Request for Proposal (RFP) Against Limited Tender Enquiry in Two Bid System

(This notice is being published only to limited bidders and is not an open invitation to quote in tender)

for

Manufacturing of Air-Cooled Battery Pack with Test Fan for Hybrid Electric Vehicle

For & On Behalf of
SRIC IIT KHARAGPUR

On E-Tender Basis

Tender No. IIT/SRIC/EE/HEV/SM/20-21/EQ-65

Sponsored Research and Industrial Consultancy (SRIC)
Indian Institute of Technology Kharagpur
Kharagpur - 721302
Email: smukh@ee.iitkgp.ac.in

Signature of the Tenderer
Date with Seal
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Indian Institute of Technology Kharagpur
Sponsored Research and Industrial Consultancy

SECTION – I

No. IIT/SRIC/EE/HEV/SM/20-21/EQ-65 Date: 13/05/2021

Invitation for Bids / RFP against Limited Tender Enquiry

(E-Procurement Mode)

Indian Institute of Technology Kharagpur is set up by the Act of parliament called The Institutes of Technology Act 1961 and it is declared as Institutions of National Importance and Institutions of Eminence. Sponsored Research and Industrial Consultancy (SRIC) is a Research and Industrial Consultancy unit of Indian Institute of Technology Kharagpur. On behalf of Sponsored Research and Industrial Consultancy, INDIAN INSTITUTE OF TECHNOLOGY KARAGPUR (IIT KGP) e-tender are invited from limited domestic manufacturer (As per Annexure II) having registered office in India, who fulfil the criteria mentioned in the tender documents for Supply of (Manufacturing of Air-Cooled Battery Pack with Test Fan for Hybrid Electric Vehicle). The list of equipment and their specifications are given in Section V.

Complete Tender Documents can be downloaded from the website “https://eprocure.gov.in/eprocure/app” from 13 May, 2021 to 27 May, 2021 upto 12:00 HRS. IIT KGP-SRIC shall open the Technical Bids Electronically on the specified date and time at IIT KARAGPUR (SRIC).

Interested eligible limited domestic manufacturer (As per Annexure II) having registered office in India may submit their bids online at https://eprocure.gov.in/eprocure/app in Two-Bids system (i.e. Technical Bid and Price Bid) in prescribed proforma. All the documents in support of eligibility criteria etc. are also to be scanned and uploaded along with the Tender Documents. Tenders sent by any other mode will not be accepted. No tender documents will be accepted after the expiry of stipulated date and time for the purpose under any circumstances what so ever.

The Competent Authority at IITKGP-SRIC reserves right to cancel the tender at any time or amend/withdraw any of the terms and conditions contained in the Tender Document, without assigning any reason, thereof.

IITKGP-SRIC reserves the right to accept either in full or in part any tender and to reject any or all offers without assigning any reason thereof.

Dated: 13/05/2021

Dean (SRIC)
Submission of a proposal in response to this notice shall be deemed to have been done after careful study and examination of this document with full understanding of its terms, conditions and implications.

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<td>05.</td>
<td>Contact details</td>
<td>Prof. Siddhartha Mukhopadhyay</td>
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<td>Department of Electrical Engineering</td>
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SECTION - II
INSTRUCTIONS TO BIDDERS

A. INTRODUCTION

DEFINITIONS

“The Purchaser” means the DEAN (SRIC), (IIT KGP-SRIC) INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR, Kharagpur, SRIC

“The Bidder” means the individual or firm who participates in the tender and submits bid

“The Agency” means the individual or firm rendering the services under the contract.

“The Services” means all activities related to conduct & performance of contractual obligations under the contract.

“The Advance Purchase Order/ Letter of intent” means the intention of IIT KGP – SRIC to place the Purchase Order on the bidder.

“The Purchase Order” means the order placed by IIT KGP-SRIC on the Supplier/ Agency signed by IIT KGP-SRIC including all attachments and appendices thereto and all documents incorporated by reference therein. The purchase order shall be deemed as “Contract” appearing in the document.

“The Contract Price” means the price payable to the Supplier/ Agency under the purchase order for the full and satisfactory performance of its contractual obligations.

“Acceptance is a process of accepting satisfactory services rendered by “Supplier/ Agency” by IIT KGP- SRIC.

1. ELIGIBILITY CRITERIA

The invitation of bids is limited to domestic manufacturer (As per Annexure II) having registered office in India who fulfil the criteria as specified below:

(I) The Bidder shall only be either “Class-I Local Supplier” or “Class-II Local Supplier” as defined under the order no. P- 45021/2/2017-PP (B.E.-II) dated. 16/09/2020 of Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade (Public Procurement Section). (A self-certificate shall be submitted by the bidder along with the bid about their category (i.e., Class-I or Class-II) in a prescribed format vide Section XI.

(II) The Bidder shall be registered legal entity under relevant act. and a copy of each of registrations shall be attached with the bids.

(III) Minimum Five (5) years’ experience in the field of supply of laboratory equipment.

(IV) Average Annual Turnover of at least 2,50,000 INR during last 3 financial years i.e. 2017-18, 2018-19 and 2019-20 is required. (Copy of Audited Annual Accounts of the organization for the financial year 2017-18, 2018-19 and 2019-20 shall be uploaded with the bid as proof in this regard).
(V) Copy of acknowledgement of filing of Income Tax Return for the financial year 2016-17, 2017-18 and 2018-19 shall be uploaded with the bid.

(VI) Must have supplied/developed/manufactured similar equipment to laboratories of State or Central Government Institutions or reputed Educational or Research Institution and proof of such supplies should be produced.

(VII) It should have PAN, TIN number and GST Registrations (proof in this regard shall be uploaded with the bid).

(VIII) It should not have been blacklisted by the Government Organizations, GOI, Autonomous bodies. Undertaking in Section X in this regards has to be uploaded.

(IX) Registration Certificate/Certificate of incorporation, if any, including the certificate of MSME/NSIC/Other EMD Exemption Document etc.

(X) Authorized dealer Certificate from Manufacturer if the agency is a dealer.

(XI) Bidders should not be associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by the Purchaser to provide consulting services for the preparation of the design, specifications, and other documents to be used for the procurement of the goods to be purchased under this Invitation of Bids.

2. COST OF BIDDING

The bidder shall bear all costs associated with the preparation and submission of the bid. The Purchaser will, in no case, be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

3. BID DOCUMENTS

3.1 The services required to be rendered, bidding procedures and contract terms and conditions are prescribed in the Bid Documents. The Bid documents include:

a) Notice Inviting Tender & List of Equipment - Section - I
b) Time Schedule of Tender - Section IA
c) Instructions to Bidders and General terms and Conditions - Section II
d) General (Commercial) Conditions of Contract - Section III
e) Special Conditions of the Contract - Section IV
f) Schedule of Requirements with Techno-Commercial Terms - Section V
g) Proforma for Technical Bid - Section VI
h) Price Bid Declaration - Section VII
i) Performance Security Guarantee Bond - Section VIII
j) Bid Security Self Declaration Form - Section IX
k) Undertaking - Section X
l) Self-certificate for Local Content (Preference to make in India for price preference) – Section XI
m) (For Goods/ Services Contracts) Certificate - Bidder Not from/ from Country sharing Land border with India & Registration of Bidder with Competent Authority – Section XII
n) (For Works Contracts, including Turnkey Contracts) Certificate – Bidder Not from/ from Country sharing Land border with India, Registration of Bidder with Competent Authority & not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority – Section XIII
o) Checklist for the Tenderer – Section XIV

3.2 The Bidder is expected to examine all instructions, forms, terms and specifications in the Bid Documents. Failure to furnish all information required as per the Bid Documents or submission of the bids not substantially responsive to the Bid Documents in every respect will be at the bidder’s risk and shall result in rejection of the bid.

