Indian Institute of Technology Delhi

HAUZ KHAS, NEW DELHI-110016

Dated/ दिनांक: 23/02/2021

<table>
<thead>
<tr>
<th>Open Tender Notice No. / खुला प्रस्ताव निविदा सूचना नंबर: IITD/CART(SP-3394)/2021</th>
</tr>
</thead>
</table>

Indian Institute of Technology Delhi is in the process of purchasing following item(s) as per details as given under.

### Details of the item

<table>
<thead>
<tr>
<th>आइटम का विवरण</th>
<th>Motor Test Bench</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earnest Money Deposit to be submitted</strong> बयाना जमान करने के लिए जमान राशि</td>
<td>NIL. However, bidders are required to submit ‘Bid Security Undertaking’ in lieu of EMD (Annexure-IX)</td>
</tr>
<tr>
<td><strong>Warranty</strong> वांछी अवधि</td>
<td>2 Years/2 साल</td>
</tr>
<tr>
<td><strong>Performance security</strong> निष्ठावान सुरक्षा</td>
<td>3% of item value</td>
</tr>
<tr>
<td><strong>Delivery Schedule</strong></td>
<td>12 to 16 weeks Pl, refer Terms &amp; Conditions No.12</td>
</tr>
</tbody>
</table>

Tender Documents may be downloaded from Central Public Procurement Portal [http://eprocure.gov.in/eprocure/app](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](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’.

Tenderers can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type ‘IIT’). Thereafter, Click on “GO” button to view all IIT Delhi tenders. Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website [http://eprocure.gov.in/eprocure/app](http://eprocure.gov.in/eprocure/app) as per the schedule given in the next page.

No manual bids will be accepted. All quotation (both Technical and Financial should be submitted in the E-procurement portal).

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| **SCHEDULE** |
|-----------------|----------------------------------|
| **Name of Organization** | Indian Institute of Technology Delhi |
| **Tender Type** (Open/Limited/EOI/Auction/Single/Global) | Single |
| **Tender Category (Services/Goods/works)** | Goods |
| **Type/Form of Contract (Work/Supply/Auction/Service/Buy/Empanelment/Sell)** | Buy |
| **Product Category (Civil Works/Electrical Works/Fleet Management/Computer Systems)** | Others |
| **Source of Fund (Institute/Project)** | Budget Code______/Project Code __PLN01/HF03 |
| **Currency** | Indian Rupee (INR) |
| **Date of Issue/Publishing** | 23/02/2021 (17:15 Hrs) |
| **Document Download/Sale Start Date** | 23/02/2021 (17:15 Hrs) |
| **Document Download/Sale End Date** | 23/03/2021 (15:00 Hrs) |
| **Date for Pre-Bid Conference** | --- |
| **Venue of Pre-Bid Conference** | --- |
| **Last Date and Time for Uploading of Bids** | 23/03/2021 (15:00 Hrs) |
| **Date and Time of Opening of Technical Bids** | 24/03/2021 (15:00 Hrs) |
| **Tender Fee (If any)** | Rs.__NIL__/-(For Tender Fee) |

(To be paid through RTGS/NEFT. IIT Delhi Bank details are as under:)

- **Name of the Bank A/C**: IITD Revenue Account
- **SBI A/C No.**: 10773572622
- **Name of the Bank**: State Bank of India, IIT Delhi, Hauz Khas, New Delhi-110016
- **IFSC Code**: SBIN0001077
- **MICR Code**: 110002156
- **Swift No.**: SBININBB547

(This is mandatory that UTR Number is provided in the on-line quotation/bid. (Kindly refer to the UTR Column of the Declaration Sheet at Annexure-II)

| **No. of Covers (1/2/3/4)** | 02 |
| **Bid Validity days (180/120/90/60/30)** | 90 days (From last date of opening of tender) |
| **Address for Communication** | **Prof. B.K. Panigrahi**  
HoC CART (formerly ITMMEC)  
Indian Institute of Technology, Delhi  
Hauz Khas, New Delhi- 110016 |
| **Contact No.** | 011-26596438 (office), 9582782220 (Mobile) |
| **Email Address** | bkpanigrahi@ee.iitd.ac.in |

**Chairman Purchase Committee**  
(Buyer Member)
Instructions for Online Bid Submission/ ऑनलाइन बोली (बिड) के लिए निर्देश:
As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal (URL: http://eprocure.gov.in/eprocure/app). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at:
http://eprocure.gov.in/eprocure/app

REGISTRATION

1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: http://eprocure.gov.in/eprocure/app) by clicking on the link “Click here to Enroll”. Enrollment on the CPP Portal is free of charge.

2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.

5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
6) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken.

6) बोलीदाता फिर अपने यूजर आईडी / पासवर्ड और डीएससी / ईटीकन के पासवर्ड को दर्ज करके सुरक्षित लॉ-इन के माध्यम से साइट पर लॉग ऑन करता है।

SEARCHING FOR TENDER DOCUMENTS/ निविदा दस्तावेजों के लिए खोजना

1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.

1) सीपीपी पोर्टल में दनदमवत दिदभन्न िोज दिकल्प हैं, त दक बोलीदाता को कई मापदंडों से सक्रिय निविदाएं खोज सकें। इन मापदंडों में निविदा आईडी, संगठन का नाम, स्थान, तिथि, मूल्य आदि शामिल हो सकते हैं। निविदाओं के लिए उजर खोज का एक विकल्प भी है, जिसमें बोलीदाता कई नामों को जोड़ सकते हैं जैसे संगठन का नाम, अनुबंध का स्थान, स्थान, सीपीपी पोर्टल पर प्रकाशित निविदा की खोज के लिए तारीख, अन्य कोड आदि।

2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective ‘My Tenders’ folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

2) बोलीदाता ने एक बार निविदाएं चुनी हैं जिसमें वे रुचि रखते हैं, उसका वे आवश्यक दस्तावेज / निविदा कार्यक्रम डाउनलोड कर सकते हैं। वे निविदाएं मेरी निविदाओं फॉल्डर में ले जाई जा सकती हैं। इससे सीपीपी पोर्टल को बोलीदाताओं को एसएमएस / ई-मेल के माध्यम से चुनित किया जा सकता है, यदि निविदा दस्तावेज में कोई शुद्धि जारी कि गई है।

3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

3) बोलीदाता को प्रत्येक निविदा को निर्देशित अद्वितीय निविदा आईडी का नोट बनाना चाहिए, अगर वे हेल्पडेस्क से कोई स्पष्टीकरण / सहायता प्राप्त करना चाहते हैं।

PREPARATION OF BIDS / बोली (बिड) की तैयारी

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

1) बोलीदाता को अपनी बोलियां जमाने से पहले निविदा दस्तावेज पर प्रकाशित किसी भी बुद्धि को ध्यान में रखना चाहिए।

2) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

2) कृपया बोली के भाग के रूप में जमा किए जाने वाले दस्तावेजों को समझने के लिए निविदा विज्ञापन और निविदा दस्तावेज ध्यान से देखें। कृपया उन अंकों की संख्या पर ध्यान दें जिन में बोली दस्तावेज जमा करना है, दस्तावेजों की संख्या - जिसमें प्रत्येक दस्तावेज के नाम और सामग्री शामिल हैं, जिन्हें प्रस्तुत करने की आवश्यकता है। इनमें से कोई भी विपक्ष बोली को अस्वीकार कर सकता है।

3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.
4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “My Space” area available to them to upload such documents. These documents may be directly submitted from the “My Space” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

SUBMISSION OF BIDS/ बोली (विड) का जमा करना

1) 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.

2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

3) Bidder has to select the payment option as “on-line” to pay the tender fee as applicable and enter details of the instrument. Whenever, Tender fees is sought, bidders need to pay the tender fee separately on-line through RTGS (Refer to Schedule, Page No.2).

4) 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 white 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.

एक मानक BoQ प्रारूप को सभी बोलीदाताओं द्वारा भरने के लिए निर्दिष्ट दस्तावेज दिया गया है। बोलीदाताओं को इस बात का ध्यान रखना चाहिए कि उन्हें आवश्यक प्रारूप में अपनी वित्तीय बोली जमा करनी चाहिए और कोई अन्य प्रारूप शीर्षक नहीं है। बोलीदाताओं को बोली फाइल को डाउनलोड करने, इसे खोलने और अपने संबंधित वित्तीय उद्देश्य और अन्य विवरण (जैसे बोलीदाता का नाम) के साथ संवेदन रूपांतर (अनुसूचित) कोशिकाओं को भी तैयार करना आवश्यक है। कोई भी अन्य कक्ष नहीं बदला जाना चाहिए। एक बार विवरण पूरा हो जाने पर, बोलीदाता को इसे सही माना और इसे अनलाइन जमा करना होगा, बिना फाइल नाम बदलना। यदि BOQ फाइल को बोलीदाता द्वारा संशोधित किया गया है, तो बोली को खारिज कर दिया जाएगा.
5) 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.

6) 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.

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

8) 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.

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

ASSISTANCE TO BIDDERS / बidders को सहायता

1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 233 7315.

General Instructions to the Bidders / बidders के लिए सामान्य निर्देश

1) The tenders will be received online through portal http://eprocure.gov.in/eprocure/app. In the Technical Bids, the bidders are required to upload all the documents in .pdf format.
2) Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://eprocure.gov.in/eprocure/app under the link “Information about DSC”.

3) Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at https://eprocure.gov.in/eprocure/app.

