessory kit to be included as standard Atmosphere can be static or dynamic, including nitrogen, helium, carbon dioxide, air, oxygen, argon or other inert or active gases over full temp range. Data can be collected without PC connections (via USB) as long as calibration is completed through the wizard on the PC desktop Fully automated Autosampler with a minimum of 40 positions to be available as an option. True on line ups.	**1**

Lot – 3			
S. #:	**NAME OF ITEMS**	**TECHNICAL SPECIFICATIONS**	**Quantity**
1.	Atomic Force Microscope (AFM)	AFM scan head with new, extended footprint; not backwards compatible to previous AFM sample stages and IMO options AFM scan head with 100 µm range XY flexure guided scanner and decoupled Z-actuator (an extension of the Z range to 12 µm is possible) No laser alignment due to alignment structure on cantilever chip and high precision of cantilever holder Low coherence 650 nm laser, four-quadrant split photodiode Sample size: unlimited without sample stage, 100 mm on sample stage Automatic approach: 2 mm Optical view: dual view system (top/side view) Operation in air and liquid Maximum petri dish height: 9 mm, fluid level: 6 mm Scan range XYZ: 100 µm x 100 µm x 10 µm Z-sensor Sealing membrane to reduce the risk of liquid spill into the scan head Operation together with controller: XY Drive resolution: 6 pm Z Drive resolution: 0.6 pm Z measurement noise level: typ. 35 pm max. 50 pm (RMS, dynamic mode in air) in appropriate environment XY-linearity mean error: < 0.1% XY-flatness at maximum scan range: typ. 5 nm Detector bandwidth: DC - 4 MHz Detector noise level: typ. 60 pm / max. 100 pm Z-sensor noise level (RMS): typ. 180 pm / max. 200 pm Floor vibration requirements: VC-E better for best performance Environmental acoustic requirements: State of the art electronic design All digital signal processing for maximum freedom of operations Very sensitive 24-Bit ADC/DAC for zoom-in and precise acquisition Highest quality of analog signal handling for minimum electronic noise 32-Bit CPU and multitasking operating system for parallel operations Hardware specifications X/Y/Z-axis scan & position controller 3x 24-bit DAC, 200 kHz Z-axis position measurement 1x 24-bit ADC, 200 kHz Excitation & modulation outputs 2x 16-bit DAC, 20 MHz Analog signal input bandwidth DC to 5 MHz Main input signal capturing 2x 16-bit ADC, 20 MHz, 2 x 24-bit ADC, 200 kHz Additional user signal inputs 1x 24-bit ADC, 200 kHz Digital Synchronization Sync Out 1/2: digital outputs, signal range 0/5V TTL pulses FPGA module & embedded processor ALTERA FPGA, 32-bit NIOS-CPU, 80 MHz, 256 MB RAM, multitasking OS Communication USB 2.0 Hi-Speed to PC System synchronization 10 MHz internal quarts or external clock Power 90-240 V AC, 70 W, 50/60 Hz Standard imaging operating modes –	**1**

		Static Force, Lateral Force, Force Modulation, Spreading Resistance (conductive)- Dynamic Force, Phase Contrast- Magnetic Force, Electrostatic Force- Multiple spectroscopy modes- Lithography and manipulation modes Imaging functions - Up to 8000x8000 data points, 24-bit zoom-in- 8 acquisition channels with dynamic digital filters and channel assignment- Constant height mode- X/Y sample slope correction and over scan Standard spectroscopy operating modes - Force vs. Distance, Amplitude vs. Distance, Phase vs. Distance- Tip Current vs. Tip Voltage Spectroscopy functions - Setup Wizard for each spectroscopy mode- X/Y-position table: point, line, grid and free mode- 3 phase spectroscopy: - Move to start offset (absolute or relative to surface)- Forward modulation & acquisition- Backward modulation & acquisition Standard lithography operating modes - Free vector objects drawing or real time drawing by mouse- List of vector objects on layers with different lithography parameters- Tip lift or force control during movement from point to point Sample Approach - Fast Home, Retract and Advance movement- Automatic approach with definable final end position- Continuous or Step-By-Step approach mode Contents: C3000i Controller USB stick with Microsoft Windows Control software, new EC Cell sample holder provides capability for in situ EC experiments. The sample holder allows usage of flat working electrodes with thickness between 0.2 and 2 mm and lateral dimensions 20 mm x 20 mm up to 25 mm x 25 mm. The EC Cell comes with an integrated environmental ring with feedthroughs for tubings and cabling as well as for the standard small diameter (2mm) Ag/AgCl reference electrode. The EC Cell is designed such, that it can be combined with the optional heater or heater/cooler sample holders to allow in combination with the optional. TEC controller CH1 control of the bath temperature during EC experiments. Contents: EC cell sample holder with PEEK and PVDF chambers 30 cm silver wire 30 cm Pt/Ir wire 1 pcs 25 mm x 25 mm x 1 mm gold-coated quartz glass (working electrode) Ag-AgCl2 reference electrode, 2mm diameter Tools 2 pcs O-rings. Graphite (HOPG) on Sample Support The sample can be used for both STM and AFM measurements. In STM measurements, the atomic lattice can be observed. In high resolution AFM measurements, the atomic steps on the graphite surface can be seen and the atomic lattice can be resolved depending on the instrument used. Conductivity variations can be observed in spreading resistance mode.	