B. PREPARATION OF BIDS

Bidder should take into account any corrigendum published on the tender document before submitting their bids.

4. DOCUMENTS COMPRISING THE BID

The bid prepared by the bidder shall comprise the following components (these will also be used for determining the eligibility criteria)

4.1 Documentary evidence established in accordance with the eligibility criteria explained above that the bidder is eligible to bid and is qualified to perform the contract if the bid is accepted.

4.2 Bid Security Self Declaration Form at a prescribed format shall be furnished.

4.3 A bid form and price schedule completed in accordance with the guideline.

4.4 Bidder shall furnish a clause-by-clause compliance to the requirements and commercial conditions demonstrating responsiveness to terms and conditions. In case of deviations, a statement of deviations and exceptions of provisions of the contract and commercial conditions shall be given by the bidder. A bid without clause-by-clause compliance of terms and conditions shall not be considered.

4.5 The Copy of Audited Annual Accounts of the organization for the financial year 2017-18, 2018-19 and 2019-20 in support of an average annual turnover of at least 2,50,000 INR during last 3 years i.e. 2017-18, 2018-19, 2019-20 shall be uploaded.

4.6 Registration Certificate of the company as per eligibility criteria.

4.7 Income Tax Return for three financial years i.e. 2016-17, 2017-18 and 2018-19.
Indian Institute of Technology Kharagpur
Sponsored Research and Industrial Consultancy

4.8 GST Registration Certificate.
4.9 Copy of PAN of the Company/ firm.
4.10 Lists of clients with reference in minimum five firms with name, designation and contact details.
4.11 Self-certification of full-fledged office infrastructure.
4.12 Brief on supply of laboratory equipment handled during last five years.
4.13 List of offices/branches in India/West Bengal with address and contact details.
4.14 Email id and phone number of the contact person of the firm.

5 BID FORM
The bidder shall submit the bid form in their own Stationery and by using only prescribed format. Use of any other format, the bid may be liable for rejection.

6 BID PRICES
6.1 The bidder shall give FOR destination price, inclusive of all Levies & Taxes for laboratory equipment for IIT KGP-SRIC. The price should be indicated as per BOQ.xls Format under Financial Cover.
6.2 A bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.
6.3 The price quoted by the bidder shall remain fixed during the entire period of contract and shall not be subject to variation on any account.
6.4 “DISCOUNT, if any, offered by the bidders shall not be considered unless they are specifically indicated in the price schedule. Bidders desiring to offer discount shall therefore modify their offers suitably while quoting and shall quote clearly net price taking all such factors like Discount, free service, etc, into account”.
6.5 The price accepted by the IIT KGP-SRIC for the supply of equipment will be inclusive of Levies and Taxes.

7 GUARANTEE/WARRANTY

Comprehensive onsite warranty for one year is required. Warranty period will start from the date of installation of items. In case at installation stores / part of stores are found defective / damaged during or after delivery to consignee, the supplier will replace or repair the store under warranty at consignee’s location in India free of cost or if any case it is required to send back to foreign manufacturer / supplier should bear the cost. Bank Guarantee equivalent to the cost of equipment is required to be submitted before lifting the store. All expenses in this regard will be borne by the supplier.
8 BID SECURITY

8.1 The Bidder should submit the Bid Security Declaration as per Format specified in Section X and it should be notarized along with the tender.

8.2 After accepting Bid Security declaration, if bidder withdraw or modify their bids during the period of validity, they will not be allowed to participate to any tender of IIT Kharagpur for a period of 1 (one) year from the date of notification issued by IIT Kharagpur.

9 PERIOD OF VALIDITY OF BIDS

9.1 Bid shall remain valid for 90 days after the date of opening of bids prescribed by IIT KGP-SRIC. A bid valid for a shorter period shall be rejected by IIT KGP-SRIC as non-responsive.

9.2 In exceptional circumstances, IIT KGP-SRIC may request the consent of the bidder for an extension to the period of bid validity. The request and the response thereto shall be made in writing. The Bid Security Self Declaration as per Section IX shall also be suitably extended. A bidder accepting the request and granting extension will not be permitted to modify his bid.

C. SUBMISSION OF BIDS

10 Information for Bidder on e-Procurement

10.1 Tender Documents may be downloaded from Central Public Procurement Portal http://eprocure.gov.in/eprocure/app. Aspiring Bidders who have not enrolled/registered in e-procurement should enroll/register before participating through the website http://eprocure.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at ‘Instructions for online Bid Submission’.

10.2 Help for Service Providers, FAQ, Information about DSC and Bidders Manual Kit containing the detailed guidelines for e-Procurement system are also available on Central Public Procurement Portal. [https://eprocure.gov.in/eprocure/app]

10.3 It is mandatory for all the bidders to have a valid Class-II/Class-III Digital Signature Certificate (in the name of person having power of attorney to sign the Bid) from any of the licensed Certifying Agency (Bidders can see the list of licensed CA’s from the link www.cca.gov.in) to participate in e-Procurement of IIT KHARAGPUR.

10.4 It is mandatory for the bidders to get their firm/company registered with e-procurement portal https://eprocure.gov.in/eprocure/app to have user ID & password.

10.5 Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

10.7 The tender documents shall be submitted online in the prescribed format given on the websites and technical bids received online shall be opened as per NIT or Corrigendum thereof. No other mode of submission is acceptable. Detailed credentials as per the requirement of eligibility criteria and all tender papers except Bill of Quantities are to be submitted in “Technical Bid”.

10.8 Bill of Quantities with rates duly filled in are to be submitted in the format provided online in the name of “Financial Bid”.

10.9 Bidders cannot submit the tender after the due date and time of e-bid submission. Time being displayed on Central Public Procurement Portal [https://eprocure.gov.in/eprocure/app (“Server System Clock Time”) ] shall be final and binding on the bidder. E-Bids are required to be submitted by bidders, only as per the Indian Standard Time (IST) and not the time as per their location/country.

10.10 The bidders are advised to submit their e-bids well before the e-bid due date. IIT Kharagpur shall not be responsible for any delay in submission of e-bids for any reason including server and technical problems.

10.11 The Technical and Financial Bid shall be digitally signed by the Authorized Signatory of the bidder & submitted “on-line” only. The authorized signatory of the bidder must be in possession of Power of Attorney before submitting the digitally signed bid. Scanned copies of various documents can be prepared in .pdf file format.

10.12 A standard BoQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BoQ file, open it and complete the blue colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.

