INVITATION FOR TENDER FOR SUPPLY OF EQUIPMENT

Sealed tender offers are invited in two separate sealed covers (Technical and Commercial offers) from eligible manufacturers/suppliers or their direct Indian agents for the supply of the following equipment.

A dexterous and modular upper arm prosthetic device

Please send offers, ALONG WITH DESCRIPTIVE CATALOGUE/ BROCHURE. The validity of the bid should be at least four months (120 days) or more from the date of the opening of this tender. Please ensure that your quotation reaches not later than **09.04.2015 at 15:00 hrs** at the following address:

**Dr. C. S. Kumar**  
**Professor, Department of Mechanical Engineering,**  
**Indian Institute of Technology Kharagpur,**  
**Pin-721 302, West Bengal, India**

Earnest money of **Rs. 60,000/-** is to be deposited in the form of Account payee Demand Draft in favour of IIT Kharagpur, payable at Kharagpur, India. Any bid which is not accompanied with an EMD shall be summarily rejected. Earnest money deposited will be forfeited if the tenderer withdraws or amends its tender or impairs or derogates from the tender in any respect within the period of validity of its tender. No interest will be paid on the earnest money of the unsuccessful bidders.

<table>
<thead>
<tr>
<th>Tender Reference</th>
<th>IIT/SRIC/ME/RNC/CSK/EQ/2014-15/1, Dated: 13.03.2015</th>
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</thead>
<tbody>
<tr>
<td>Price of Tender Document</td>
<td>NIL</td>
</tr>
<tr>
<td>Last Date and Time for submitting the tender document</td>
<td><strong>09.04.2015, 15:00 Hrs</strong> (Indian time)</td>
</tr>
<tr>
<td>Time and Date of Opening of Bids</td>
<td><strong>09.04.2015, 16:00 Hrs</strong> (Indian time)</td>
</tr>
<tr>
<td>Place of Opening tender offers</td>
<td>Department of Mechanical Engineering, Indian Institute of Technology Kharagpur – 721 302, West Bengal, India</td>
</tr>
<tr>
<td>Address of Communication</td>
<td>As stated above</td>
</tr>
<tr>
<td>Contact Telephone Numbers</td>
<td>+91- 3222 - 282934</td>
</tr>
<tr>
<td>E-mail:</td>
<td><a href="mailto:kumar@mech.iitkgp.ernet.in">kumar@mech.iitkgp.ernet.in</a></td>
</tr>
</tbody>
</table>
Detailed Specifications of

A dexterous and modular upper arm prosthetic device

Configuration of device:
1. Hand, finger, wrist and forearm (below elbow) with an anthropomorphic configuration to fit as an external powered artificial prosthetic arm.
2. The device should be upgradeable at a later stage to elbow, upper arm and up to shoulder level usage with appropriate additional hardware.

Mechanical details:
1. Design should resemble an anthropomorphic configuration – either left or right or both.
2. Independent powered (with motor) rotating thumb having at least 2 axis of degree of freedoms.
3. 4-multi-articulating, independent motorized fingers with independent axis of movement.
4. Degree of freedom and range of motion: Flexion-extension, abduction-adduction for wrist, hand and finger; rotation (pronation-supination) for wrist. Degree and range of motion—compliant with the range of normal human upper limb.
5. Various predefined grip patterns (e.g. standard precision pinch grip open-close, tripod grip, lateral grip, index point, open palm, grasp, cylindrical, thumb rotation, screw grip etc.) and option for user defined other grip patterns.
6. Details of grip force and load carrying capacity of the hand and of the individual finger to be provided. The range of the values should comply with that of the range of normal human hand. Preferable speed of action: full flexion to full extension in ~ 1 sec and vice versa. Full abduction to full adduction in ~ 1 Sec and vice versa.
7. Details of force and load carrying capacity of the arm, wrist and hand are to be provided. The range of value should be in the comparable range for the same for normal human arm. Preferable speed of action: full flexion to full extension in ~ 1 Sec and vice versa. Full abduction to full adduction in ~ 1 Sec and vice versa. Full supination to full pronation in ~ 1 Sec and vice versa.