		Due to the mosaic spread, the cleaved surface will have several steps within a square micrometer. Sample size: approx. 5 mm x 5 mm Mosaic spread: 3.5° +/-1.5° Mounted on sample support Contents: HOPG on sample support. Core AFM Static Force mode kit - Constant force mode and Constant height mode- channels: topography, deflection- Cantilever ContAl-G (3 pcs),Si gri Core AFM Dynamic mode kit - Constant amplitude mode and Constant height mode- channels: topography, amplitude- DVD sample, mica on Teflon substrates (3 pcs) Core AFM Dynamic mode kit - Constant amplitude mode and Constant height mode- channels: topography, amplitude- DVD sample, mica on Teflon substrates (3 pcs) Isostage 300L Active vibration isolation table Load range: 2 to 12 kg Footprint: 300 mm x 300 mm Frequency range active: 1 - 200 Hz Isolation power: min. 23 dB (93.0%) at 5 Hz, 40 dB (99.0%) above 15 Hz Spike Guard for detection of out of range disturbances and correction thereof Contents: Isostage 300L damping table Isostage controller Connection cable to AFM controller. AFM Video Camera Dual view camera with two 5.0 Mpixel (2592x1944 pixels) Color CMOS camera. Focus: Motorized, user-controlled focus for each camera Zoom range: 4-Fold digital zoom in 3 steps (1/2/4×) Video output: USB 3.0 Top view: field of view: ~1.5 mm x 1.1 mm, resolution < 2µm Side view: field of view: ~ 3 mm x 3 mm. Acoustic enclosure AE350 For use with AFM systems and small Nanite systems. Provides shielding against sound, electrical noise, light, airflow. Usage together with Isostage recommended. Inside volume (d x w x h): 0.29 x 0.31 x 0.33 m Volume needed for opening (d x w x h): 0.49 x 0.510 x 0.70 m Body: Steel on all six sides Damping material: steel and PUR ether acoustic foam Isolated cable feed through Acoustic isolation: over 30 dB above 250 Hz Cantilever Stat0.2LAuD-10 (20 pcs) The Stat0.2LAuD cantilever is designed for static/contact mode imaging, for force-distance spectroscopy mode and offers excellent tip radius of curvature. With the gold reflection coating it can be used in both air and buffer solutions. The alignment grooves assure easy and reproducible mounting of the cantilever. Spring constant 0.2 N/m (0.02-0.77 N/m) Res. freq. 13 kHz (6-21 kHz) Length 450 µm Width 50 µm Contents: Pack of 10 Stat0.2LAuD cantilevers Reflective gold coating on detector side. Cantilever qp-CONT-10 (20 pcs) Contact mode cantilevers suited for experiments in liquids low drift, detector side features a gold-coated patch at the end of the cantilever Spring constant 0.1 N/m Length: 125 µm Width: 35 µm Res. freq.: 30 kHz Contents: Pack of 10 qp-cantilevers.	

		Cantilever (20 pcs) cantilever is designed for non-/intermittent contact applications (intermittent contact, dynamic mode in air). The alignment grooves assure easy and reproducible mounting of the cantilever. Spring constant: 48 N/m (20-75 N/m) Length: 225 µm (213-237 µm) Width: 38 µm (29-47 µm) Res. freq.: 190 kHz (140-220 kHz) Contents: Pack of 10 Dyn190Al cantilevers. Cantilever Tap. (20 pcs) Spring constant 5 N/m Res. Freq. 150 kHz Length 125 µm Width 25 µm Usage: soft tapping mode applications Contents: Box with 10 cantilevers. Cantilever MagneticMulti (20 pcs) Spring constant 3 N/m Res. Freq. 75 kHz Length 225 µm Width 28 µm Usage: for Magnetic Force Microscopy Operation Contents: Package of 10 Multi75M-G cantilevers. Cantilever ElectriMulti(20 pcs) Spring constant 3 N/m Res. Freq. 75 kHz Length 225 µm Width 28 µm Usage: Electric measurement modes operation Contents: Package of 10 cantilevers.	
2.	Nano-Indentor	**<u>Standard Features Include:</u>** Test Load Range 5-2000gf AUTOMATIC Turret with both KNOOP & VICKERS installed for performing both tests on one unit Manual X-Y stage with English micrometers (1" x 1" travel) Automatic Load and Release Dwell Time 5-99 seconds 10x & 50x objectives are standard, plus two optional objectives may be factory installed with original purchase. If optional objectives are purchased later, field installation will be required at an additional service call charge. Electronic measuring LCD color display & touch control panel LED Illumination Automatic Conversions Case Depth Measurement Mode Available outputs: RS232C and USB 110/220VAC, 50/60Hz switchable. **<u>Standard Accessories Include:</u>** Operation and maintenance manual Dust cover Setup tools Single Test block for both KNOOP & VICKERS Test certificate Accessory box INDENTER VICKERS DIAMOND MICRO Indenter Knoop Diamond Micro.	**1**