10.13 The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

10.14 All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.

10.15 The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

Signature of the Tenderer
Date with Seal
Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

**GENERAL TERMS AND CONDITIONS:**

1. **BID OPENING AND EVALUATION**

   1.1 **OPENING OF BIDS BY SRIC, IIT KGP**

      1.1.1 IIT KGP-SRIC shall open the Technical Bids Electronically on 28/05/2021 at 12:00 HRS IIT Kharagpur (SRIC).

      1.1.2 The date fixed for opening of bids if subsequently declared as holiday by SRIC, IIT KGP the revised date of schedule will be notified. However, in absence of such notification, the bids will be opened on next working day, time and venue remaining unaltered.

      1.1.3 The financial bid will be opened only for bidders declared eligible and selected after techno-commercial evaluation. The financial bid will be opened on a date fixed after evaluation of techno-commercial bids and will be intimated to all eligible bidders in advance.

2. **CLARIFICATION OF BIDS**

   In case any bidder requires any clarification, bidder can feel free to raise their query on or before the date given in SECTION-1A of the tender document. Release of response to clarifications on queries shall be available in the Institute’s website [www.iitkgp.ac.in](http://www.iitkgp.ac.in) by the respective principal investigator.

   All interested bidders shall follow the institute’s website and CPP Portal at regular intervals for clarifications / corrigendum if any.

3. **SELECTION PROCEDURE**

   3.1 Agencies found to fulfil eligibility conditions will be considered after verifications of eligibility criteria mentioned in Section II.

   3.2 The bidders shall be evaluated as per criteria mention in the tender documents.

   3.3 Financial bids of the selected agencies only shall be opened.

4. **Evaluation of Bids**

   4.1 The technical bids will be evaluated in two steps

   The bids will be examined based on eligibility criteria stipulated at Section-II-1 to shortlist the eligible bidders.

   The technical bids of only the short listed eligible bidders shall be evaluated based on technical specifications stipulated.
The bidders whose technical bid is found to meet both the requirements as specified above will qualify for opening of the financial bid and will be informed about the date and time of the opening of the financial bid.

The duly constituted Tender Evaluation Committee (TEC) shall evaluate the bids. The TEC shall be empowered to take appropriate decisions on minor deviations, if any.

The bidder’s name, bid prices, discounts and such other details considered as appropriate will be announced at the time of opening of the financial bids.

4.2 Comparison of Bids

Only the short-listed bids from the bid evaluation shall be considered for commercial comparison.

The Financial bids will be evaluated on the basis of prices quoted.

The contract will be awarded to lowest evaluated bidder.

4.2.1 SRIC-IIT KGP reserves the right to offer the contract to a qualified bidder.

4.2.2 SRIC-IIT KGP’s decision in regard to evaluation & selection shall be Final and binding on the Agency and same shall not be challenged by the agency before the Court.

5. CONTACTING SRIC, IIT KGP

5.1 No bidder shall try to influence SRIC, IIT KGP on any matter relating to the bid.

5.2 Any effort by a bidder to influence SRIC, IIT KGP in SRIC, IIT KGP’s bid evaluation, bid comparison or contract award decision shall result in the rejection of the bid.

6. AWARD of Contract

6.1 IIT KGP-SRIC shall award the contract to the Bidder(s) whose Bid(s) has been determined to be substantively responsive, eligible and qualified, technically suitable and who has offered the lowest evaluated bid price as per evaluation criteria detailed in the tender document. The contract will be awarded based on the guidelines mentioned in the ‘Public Procurement (Preference to Make in India), Order 2017’ order no. P- 45021/2/2017-PP (B.E.-II) dated. 16/09/2020 of Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade (Public Procurement Section) and any subsequent revision thereafter.

6.2 Award of work shall be considered on the basis of requirement as assessed by SRIC, IIT KGP.

6.3 A purchase order will be issued by SRIC, IIT KGP to the successful bidder.

6.4 The Agency should supply the equipment as early as possible after the award of purchase order.

6.5 Upon the successful bidder furnishing of performance security pursuant to clause 2 Section III, IIT KGP-SRIC shall discharge the bid security in pursuant clause to 8, Sec II.

6.6 The selection of the agency will be at the sole discretion of the SRIC, IIT Kharagpur.
7. **SRIC, IIT KGP’s RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS**

   IIT KGP –SRIC reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of contract without assigning any reason whatsoever and without thereby incurring any liability to the affected bidder or bidders on the grounds of SRIC, IIT KGP’s action.

8. **JURISDICTION**

   This tender and or the contract or work order issued under this tender shall be governed by Laws of India and shall be exclusive jurisdiction of courts at Medinipur, West Bengal.

9. **TAXES**

   Suppliers shall be entirely responsible for all taxes, duties, license fees, octroi, road permits, etc., incurred until delivery of the contracted Goods to the Purchaser.

   For research purpose(s) ONLY, 5% GST will be applicable with concessional GST Certificate.

10. **DUTIES**

   IIT Kharagpur is exempted from paying custom duty under notification No.51/96 (partially or full) and necessary “Custom Duty Exemption Certificate” can be issued after providing following information and Custom Duty Exemption Certificate will be issued to the shipment in the name of the Institute, (no certificate will be issued to third party): The procured product should be used for teaching, scientific and research work only.

11. **Bidders should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) on the same and specific to the tender should be enclosed.**

   (ii) An undertaking from the OEM is required stating that they would facilitate the bidder on a regular basis with technology/product updates and extend support for the warranty as well.

   (iii) OEM should be internationally reputed Branded Company.

   (iv) Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid.

   (v) In the tender, either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same tender.

   (vi) If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same tender for the same item/product.
SECTION - III

GENERAL (COMMERCIAL) CONDITIONS OF CONTRACT

1. APPLICATION

The general condition shall apply in contracts made by IIT KGP-SRIC for the procurement of goods/services.

2. PERFORMANCE SECURITY

2.1 The successful bidder shall be required to deposit 3% of the total value of the order as performance security, within 14 days of issue of Purchase Order /letter of intent in the form of D.D*/Pay Order*/Fixed Deposit Receipt* / Bank Guarantee (performance security bond prescribed in Section VIII) from commercial bank drawn in favour of “IIT Kharagpur, payable at Kharagpur” and the bank guarantee shall remain valid for 60 days beyond the date of completion of all contractual obligation of supplier including warranty obligation for the equipment/goods.

2.2 The amount of performance security so withheld will be discharged after the warranty period is over.

2.3 If the contractor fails or neglects any of the bid obligations under the contract it shall be lawful for IITKGP-SRIC to forfeit either whole or any part of performance security furnished by the bidder as penalty for such failure.

2.4 The proceedings of performance security shall be payable to IITKGP-SRIC as compensation for any loss resulting from Supplier/Agency’s failure to complete its obligation under the contract.

2.5 The performance security bond shall be extended suitably in the event of extension of period of contract or till all obligations under the contract has been satisfied.

*Performance Security will not be carrying any interest.

3. PAYMENT TERMS

100% Payment will be made on submission of all required documents by the supplier/contractor after receipt and satisfactory installation (as certified by the concerned PI) of the store at the designated place in IITKGP.