निविदाकर्ता को सलाह दी जाती है कि वे निविदाकर को निर्देश दिए गए हों ताकि ई-प्रोक्योरमेंट के लिए सेंट्रल पब्लिक प्रोकॉमर्स एंटरप्राइज पोर्टल के जरिए https://eprocure.gov.in/eprocure/app पर ऑनलाइन निविदाएं जमा कर सकें।
NOTICE INVITING QUOTATIONS

Subject: Motor Testbench

Invitation for Tender Offers

Indian Institute of Technology Delhi invites online Bids (Technical bid and Commercial bid) from eligible and experienced OEM (Original Equipment Manufacturer) OR OEM Authorized Dealer for Motor Testbench with (warranty period as stated at page #1 of this tender) on site comprehensive warranty from the date of receipt of the material as per terms & conditions specified in the tender document, which is available on CPP Portal http://eprocure.gov.in/eprocure/app

TECHNICAL SPECIFICATION:

The desired Motor Test Bench should be suitable for Performance as well as endurance testing of Synchronous (PM, BLDC, Servo, etc.) as well as Asynchronous AC Induction Motors variants which IIT Delhi (CART) intends to evaluate for Automotive e-Vehicle application. The application should include motor under test for various two-wheelers, three-wheelers and light commercial four-wheelers. The dynamometer should be able to operate in constant torque and constant speed modes and tested well for different torque and speed test points including rated and stalling conditions. The test bench should equip with a power level upto 36kW continuous power, to test EV motor ratings for continuous duty cycle, with regenerative braking capability. The complete setup should comprise of dynamometer & EV motor mounted on common MS frame having suitable T slots. Also, the driveline should be with flexible disc coupling covered by steel sheet guard.
<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Description</th>
<th>Technical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dynamometer (1 no.)</td>
<td>- It should provide High dynamic performance with compact dimensions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It should have high overload capacity that gives the motor an excellent dynamic response as compared to a conventional AC Induction Motor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The AC Dynamometer to be connected to the EV Motor under test should have suitable Flexible Disc Coupling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The Motor along with its 4 Quadrant Drive should provide a Loading media or a drive media.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- During the regenerative mode, the power absorbed is to be fed back to Mains Grid.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- During Overrun phase the AC Dynamometer acts as a motor &amp; the AC Drive draws power from the AC mains. The overrun/drive mode is used to motor the test subject at different speeds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Should have a high precision encoder feedback which provides closed loop speed control, essential for accurately executing user programmed test cycles,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Angular accuracy: +/- 20 angular seconds, for 2048 ppr line count for high precision position encoder, with incremental signal: +/-1V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SAE 1410 flange should be provided for adaption of the AC Dynamometer to the driveline.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Encoder mounted at Non – drive end of the AC Motor should be flexible for Speed measurement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It should have stator winding temperature monitoring using Temperature sensor (PTC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The motor should have one half coupling [SAE 1410] for connection at the drive end (encoder will be mounted at non-drive end).</td>
</tr>
<tr>
<td>Parameter</td>
<td>Unit</td>
<td>Specification</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Rated Speed Range</td>
<td>[rpm]</td>
<td>≥ 2000 and ≤ 2500</td>
</tr>
<tr>
<td>Maximum Speed (constant power)</td>
<td>[rpm]</td>
<td>≥ 6500 and ≤ 7000</td>
</tr>
<tr>
<td>Max Mechanical Speed</td>
<td>[rpm]</td>
<td>10000</td>
</tr>
<tr>
<td>Rated Power</td>
<td>[kW]</td>
<td>between 30 to 40 kW</td>
</tr>
<tr>
<td>Rated Torque</td>
<td>[Nm]</td>
<td>between 170Nm and 180Nm</td>
</tr>
<tr>
<td>Cyclic duration factor</td>
<td></td>
<td>Should be S1</td>
</tr>
<tr>
<td>Motor voltage</td>
<td>[V]</td>
<td>400</td>
</tr>
<tr>
<td>Frequency</td>
<td>[Hz]</td>
<td>50 to 100</td>
</tr>
<tr>
<td>Rated current</td>
<td>(A)</td>
<td>≥ 80</td>
</tr>
<tr>
<td>Insulation Class</td>
<td></td>
<td>Should be F</td>
</tr>
<tr>
<td>Noise Level</td>
<td></td>
<td>&lt; 80 dB</td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
<td>IC 06 Forced Ventilation</td>
</tr>
<tr>
<td>Enclosure</td>
<td></td>
<td>IP 55</td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
<td>IM B3</td>
</tr>
<tr>
<td>Rotor Inertia</td>
<td></td>
<td>0.1 to 0.3 kg m²</td>
</tr>
<tr>
<td>Motor Weight</td>
<td>[kg]</td>
<td>≤ 200</td>
</tr>
</tbody>
</table>

**2. Bidirectional power supply (1 no.)**

- The bi-directional programmable DC power supply should combine two functions in one: source and sink with energy regeneration.
- Based on these two functions, the unit should offer the functionality of two-quadrant operation.
- It should ensure the regenerative capability and the energy consumed to be put back onto the grid cleanly, by saving costs from energy consumption and cooling, while not interfering with the grid.
- Unlike traditional power supplies and E-loads, for which there will be short transitions and inconsistencies in the middle of positive and negative current switching, the unit should be capable of high-speed bidirectional power supply, enables high-speed source and sink current, fast and continuous seamless switching, effectively avoiding voltage or current overshoot.

**It should include the following salient features:**
- Compact 3U rack space
- High regenerative efficiency between 90% to 98%
- Full protections: support OVP, ±OCP, ±OPP, OTP, power down protection, anti-islanding protection
- Support control loop priority mode setting, different loop speed can be set
- Built-in voltage curves comply with DIN 40839, ISO-16750-2/ISO21848 automotive standards
- Support photovoltaic I-V curves simulation function
- Built-in function generator, support arbitrary-waveform generating
- Adjustable output impedance
- Support multiple working modes, rising and falling time can be adjustable

**Technical Specifications:**
Voltage : 0 to 300 V  
Current : - 450 ~ 450 A  
Power : - 36 kW ~ 36 kW  
Resistance : 0 ~ 1 Ohm

<table>
<thead>
<tr>
<th>3.</th>
<th>Test Motors (3 no.s)</th>
<th>The Following Test Motors should be supplied along with the Equipment for the purpose of evaluation / dynamic trials.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BLDC Motor (3000 W) with Invertor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BLDC Wheel Hub Motor (1000 W) with Inverter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC Induction Motor (20 kW, 3000 RPM) with Delta VFD</td>
<td></td>
</tr>
</tbody>
</table>
The current transducer should have the following salient features:

- Current sensor which offers a 1000:1 current transfer ratio for maximum 850 A peak current (600 A RMS).
- For DC currents, a maximum of 600 A DC can be measured continuously. With an overload capacity of 20%.
- Sinusoidal currents of 85 A RMS, 170 A RMS and 430 A RMS can be measured.
- Maximum continuous DC currents are the same as the AC peak limits.

**Technical specs:**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Input Current (I_{PN})</td>
<td>≥ +/- 600 A</td>
</tr>
<tr>
<td>Output Transfer Ratio</td>
<td>≥ 0.6 A at I_{PN}</td>
</tr>
<tr>
<td>Output Load</td>
<td>0 to 7 Ohm (Burden resistor at I_{PN})</td>
</tr>
<tr>
<td>Output Max</td>
<td>≤ +/- 1 A</td>
</tr>
<tr>
<td>Small Signal Bandwidth (5% of I_{PN})</td>
<td>800 kHz (-3 dB)</td>
</tr>
<tr>
<td>Output Offset Error at 23° C</td>
<td>&lt; 5 ppm/K</td>
</tr>
<tr>
<td>Linearity Error (related to actual I_{OUT})</td>
<td>&lt; 3.3 ppm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>≥ +/- 15 V</td>
</tr>
<tr>
<td>Power Consumption at I_{PN}</td>
<td>≤ 9.5 W</td>
</tr>
<tr>
<td>Ambient Operating Temperature</td>
<td>0° to 40° C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>20 to 80 % (Non-Condensing)</td>
</tr>
<tr>
<td>Protection Class</td>
<td>III (IEC 60 950-1)</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage (1 no.)</th>
<th>The voltage transducer should have the following salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Measurement Voltage</td>
</tr>
<tr>
<td></td>
<td>✓ Nominal Value 350 V</td>
</tr>
<tr>
<td></td>
<td>• Conversion Ratio 500V:10V</td>
</tr>
<tr>
<td></td>
<td>• Measuring Range 500 V</td>
</tr>
<tr>
<td></td>
<td>• Accuracy 0.2 %</td>
</tr>
<tr>
<td></td>
<td>• Op. Temperature -40 °C / 85 °C</td>
</tr>
<tr>
<td></td>
<td>• Technology Closed loop Fluxgate C type</td>
</tr>
</tbody>
</table>

5. Power Analyzer interface (1 no.)

- Suitable interface of PC Based Test Cycle Automation system with Power Analyzer- **Hioki power anaylzer**
- Communication cable for interfacing.

6. AC Drive (1 no.)

- The AC Drive Panel should comprise of 4 Quadrant Drive which is used to control the AC Dynamometer in Motoring, & Braking mode.
- The digital drive should ensures fast and reliable response of the system along with ease of programmability.
- Should have the flexibility in real time Control System for setting the mode of operation, the demand values & monitors safety interlocks.
- The system should suited for bi-directional operation i.e. speed control in both the directions of rotation, and torque control in motoring and absorption/braking mode.

**Note:- Should include Regenerative braking**

VFD System should consist of the following major BOM Components:
- Incomer Section:
  - Switch Disconnector Fuse of suitable rating with protection
  - Pilot Lamps to indicate R, Y, B ON and On / Off / Trip Indication:
  - MFM meter with CT’s and RS 485 Port.
  - Emergency Stop Pushbutton.
  - Control Transformer with Protections
Converter Side:
- Unidrive M701 Series Drive fully Digital Frequency Converter suitable for Open Loop / Closed Loop /RFC Mode with door mounted Keypad.
- Output Choke
- Dynamic Braking Resistor
Indication Lamps:
- Motor On /Off / Trip Pushbuttons
- Drive ON-Off Push Button

Features
- Need to operate under condition of AC Mains instability.
- Need to comply with IP 20 Protection EN 60529 Standards
- Energy Saving
- The Input Current needs to be sinusoidal and rear unity power factor.
- Low losses, up to 98% efficient.

Safety Relay for AC Dynamometer PTC Interface

- Thermistor Relay for monitoring critical temperature of the AC Dynamometer.
- The stator & winding temperature sensors with relay.
- The relay should be suitable for 3 PTC serial connected sets.