3.	Electrospinning Apparatus for Nanofibers	The Electrospinning Machine features an innovative design where all functional components are externalized. All metal parts and electrical mechanisms are equipped with insulated casings for isolation and protection. This ensures that the internal electric field within the machine is pure and free from any additional electromagnetic interference. As a result, the fibers produced are consistently stable and uniform. The designed with extensive functions and super clean environment. It comes equipped with a variety of nozzles and collector devices, allowing for dozens of different combinations in the production of various forms and arrangements of nanofibers. This versatility makes an excellent choice for advanced nanofiber fabrication. **1.High Voltage Power Supply:** Positive High Voltage: 0~30KV, 0~1mA, digital display, overcurrent protection, overvoltage protection, maximum output power 50W. Negative High Voltage: 0~-20KV, 0~1mA, digital display, overcurrent protection, overvoltage protection, maximum output power 50W. Voltage Stability: ≤0.1% per hour (calculated after 30 minutes of startup). Voltmeter Accuracy: ±0.05% (at 25°C and 45%-75% RH). Ammeter Accuracy: ±0.3%. Automatic Protection: Output cut-off, manual reset. Includes overvoltage protection (at 110% of rated value), overcurrent protection (1.5~1.8mA), output short circuit and arc discharge protection, temperature protection. Operating Environment: Temperature -10°C to 50°C; humidity 20% to 90% RH. Dual Control System: Both positive and negative high voltages can be independently controlled or set via touchscreen, with data recording. Programmable Adjustment: Both positive and negative voltages can be adjusted programmatically, with settings for increasing and decreasing speeds. High Voltage Output: Plug-in style with 150KV pressure-resistant insulation wire, 6 meters long, durable. Negative High Voltage Compensation: Settable time intervals and compensation voltage on touchscreen to mitigate the insulating effects of the spinning film on the electric field, maintaining constant electric field. **2. Four Channel Metering Pump:** Designed for electrospinning: with a specialized insulation system that separates the motor from the syringe loaded with high voltage liquid, suitable for various electrospinning solvents. 4 different solutions can be used at the same time. Settable total injection volume with overload protection. Minimum setting: 0.5nl/min = 0.03µl/h	

		High precision servo motor control system. Adjustment and recording of parameters via touchscreen. Programmable control: Set different channel speeds and sequences, with the ability to store historical programs. **3. Spinnerets** Single needle spinneret: Uses SS316 syringe needles, interchangeable with various diameters. Includes 100 needles of different diameters to meet diverse experimental needs. Micron Nozzle: Offers five-micron needles ranging from 1-45μm in diameter for spinning ultrafine fibers. V-Type Spinneret: Four-needle, V-shaped spinneret increases output and ensures highest uniformity of film formation. Four needles are positioned on both sides of the drum for even film coating. Triaxle, Coaxial spinnerets Each equipped with five sets of inner and outer needles of different sizes. Both inner and outer needles are interchangeable. Specially made needles ensure precise concentricity. 2-3 times longer than standard coaxial nozzles, requires lower spinning voltage, and easier control of process parameters. Side by Side Spinneret: Two channels controlled independently, capable of spinning composite fiber films with different components. Comes with five sets of needles of varying sizes. Two-channel Tubeless Spinneret: Requires only 0.5ml of solution for experiments, no hose connection needed, no consumable use, environmentally friendly. Multi-channel spinneret: Includes five sets of needles in different sizes. **4. Smart Nozzle Configuration** Insulated Fixtures: Each type of spinneret comes with a dedicated insulated fixture for operator safety. Automatic Nozzle Cleaning Device: Specially designed for automatic cleaning adjustable for all mentioned nozzles. Cleaning frequency can be set via touchscreen. Nozzle Movement Device (CNC Slide): Allows for uniform reciprocating motion, adjustable travel distance. Digital display, stepless speed adjustment, nozzle can be adjusted up, down, left, right, forward, and backward, with freely adjustable spray angles. **5. Nanofiber Collectors (Made of Stainless Steel SS316)** Can produce fiber films ≥500 microns to a few mm thick. Flat Plate Collector: Includes X-Y moving stage, size 10cm x 10cm. Rotating Collector, RC-5000: Speed range 1–5000rpm, speed error +/-1rpm. Equipped with a high-speed wind shield for stable, vibration-free operation.	

		Disc Collector: For collecting highly oriented arrays of nanofibers. Disk diameter 140mm, sharp edges, beveled, customizable thickness. Cage Collector: For producing highly oriented fibers. Slot spacing and number can be customized. Drum Collector, diameter 100mm, length 300mm. Super-Oriented Collector: Diameter 140mm, length 50mm. Mandrel Collectors: Diameter 2, 3, 4, 5, 6, 8mm, length 300mm. **6. Environmental Control System:** Temperature control: **Dust-free heaters**. Heats from room temperature to 45°C. Heats the space between the nozzle and the fiber collector, aiding rapid solvent evaporation. Humidity control: Equipped with a compressor dehumidifier. Controls humidity by introducing dry air into the casing, quickly reducing humidity to about 30%. Adjustable air flow. Humidity range: 30-80%. Installation of hygrometers: Real-time online display of temperature and humidity, also shows the highest and lowest values in 24 hours. **7. Spinning Chamber:** Casing material: High-quality metal sheet (black/navy blue) + PP/PE insulated inner walls. Viewing windows made of tempered glass. Multi-Grounding: Ensures operational safety. Insulated inner walls: The entire inner surface is covered with insulated PE/PP sheets, isolating the high-voltage fiber collector from the grounded casing. Clean space: It is designed for easy cleaning, with no hard-to-reach spots. All nozzles are removable for cleaning; fiber collector is also removable. Dual viewing windows: High transparency, corrosion-resistant glass. Exhaust system: Adjustable exhaust rate. Built-in adjustable exhaust fan, external exhaust duct can be connected to a ventilation system or outdoors for solvent evaporation. UV sterilization lamp. Gas inlet. **8. Safety System:** Emergency stop button. Door-open power cut: High voltage system cuts off when the door is opened, other systems continue to operate. Static elimination device. Grounding system: Multiple grounding points for safety during experiments. Photography mode: Allows spinning and filming with the door open due to window reflection when closed. **9. Touchscreen Control System:** 7-inch imported touchscreen. Controls nozzle movement system.	