4. PRICES

4.1 The rates quoted for the equipment shall be for free delivery and installation at IITKGP-SRIC (designated Laboratories/Department/Centre/Schools)

4.2 Prices charged by the supplier for goods delivered and services performed under the contract shall not be higher than the price quoted by the supplier in his bid.

4.3 Prices will be fixed at the time of issue of purchase order as per taxes and statutory duties applicable at that time.
4.4 In case of reduction of taxes and other statutory duties during the scheduled delivery period, purchaser shall take the benefit of decrease in these taxes/duties for the supplies made from the date of enactment of revised duties/taxes.

4.5 In case of increase in duties/taxes during the scheduled delivery period, the purchaser shall revise the prices as per new duties/taxes for the supplies, to be made during the remaining delivery period as per terms and conditions of the purchase order.

4.6 Any increase in taxes and others statutory duties/levies after the expiry of scheduled delivery date or award of contract/work order shall be to the supplier account. However, benefit of any decrease in these taxes/duties shall be passed on to the purchaser by the supplier.

5. **CHANGES IN PURCHASE ORDERS**

5.1 SRIC, IIT KGP may, at any time, by a written order given to a Supplier/ Agency, make changes within the general scope of the contract related to terms & references, enlarging the scope, analysis or specifications.

5.2 If any such change causes an increase or decrease in the cost of, or the time required for the execution of the contract an equitable adjustment shall be made in the contract price or delivery schedule, or both, and the contract shall accordingly be amended. Any proposal by the Supplier/Agency for adjustment under this clause must be made within thirty days from the date of the receipt of the change in order.

6. **Liquidated Damage Clause**

The Liquidated Damages shall be levied, for delay in supply beyond the contractual delivery date at the rate 0.5% per week subject to maximum of 5% of contract value of the stores the delivery of which is delayed, for each month or part of a month.

7. As per Ministry of Finance, Deptt. of Expenditure, Public Procurement Division Order (Public Procurement No.1) issued from file No.6/18/2019-PPD dated 23rd July, 2020 regarding Restrictions under Rule 144 (xi) of the General Financial Rules (GFRs) 2017, it is directed that any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority i.e. the Deptt. for Promotion of Industry and Internal Trade (DPIIT). The said order will not apply to bidders from those countries (even sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects (updated lists of the countries are given in the Ministry of External Affairs).

“Bidder” (including the term ‘tenderer’, ‘consultant’ or ‘service provider’ in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated herebefore, including any agency branch or office controlled by such person, participated in a procurement process.
“Bidders from a country which shares a land border with India” for the purpose of this Order means:

i. An entity incorporated, established or registered in such a country; or

ii. A subsidiary of an entity incorporated, established or registered in such a country; or

iii. An entity substantially controlled through entities incorporated, established or registered in such a country; or

iv. An entity whose beneficial owner is situated in such a country; or

v. An Indian (or other) agent of such an entity; or

vi. A natural person who is the citizen of such a country; or

vii. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

The beneficial owner for the purpose of above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercise control through other means.

Explanation -

a. “Controlling ownership interest” means ownership of or entitlement to more than twenty-five per cent of share or capital or profit of the company;

b. “Control” shall include the right to appoint majority of the directors or to control the management of policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

An agent is a person employed to do any act for another, or to represent another in dealings with the third person.

For Works contracts, including Turnkey contracts, the successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

A certificate shall be submitted by bidders in the tender documents regarding their compliance with the said order. If the certificate submitted by a bidder whose bid is accepted is found to be false, this would be a ground for immediate termination and further legal action in accordance with law. \textbf{Section XII} (For Goods/ Services contracts)/ \textbf{Section XIII} (For Works contracts, including Turnkey contracts)
8. It is mandatory for bidders to quote items having local content more than 20%. Refer revised Public Procurement (Preference to Make in India), Order 2017 P-45021/2/2017-B.E-II dated 04.06.2020 issued by DPIIT, Ministry of Commerce and Industry, Govt. of India. (Submit duly filled Section-XI for the same)

9. **FORCE MAJEURE**

9.1 If, at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract is prevented or delayed by reasons of any war, or hostility, acts of the public enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes, lockouts, or act of God (hereinafter referred to as events) provided notice of happenings of any such eventuality is given by either party to the other within 21 days from the date of occurrence thereof, neither party shall by reason of such event be entitled to terminate this contract nor shall either party have any claim for damages against other in respect of such non-performance or delay in performance, and deliveries under the contract shall be resumed as soon as practicable after such an event come to an end or cease to exist, and the decision of SRIC, IIT KGP as to whether the deliveries have been so resumed or not shall be final and conclusive. Further that if the performance in whole or part of any obligation under this contract is prevented or delayed by reasons of any such event for a period exceeding 60 days, either party may, at its option, terminate the contract.

9.2 Provided, also that if the contract is terminated under this clause, SRIC, IIT KGP shall be at liberty to take over from the contractor at a price to be fixed by SRIC, IIT KGP, which shall be final, all unused, undamaged and acceptable materials, bought out components and stores in course of manufacture which may be in possession of the contractor at the time of such termination or such portion thereof as SRIC, IIT KGP may deem fit, except such materials, bought out components and stores as the contractor may with the concurrence of SRIC, IIT KGP elect to retain.

10. **TERMINATION FOR DEFAULT**

10.1 SRIC, IIT KGP may, without prejudice to any other remedy for breach of contract, by written notice of default, sent to the Supplier/ Agency, terminate this contract in whole or in part,

(a) If the Supplier/ Agency fails to deliver satisfactorily any or all of the goods & services within the time period (s) specified in the contract, or any extension thereof granted by IIT KGP-SRIC.

(b) If the Supplier/ Agency fails to perform any other obligation(s) under the Contract; and

(c) If the Supplier/ Agency, in either of the above circumstances, does not remedy his failure within a period of 15 days (or such longer period as SRIC, IIT KGP may authorize in writing) after receipt of the default notice from SRIC, IIT KGP.

10.2 In the event SRIC, IIT KGP terminates the contract in whole or in part to SRIC, IIT KGP may procure, upon such terms and in such manner as it deems appropriate, services similar to
those undelivered and the Supplier/Agency shall be liable to SRIC, IIT KGP for any excess cost for such similar supplies. However, the Supplier/Agency shall continue the performance of the contract to the extent not terminated.

11. **REJECTION:**

In the event that any of the stores supplied by the Contractor is found defective in material or workmanship or otherwise not in conformity with the requirements of the Contract specifications, the purchaser shall either reject the stores or request the Contractor, in writing, to rectify the same. The Contractor, on receipt of such notification, shall either rectify or replace the defective stores free of cost to the purchaser. If the Contractor fails to do so, the purchaser may at his option either—

(a) replace or rectify such defective stores and recover the extra cost so involved from the Contractor, or
(b) terminate the Contract for default as provided under clause 8 above, or
(c) acquire the defective stores at a reduced price considered equitable under the circumstances. The provision of this article shall not prejudice the Purchaser’s rights.

12. **REPLACEMENT:**

If the stores or any portion thereof is damaged or lost during transit, the Purchaser shall give notice to the Contractor setting forth particulars of such stores damaged or lost during transit. The replacement of such stores shall be effected by the Contractor within a reasonable time to avoid unnecessary delay in the intended usage of the Stores. In case the purchaser agrees, the price towards replacement items shall be paid by the purchaser on the basis of original price quoted in the tender or as reasonably worked out from the tender.