Drive Panel

- The Drive System needs to be housed in rigid freestanding, floor mounted sheet steel enclosure.
- Enclosure with hinged doors in front and bolted cover on rear.
- Suitable approachable grouting holes.
- Blank detachable gland plates fitted to the cubicle, with all the cables entry from bottom.
- Force air ventilated panel & conforming to IP 41 protection.
- Drive Panel to be installed in a pressurized room to avoid dust and dirt.
- Enclosure fabricated using sheet steel by local reputed panel manufacturer.
- Accessibility: Front only
- Bus Bar: Aluminum Only
- Cable Entry: Bottom
- Tentative Dimensions: 600 mm (W) X 600 mm (D) X 2100 mm (H)

Panel Wiring

- Drive panel wiring using suitable dia Copper wires.
- Use shielded wires for electronic signals.
- All wires ferruled at both ends for easy identification.
- All wires needs to be routed through PVC channels wherever possible, 
  neatly bunched and clipped where PVC channels are not feasible.
- Segregation of cables of different levels of voltages to reduce signal 
  distortion.

SAFETY INTERLOCKS REQUIREMENTS

- **EMERGENCY STOP**: To Stop the AC Dynamometer with gradual 
  halt.
- **HIGH STATOR WINDING TEMPERATURE**: To monitor 
  temperature of AC Dynamometer Stator Winding & to achieve trip 
  condition against safety limit.
- **OVER SPEED**: Trip the drive in case the Speed of the AC Motor 
  increases beyond set safety limit.
- **OVER TORQUE PROTECTION**: Controller to limit the AC Motor 
  Torque to suit continuous rating S1 duty. Beyond this limit the drive 
  shall trip.
- **COMMUNICATION NOT HEALTHY** this alarm to trigger in case of 
  loss in communication between the Drive & PLC.

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<tr>
<td><strong>7.</strong></td>
<td>Cooling Bowler (1 no.)</td>
<td>Light duty air blower with the following specifications is required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Centrifugal</td>
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<tr>
<td></td>
<td></td>
<td>• Air Flow: 2100 m3/hr</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Drive Arrangement: Direct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise Level per Blower: 75 dBA @ 1 mtr</td>
</tr>
</tbody>
</table>

| **8.** | Alignment Kit (1 no.) | For the alignment of the AC Dynamometer & Test Motor a Dial 
  Gauge Type Alignment Kit is required. |
|   |   | • The kit should be suitable to carry out alignment of Shaft diameter 
  from 25 to 150 mm and with Distance Between Shaft ends (DBSE) 
  up to 200 mm by using single set dial gauge. |
|   |   | • The kit should comprises of aluminum clamps, precisely grounded 
  steel rods, clamping knobs, dial gauges, stands & nuts. |

| **9.** | Stool for AC dynamometer (1 no.) | The MS Fabricated Stool is required |
|   |   | • The Stool should adapt to Common MS Fabricated Frame to 
  maintain workable center height of approx. 850 mm from the 
  ground level. |
|   |   | • The fabricated structure should be stress relived and designed to 
  withstand Dynamic shocks and also the Stool should ensure Motor 
  perfectly rests on four points. |
|   | Inline Torque transducer (1 no.) | - Nominal torque measurement up to 500 Nm  
|   |                                  | - Nominal rotational speed up to 20000 rpm  
|   |                                  | - Accuracy class: 0.5 - Contactless transmission of measurement signals  
|   |                                  | - Measurement on rotating or stationary parts - Cylindrical shaft ends for non-play friction joints - ±5 V and 10±8 mA torque output signal  
| 11. | Calibration kit (1 no.) | To carry out periodic torque measurement verification for the Torque transducer. It should comprises of: -  
|   |                                  | - Calibration Arm & Counter Balance Arm with Rider Weight  
|   |                                  | - Weight pan assembly  
|   |                                  | - One set of Calibration Weights (to suit verification upto 170 Nm)  
|   |                                  | - **Note:** The Kit should suitable for Torque measurement accuracy verification up to +/- 0.2% of 170 Nm.  
| 12. | Dynamometer Coupling Locking Attachment (1 no.) | This attachment should mount on drive end of the AC Dynamometer which is essential when using the Calibration Kit.  
| 13. | Flexible Disc Coupling (2 no.) | A Suitable Flexible Disc Coupling is to be provided for connection between the AC Dynamometer & EV Motor to be tested.  
|   | Nominal Torque Capacity          | : between 185 Nm and 195Nm  
|   | Peak Torque Capacity             | : between 245 Nm and 255Nm  
|   | Weight                          | : ≤ 3.54 kg  
|   | Inertia                         | : 0.002 to 0.003 kg m²  
|   | Max Angular Misalignment        | : 0.75 Deg per flange  
|   | Max Axial Misalignment          | : +/- 2.4 mm  
|   | Max Parallel Offset             | : +/- 0.6 mm  
|   |                                  | The specification of Coupling is as follows:
| 14. | Sheet Steel guard with interlock (1 no.) | - MS fabricated sheet steel guard with suitable thickness is should be provided for safety against rotating assemblies during testing.  
- Pivotal cover and quick release mechanical lock are also required. Provision for safety interlocking with Test Bed Automation system is to be considered which ensures the test cycle is not executed unless coupling guard is secured. |
| 15. | Adaption Coupling for EV Motor (2 no.s) | - Adaption Coupling for EV Motor should be provided to suit connection of the EV Motor (O/P Shaft) with the Flexible Coupling (flange). |
| 16. | Fixture for Centre motor Mount Type EV Motor (2 no.s) | - Fixture for Center Mount Type EV Motor is required to mount the Center Mount EV Motor on the T Slotted Common MS Base Frame. The fixture would cater mounting of one variant each (in total 4 variants).  
**Note:** -  
- For Foot mounted motor a mounting plate with tapped holes is required. The Plate should adapt to T-Slots of Common MS Frame. |
| 17. | Fixture for Wheel Hub Type EV Motor (1 no.s) | Should provide fixture to mount Wheel Hub Type EV Motor (also referred as Outer Rotor type) on the T Slotted Common MS Base Frame. The fixture would cater mounting of one such variant only. |
| 18. | Common Ms Fabricated Frame (1 no.) | The AC Dynamometer & Motor (to be tested) should be mounted on a Common Base Frame fabricated from steel sections, which ensures easy & quick alignment of Dynamometer wrt the test subject.  
- The fabricated structure should be stress relived and designed to withstand the Dynamic shocks. Main attention need to be paid to stiffness and stability of the concrete base to ensure minimum deflection under applied loads.  
- Workable height should be 850 mm from ground level. Approx. Size of frame is 1600 Length x 600 mm Width (mm)  
**Levelling Mounts:**  
The above Base frame should be mounted on Levelling cum Anti Vibration Mounts.  
- These mounts should help in levelling the frame as well as dampen low amplitude vibrations which may arise during testing. The mounts should rest free on the customer built concrete floor, which is flat as per Industrial Floor norms. |
PC Based Test Cycle Automation System (1 no.)

- PC Based Test Cycle Automation System which is designed to,
  a) Execute Customer Defined Test Sequences
  b) Log Test Parameters
  c) Prepare Test Reports

- Should be flexible to prepare a test Sequence in the software with User interface that can be executed via the PLC & 4Q Drive.
- EV Motor parameters such as Power O/P, Torque, Speed should have logged by the system during test cycle.
- Information/Details related to the EV Motor such as Identification No, Serial No, Production Batch, Test Operator Name, etc. is fed manually in the system prior to start of test.
- This system should allow autonomous monitoring and logging of the test parameters & can trigger shutdown if Dyno safety interlocks are triggered.
- At the end of the test a Test Report should be printed & stored in the PC.
- Fault conditions can be set for each parameter & be defined by Audio visual alarm.

It should comprise of following hardware:

<p>| Commercial Grade PC, i5-9500, 8 GB DDR4 RAM, 1 TB Hard Disk, DVD Drive, 1 DP Port, 1 HDMI Port, USB Keyboard ,Wireless Mouse |
| 19” Panel mounting rack for CPU &amp; Monitor |
| Windows 10 (Professional) &amp; Office 2016 |
| Application Software License with Dongle |
| Siemens Simatic S7 1200 with Profinet Interface (Type A) |
| HMI Unit (Human machine interface) 9.0” (SIMATIC TP 900 Comfort Touch) |
| Control circuit transformer and fusing mounting and wiring of interface relays |
| 29 U, RAL 7035, 19” Rack Panel Powder Coated (Make: Schneider/Rittal) |
| EMERGENCY STOP Circuit (Relay and Timer) (in cell &amp; at control point) |
| Basic Push Buttons &amp; Illuminated Lamps. |
| Three Pillar Lamp for Test Equipment Status Indication |
| Panel Cooling Fans |
| Hooter for Audio Indications |
| MCCB ON/OFF |</p>
<table>
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</thead>
<tbody>
<tr>
<td>UPS 1.0 kVA [APC 1100 Model Offline, 5 min back up]</td>
<td></td>
</tr>
<tr>
<td>Printer HP Multi-Function Thermal Inkjet Printer, Deskjet 2677 (Colour)</td>
<td></td>
</tr>
<tr>
<td>PC Desk for housing PC, Printer &amp; UPS</td>
<td></td>
</tr>
</tbody>
</table>

**SAFETY INTERLOCKS**

- **EMERGENCY STOP**: should remove the load applied by Dynamometer when pressed during emergency
- **ZERO SPEED INTERLOCK**: Protection for ON/OFF operation should be happen at stand still condition of motor.
- **OVER SPEED**: In case the Speed of the Dynamometer increases beyond set limit, an audible & visual alarm should be triggered & system should trip (will be set for 10000 RPM).
- **OVER TORQUE PROTECTION**: Controller to limit the AC Dynamometer torque to suit continuous safe rating S1. Beyond this limit the system should trip (will be set for 170 Nm).

20. | Incell Pendent (1 no.) | A Handheld Pendent Unit should provide following remote functionality
  
  - Ready
  - Test Stop
  - EMERGENCY STOP (Mushroom Push Button).