		Controls rotational fiber collecting device: Precision +/-1 RPM. Real-time parameter modification, controls coordination among movement units. Nozzle automatic cleaning: Frequency, cycle, and speed of cleaning can be set. Control and record high-voltage power parameters. Control and record micro-pump parameters. Record and store all system parameters, data exportable. **10. Consumables:** Syringes: 100 pcs, 10ml & 20ml. Needles: 100 pcs. PTFE tube (PP Luer fittings): 60 pcs. Reusable PP Luer fittings + PTFE hose: 200m. Special PVA water solution for electrospinning, MW80000, 10wt%. **11. Vision system.** The droplet observation system can observe the droplet status in real time and is equipped with a 2x optical magnification system. **12. Optional Components:** A wide selection of dozens of spinnerets and fiber collectors is available. 12.1 Spiral Collector Used for the preparation of continuously wound nanofibers and the fabrication of 3D nanofiber thick mats. • Equipped with a dedicated conjugate nozzle. • Rotating cup speed: 3~3000 rpm. • Winding speed range: 0~40 rpm. • Oscillation speed range: 0~60 mm/s. • Dimensions: 71 × 31 × 37 cm. • Includes a digital control box for controlling winding and oscillation. 14.2 Roll-to-Roll Continuous Collector • Winding width: Max = 250 mm • Winding diameter: Max = 65 mm • Winding core inner diameter: 28~48 mm • Unwinding core inner diameter: 20~48 mm • Winding length: Varies depending on material thickness, typically 50~100 meters in total. • Operating speed: 1~40 mm/s Main Features: • Constant linear speed: Maintains a consistent feeding speed even as the winding and unwinding diameters change during operation. • Automatic length calculation. • Preset length function: Stops automatically when the preset length is reached. • Ability to apply negative high voltage to the collector for improved spinning stability.	

		• Uses insulated and corrosion-resistant materials. • Cantilever drum design for easy paper tube replacement and operation. 14.3 Air-Electrospinning Device Combines the effects of airflow and high-voltage electrostatics to produce a wide variety of nanofiber morphologies, such as fiber membranes, fluffy fiber mats, 3D cotton-like fibers, and short fibers. The production output per single nozzle is more than 20 times that of traditional electrospinning. Main Components: • Dedicated air supply equipment with multi-layer filters and real-time flow rate display. • Specialized air-electrospinning nozzle. • Insulated support frame. • Air-electrospinning collector. • Additional accessories. 14.4 Nanoparticle Generation Device Used to produce nanoparticles and disperse them in liquids. Main Components: • IKA Magnetic Stirrer • Insulated Base • Microsphere Nozzle and Stand • Auxiliary Electrode 14.5 Cross-Layer Fiber Collection Device Designed to collect multilayer fiber membranes with longitudinal and transverse arrangements. Main Components: • Parallel Dual-Disc Rotating Collector with a speed range of 1-5000 rpm. • Collection Platform with a 90° rotating stage. • Digital Control Box. 14.6 High-Temperature Spinneret Features: • Temperature Range: Room temperature to 150°C. • Electrically Heated Nozzle that can directly connect to a high-voltage power supply. • Compatible with standard 5-10 ml glass syringes. • Includes 6 interchangeable needle sizes and supports inexpensive disposable glass consumables. • Uses polymers as spinning materials without the need for solvents. • Suitable for simple melt direct writing applications. 14.7 Insulated X-Y Motion Platform Designed for collecting nanofibers on non-bendable collection materials and for simple near-field direct writing applications.	

4.	Micro Hardness Tester	Load Range	**Load range from 0.002452 - 612.9 N (0.25gf to 62.5 kgf)** of the hardness tester and is applied by means of a closed control loop	**1**
		Standard	**Vickers** according to DIN EN ISO 6507, ASTM E384, ASTM E92 **Knoop** according to DIN EN ISO 4545, ASTM E384, ASTM E92 **Case hardening** depth CHD according to DIN EN ISO 2639 **Case hardening** depth after surface hardening according to DIN EN 10328, **Nitriding hardening** depth Nht according to DIN 501903	
		Indenters	**Vickers indenter with certificate (EN ISO+ASTM)** (cut line < 0.0005 mm) length 5 mm, dia. 6 mm **KNOOP** indenter with certificate (EN ISO+ASTM) length 5 mm, dia. 6 mm	
		Lens	5X, 10X ,50X ,100X	
		Test Blocks	**Test block HV 1** - value approx. 300 with EN ISO certificate 60x60x16 square Steel **Test block HV 1** - value approx. 700 with EN ISO certificate 60x60x16 square Steel **Test block HV 10** - value approx. 550 with EN ISO certificate 60x60x16 square Steel **Test block HV 30** - value approx. 550 with EN ISO certificate 60x60x16 square Steel **Test block HK 1** - value approx. 550 with EN ISO certificate 60x60x16 square Steel	
		Sample Holders	**Sample holder** for metal sheets up to 6mm for use up to 30kgf test load.	