13. **TERMINATION FOR INSOLVENCY**

SRIC, IIT KGP may at any time terminate the Contract by giving written notice to the Supplier/Agency, without compensation to the Supplier/Agency. If the Supplier/Agency becomes bankrupt or otherwise insolvent as declared by the competent court provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to SRIC, IIT KGP.
SECTIO N - IV

Special conditions of the Contract: -

1. The special conditions of the contract shall supplement the 'Instructions to the Bidders' as contained in Section II & "General Conditions of the Contract" as contained in Section III and wherever there is a conflict, the provisions herein shall prevail over those in Section II and Section III.

2. If the date fixed for opening of bids is subsequently declared as holiday by the Government of India, the revised schedule will be notified. However, in absence of such notification, the bids will be opened on next working day, time and venue remaining unaltered.

3. Purchaser reserves the right to disqualify such bidders who have a record of not meeting contractual obligations against earlier contracts entered into with the purchaser.

4. Any clarification issued by purchaser in response to query raised by prospective bidders shall form an integral part of bid documents and it may amount to amendment of relevant clauses of the bid documents.

5. Purchaser reserves the right to blacklist a bidder for a suitable period in case he fails to honour his bid as per bid declaration form.

6. The bidder has to arrange demonstration of the product to be supplied at his own cost.

7. The Agency shall be responsible for compliance of all applicable laws, codes, statutory Regulations & established practice as required for performance of services under this contract. Whether now in force or which may hereinafter come in force during the currency of the contract and or extension thereof.

8. Invoices should be in the name of The Dean (SRIC), IIT Kharagpur, Kharagpur-721302, Dist: Paschim Medinipur, West Bengal, India.

9. Scope of Work
Manufacture of 48V 40AH Li-Ion battery pack with A123 pouch cells with 2P15S configuration as specified in the technical specification document (Annexure-I). Only the pouch cell will be supplied by IIT Kharagpur free of cost to make the battery pouch. The battery management system (BMS) is not in the scope of this tender specification. But, provision for mounting the BMS on the end plates should be made.
Indian Institute of Technology Kharagpur
Sponsored Research and Industrial Consultancy

SECTION – V

DETAILED TECHNICAL SPECIFICATIONS

Manufacturing of Air-Cooled Battery Pack with Test Fan for Hybrid Electric Vehicle

Detailed technical specifications:  Annexure – I

(Techno-Commercial Terms and Conditions to be submitted by the vendor/firm on its official letter head)

Techno-Commercial Terms & Conditions:

1. Prices (quoted in INR) : FOR IIT Kharagpur
2. Payment : Should be clearly mentioned, as per payment terms
3. Validity of the quotation :
4. Delivery Period :
5. Warranty :

Signature________________
Name___________________
Designation______________

Indian Institute of Technology Kharagpur invites online Bids (Technical bid and Commercial bid) from all domestic manufacturer having registered office in India and experienced OEM (Original Equipment Manufacturer) OR OEM Authorized Dealer

A complete set of tender documents may be Download by prospective bidder free of cost from the website http://eprocure.gov.in/eprocure/app.

Signature of the Tenderer
Date with Seal
**SECTION – VI**

**TECHNICAL BIDS**

Specification of the equipment / item (in detail) to be purchased

<table>
<thead>
<tr>
<th>Details of Technical Specifications</th>
<th>Whether complied with YES/NO</th>
<th>If yes, please attach Tech literature of the equipment duly printed &amp; clearly specify page No of Bulletin which specifically confirm this</th>
<th>If no, attach deviation statement</th>
<th>Remarks (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Please indicate the page numbers where documents uploaded /attached. The entire tender document should be serially page numbered including enclosures.

**N.B.:**
1. All the bidders are requested to provide true statement in the columns. Concealing of facts will liable to be rejected the tender completely. No communication will be made in this regard.

2. Category of classification of the goods in its packing as per IATA definition inclusive of nature of sensitivity and volume of cargo.

3. Separate page, if required may be used for the stated information with same format.

Signature of Tenderer with office seal

Signature of the Tenderer
Date with Seal
SECTION - VII

Price Bid Declaration

No. IIT/SRIC/EE/HEV/SM/20-21/EQ-65

Date: 13/05/2021

To
Prof. Siddhartha Mukhopadhyay,
Electrical Engineering Department
Indian Institute of Technology Kharagpur
P.O.: Kharagpur, Dist: Medinipur (West)
Kharagpur - 721302

Dear Sir,

Having examined the conditions of contract and specifications including addenda Nos. (If any) the receipt of which is hereby duly acknowledged, we, undersigned, offer to provide as per tender terms and conditions in conformity with the supply of the equipment, conditions of contract and specifications for the sum shown as per Section V, Section VI and price as per BOQ.xls format under Financial Cover and made part of this Bid.

We undertake, if our Bid is accepted, to commence deliveries within schedule time frame and to complete delivery of all the supplies specified in the contract within as per schedule calculated from the date of issue of your purchase order/RO.

If our Bid is accepted, we will obtain the performance guarantees of a Scheduled Bank for 3% of the cost of equipment.

We agree to abide by this Bid for a period of 90 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 Purchase Order of Contract is prepared and executed, this Bid together with your written acceptance thereof in 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.

We have applied and have submitted required bid security as per clause 8, section II of tender document.

Dated this ................................ day of ....................... 2021

Name and Signature ..................................................

In the capacity of ..................................................

Duly authorized to sign the bid for and on behalf of ..................................................

Signature of the Tenderer
Date with Seal
SECTION - VIII

PERFORMANCE SECURITY GUARANTEE BOND

In consideration of Indian Institute of Technology Kharagpur, (SRIC) (herein after called the “SRIC, IIT KGP”) having agreed to exempt ___________________ (hereinafter called “the said contractor(s)”) from the demand under the terms and conditions of an agreement/(Purchase Order) No ______________ dated ___________ made between ____________ and ______________ for ___________________________________, of security deposit for the due fulfilment by the said contractor(s) of the terms and conditions contained in the said Agreement, on production of the bank guarantee for _______________________________________________________________, we, (name of the bank) ________________ do hereby undertake to pay to SRIC, IIT KGP an amount not exceeding __________________ against any loss or damage caused to or suffered by the government by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement or any reason of the contracts failure to perform said Agreement.

2. We (name of the bank) _______________ do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demanded from SRIC, IIT KGP stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by SRIC, IIT KGP by reason of breach by the said contractor(s)’ of any of the terms or conditions contained in the said Agreement or by reason of the contractors(s)’ failure to perform the said Agreement or roll out the supply as per schedule V & parameters for failure of compliance of intellectuals property rights. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee where the decision of SRIC, IIT KGP in these counts shall be final and binding on the bank. However, our liability under this guarantee shall be restricted to an amount not exceeding _____________________.

3. We undertake to pay to SRIC, IIT KGP any money so demanded not withstanding any dispute or disputes raised by the contractor(s)/Supplier/ Agency(s) in any suit or proceeding pending before any court or tribunal relating thereto our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the contractor(s)/Supplier/ Agency(s) shall have no claim against us for making such payment.