  The pendent should hard wired and mounted on a fabricated stand. EMERGENCY STOP for Pendent, Control & Drive Panel are in series.

21. | Data Acquisition Module (1 no.) | Data acquisition module should be for high frequency logging of EV Motor temperature & vibration measurement data.

**Specifications:**

- \( \geq 14 \) Analog Inputs built in
- 16-bit high-speed ADC (up to 100k samples/s)
- Software Configurable Resolution Settings
- Single-Ended Inputs (\( \geq 14 \)) or Differential Inputs (\( \geq 7 \))
- Analog input ranges: \( \pm 10V, \pm 1V, \pm 0.1V \) and \( \pm 0.01V \)
- All analog input features are software programmable by configuring the Analog Input Registers
- High speed sampling configurable by using Stream Mode. Speeds up to 100 kS/s
- Low Latency Sampling and Control (less than 1ms) is made easy with Command-Response Modbus messages
| 20. | Cable Loom | Easy integration with sensors like thermocouples, load cells, bridges, and more ...

**Analog Output:**
- ≥ 2 analog outputs (12-bit, 0-5V)
- Waveform generation via Stream Out
- Integrated LJTick-DAC support for multiple +/-10V outputs

**Digital I/O:**
- ≥ 23 Digital I/O
- ≥ 5 PWM Outputs with individual phase control
- ≥ 5 Pulse Outputs with configurable number, frequency, and width
- ≥ 2 Frequency Inputs returning both frequency and period
- ≥ 2 Pulse Width Inputs measuring time spent high and low as well as duty cycle
- ≥ 2 Line-to-Line Inputs measuring the time between edges on 2 different lines
- ≥ 4 High-Speed Counters
- ≥ 6 Software Counters with debounce capabilities
- ≥ 3 Pairs of Quadrature Inputs

**Communication Options:** USB, Ethernet

Following list of Cables should be provided along with the Test Bench,
- Mains Incomer Power Supply Cable to the AC Drive Panel (atleast 5 m)
- Mains Power Supply Cable to Control Panel (atleast 5 m)
- Power Cable between AC Drive Panel & AC Motor (atleast 5 m)
- Signal Field Cables (Shielded) terminated in Junction Box
- Signal Cables (Shielded) from Junction Box to Control Panel (atleast 10 m).
- Signal Cable from Control Panel to Pendent (atleast 10 m)
- Signal Cable from Control Panel to Drive Panel (atleast 10 m)
- Stator cable, Encoder cable, Blower motor cable, Thermistor cable.
- Ethernet, Profibus & Serial Cables

<table>
<thead>
<tr>
<th>23.</th>
<th>Other requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- System Engineering and Documentation</td>
</tr>
<tr>
<td></td>
<td>- Pre-dispatch Inspection</td>
</tr>
<tr>
<td></td>
<td>- Shipping, Installation, on site training (over every 6 to 12 months)</td>
</tr>
<tr>
<td></td>
<td>- Supervision of instruction and shipping</td>
</tr>
<tr>
<td></td>
<td>- Two years of warranty</td>
</tr>
</tbody>
</table>

**BIDDER QUALIFYING STANDARD:**
- **Manufacturer:** Bidder should be supplier of EV Motor Test Bench for more than 5 Years.
- **Manufactured Nos. of Dynamometers & Experience:** Firm should have supplied more than 5 no of Test Benches for evaluating EV Motors. These dynamometers should have been supplied for testing BLDC EV Motors specifically.
- **Manufacturer:** Bidder be in the field of Motor Test Rigs for more than 10 years.
- **ISO Certified:** Firm should be ISO 9001: 2015 Certified.
- Those who are registered with NSIC will be exempted from EMD.
- **Reference list:** User shall arrange reference List of Clients using EV Motor Test Bench.
- At least 2 EV Motors must be tested in Dynamic condition at supplier end during Pre-dashpact inspection.
- Dynamometer should be motored to its max speed at Supplier facility during PDI.
- NABL Traceable Calibration certificate of the Dynamometer should be provided prior to dispatch of the Dynamometer.

A complete set of tender documents* may be Download by prospective bidder free of cost from the website [http://eprocure.gov.in/eprocure/app](http://eprocure.gov.in/eprocure/app). Bidder has to make payment of requisite fees (i.e. Tender fees, if any online through RTGS/NEFT only.
### Terms & Conditions Details

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Due date:</strong> The tender has to be submitted on-line before the due date. The offers received after the due date and time will not be considered. No manual bids will be considered.</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Preparation of Bids:</strong> The offer/bid should be submitted in two bid systems i.e. Technical bid and Financial bid. The Technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item wise price for the items mentioned in the technical bid in the given format i.e BoQ_XXXX. The Technical bid and the financial bid should be submitted Online. <em>Note:</em> Comparison of prices will be done ONLY on the bids submitted for the Main Equipment and anything asked as ‘Optional’ in the specs is not to be included for overall comparison.</td>
</tr>
<tr>
<td>3.</td>
<td><strong>EMD (if applicable):</strong> The tenderer should submit an EMD amount through RTGS/NEFT. The Technical Bid without EMD would be considered as UNRESPONSIVE and will not be accepted. The EMD will be refunded without any interest to the unsuccessful bidders after the award of contract. Refer to Schedule (at page 1 of this document) for its actual place of submission.</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Refund of EMD:</strong> The EMD will be returned to unsuccessful Tenderer only after the Tenders are finalized. In case of successful Tenderer, it will be retained till the successful and complete installation of the equipment.</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Opening of the tender:</strong> The online bid will be opened by a committee duly constituted for this purpose. Online bids (complete in all respect) received along with EMD (if any) will be opened as mentioned at “Annexure: Schedule” in presence of bidders representative if available. Only one representative will be allowed to participate in the tender opening. Bid received without EMD (if present) will be rejected straight way. The technical bid will be opened online first and it will be examined by a technical committee (as per specification and requirement). The financial offer/bid will be opened only for the offer/bid which technically meets all requirements as per the specification, and will be opened in the presence of the vendor’s representatives subsequently for further evaluation. The bidders if interested may participate on the tender opening Date and Time. The bidder should produce authorization letter from their company to participate in the tender opening.</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Acceptance/ Rejection of bids:</strong> The Committee reserves the right to reject any or all offers without assigning any reason.</td>
</tr>
</tbody>
</table>
| 7.      | **Pre-qualification criteria:**  
(i) 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. (Ref. Annexure-II)  
(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. |
<p>| 8.      | <strong>Performance Security:</strong> The supplier shall require to submit the performance security in the form of irrevocable bank guarantee issued by any Indian Nationalized Bank for an amount which is stated at page #1 of the tender document within 21 days from the date of receipt of the purchase order and should be kept valid for a period of 60 days beyond the date of completion of warranty period. |</p>
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</table>
| **9. Force Majeure:** | The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, it’s delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.  
  - For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.  
  - If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event. |   |
| **10. Risk Purchase Clause:** | In event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from the other source on the total risk of the supplier under risk purchase clause. |   |
| **11. Packing Instructions:** | Each package will be marked on three sides with proper paint/indelible ink, the following:  
  i. Item Nomenclature  
  ii. Order/Contract No.  
  iii. Supplier’s Name and Address  
  iv. Consignee details  
  v. Packing list reference number |   |
| **12. Delivery and Documents:** | Delivery of the goods should be made within a maximum of 12 to 16 weeks *(for goods ready for shipment)* & Maximum *(To be filled by Purchaser)* weeks *(For special/to be fabricated goods)* from the date of the Purchase Order. Within 24 hours of shipment, the supplier shall notify the purchaser and the insurance company by email the full details of the shipment including contract number, railway receipt number/ AAP etc. and date, description of goods, quantity, name of the consignee, invoice etc. The supplier shall mail the following documents to the purchaser with a copy to the insurance company:  
  1. 4 Copies of the Supplier invoice showing contract number, goods' description, quantity  
  2. unit price, total amount;  
  3. Insurance Certificate if applicable;  
  4. Manufacturer's/Supplier's warranty certificate;  
  5. Inspection Certificate issued by the nominated inspection agency, if any  
  6. Supplier’s factory inspection report; and  
  7. Certificate of Origin (if possible by the beneficiary);  
  8. Two copies of the packing list identifying the contents of each package.  
  9. The above documents should be received by the Purchaser before arrival of the Goods (except where the Goods have been delivered directly to the Consignee with all documents) and, if not received, the Supplier will be responsible for any consequent expenses. |   |
| **13. Delayed delivery:** | If the delivery is not made within the due date for any reason, the Committee will have the right to impose penalty 1% per week and the maximum deduction is 10% of the contract value / price. |   |
| **14. Prices:** | The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges.  
  Price quoted should be in Indian Rupees, free delivery at IIT Delhi Campus at site (DDP/FOR). |   |
Further, depending on the nature of the goods, there may be cost elements towards installation and commissioning, operator’s training, and so on. Normally, it may be included in the equipment cost but if it is quoted separately, the same will be added in the item price for the determination of ranking of the bidders.

The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However, the percentage of taxes & duties shall be clearly indicated. Necessary certificate will be issued on demand.

The Buyer/PFC will have the right to award contracts to different Bidders for being lowest in particular items.

For ranking of offers, price of complete scope of supply as detailed in technical specifications, the procuring authority/Purchaser may decide as follows for comparison of price bid -

(i) All items of the bid which are mandatorily required to meet the tendered specifications of the item/system

(ii) If a bidder has put certain items/modules which are required to meet the tendered specifications in the ‘optional’ part of the bid, then such optional items shall also be included for the purpose of price comparison

(iii) On the other hand, if a bidder has inadvertently included any item/module in its main price bid which is not required as per tender specifications, then the price of such item/module shall be excluded from the price comparison provided that the price for the said item/module is clearly reflected separately in the bid

(iv) Anything asked as ‘optional’ in our specs is not to be included for overall comparison

Non-conformities between Figures and words:

Sometimes, non-conformities/errors are also observed in responsive tenders between the quoted prices in figures and in words. This situation normally does not arise in case of e-Procurement. This should be taken care of in the manner indicated below:

(i) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price will prevail and the total price will be corrected.