			Sample holder for dia. 50 mm and 2" for use up to 30kgf test load. **Reducing ring** for sample holder 50mm/2" to 30mm/1.25" **Reducing ring** for sample holder 50mm/2" to 40mm/1.5" **Reducing ring** for sample holder 50mm/2" to 25mm/1"	
		Glass scales	**X-Y axes** to increase the absolute positioning accuracy to < 1 µm	
		Camera	**12 Mpix evaluation camera with CMOS sensor**	
		PLC measurement and control electronics	For controlling the load application with automatic test load change and vertical motor-driven adjustable test unit	
		Test Table (WxD)	150x200mm	
		Motor-driven X-, Y- and Z-linear slide in asym. assembly, traverse path	150 x 150 x 260 mm (X/Y/Z)	
		Personal Computer	**PC components standard English consisting of:** Technically currently available PC model (guaranteed compatible with Manufacturer of hardness tester) incl. Windows 11 Professional 64 bit Full HD LCD-Screen Mouse and keyboard	
		Software	**Basic operating software incl. 1 test method IMAGE for fully automatic image analysis according to standards (Vickers, Knoop)** Automatic brightness control and autofocus with statistic and report functions SAMPLE for often used measurement settings	

			CHD-C+ for creation of automatic Chd-, Nht-,Rht- and row measurements with test coordinates(up to three hardness limits per row) **MULTIPLE SPECIMEN** for programming and fully-automatic testing of multiple samples EXPORT EDITOR for individual amendments of export data (file format: PDF, excel, XML, CSV) Calibration assistant assists in the documentation and execution of all tests of the hardness tester which are defined in the standards (daily test and indirect verification). Software module including additional tools for area based tests on a specimen. Including mapping functions (diagram shows the hardness spreading on the tested area) and automated scanning of the edges of the specimen. **Software module** for the automatic fine positioning of prepositioned rows. Automatic process using evaluation camera Software module including additional tools to place test points according to dimensional specifications. Including helplines for angle and length as well as an upgraded polyline function. For welding samples. ceramic metals according to Palmqvist ISO 28079 and Nihara ISO14627. Software module for the stress-appropriate placement of test rows at a 30° tangent at the tooth root, at half tooth height, in the tooth axis as well as the placement of the core hardness point. **Software module** to create a high definition overview picture with live in picture function.	

			Software module for testing seamless and welded tubes and tube segments. Includes additional statistics for the individual segment areas. According to the requirements of API standards for petroleum and gas transporting systems **Software module** for adjusting the live image settings of the hardness tester for metallographic analysis	
5.	Scratch Tester	Basic Device	**Universal Nano mechanical Tester** - 2-column load frame with motorized Z-drive, precise guide and granitic base - Motorized Z-drive with 70 mm travel - Programmable motorized x-y table with 100 mm x200 mm x-y travel - Measurable sample area 80 mm x 80 mm, sample height up to 65 mm - 3-axis stepping motor drive as PCIe card - Control electronics for machine and measurement head (NFU) - Control unit with monitor, keyboard and mouse - W x H x D: 640 x 790 x 390 mm - Weight: 80 kg	**1**
		Optics with Tandem microscope	**Tandem-microscope with 2 cameras** (1.3 megapixel CMOS USB 3.0) with 1 objective lens with 50x magnification, green LED top-light	
		2N measuring head	**2N Normal Force Unit (NFU),** maximum force 2 N (compression and tension) for the measurement of forces and displacements perpendicular to the sample surface Piezo drive as actuator Independent force generation and force measurement with second sensor **2N Lateral Force Unit (LFU)** Lateral 2N measuring head, maximum force 2 N	

		Accessories	- For high accuracy measurements of lateral forces and displacements with nm-resolution - Extended control electronics - Additional modules of the control and analysis Software. **Atomic Force Microscope (AFM)** Scan head type 110-µm Maximum scan range (XY) 110-µm Maximum Z-range 22-µm XY-linearity mean error< 0.6% Z-measurement noise level typ. 350 pm(RMS, static mode) (max. 500 pm) Z-measurement noise level typ. 90 pm(RMS, dynamic mode) (max. 150 pm) Automatic approach range 4.5 mm (1.5 mm below focal plane of internal optics) Sample observation Dual USB video camera system (simultaneous top and side view): 5 MP, 1.4 mm x 1 mm, color top view and 5 MP, 3.1 mm x 3.5 mm, color side view of sample and cantilever Sample illumination White LEDs (brightness 0–100%); Axial illumination for top view Built-in 8× objective lens with 45 or 60 mm parfocal distance Controller : Operations Hardware specifications X/Y/Z-axis scan & position controller 3x 24-bit DAC, 200 kHz Z-axis position measurement 1x 24-bit ADC, 200 kHz Excitation & modulation outputs 2x 16-bit DAC, 20 MHz Standard imaging operating modes (Static Force, Dynamic Force) Imaging functions Up to 8000x8000 data points 24-bit zoom-in-8 acquisition channels with dynamic digital filters and channel assignment Constant height mode X/Y sample slope correction and over scan	