4. We (name of the bank) ______________________ do hereby agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of SRIC, IIT KGP under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till expiry of 90 days beyond the date on which the warranty period of the equipment(s) expire.

5. We (name of the bank) ______________________ further agree with SRIC, IIT KGP that SRIC, IIT KGP shall have the fullest liberty without our consent and without affecting in any manner our
obligations there under to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by SRIC, IIT KGP against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act or omission on the part of SRIC, IIT KGP or any indulgence by IIT KGP-SRIC to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. We (name of the bank) ________________ lastly undertake not to revoke this guarantee during its currency except with the previous consent of SRIC, IIT KGP in writing.

Dated the ________________ day of _______ for __________________________________

(Indicate the name of bank)
SECTION - IX

Bid Security Self Declaration Form

Date: 13/05/2021

To
The Dean (SRIC)
Indian Institute of Technology Kharagpur
Sponsored Research and Industrial Consultancy
P.O.: Kharagpur, Dist: Medinipur (West)
Kharagpur - 721302

I/We The undersigned, declare that:
I/We understand that, according to your conditions, bids must be supported by a Bid Security Declaration.

I/We accept that I/We may be disqualified from bidding for any contract with the Indian Institute of Technology Kharagpur for a period of 1 (one) year from the date of notification if I am /We are in a breach of any obligation under the bid conditions, because I/We

a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or

b) having been notified of the acceptance of our Bid by the purchaser during the period of bid validity (i) fail or reuse to execute the contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We understand this Bid Security Declaration shall cease to be valid if I am/we are not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my/our Bid.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this ____ day of [month] [year] at [place of execution].

[Insert NAME OF BIDDER’S AUTHORIZED REPRESENTATIVE]
[Insert signatory’s legal capacity] Affiant
SECTION X
UNDERTAKING

I hereby undertake and declare that the agency M/S.............................................................. have not been black listed by any Government Organizations, autonomous bodies, Department of Government of India and Department of Government of West Bengal and any others State Government in India.

Signature of the Authorized Persons.............................................
Name & Seal of the Company

Date:
Place:
SECTION XI

Self-Certificate for Local Content

A. *We [name of manufacturer] hereby confirm in respect of quoted item(s) that Local Content is equal to or more than 50% and come under ‘Class-I Local Supplier’ Category. The percentage of local content is_____. As being ‘Class-I Local Supplier’, we are eligible for Purchase Preference under ‘Make in India’ Policy vide GoI Order no. P- 45021/2/2017-PP (B.E.-II) dated 16th September, 2020. The stated local content shall not include the services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. as local value addition.

OR

*We [name of manufacturer] hereby confirm in respect of quoted item(s) that Local Content is more than 20% but less than 50% and come under ‘Class-II Local Supplier’ Category. The percentage of local content is_____. The stated local content shall not include the services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. as local value addition

* Strike out whichever is not applicable

B. The details of the location(s) at which the local value addition made is/are as under:

1. …………………………………………………………………………………

2. …………………………………………………………………………………

3. …………………………………………………………………………………

C. Country of Origin ________________________________________________

Date: Seal & Signature of the Bidder

Note: Clarification for local content calculation as per OM No. P-45021/102/2019/BE-II-Part (1) (E-50310), dated March 4, 2021 of Government of India, Ministry of Commerce and Industry, Department of Promotion of Industry and Internal Trade, Public Procurement Section.
 SECTION XII

<On Organization Letter Head>

(For Goods/ Services Contracts)

No. ___________________________ Dated: __________

CERTIFICATE

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that this bidder is not from such a country.

OR (whichever is applicable)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that this bidder is from __________________ (Name of Country) and has been registered with the Competent Authority. I also certify that this bidder fulfills all the requirements in this regard and is eligible to be considered.

(Copy/evidence of valid registration by the Competent Authority is to be attached)

Signature of Bidder/ Agent

Name: ______________________________

Designation: __________________________

Organization Name: ______________________

Contact No. : __________________________

Signature of the Tenderer
Date with Seal
SECTION XIII

<On Organization Letter Head>

(For Works Contracts, including Turnkey contracts)

No. __________________________ Dated: __________

CERTIFICATE

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries and hereby certify that this bidder is not from such a country and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.

OR (whichever is applicable)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries and hereby certify that this bidder is from _______________ (Name of Country) and has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I also certify that this bidder fulfills all the requirements in this regard and is eligible to be considered.

(Copy/ evidence of valid registration by the Competent Authority is to be attached)

Signature of Bidder/ Agent

Name: ______________________________

Designation: __________________________

Organization Name: ______________________

Contact No.: __________________________

Signature of the Tenderer

Date with Seal
**SECTION XIV**

TENDER DOCUMENT FOR PURCHASE OF (Manufacturing of Air-Cooled Battery Pack with Test Fan for Hybrid Electric Vehicle)

TENDER NO. IIT/SRIC/EE/HEV/SM/20-21/EQ-65

**CHECKLIST FOR THE TENDERER**

<table>
<thead>
<tr>
<th>Name and Address of the Tenderer:</th>
<th>List of Equipment Quoted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid Security Self Declaration Format</td>
<td>Yes/ No</td>
</tr>
</tbody>
</table>

*Supportive Documents must enclose for fulfilling Eligibility criteria, to be submitted by the Tenderer*

01 Minimum Five (5) years’ experience in the field of supply of laboratory equipment  
02 Average Annual Turnover of at least 2,50,000 INR during last 3 financial years i.e. 2017-18, 2018-19 and 2019-20 is required  
03 A bid form at a prescribed Format  
04 Bid Security Self Declaration Form  
05 Audited Financial Statement for last three financial years (i.e. 2017-18, 2018-19 and 2019-20)  
06 Copy of IT Return Acknowledgement for the preceding three financial years (i.e. 2016-17, 2017-18 and 2018-19)  
07 Registration Certificate/Certificate of incorporation, if any  
08 Must have supplied similar equipment to laboratories of State or Central Government Institutions or reputed Educational or Research Institution and proof of such supplies should be produced  
09 GST Registration Certificate  
10 Copy of PAN./CIN No. of the Company  
11 Authorized dealer Certificate from Manufacturer  
12 Lists of clients with reference in minimum five firms with name, designation and contact details  
13 Brief on supply of laboratory equipment handled during last five years  
14 List of offices/branches in India, with address and contact details  
15 Contact Person Mobile No. & Land Line  
16 Self-Certificate for Local Content  
17 (For Goods/ Services Contracts) Certificate - Bidder Not from/ from Country sharing Land border with India & Registration of Bidder with Competent Authority  
18 (For Works Contracts, including Turnkey Contracts)
Certificate – Bidder Not from/ from Country sharing Land border with India, Registration of Bidder with Competent Authority & not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority

Signature of the Tenderer
Date: Date with Company Seal
ANNEXURE-I

TECHNICAL SPECIFICATION DOCUMENT

Air-Cooled Battery Pack
with Test Fan for Hybrid Electric Vehicle

NIT No. IIT/SRIC/EE/HEV/SM/20-21/EQ-65

INDIAN INSTITUTE OF TECHNOLOGY Kharagpur
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1 Project Background

Indian Institute of Technology (IIT) Kharagpur in collaboration with TATA Motors Pune plan to build a 48V 40AH Li-Ion battery pack suitable for a hybrid vehicle (HEV) under the Uchhatar Avishkar Yojana (UAY) program. The Li-ion batteries pack is designed to increase life, energy density, safety, charging speed

2 Scope of the Document

The purpose of this document is to explain design of the 48V 40AH Li-Ion battery pack with A123 pouch cells with 15S2P configuration. Packaging a pouch cell is quite challenging because of the soft nature of battery construction. Cassette mouldings and sheet metal parts were designed to hold two pouch cells in parallel, to form a sub-assembly module. These sub-assemblies are stacked to achieved the designed voltage.