(ii) If there is an error in a total corresponding to the addition or subtraction of subtotals, the sub-totals shall prevail and the total shall be corrected;

(iii) If there is a discrepancy between words and figures, the amount in words will prevail for calculation of price.

15. Notices: For the purpose of all notices, the following shall be the address of the Purchaser and Supplier.

Purchaser: Prof. B.K. Panigrahi
HoC, Center for Automotive Research and Tribology (Formerly ITMMEC)
Indian Institute of Technology, Delhi
Hauz Khas, New Delhi - 110016.

Supplier: (To be filled in by the supplier)
(Supplier should submit its supplies information as per Annexure-II).
16. **Progress of Supply**: Wherever applicable, supplier shall regularly intimate progress of supply, in writing, to the Purchaser as under:
1. Quantity offered for inspection and date;
2. Quantity accepted/rejected by inspecting agency and date;
3. Quantity dispatched/delivered to consignees and date;
4. Quantity where incidental services have been satisfactorily completed with date;
5. Quantity where rectification/repair/replacement effected/completed on receipt of any communication from consignee/Purchaser with date;
6. Date of completion of entire Contract including incidental services, if any; and
7. Date of receipt of entire payments under the Contract (In case of stage-wise inspection, details required may also be specified).

17. **Inspection and Tests**: Inspection and tests prior to shipment of Goods and at final acceptance are as follows:
- After the goods are manufactured and assembled, inspection and testing of the goods shall be carried out at the supplier’s plant by the supplier, prior to shipment to check whether the goods are in conformity with the technical specifications attached to the purchase order. Manufacturer’s test certificate with data sheet shall be issued to this effect and submitted along with the delivery documents. The purchaser shall be present at the supplier’s premises during such inspection and testing if need is felt. The location where the inspection is required to be conducted should be clearly indicated. The supplier shall inform the purchaser about the site preparation, if any, needed for installation of the goods at the purchaser’s site at the time of submission of order acceptance.
- The acceptance test will be conducted by the Purchaser, their consultant or other such person nominated by the Purchaser at its option after the equipment is installed at purchaser’s site in the presence of supplier’s representatives. The acceptance will involve trouble free operation and ascertaining conformity with the ordered specifications and quality. There shall not be any additional charges for carrying out acceptance test. No malfunction, partial or complete failure of any part of the equipment is expected to occur. The Supplier shall maintain necessary log in respect of the result of the test to establish to the entire satisfaction of the Purchaser, the successful completion of the test specified.
- In the event of the ordered item failing to pass the acceptance test, a period not exceeding one weeks will be given to rectify the defects and clear the acceptance test, failing which the Purchaser reserve the right to get the equipment replaced by the Supplier at no extra cost to the Purchaser.
- Successful conduct and conclusion of the acceptance test for the installed goods and equipment shall also be the responsibility and at the cost of the Supplier.

18. **Resolution of Disputes**: The dispute resolution mechanism to be applied pursuant shall be as follows:
- In case of Dispute or difference arising between the Purchaser and a domestic supplier relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Indian Arbitration & Conciliation Act, 1996, the rules there under and any statutory modifications or re-enactments thereof shall apply to the arbitration proceedings. The dispute shall be referred to the Director, Indian Institute of Technology Delhi and if he is unable or unwilling to act, to the sole arbitration of some other person appointed by him willing to act as such Arbitrator. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to this order.

19. **Applicable Law**: The place of jurisdiction would be New Delhi (Delhi) INDIA.

20. **Right to Use Defective Goods**:

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If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the goods proves to be unsatisfactory, the Purchaser shall have the right to continue to operate or use such goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchaser’s operation.

21. **Supplier Integrity:**
The Supplier is responsible for and obliged to conduct all contracted activities in accordance with the Contract using state of the art methods and economic principles and exercising all means available to achieve the performance specified in the contract.

22. **Training:**
The Supplier is required to provide training to the designated Purchaser’s technical and end user personnel to enable them to effectively operate the total equipment.

23. **Installation & Demonstration:**
The supplier is required to do the installation and demonstration of the equipment within one month of the arrival of materials at the IITD site of installation, otherwise the penalty clause will be the same as per the supply of materials.

In case of any mishappening/damage to equipment and supplies during the carriage of supplies from the origin of equipment to the installation site, the supplier has to replace it with new equipment/supplies immediately at his own risk. Supplier will settle his claim with the insurance company as per his convenience. IITD will not be liable to any type of losses in any form.

24. **Insurance:** For delivery of goods at the purchaser’s premises, the insurance shall be obtained by the supplier in an amount equal to 110% of the value of the goods from "warehouse to warehouse" (final destinations) on “All Risks” basis including War Risks and Strikes. The insurance shall be valid for a period of not less than 3 months after installation and commissioning.

25. **Incidental services:** The incidental services also include:
- Furnishing of 01 set of detailed operations & maintenance manual.
- Arranging the shifting/moving of the item to their location of final installation within IITD premises at the cost of Supplier through their Indian representatives.

26. **Warranty:**
(i) Warranty period shall be (as stated at page #2 of this tender) from date of installation of Goods at the IITD site of installation. The Supplier shall, in addition, comply with the performance and/or consumption guarantees specified under the contract. If for reasons attributable to the Supplier, these guarantees are not attained in whole or in part, the Supplier shall at its discretion make such changes, modifications, and/or additions to the Goods or any part thereof as may be necessary in order to attain the contractual guarantees specified in the Contract at its own cost and expense and to carry out further performance tests. The warranty should be comprehensive on site.

(ii) The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall immediately within in 02 days arrange to repair or replace the defective goods or parts thereof free of cost at the ultimate destination. The Supplier shall take over the replaced parts/goods at the time of their replacement. No claim whatsoever shall lie on the Purchaser for the replaced parts/goods thereafter. The period for correction of defects in the warranty period is 02 days. If the supplier having been notified fails to remedy the defects within 02 days, the purchaser may proceed to take such remedial action as may be necessary, at the supplier’s risk and expenses and without prejudice to any other rights, which the purchaser may have against the supplier under the contract.

(iii) The warranty period should be clearly mentioned. The maintenance charges (AMC) under different schemes after the expiry of the warranty should also be mentioned. The comprehensive warranty will commence from the date of the satisfactory installation/commissioning of the
equipment against the defect of any manufacturing, workmanship and poor quality of the components.

(iv) After the warranty period is over, Annual Maintenance Contract (AMC)/Comprehensive Maintenance Contract (CMC) up to next two years should be started. The AMC/CMC charges will not be included in computing the total cost of the equipment.

27. **Governing Language:**
The contract shall be written in English language. English language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in the same language.

28. **Applicable Law:**
The Contract shall be interpreted in accordance with the laws of the Union of India and all disputes shall be subject to place of jurisdiction.

29. **Notices:**
- Any notice given by one party to the other pursuant to this contract/order shall be sent to the other party in writing or by email and confirmed in writing to the other party’s address.
- A notice shall be effective when delivered or on the notice’s effective date, whichever is later.

30. **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. However, GST etc, in respect of the transaction between the Purchaser and the Supplier shall be payable extra, if so stipulated in the order.

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

31. **Duties:**
IIT Delhi 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.

a) Shipping details i.e. Master Airway Bill No. and House Airway No. (if exists)
b) Forwarder details i.e. Name, Contact No., etc.

IIT Delhi is partially exempted from paying GST and necessary GST Exemption Certificate will be provided for which following information are required.
b) Quotation with details of Basic Price, Rate, Tax & Amount on which ED is applicable
c) Supply Order Copy
d) Proforma-Invoice Copy.

32. **Payment:**
100% payment shall be made by the Purchaser against delivery, inspection, successful installation, commissioning and acceptance of the equipment at IITD in good condition and to the entire satisfaction of the Purchaser and on production of unconditional performance bank guarantee as specified in Clause 8 of tender terms and conditions.

33. **User list:** Brochure detailing technical specifications and performance, list of industrial and educational establishments where the items enquired have been supplied must be provided. (Ref. Annexure-III)

34. **Manuals and Drawings:**
(i) Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals. These shall be in such details as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications.
(ii) The Manuals shall be in the ruling language (English) in such form and numbers as stated in the contract.

(iii) Unless and otherwise agreed, the goods equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawing have been supplied to the Purchaser.

35. **Application Specialist:** The Tenderer should mention in the Techno-Commercial bid the availability and names of Application Specialist and Service Engineers in the nearest regional office. (Ref. to Annexure-III)

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

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

37. **Spare Parts**

The Supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier:

i. Such spare parts as the Purchaser may elect to purchase from the Supplier, providing that this election shall not relieve the Supplier of any warranty obligations under the Contract; and

iii. In the event of termination of production of the spare parts:

iv. Advance notification to the Purchaser of the pending termination, in sufficient time to permit the Purchaser to procure needed requirements; and

v. Following such termination, furnishing at no cost to the Purchaser, the blueprints, drawings and specifications of the spare parts, if requested.

Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares for the Goods, such as gaskets, plugs, washers, belts etc. Other spare parts and components shall be supplied as promptly as possible but in any case within six months of placement of order.

38. **Defective Equipment:** If any of the equipment supplied by the Tenderer is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the committee will have the right to reject the equipment or its part. The prices of such equipment shall be refunded by the Tenderer with 18% interest if such payments for such equipment have already been made. All damaged or unapproved goods shall be returned at suppliers cost and risk and the incidental expenses incurred thereon shall be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, shall be replaced within 45 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions, IIT Delhi may consider "Banning" the supplier.

39. **Termination for Default:**

The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part:

i. If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the order, or within any extension thereof granted by the Purchaser; or

ii If the Supplier fails to perform any other obligation(s) under the Contract.

iii If the Supplier, in the judgment of the Purchaser has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

● For the purpose of this Clause:
**i. “Corrupt practice”** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.