			Cantilever A nominal length of 225 µm or more, and a width of 40 µm or more A coating on the backside of the cantilever to reflect (infra)red light **ZHN steel sample holder for 5 inserts of 24 mm Ø** - For samples with maximum measurement area of Ø 24 mm - Isolated surface with electrical connection for resistance measurement indenter - sample - Working area 80 mm x 80 mm - With dovetail guide **ZHN steel sample holder for 1 insert of 50 mm Ø** - Steel sample holder for 1 big insert Ø 50 mm - Working area 80 mm x 60 mm - With dovetail guide **ZHN Clamping sample holder** **For a fast fixing of samples without glue or wax by pressing against leaf springs** - Measurable sample area maximum 12mm x 40mm - Maximum sample height: 33.5 mm - Adjustable slot width between 6 mm - 12 mm - Minimum sample width: 10 **ZHN Sample holder for foils, thin sheets or wires** - Minimum sample length for fixing: 50 mm - Maximum sample width: 18 mm - Maximum measurement area: 10 x 10 mm **Conductive Berkovich indenter** Conductive 3-sided diamond pyramid; face angle 65.27° **Conductive spherical diamond indenter with 10µm radius**	

			Conductive spherical diamond indenter with 10 µm radius (nominal) - Opening angle 90° **Ultra sharp Berkovich indenter** Ultra sharp 3-sided diamond pyramid; face angle 65.27°; tip radius <110nm **Spherical diamond indenter with 2µm radius** Spherical diamond indenter with 2 µm radius (nominal) - Opening angle 90° **Set of calibration materials** Box with fused silica (8 mm x 8 mm, both sides polished), sapphire (0001 single crystal, 10 mm diameter, one side polished) and polycarbonate (PC, 16mmx16mm) **Active vibration isolation system with 2 damping elements** Type Vario Basic 40-300 consisting of 2 damping elements and electronics - Maximum load capacity 300 kg - Frequency range for actice damping 0.6 - 200 Hz - Supply voltage 220 V, no compressed air required **Cabin For Universal Hardness Tester** Enclosure for thermic and accustic isolation - For a reduction of the influence of sound and temperature fluctuations on the measurement results - W x H x D: 932 x 1092 x 761 mm - Weight: approx. 88 kg **Robust steel table / base frame** - W x H x D: 1240 x 756 x 770 mm - low vibration - Adjustable height via support frame - Scratch-proof coated medium density fiberboard as working area	

		Software	**Control and data processing software for Universal Hardness tester Control and data processing software** - Hardware control of all nano hardness types - Analysis of depth-sensing indentation data according to DIN EN ISO 14577 - Analysis of dynamic tests, scratch and wear tests and more - comprehensive routines for analysis, corrections and calibrations - diverse export routines - incl. autofocus and focus series module **QCSM Module (Quasi Continuous Stiffness Measurement)** - Software module for depth dependent measurement of hardness and modulus at one and the same sample position by using a superposition of small oscillations in the force and displacement signal - Continuous Stiffness Measurements (QCSM, CSM), fatigue tests, frequency sweeps - Frequency range 2 Hz - 300 Hz, - Stiffness analysis up to 70 Hz **Module for Scratch and Wear Tests** Software module for scratch and wear tests by using the X- or Y-stage or with the LFU (additionally, measurement of lateral force, friction coefficient) **Profilometer module** Software module for 2-dimensional mapping of the surface with a spherical tip using the X-Y table or with the LFU (increased travel resolution); Line scans	

		Personal Computer with Printer	**Latest model suitable to the equipment with printer**	

Lot – 4			
S. #:	**NAME OF ITEMS**	**TECHNICAL SPECIFICATIONS**	**Quantity**
1.	Battery and Pouch Cell Fabrication Assemble line	System should have the following items with specifications: 1- Vacuum Oven for Slurry Making for Materials, electrode and battery: Voltage Input: 110V AC or 220V AC (selectable), 50/60 Hz. Power ~1400 W Temperature Range RT (Room Temperature) +10°C to 250°C Temperature Fluctuation ±0.5°C to ±1.0°C Vacuum Degree≤133 Pa (-0.1 MPa) Inner Chamber Material304 Stainless steel (or 1Cr18Ni9Ti) Inner Chamber Size (L*W*H) 415 mm x 345 mm x 370 mm External Dimensions (L*W*H) 710 mm x 560 mm x 550 mm Volume Approximately 50 L Shelves 2 pieces included (solid or mesh options available) Along with, Lab. Vacuum Mixer and Viscometer. 2-Desktop Film Coating Machine for Coating: Lab-scale vacuum film coating machine for lithium battery research, featuring adjustable speed (0-100mm/s), heating up to 200°C with ±1°C accuracy, and a built-in vacuum pump, ideal for uniform coating on substrates like copper/aluminum foil. Key specs include a 150mm coating width, adjustable stroke (10-250mm), digital touch screen control, and compatibility with glove boxes for high-precision, small-batch electrode preparation. Along with NMP Process. 3- Electrode Making: the following items must be supplied with, Manual Cutter size: 400*300mm Qty.02 Lab Hot Roll Press machine, 4- Assemble System must have the following items: Manual Electrode Die Cutter Machine, Manual Stacking Machine, Ultrasonic Welding Machine, Short Testing Machine, Aluminum Pouch Di size should be: 40*60mm, Top-side Sealing Machine, Battery Shirt Circuit Tester for Pouch Film And Tab. 5- Filling System: Manual Pipette for Filling, Electrolyte Diffusion Chamber AND Vacuum Pre-Sealing Machine must be included along with Glove Box. 6- Sealing System: Secondary Sealing Machine, Use Pre-sealing machine,	**1**