3 Battery pack specification

The 48V, 40Ah Li-Ion battery pack is designed to drive a 48-V, 7.7kW permanent-magnet synchronous motor (PMSM). The specification of the battery pack is given in Table 3.1. The battery pack assembly is show in Fig. 3.1.

<table>
<thead>
<tr>
<th>SN</th>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capacity</td>
<td>48V, 40Ah</td>
</tr>
<tr>
<td>2</td>
<td>Battery - Pouch Cells</td>
<td>3.2V, 20Ah</td>
</tr>
<tr>
<td>3</td>
<td>Configuration</td>
<td>15S2P</td>
</tr>
<tr>
<td>4</td>
<td>Peak pulse discharge</td>
<td>240A (10 s), 200A (30 s)</td>
</tr>
<tr>
<td>5</td>
<td>Maximum continuous discharge</td>
<td>160 A</td>
</tr>
<tr>
<td>6</td>
<td>Packaging</td>
<td>Custom metallic enclosure with necessary safety provisions acrylic / Bakelite sheets for protection</td>
</tr>
<tr>
<td>7</td>
<td>Cooling</td>
<td>Forced cooling with 25°C cabin air</td>
</tr>
</tbody>
</table>
Figure 3.1: Battery Pack Layout
4 Mechanical component designs

The battery pack assembly contains several components and the bill of material is given in Table. 4.1.

4.1 Pouch cell

The battery pack is composed of thirty (30) A123 pouch cells in 15S2P configuration. The specification of the cell is given in Table 4.2 according to the manufacturers user documentation[1]. The dimensions of the pouch cell are given in Fig. A.1.

4.2 Cassette

Cassette mouldings shown in Fig. A.2 are made of Nylon PA-12, 23% Glass Fibre filled. It offers stiffness, toughness as well as excellent electrical insulation properties and superior surface finish. It provides excellent dimensional properties and moisture stability, and it has good heat resistance property.

4.3 Heat transfer plate

Heat transfer plate shown in Fig. A.3 is used to dissipate heat generated by the cells. It is made of Al 1050 H4 (or extruded LM-35) with 15µm thick anodizing. This anodised (aluminium oxide) layer is thermally conductive and electrically insulated. Cells' planar face is in contact with the heat transfer plate on each side. Fins on the side provide thermal interface with external air cooling system. The heat transfer plates have locator pins for alignment.

4.4 Compliant pads

To operate the cell at its peak performance and have the longest possible service life, the cell needs to be mounted with some amount of pressure on its two broad faces. This pressure must be evenly distributed and be compliant to the regular expansion cycles the cell experiences during cycling and over its service life. The manufacturer A-123 systems performed extensive testing on the effects of the pressure on the faces of the cells and on the cycle life of the cells. The optimum pressure on the cell’s face is reported to be between 4 and 12 psi. It is shown in Fig. A.7.
Table 4.1: Bill of material for one battery pack

<table>
<thead>
<tr>
<th>SN</th>
<th>Material and Description</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A-123 20Ah Pouch cell</td>
<td>30</td>
<td>Bought out</td>
</tr>
<tr>
<td>2</td>
<td>Cassette, Nylon PA-12 with 23% Glass fibre</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Heat sink - Type-1, Extruded Aluminium LM-35 anodised 15 µm thick</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Heat sink - Type-2, Extruded Aluminium LM-35 anodised 15 µm thick</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Compliant Pads, Poron®, thickness 3.18 mm or 1.57mm, Pressure 4 to 18 psi, Maximum Compression 0.2 mm</td>
<td>16</td>
<td>Bought out</td>
</tr>
<tr>
<td>6</td>
<td>Top pouch Separator, Nylon PA-12 with 23% glass fiber filled</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Busbar, Cu (electrolytic) and Al (1100)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>End connector, Cu (electrolytic) and Al (1100)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>End pressure plate, Al (6061)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Terminal, Al (1100) or Cu (electrolytic)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Al (1050) Enclosure with necessary safety provisions with Acrylic or Backelite sheets</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.1: (Continued)

<table>
<thead>
<tr>
<th>SN</th>
<th>Material and Description</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>bottom separator plate made from PA-12-23%GF</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Al (1050) Bottom cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Mild steel (painted) bottom plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Axial flow fan with PWM speed control. Model: Sanyo Denki 9WL1448P1A001</td>
<td>6</td>
<td>Bought out</td>
</tr>
</tbody>
</table>

4.5 Spacer plates between cells

There are top spacers (Fig. A.7) and bottom spacer plate so that the distance between cells sub-assembly consisting of two cell pairs in parallel are maintained. These are made of Nylon PA-12, 23% Glass Fibre filled or Bakelite

4.6 End pressure plates

End pressure plate shown in Fig. A.8 is used to hold all sub-assemblies with the help of steel band and maintain the required pressure on the cells. It is made of Al 6061 (or cast LM-35); groves are provided to reduce the weight. It is fitted with terminal bolt and thermal insulation barrier. Mounting has been provided for BMS.