**ii. “Fraudulent practice”** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;”

- In the event the Purchaser terminates the Contract in whole or in part, the Purchaser may procure, upon such terms and in such manner, as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to the Purchaser for any excess costs for such similar Goods or Services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.

**40. Downtime:** During the warranty period not more than 5% downtime will be permissible. For every day exceeding permissible downtime, penalty of 1/365 of the 5% item value will be imposed. Downtime will be counted from the date and time of the filing of complaint with in the business hours.

**41. Training of Personnel:** The supplier shall be required to undertake to provide the technical training to the personnel involved in the use of the equipment at the Institute premises, immediately after completing the installation of the equipment for a minimum period of one week at the supplier’s cost.

**42. Disputes and Jurisdiction:** Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within New Delhi.

**43. Compliancy certificate:** This certificate must be provided indicating conformity to the technical specifications. (Annexure-I)

**44. 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 hereinbefore, 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:

- An entity incorporated, established or registered in such a country;
- A subsidiary of an entity incorporated, established or registered in such a country;
- An entity substantially controlled through entities incorporated, established or registered in such a country;
- An entity whose beneficial owner is situated in such a country;
- An Indian (or other) agent of such an entity;
- 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. Annexure VI (For Goods/ Services contracts)/ Annexure VII (For Works contracts, including Turnkey contracts)

45. 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 Annexure VIII for the same)
## TECHNICAL SPECIFICATION

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Technical specification</th>
<th>Compliance (Y/N)</th>
</tr>
</thead>
</table>
| 1.      | Dynamometer (1 no.)       | - It should provide High dynamic performance with compact dimensions.  
- It should have high overload capacity that gives the motor an excellent dynamic response as compared to a conventional AC Induction Motor.  
- The AC Dynamometer to be connected to the EV Motor under test should have suitable Flexible Disc Coupling.  
- The Motor along with its 4 Quadrant Drive should provide a Loading media or a drive media.  
- During the regenerative mode, the power absorbed is to be fed back to Mains Grid.  
- During Overrun phase the AC Dynamometer acts as a motor & the AC Drive draws power from the AC mains. The overrun/drive mode is used to motor the test subject at different speeds.  
- Should have a high precision encoder feedback which provides closed loop speed control, essential for accurately executing user programmed test cycles.  
- Angular accuracy: +/- 20 angular seconds, for 2048 ppr line count for high precision position encoder, with incremental signal: +/-1V  
- SAE 1410 flange should be provided for adaption of the AC Dynamometer to the driveline.  
- Encoder mounted at Non – drive end of the AC Motor should be flexible for Speed measurement.  
- It should have stator winding temperature monitoring using Temperature sensor (PTC)  
- The motor should have one half coupling [SAE 1410] for connection at the drive end (encoder will be mounted at non-drive end). |
| **Rated Speed** | [rpm] : | ≥ 2000 and ≤ 2500 |
| **Range** | | |
| **Maximum Speed** | [rpm] : | ≥ 6500 and ≤ 7000 |
| **(constant power)** | | |
| **Max Mechanical Speed** | [rpm] : | 10000 |
| **Rated Power** | [kW] : | between 30 to 40kW |
| **[Nm]** : | between 170Nm and 180Nm |
| **Cyclic duration factor** | : | Should be S1 |
| **Motor voltage** | [V] : | 400 |
| **Frequency** | [Hz] : | 50 to 100 |
| **Rated current** | (B) : | ≥ 80 |
| **Insulation Class** | : | Should be F |
| **Noise Level** | : | < 80 dB |
| **Cooling** | : | IC 06 Forced Ventilation |
| **Enclosure** | : | IP 55 |
| **Mounting** | : | IM B3 |
| **Rotor Inertia** | : | 0.1 to 0.3 kg m² |
| **Motor Weight** | [kg] : | ≤ 200 |

2. **Bidirectional power supply** (1 no.)

- The bi-directional programmable DC power supply should combine two functions in one: source and sink with energy regeneration.
Based on these two functions, the unit should offer the functionality of two-quadrant operation.

It should ensure the regenerative capability and the energy consumed to be put back onto the grid cleanly, by saving costs from energy consumption and cooling, while not interfering with the grid.

Unlike traditional power supplies and E-loads, for which there will be short transitions and inconsistencies in the middle of positive and negative current switching, the unit should be capable of high-speed bidirectional power supply, enables high-speed source and sink current, fast and continuous seamless switching, effectively avoiding voltage or current overshoot.

**It should include the following salient features:**

- Compact 3U rack space
- High regenerative efficiency between 90% to 98%
- Full protections: support OVP, ±OCP, ±OPP, OTP, power down protection, anti-islanding protection
- Support control loop priority mode setting, different loop speed can be set
- Built-in voltage curves comply with DIN 40839, ISO-16750-2/ISO21848 automotive standards
- Support photovoltaic I-V curves simulation function
- Built-in function generator, support arbitrary-waveform generating
- Adjustable output impedance
- Support multiple working modes, rising and falling time can be adjustable

**Technical Specifications:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>0 to 300 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>-450 ~ 450 A</td>
</tr>
<tr>
<td>Power</td>
<td>36 kW ~ 36 kW</td>
</tr>
<tr>
<td>Resistance</td>
<td>0 ~ 1 Ohm</td>
</tr>
</tbody>
</table>

3. **Test Motors (3 no.s)**

   The Following Test Motors should be supplied along with the Equipment for the purpose of evaluation / dynamic trials.
   - BLDC Motor (3000 W) with Invertor
   - BLDC Wheel Hub Motor (1000 W) with Inverter
   - AC Induction Motor (20 kW, 3000 RPM) with Delta VFD
The current transducer should have the following salient features

- Current sensor which offers a 1000:1 Current transfer ratio for maximum 850 A peak current (600 A RMS).
- For DC currents, a maximum of 600 A DC can be measured continuously. With an overload capacity of 20%.
- Sinusoidal currents of 85 A RMS, 170 A RMS and 430 A RMS can be measured.
- Maximum continuous DC currents are the same as the AC peak limits.

**Technical specs:**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Input Current ($I_{PN}$)</td>
<td>$\geq \pm 600$ A</td>
</tr>
<tr>
<td>Output Transfer Ratio</td>
<td>$\geq 0.6$ A at $I_{PN}$</td>
</tr>
<tr>
<td>Output Load</td>
<td>0 to 7 Ohm (Burden at $I_{PN}$)</td>
</tr>
<tr>
<td>Output Max</td>
<td>$\leq \pm 1$ A</td>
</tr>
<tr>
<td>Small Signal Bandwidth ($5%$ of $I_{PN}$)</td>
<td>800 kHz (-3 dB)</td>
</tr>
<tr>
<td>Output Offset Error at 23°C</td>
<td>$&lt; 5$ ppm/K</td>
</tr>
<tr>
<td>Linearity Error (related to actual $I_{OUT}$)</td>
<td>$&lt; 3.3$ ppm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>$\geq \pm 15$ V</td>
</tr>
<tr>
<td>Power Consumption at $I_{PN}$</td>
<td>$\leq 9.5$ W</td>
</tr>
<tr>
<td>Ambient Operating Temperature</td>
<td>0°C to 40°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>20 to 80 % (Non-Condensing)</td>
</tr>
<tr>
<td>Protection Class</td>
<td>III (IEC 60950-1)</td>
</tr>
</tbody>
</table>

The voltage transducer should have the following salient features

- Measurement Voltage
  - Nominal Value 350 V
- Conversion Ratio 500V:10V
- Measuring Range 500 V
- Accuracy 0.2 %
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Op. Temperature -40 °C / 85 °C</th>
<th>Technology Closed loop Fluxgate C type</th>
</tr>
</thead>
</table>
| 5. | Power Analyzer interface (1 no.) | • Suitable interface of PC Based Test Cycle Automation system with Power Analyzer- *Hioki power analyzer*  
• Communication cable for interfacing. |   |
|   | AC Drive (1 no.) | • The AC Drive Panel should comprise of 4 Quadrant Drive which is used to control the AC Dynamometer in Motoring, & Braking mode.  
• The digital drive should ensures fast and reliable response of the system along with ease of programmability.  
• Should have the flexibility in real time Control System for setting the mode of operation, the demand values & monitors safety interlocks.  
• The system should suited for bi-directional operation i.e. speed control in both the directions of rotation, and torque control in motoring and absorption/braking mode. |  |
- Need to operate under condition of AC Mains instability.
- Need to comply with IP 20 Protection EN 60529 Standards
- Energy Saving
- The Input Current needs to be sinusoidal and rear unity power factor.
- Low losses, up to 98% efficient.

Safety Relay for AC Dynamometer PTC Interface

- Thermistor Relay for monitoring critical temperature of the AC Dynamometer.
- The stator & winding temperature sensors with relay.
- The relay should be suitable for 3 PTC serial connected sets.

Drive Panel

- The Drive System needs to be housed in rigid freestanding, floor mounted sheet steel enclosure.
- Enclosure with hinged doors in front and bolted cover on rear.
- Suitable approachable grouting holes.
- Blank detachable gland plates fitted to the cubicle, with all the cables entry from bottom.
- Force air ventilated panel & conforming to IP 41 protection.
- Drive Panel to be installed in a pressurized room to avoid dust and dirt.
- Enclosure fabricated using sheet steel by local reputed panel manufacturer.
- Accessibility: Front only
- Bus Bar: Aluminum Only
- Cable Entry: Bottom
- Tentative Dimensions: 600 mm (W) X 600 mm (D) X 2100 mm (H)

Panel Wiring

- Drive panel wiring using suitable dia Copper wires.
- Use shielded wires for electronic signals.
- All wires ferruled at both ends for easy identification.
- All wires needs to be routed through PVC channels wherever possible, neatly bunched and clipped where PVC channels are not feasible.
- Segregation of cables of different levels of voltages to reduce signal distortion.