		7- Testing System: Internal Resistance Tester and Battery Tester Machine must be supplied a complete setup.	
2.	3D Printer for Printing Microelectrode	Resolution (XY/Z)10 µm (minimum feature size)Layer Thickness5–25 µm (selectable)Build Volume100 mm × 100 mm × 75 mm (750 cm^3) – up to 7x larger than S140 for batch production Tolerance/Accuracy±25 µm (micron-level precision for scalable microelectrode production)Printing SpeedUp to 150 mm/hour (Z-axis) – 10x faster than S140 for higher throughput Material Compatibility-curable photopolymer resins (e.g., high-strength engineering, conductive, or functional for electrodes); broad compatibility with post-processing techniquesTechnologyPµSL (Projection Micro-Stereolithography) – enables rapid layer photo polymerization for production-quality parts Software microArch proprietary software (advanced automation, batch queuing, quality analytics)Power Requirements110–240 V AC, 50/60 Hz, ~1,000 W (single-phase). Operating Environment Temperature: 18–28°C; Humidity: 30–70% RH (non-condensing); requires dedicated space Connectivity Ethernet, USB; API integration for factory automation Other Features. Automated resin handling; up to 10x throughput for short-run manufacturing; enhanced optics for consistent micron accuracy; 2025 updates include improved material library for conductive applications. Applications Suitability. Suited for industrial-scale microelectrode production (e.g., wearable sensors, microfluidic devices) with balanced precision and efficiency. microArch S240.	**1**
3.	Ceramic 3D Printer for Prosthetics	Technology Projection Micro Stereo lithography (PµSL) for high-resolution ceramic printing. Layer Resolution 2 µm (xy resolution) for ultra-fine details in prosthetic interfaces or implants. Build Volume 50 x 50 x 50 mm, suitable for small-to-medium prosthetic components (e.g., dental crowns, socket liners, or joint parts). Material Compatibility Ceramic-filled resins (e.g., BASF Ultracur3D 3280) or alumina/zirconia slurries; post-process able for biocompatibility (ISO 10993-compliant after sintering). Print Speed Up to 5x faster than comparable 2 µm systems; ~1–2 hours for small prosthetic parts (varies by complexity). Post-Processing Debinding and sintering required to convert green parts to dense ceramics; furnaces needed (not included). Accuracy ±10 µm for tight tolerances in patient-	**1**

		specific designs. Software BMF's proprietary software for precise control, STL file compatibility, and automated support generation. Applications Custom prosthetic sockets, dental implants, microneedles, or wear-resistant connectors. Build Platform Heated platform for stable curing of ceramic resins; auto-leveling for consistency. Footprint Compact (~1.5 m^2 floor space) for lab or clinic use. Power Requirements Standard 110–240V, single-phase; ~1–2 kW consumption.		
4.	Nano-Contact Type Dilatometer	Maximum Furnace temperature	RT up to 2000°C	**1**
		Temperature at specimen	RT up to 2000°C	
		Heating Rate	Up to 50°C/min	
		Temperature Resolution	0.2°	
		Sample Dimensions	24x22x40mm	
		Resolution	Up 1µm or 3ppm(with standard sample)	
		Vacuum	Up to 10^{-5} mbar	
		Hydrogen Atmosphere	Hydrogen Safety System	
		Inert Atmosphere	For Nitrogen Gas Flow rates from 5ml up to 100ml per minute	
		Measuring range contact angle	0….180° ±0.1°	
		CCD Camera	High resolution real time analysis of the sample either a single frame or as video sequence	
		Calibration Standards	According to Material Category	
		International Standards	ASTM C372, ASTM D1857, CEN/TR 15404, BS1016:Part15, CEN/TS 15370-1, DIN 51730, ISO	

		Detection Modes	12891, ISO 540, NF M03-048 Sintering, Softening Point, Deformation Point, Sphere, Half-Sphere, Melting Point, CTE coefficient of thermal expansion, Linear and volumetric thermal expansion, Contact Angle, Surface Tension, Volume Symmetry, Asymmetry, Height, width ration, Specific Heat, TMA and many others.	

Lot – 5			
S. #:	**NAME OF ITEMS**	**TECHNICAL SPECIFICATIONS**	**Quantity**
1.	Sonicator	Specifications should be: Durable tank and basket made of stainless steel SUS304 Adjustable temperature and timer Digital timer and controlled heater Thorough cleaning can be done using tap water Highly efficient cleaning can be done using industrial alcohol or solvent cleaner Microprocessor controller, well-built, reliable circuit control board Built-in drain for safe disposal of contaminated solutions Capacity : 30 L Ultrasonic Frequency: 40000 Hz Temp. Range: 20°C to 80°C Timer Range: 1-30 min Heating Power 500 W Ultrasonic Power 600 W Power Supply: AC 220-240V, 50 / 60 Hz	**4**
2.	Autoclave	Specifications should be: The instrument is made of SUS304/AISI 304 fully stainless-steel structure. Hand wheel type of quick-open door system Equipped with Door safety lock system Microprocessor controller system Digital display of working status, touch of key Over temperature & over pressure auto-protection Protection against low water level Self-inflating type of seal Automatically shuts off with a beep reminding of the completion of the sterilization cycle It has a Steam-water inner circulation system wherein no steam discharge occurs and the environment remains clean and dry Standard Accessory: Two stainless steel sterilization baskets Capacity : 100 L Sterilization Temperature 0°C-134°C Working Temp.: 134°C Heat Average: ≤±1°C Sterilization Time 0-99min or 0-99hour59min Working Pressure: 0.22 Mpa Inner Dimension ϕ440×650 mm Power: 4500W Power Supply: AC 220V 50Hz	**4**
3.	Tube Furnace	Specifications should be: PID controlled software and synchronized hardware 4-line wide LCD display and user-friendly operation Audio warnings at the end of each step and at the end of the whole heating program Total heating time and average working temperature are displayed Date and time settings available	**4**