4.7 Bus bar

The composite busbar shown in Fig A.9a consists of the following parts

1. Al Busbar - Positive terminal
2. Cu Busbar - Negative terminal
3. Intermediate busbar (Al-Cu)
<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Notes/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrolyte</td>
<td>LiFP$_6$</td>
<td></td>
</tr>
<tr>
<td>Nominal Capacity</td>
<td>20 Ah</td>
<td></td>
</tr>
<tr>
<td>Minimum Capacity</td>
<td>19.5 Ah</td>
<td>25°C, 6A discharge, 3.6V to 2.0V, at BOL</td>
</tr>
<tr>
<td>Nominal Voltage</td>
<td>3.3 V</td>
<td>at 50% SOC</td>
</tr>
<tr>
<td>Voltage range</td>
<td>2.0 V to 3.6 V</td>
<td>Fully discharged to fully charged</td>
</tr>
<tr>
<td>Absolute Maximum Terminal Voltage</td>
<td>4.0 V</td>
<td>Above which will cause immediate damage to the cell</td>
</tr>
<tr>
<td>Recommended Maximum Charge Voltage</td>
<td>3.6 V</td>
<td></td>
</tr>
<tr>
<td>Recommended Float Charge Voltage</td>
<td>3.5 V</td>
<td></td>
</tr>
<tr>
<td>Recommended End of Discharge Cut-off Voltage</td>
<td>2.0 V</td>
<td></td>
</tr>
<tr>
<td>Recommended Standard Charge Current</td>
<td>20 A</td>
<td>to 3.6V</td>
</tr>
<tr>
<td>Recommended Maximum Charge Current</td>
<td>100 A</td>
<td>to 3.6V, cell temperature &lt; 85°C</td>
</tr>
<tr>
<td>Pulse 10s Charge Current</td>
<td>200 A</td>
<td>23°C ≤ $T_{\text{cell}}$ ≤ 85°C, $V_{\text{cell}}$ &lt; 3.8V</td>
</tr>
<tr>
<td>Maximum Discharge Continuous Current</td>
<td>200A</td>
<td>23°C ≤ $T_{\text{cell}}$ ≤ 85°C, SOC = 50%</td>
</tr>
<tr>
<td>Pulse 10s Discharge Current</td>
<td>600 A</td>
<td>23°C ≤ $T_{\text{cell}}$ ≤ 85°C, SOC = 50%</td>
</tr>
<tr>
<td>Pulse 10s Discharge Power</td>
<td>820 W</td>
<td>$T_{\text{cell}}$=23°C, SOC=100%, assumed DCR=2mOhm (nominal)</td>
</tr>
<tr>
<td>DCR Impedance</td>
<td>1.5 - 3 mOhm</td>
<td></td>
</tr>
<tr>
<td>ACR Impedence</td>
<td>0.78 mOhm</td>
<td></td>
</tr>
<tr>
<td>Operating Temp Range</td>
<td>-30°C to 60°C</td>
<td>Ambient around cell</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-40°C to 65°C</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>495 g</td>
<td></td>
</tr>
<tr>
<td>Cycle Life to 80% Beginning of Life (BOL) capacity</td>
<td>3000 cycles</td>
<td>100% Full DOD cycles, 1C/-2C @ 23°C, 8-14 psi face clamp pressure</td>
</tr>
</tbody>
</table>
The composite Cu-Al busbar must match cell tab metallurgy for resistance welding. Intermediate composite busbar is made of ultrasonically welding copper and aluminium busbar sub-components. A flag shape has been provided on Cu busbar to facilitate resistance welding of harness connection.

4.8 Metallic enclosure (with acrylic/Bakelite for electrical insulation)

The metallic enclosure shown in Fig. A.12 consists of the side covers, the top protection cover and the bottom frame.

The top protection cover design incorporates longitudinal stiffening ribs. It has been provided with polarity marking on top of the cover and Internal separator ribs have been provided between bus bars.

4.9 Cooling fan

An axial flow fan with 140mm x 140mm x 38mm aluminium frame and aerodynamically shaped plastic impeller blades suitable for maximum air temperature of 60°C is selected. The IP68 motor has pulse sensors with PWM control function. These fans are used for the test setup. In the car the air supply will be through a duct.

4.10 Battery package terminals

Terminal block: It is securely located and screwed with end pressure plate

Terminal bolt: It is a Cu bolt located in terminal block

Terminal bung: It acts as stopper for terminal bolt

Terminal protection cover: These are the rubber covers with polarity marking on it

4.11 Bought out items

Bought out items include steel banding straps, bolts, nuts, bi-metallic washer etc.
5 Battery pack assembly

Each battery pouch is in contact with two aluminium heat transfer plates. Two pouches connected in parallel make the battery pack sub-assembly. Fifteen such sub-assemblies make the 15S2P configuration as shown in Fig. 5.1. The tabs of these two batteries in the sub-assembly are connected in parallel as shown in Fig. 5.2 The exploded view of the battery pack is shown in Fig. 5.3. As the battery pouch thickness (7.3mm) can increase by upto 2%, the self-assembly of two batteries are separated by a compressible pad. The pressure versus deflection curve for the Poron® compliant pad in Fig.5.4 shows that these compressible pads should be operated in the flat region of the curve between 4 to 12 psi. A 3.18 mm compressible pad was chosen to accommodate the expansion of the pouch cell and the battery pack is wound with a stainless steel strapping tape at two different heights as shown in Fig. 5.5 to maintain the pressure within 4 to 12 psi.

Joining the busbar to the thin battery tabs is a challenging task and the different joining technologies available for this purpose is reviewed by Das et al. [2]. A 2mm thick composite busbar is formed by joining aluminium busbar sub-component with Cu busbar sub-component by ultrasonic welding or friction stir welding as shown in the Fig.5.6. Two Cu tabs of 200µm thickness each are first riveted and then spot welded with the Cu busbar sub-component. The Al busbar sub-component is first prepared for spot welding to the Al battery tabs by making small projections as shown in the Fig.5.6 and then two Al tabs of 300µm thickness are spot welded to the Al busbar sub-component as shown in the Fig.5.6. Care must be taken to remove the hard oxide layer from the aluminium before joining.

Six such fans will be used to cool the battery. The fan characteristics are shown in Fig. 5.7. The air has to be filtered to get rid of the dust particles that has the potential to settle inside the battery. The other alternative will be to use liquid coolant to cool the fins of the heat transfer plate.

The detail drawing of different parts of the battery are shown in the Appendix-A

6 Battery Performance Tests

Tests should be done to measure the temperature of the pouch cell, bass bar and record the voltage during discharge at C/4, C/2, 1C, 2C, 3C, 5C and 10C. The battery pack has fifteen (15) voltage measurements points and five (5) temperature measurements points on the bus bar as shown in Fig 3.1. The tests should be done in collaboration with the client. The temperature of three plates will also be measured from the bottom. The safety performance of the battery under a vibration environment during the normal operation of the vehicle.
7 Interface with battery management system

The battery management system (BMS) is not in the scope of this tender specification. But, provision for mounting the BMS on the end plate should be made. The battery pack has fifteen (15) voltage measurement points and five (5) temperature measurement points on the bus bar. Suitable connecting wires with terminations should be provided for interfacing with the BMS.
Figure 5.1: Battery arrangement in the pack

Figure 5.2: Battery pack sub-assembly
Figure 5.3: Exploded view of the battery pack

Figure 5.4: Compressible characteristics of the compliant pad[1]
Figure 5.5: Cross-section showing the stainless steel strapping tape

(a) Composite busbar construction
(b) Joining Cu tabs to busbar
(c) Joining Al to Cu by friction stir welding
(d) Joining Al tabs to busbar

Figure 5.6: Joining of busbar with the battery tabs
Figure 5.7: Manufacturers fan performance data
A Part Drawings

The different parts of the battery pack are shown the following detail drawings.
Figure A.2: Cassette
(a) Type-1  
(b) Type-2

Figure A.3: Heat transfer plate
(a) Top spacer plate – Type-1

(b) Top spacer plate – Type-2

Figure A.4: Top spacer plates
Figure A.5: Bottom Spacer Plates
Figure A.6: Bottom Cover Plate
Figure A.7: Compliant pad
Figure A.8: End pressure plate
(a) Busbar

(b) End Busbar

Figure A.9: Bus bar
Figure A.10: Top cover
Figure A.11: Bottom cover made of steel
Figure A.12: Battery pack cover
Figure A.13: Axial flow fan with 140mm x 140mm x 38mm aluminium frame and plastic impeller
References


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