SAFETY INTERLOCKS REQUIREMENTS
- **EMERGENCY STOP**: To Stop the AC Dynamometer with gradual halt.
- **HIGH STATOR WINDING TEMPERATURE**: To monitor temperature of AC Dynamometer Stator Winding & to achieve trip condition against safety limit.
- **OVER SPEED**: Trip the drive in case the Speed of the AC Motor increases beyond set safety limit.
- **OVER TORQUE PROTECTION**: Controller to limit the AC Motor Torque to suit continuous rating S1 duty. Beyond this limit the drive shall trip.
- **COMMUNICATION NOT HEALTHY**: this alarm to trigger in case of loss in communication between the Drive & PLC.

### 7. Cooling Bowler (1 no.)

Light duty air blower with the following specifications is required.

- Type: Centrifugal
- Air Flow: 2100 m³/hr
- Drive Arrangement: Direct
- Noise Level per Blower: 75 dBA @ 1 mtr

### 8. Alignment Kit (1 no.)

For the alignment of the AC Dynamometer & Test Motor a Dial Gauge Type Alignment Kit is required.

- The kit should be suitable to carry out alignment of Shaft diameter from 25 to 150 mm and with Distance Between Shaft ends (DBSE) up to 200 mm by using single set dial gauge.

The kit should comprises of aluminum clamps, precisely grounded steel rods, clamping knobs, dial gauges, stands & nuts.

### 9. Stool for AC dynamometer (1 no.)

The MS Fabricated Stool is required

- The Stool should adapt to Common MS Fabricated Frame to maintain workable center height of approx. 850 mm from the ground level.

The fabricated structure should be stress relived and designed to withstand Dynamic shocks and also the Stool should ensure Motor perfectly rests on four points.

### 10. Inline Torque transducer (1 no.)

- Nominal torque measurement up to 500 Nm
- Nominal rotational speed up to 20000 rpm
- Accuracy class: 0.5 - Contactless transmission of measurement signals

Measurement on rotating or stationary parts - Cylindrical shaft ends for non-play friction joints - ±5 V and 10±8 mA torque output signal
11. Calibration kit (1 no.)

To carry out periodic torque measurement verification for the Torque transducer. It should comprises of:

- Calibration Arm & Counter Balance Arm with Rider Weight
- Weight pan assembly
- One set of Calibration Weights (to suit verification upto 170 Nm)

*Note:* The Kit should suitable for Torque measurement accuracy verification up to +/- 0.2% of 170 Nm.

12. Dynamo meter Coupling Locking Attachment (1 no.)

This attachment should mount on drive end of the AC Dynamometer which is essential when using the Calibration Kit.

13. Flexible Disc Coupling (2 no.)

A Suitable Flexible Disc Coupling is to be provided for connection between the AC Dynamometer & EV Motor to be tested.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Torque Capacity</td>
<td>between 185 Nm and 195 Nm</td>
</tr>
<tr>
<td>Peak Torque Capacity</td>
<td>between 245 Nm and 255 Nm</td>
</tr>
<tr>
<td>Weight</td>
<td>≤ 3.54 kg</td>
</tr>
<tr>
<td>Inertia</td>
<td>0.002 to 0.003 kg m²</td>
</tr>
<tr>
<td>Max Angular Misalignment</td>
<td>0.75 Deg per flange</td>
</tr>
<tr>
<td>Max Axial Misalignment</td>
<td>+/- 2.4 mm</td>
</tr>
<tr>
<td>Max Parallel Offset</td>
<td>+/- 0.6 mm</td>
</tr>
</tbody>
</table>

The specification of Coupling is as follows:
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Requirements</th>
</tr>
</thead>
</table>
| 14 | **Sheet Steel guard with interlock (1 no.)**                                                   | - MS fabricated sheet steel guard with suitable thickness is should be provided for safety against rotating assemblies during testing.  
   |                                              | - Pivotal cover and quick release mechanical lock are also required.  
   |                                              | Provision for safety interlocking with Test Bed Automation system is to be considered which ensures the test cycle is not executed unless coupling guard is secured. |
| 15 | **Adaption Coupling for EV Motor (2 no.s)**                                                    | - Adaption Coupling for EV Motor should be provided to suit connection of the EV Motor (O/P Shaft) with the Flexible Coupling (flange). |
| 16 | **Fixture for Centre motor Mount Type EV Motor (2 no.s)**                                     | - Fixture for Center Mount Type EV Motor is required to mount the Center Mount EV Motor on the T Slotted Common MS Base Frame. The fixture would cater mounting of one variant each (in total 4 variants).  
   |                                              | **Note:**  
   |                                              | - For Foot mounted motor a mounting plate with tapped holes is required. The Plate should adapt to T-Slots of Common MS Frame. |
| 17 | **Fixture for Wheel Hub Type EV Motor (1 no.s)**                                              | Should provide fixture to mount Wheel Hub Type EV Motor (also referred as Outer Rotor type) on the T Slotted Common MS Base Frame. The fixture would cater mounting of one such variant only. |
| 18 | **Common Ms Fabricated Frame (1 no.)**                                                       | The AC Dynamometer & Motor (to be tested) should be mounted on a Common Base Frame fabricated from steel sections, which ensures easy & quick alignment of Dynamometer wrt the test subject.  
   |                                              | - The fabricated structure should be stress relived and designed to withstand the Dynamic shocks. Main attention need to be paid to stiffness and stability of the concrete base to ensure minimum deflection under applied loads.  
   |                                              | - Workable height should be 850 mm from ground level. Approx. Size of frame is 1600 Length x 600 mm Width (mm)  
   |                                              | **Levelling Mounts:**  
   |                                              | The above Base frame should be mounted on Levelling cum Anti Vibration Mounts. |
- These mounts should help in levelling the frame as well as dampen low amplitude vibrations which may arise during testing. The mounts should rest free on the customer built concrete floor, which is flat as per Industrial Floor norms.

<table>
<thead>
<tr>
<th>19. PC Based Test Cycle Automation System (1 no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- PC Based Test Cycle Automation System which is designed to,</td>
</tr>
<tr>
<td>d) Execute Customer Defined Test Sequences</td>
</tr>
<tr>
<td>e) Log Test Parameters</td>
</tr>
<tr>
<td>f) Prepare Test Reports</td>
</tr>
<tr>
<td>- Should be flexible to prepare a test Sequence in the software with User interface that can be executed via the PLC &amp; 4Q Drive.</td>
</tr>
<tr>
<td>- EV Motor parameters such as Power O/P, Torque, Speed should have logged by the system during test cycle.</td>
</tr>
<tr>
<td>- Information/Details related to the EV Motor such as Identification No, Serial No, Production Batch, Test Operator Name, etc. is fed manually in the system prior to start of test.</td>
</tr>
<tr>
<td>- This system should allow autonomous monitoring and logging of the test parameters &amp; can trigger shutdown if Dyno safety interlocks are triggered.</td>
</tr>
<tr>
<td>- At the end of the test a Test Report should be printed &amp; stored in the PC.</td>
</tr>
<tr>
<td>- Fault conditions can be set for each parameter &amp; be defined by Audio visual alarm.</td>
</tr>
</tbody>
</table>

It should comprise of following hardware:

- Commercial Grade PC, i5-9500, 8 GB DDR4 RAM, 1 TB Hard Disk, DVD Drive, 1 DP Port, 1 HDMI Port, USB Keyboard ,Wireless Mouse
- 19” Panel mounting rack for CPU & Monitor
- Windows 10 (Professional) & Office 2016
- Application Software License with Dongle
- Siemens Simatic S7 1200 with Profinet Interface (Type A)
- HMI Unit (Human machine interface) 9.0” (SIMATIC TP 900 Comfort Touch)
- Control circuit transformer and fusing mounting and wiring of interface relays
- 29 U, RAL 7035, 19” Rack Panel Powder Coated (Make: Schneider/Rittal)
- EMERGENCY STOP Circuit (Relay and Timer) (in cell & at control point)
- Basic Push Buttons & Illuminated Lamps.
- Three Pillar Lamp for Test Equipment Status Indication
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Panel Cooling Fans</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hooter for Audio Indications</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>MCCB ON/OFF</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>UPS 1.0 kVA [APC 1100 Model Offline, 5 min back up]</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>Printer HP Multi-Function Thermal Inkjet Printer, Deskjet 2677 (Colour)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>PC Desk for housing PC, Printer &amp; UPS</strong></td>
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<tr>
<td></td>
<td><strong>SAFETY INTERLOCKS</strong></td>
<td></td>
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<tr>
<td></td>
<td>• <strong>EMERGENCY STOP</strong>: should remove the load applied by Dynamometer when pressed during emergency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>ZERO SPEED INTERLOCK</strong>: Protection for ON/OFF operation should be happen at stand still condition of motor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>OVER SPEED</strong>: In case the Speed of the Dynamometer increases beyond set limit, an audible &amp; visual alarm should be triggered &amp; system should trip (will be set for 10000 RPM).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>OVER TORQUE PROTECTION</strong>: Controller to limit the AC Dynamometer torque to suit continuous safe rating S1. Beyond this limit the system should trip (will be set for 170 Nm).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20. <strong>Incell Pendent (1 no.)</strong></td>
<td>A Handheld Pendent Unit should provide following remote functionality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ready</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Test Stop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- EMERGENCY STOP (Mushroom Push Button).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The pendent should hard wired and mounted on a fabricated stand. EMERGENCY STOP for Pendent, Control &amp; Drive Panel are in series.</td>
</tr>
<tr>
<td></td>
<td>21. <strong>Data Acquisition Module (1 no.)</strong></td>
<td>Data acquisition module should be for high frequency logging of EV Motor temperature &amp; vibration measurement data.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Specifications:-</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ( \geq 14 ) Analog Inputs built in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 16-bit high-speed ADC (up to 100k samples/s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Software Configurable Resolution Settings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Single-Ended Inputs (( \geq 14 )) or Differential Inputs (( \geq 7 ))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Analog input ranges: ( \pm 10V, \pm 1V, \pm 0.1V ) and ( \pm 0.01V )</td>
</tr>
</tbody>
</table>
- All analog input features are software programmable by configuring the Analog Input Registers
- High speed sampling configurable by using Stream Mode. Speeds up to 100 kS/s
- Low Latency Sampling and Control (less than 1ms) is made easy with Command-Response Modbus messages
- Easy integration with sensors like thermocouples, load cells, bridges, and more ...  