		Microprocessor automatically cuts power to the heating elements and alerts if the control unit/ control card is overheated or if the furnace is heated above the maximum heating temperature Dimension: 20x250 mm Maximum Temperature: 1300°C Working Temperature: 1250°C Thermal Rate: 3°C/min-20°C/min Temp. Accuracy ±1°C Amperage (Imax) 5 A Heating Program Direct/two step Program Memories: 2 Heated Length (mm): 250 mm Maximum Power 1000 W Power Supply: 220V / 50Hz	
4.	Centrifuge	Specifications should be: It has a Stainless-steel structure for sustainable use. It has advanced CPU control system. Microprocessor based control of Speed, RCF and Temperature. Maintenance-free frequency conversion motor. It has been included with protection from over speed, over temperature and imbalance. Also it has protection of automatic electronic or mechanical lock to ensure the safety of operators and devices. Max. Speed (RPM): 24000 Max. RCF (x g): 47800 Max. Capacity: 4*100 ml Ambient Temperature: +15 ℃ Speed Accuracy ±50 rpm Speed Control 0-24000 Set Speed (increments) 50rpm Timer range: 0-99 mins Set Time (increments for LCD): 1 second Set Time (increments for Digital): 1 min Control System: Microprocessor Program Memory: 9 Display LCD/ Digital Motor (DC/ Brushless): AC Frequency Conversion Motor Acceleration/ Deceleration Rate: 9 grade Noise Level: ≤65 dB Rotor Material: Aluminum Alloy Power Supply: AC 220V & 110V 50 & 60Hz 5A Power Consumption: 550 W	**1**
5.	Rotary Evaporator	Specifications should be: The housing of water bath is of stainless steel to prevent it from undesirable corrosion of the bath. Vacuum seal is made of double-binding Teflon and NBR nitrile in order to provide the seal with anti-abrasion, anti-aging and anti-chemical functionality, which enables the machine to make higher vacuum pressure compared to most of other imported equipment. The leaning angle of the evaporating flask can be easily manipulated by screwing a simple bolt type controller.	**4**

		Combi-Clip can easily remove or attach the evaporating flask. The insulated heater prevents the machine from burning accident or heat loss. Set the water temperature in water bath at 60°C. Sample Flask: 1L Sample Input: 500 ml Speed: 20-280 rpm Capacity of FlasksStandard: 50 ml to 3000 ml Optional: 4000 ml Temperature: RT -180 ℃ Display Digital Timer Range: 0-999 min Capacity of Bath 4.3 L Bath Dimension (ϕ×H): 245×120 mm Power of Heating Bath: 1000 W Weight of Bath: 2.8 kg Height adjustment of Heating Bath 150 mm Lift: Motorized Power Supply: AC 220V 50/60 Hz Supplied with Vacuum pump and chiller	
6.	Glove Box	Specifications should be: Size: 1200*800*700 Material Thickness: 10mm Door Shape: Round door (Left) 300-400mm Transition box: 160mm Glove Dimension(L*W*H) mm: 145*600*1.1 or 145*800*0.3 Operation/Main Box Dimension: 1200*800*700(mm) Transition Box Dimension: 240*240*240(mm) Basic configuration: 1 vacuum meter; 1 vacuum valve; 3 inlet and outlet valve; one power supply board Vacuum degree of transition room: 0~-0.1Mpa (2.5 level vacuum meter), pressure maintaining over 12 hours	**4**
7.	Fume Cupboard	Specifications should be: Durable and helps in the removal of Hazardous chemical gases. Made of Porcelain white (PP thickness 8mm) which is resistant to strong acid, alkali and is anti-corrosive. Work surface is made of Solid Chemical with Resistant physiochemical board. Has an anti-corrosive water tap. Front window which is made of thick transparent toughened glass of 5mm thickness. Provides Maximize light and visibility inside the fume hood. The blower is present on top of fume hood. Centrifugal Fan with an adjustable speed is present inside the fume hood. Microprocessor controlled system. LCD display. Illuminator Fluoresce Lamp. Standard Accessory: Illuminating Lamp, Water tap – 1pc, Gas tap – 1pc, Water sink – 1pc, Base cabinet – 1pc, Waterproof sockets – 2pc, 4 meters PVC exhaust duct (Diameter:250mm) – 1pc, PP Centrifugal Blower – 1pc, Pipe strap – 2pc	**4**

		Overall Dimension (WxDxH): 1540x800x2200mm Inner Dimension (WxDxH): 1320x570x872mm Work Surface Height: 740mm Max Opening: 815mm Air Velocity: 0.3~0.6m/s Noise: ≤60dB Blower: Built-in PP centrifugal Blower (2 blowers for LSFH-304 only), Speed adjustable. Exhaust Duct: PVC, Standard length: 4 meters (ϕ 300mm) Front Window: Manual, Resistant to acid, alkali 5mm toughened glass, height adjustable Power Supply: AC220V±10%, 50/60Hz ; 110V±10%, 60Hz Power Consumption: 360W Exterior Material Made of Porcelain white PP, thickness 8mm, resistant to strong acid, alkali and anti-corrosion Interior Material Chemical resistant phenolic resin Work Table Material: Chemical resistant phenolic resin	