**Analog Output:**
- ≥ 2 analog outputs (12-bit, 0-5V)
- Waveform generation via Stream Out
- Integrated LJTick-DAC support for multiple +/- 10V outputs

**Digital I/O:**
- ≥ 23 Digital I/O
- ≥ 5 PWM Outputs with individual phase control
- ≥ 5 Pulse Outputs with configurable number, frequency, and width
- ≥ 2 Frequency Inputs returning both frequency and period
- ≥ 2 Pulse Width Inputs measuring time spent high and low as well as duty cycle
- ≥ 2 Line-to-Line Inputs measuring the time between edges on 2 different lines
- ≥ 4 High-Speed Counters
- ≥ 6 Software Counters with debounce capabilities
- ≥ 3 Pairs of Quadrature Inputs

**Communication Options:**  
USB, Ethernet

| 22. | Cable Loom | Following list of Cables should be provided along with the Test Bench,
-Mains Incomer Power Supply Cable to the AC Drive Panel (atleast 5 m)
-Mains Power Supply Cable to Control Panel (atleast 5 m)
-Power Cable between AC Drive Panel & AC Motor (atleast 5 m)
-Signal Field Cables (Shielded) terminated in Junction Box
-Signal Cables (Shielded) from Junction Box to Control Panel (atleast 10 m).
-Signal Cable from Control Panel to Pendent (atleast 10 m) |
<table>
<thead>
<tr>
<th>23.</th>
<th>Other requirements</th>
</tr>
</thead>
</table>
|     | - System Engineering and Documentation  
|     |   - Pre-dispatch Inspection  
|     |   - Shipping, Installation, on site training (over every 6 to 12 months)  
|     |   - Supervision of instruction and shipping  
|     | Two years of warranty |

<table>
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<tr>
<th>24.</th>
<th>Bidder Qualifying Standards</th>
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</thead>
</table>
|     | **Manufacturer:** Bidder should be supplier of EV Motor Test Bench for more than 5 Years.  
|     | **Manufactured Nos. of Dynamometers & Experience:** Firm should have supplied more than 5 no of Test Benches for evaluating EV Motors. These dynamometers should have been supplied for testing BLDC EV Motors specifically.  
|     | **Manufacturer:** Bidder be in the field of Motor Test Rigs for more than 10 years.  
|     | **ISO Certified:** Firm should be ISO 9001: 2015 Certified.  
|     | Those who are registered with NSIC will be exempted from EMD.  
|     | **Reference list:** User shall arrange reference List of Clients using EV Motor Test Bench.  
|     | At least 2 EV Motors must be tested in Dynamic condition at supplier end during Pre-dispatch inspection.  
|     | Dynamometer should be motored to its max speed at Supplier facility during PDI.  
|     | NABL Traceable Calibration certificate of the Dynamometer should be provided prior to dispatch of the Dynamometer. |

I have also enclosed all relevant documents in support of my claims, (as above) in the following pages.

**Signature of Bidder**

Name: ____________________________

Designation: ______________________

Organization Name: ____________________

Contact No.: _________________________

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We, _______________________________ hereby certify that all the information and data furnished by our organization with regard to this tender specification are true and complete to the best of our knowledge. I have gone through the specification, conditions and stipulations in details and agree to comply with the requirements and intent of specification.

This is certified that our organization has been authorized (Copy attached) by the OEM to participate in Tender. We further certified that our organization meets all the conditions of eligibility criteria laid down in this tender document. Moreover, OEM has agreed to support on regular basis with technology / product updates and extend support for the warranty.

The prices quoted in the financial bids are subsidized due to academic discount given to IIT Delhi.

<table>
<thead>
<tr>
<th>We, further specifically certify that our organization has not been Black Listed/De Listed or put to any Holiday by any Institutional Agency/ Govt. Department/ Public Sector Undertaking in the last three years.</th>
<th>NAME &amp; ADDRESS OF THE Vendor/ Manufacturer / Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Phone</td>
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<td>2. Fax</td>
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<td>3. E-mail</td>
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<tr>
<td>4. Contact Person Name</td>
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<td>5. Mobile Number</td>
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<td>6. GST Number</td>
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<td>7. PAN Number</td>
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<td>(In case of on-line payment of Tender Fees)</td>
<td></td>
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<tr>
<td>8. UTR No. (For Tender Fee)</td>
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<tr>
<td>9. Kindly provide bank details of the bidder in the following format:</td>
<td></td>
</tr>
<tr>
<td>a) Name of the Bank</td>
<td></td>
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<tr>
<td>b) Account Number</td>
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</table>

(Signature of the Tenderer)

Name: _______________________________

Seal of the Company
### List of Government Organizations for whom the Bidder has undertaken such work during last three years (must be supported with work orders)

<table>
<thead>
<tr>
<th>Name of the organization</th>
<th>Name of Contact Person</th>
<th>Contact No.</th>
</tr>
</thead>
<tbody>
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### Name of application specialist / Service Engineer who have the technical competency to handle and support the quoted product during the warranty period.

<table>
<thead>
<tr>
<th>Name of the organization</th>
<th>Name of Contact Person</th>
<th>Contact No.</th>
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</table>

**Signature of Bidder**

Name: __________________________

Designation: __________________

Organization Name: __________________

Contact No. : ___________________
# PREVIOUS SUPPLY ORDER DETAILS

Annexure - IV

Name of the Firm_____________________________________

<table>
<thead>
<tr>
<th>Order placed by (Full address of Purchaser)</th>
<th>Order No. and Date</th>
<th>Description and quantity of order equipment</th>
<th>Value of order</th>
<th>Date of Completion of delivery as per contract</th>
<th>Has the equipment been installed satisfactorily (Attach a Certificate from the Purchaser/Consignee)</th>
<th>Contact person along with Telephone No., Fax No. and email address</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Signature and Seal of the Manufacturer/ Bidder

__________________________________

Place: ____________________________

Date: ______________________________
To
The Director,
Indian Institute of Technology Delhi,
New Delhi- 110016

Dear Sir,

We manufacture original equipment at (…………………………..address of factory……………………………) do hereby authorize M/s (Name and address of Agent) to submit a bid, negotiate and receive the order format against your tender enquiry.

M/s. ………………………………. is authorized to bid and conclude the contract in regard to this business.

We hereby extend our full guarantee and warranty as per clause ……………………… of the terms and conditions NIQ for the goods and services offered by the above firm.

Yours Faithfully,

(Name)

(Name & Seal of Manufactures)

Note: -

1. **Items of indigenous nature or quoted in INR**, more than 1 authorized representative may participate in the same tender and submit their bids on behalf of their OEM/Principal/Manufacturer if the OEM permits more than one authorized bidder in such case as per their policy.

2. **In cases of agents quoting in offshore procurements**, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. **One manufacturer can also authorize only one agent/dealer**

3. The 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. The same should be included by the bidder in its techno-commercial unpriced bid.

---

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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. : ____________________________
(ANNEXURE-VII)
(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. : ____________________________
To,
The Director,
Indian Institute of Technology Delhi
New Delhi-110016

Subject: - Declaration of Local Content

Tender Reference No:_____________________

Name of Tender/ Work: __________________________________________________________


2. We hereby declare that items offered has _______% local content

“Local Content” means the amount of value added in India which shall, be the total value of the item being offered minus the value of the imported content in the item (including all customs duties) as a proportion of the total value, in percent.

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

Yours faithfully,

(Signature of the bidder, with Official Seal)
BID SECURITY UNDERTAKING
(To be issued by the bidder on company’s letterhead in lieu of EMD)

To,

The Registrar,
I.I.T. Delhi, Hauz Khas,
Delhi – 110016.

We, M/s ________________________________ (Name of the Firm), with ref. to Tender
No. _______________ dated ________ hereby undertake that:

1. We accept all terms and conditions of the tender document.
2. We accept that, we will not modify our bid during the bid validity period and will honour the contract after
the award of contract.
3. In the event of any modification to our bid by us or failure on our part to honour the contract after final
award, our firm may be debarred from participation in any tender/ contract notified by IIT Delhi for a period
of one year.

Yours faithfully,

(signature)
Name:
Date:
Office Seal:
**BID SUBMISSION**

**Online Bid Submission:**

The Online bids (complete in all respect) must be uploaded online in **two** Envelops as explained below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Document</th>
<th>Content</th>
<th>File Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Compliance Sheet (Annexure – I)</td>
<td>.PDF</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Organization Declaration (Annexure – II)</td>
<td>.PDF</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>List of organizations/ clients where the same products have been supplied (in last two years) along with their contact number(s). (Annexure-III)</td>
<td>.PDF</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Technical supporting documents in support of all claims made at Annexure-I</td>
<td>.PDF</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Previous Supply Order (Annexure – IV)</td>
<td>.PDF</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Original Equipment Manufacturing Manufacturing Authorization Form (MAF) (Annexure – V)</td>
<td>.PDF</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td><strong>(For Goods/ Services Contracts)</strong> Certificate - Bidder Not from/ from Country sharing Land border with India &amp; Registration of Bidder with Competent Authority (Annexure-VI)</td>
<td>.PDF</td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td><strong>(For Works Contracts, including Turnkey Contracts)</strong> Certificate – Bidder Not from/ from Country sharing Land border with India, Registration of Bidder with Competent Authority &amp; not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority (Annexure-VII)</td>
<td>.PDF</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td>Declaration of Local Content (Annexure-VIII)</td>
<td>.PDF</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>Bid Security Undertaking in lieu of EMD (Annexure-IX)</td>
<td>.PDF</td>
</tr>
</tbody>
</table>

**Envelope – 2**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Document</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Financial Bid</td>
<td>Price bid should be submitted in given BOQ_XXXX.xls format. <em>(Note: -Comparison of prices will be done ONLY on the bids submitted for the Main Equipment and anything asked as ‘Optional’ in the specs is not to be included for overall comparison.) Bids for optional items are to be submitted in ‘sheet2_Quote for optional items’</em></td>
</tr>
</tbody>
</table>