Details of the Electrical, electronic subsystems and sensors:
1. External powered upper limb.
2. Provision for biosignal (e.g. EMG or similar user defined signals) based control option should be provided; mode of control must include at least proportional control and on-off control.
3. Option for hardware switch based control for all the different modes of operations of the entire prosthetic device (e.g. selection of grip pattern, proportional or other speed control, option of force and tactile sensor feedback).
4. Provide EMG electrodes (along with associated cables, connectors and arrangement for attachment to the skin surface) required to acquire signals from at least 2 muscle sites. Additionally, 32 more EMG electrodes (along
with associated cables, connectors and arrangement for attachment to the skin surface) to be provided and appropriate flexible mounting options to be mentioned. Option for addition or modification of location of surface EMG electrodes and its connections with the main controller of the device should also be provided.

5. Provision and supply of multiple force and position sensors (to be attachable at the finger tips or other positions)- at least 5 of each category. Provide additional 2 sensors of each type. Sensor delay ~ 1ms.

6. Option to be provided for interfacing force and position sensor feedback for close loop control of each of the finger’s active axis. Access to the sensor data acquisition electronics should be provided for research and modification in standard laboratory set up.

7. Battery and motor specification should include:
   a) Battery chemistry (i.e. Lithium-polymer/ Lithium-ion), capacity.
   b) Motor (brushless/ brushed) and its control mode.

8. Option for interfacing other sensor inputs and actuator outputs with the main embedded controller of the device via standard serial connections.

Details of the Embedded system and software:

1. The embedded controller programming support should cover (through API or SDK) individual, sequential and / or simultaneous control of motions of all the degrees of freedom in 3D space as well as specific grip/ grasp and various functions of the device.

2. Options, if available, for running custom made application programs (using C/C++, Matlab, Python etc.) in the prosthesis’ controller should be mentioned.

3. Option should be available to integrate the device with biosignals based control, like from EMG / myoelectric sensor for each control level or with other biosignals like EEG signals etc.

4. Control of the device may be through wired (standard serial communication like either USB and / or RS232, SPI etc.) and wireless communication (Bluetooth, wifi) from a console point (e.g. external microcontroller, pc, smartphone).
GENERAL TERMS & CONDITIONS

PLEASE SPECIFICALLY INDICATE THE FOLLOWING POINTS IN YOUR QUOTATIONS AND COMPLY THE TERMS AS MENTIONED HEREUNDER:-

1. TENDER ARE INVITED COMPLYING THE REQUIREMENT FOR TENDER AS DETAILED IN THE TENDER SPECIFICATION TO BE SUBMITTED IN THE COMPANY’S / FIRM’S LETTERHEAD NEATLY PRINTED / TYPED DULY SIGNED BY AUTHORIZED PERSON WITH THE SEAL OF THE BIDDERS. ALL ENVELOPS CONTAINING THE TENDER SHOULD BE PROPERLY SEALED. SEPARATE ENVELOPS SHOULD BE USED FOR TECHNICAL AND PRICE BID AND INDICATION TO THEIR EFFECT MAY PLEASE BE SUPERSCRIBED ON THE ENVELOP.

THE FOLLOWING DOCUMENTS ARE REQUIRED FROM THE INDIAN AGENTS OF FOREIGN FIRMS:

1.1 FOREIGN PRINCIPAL’S PROFORMA INVOICE INDICATING THE COMMISSION PAYABLE TO THE INDIAN AGENT AND NATURE OF AFTER SALES SERVICE TO BE RENDERED BY THE INDIAN AGENT.

1.2 COPY OF THE AGENCY AGREEMENT WITH THE FOREIGN PRINCIPAL INDICATING THE NATURE OF AFTER SALES SERVICES, PRECISE RELATIONSHIP BETWEEN THEM AND THEIR MUTUAL INTEREST IN THE BUSINESS.

1.3 PLEASE ENCLOSE THE DOCUMENT(S) RELATED TO THE ENLISTMENT OF THE INDIAN AGENT WITH DIRECTOR GENERAL OF SUPPLIES & DISPOSALS (DGS & R) UNDER THE COMPULSORY REGISTRATION SCHEME OF MINISTRY OF FINANCE.

2. TECHNICAL CATALOGUE/LEAFLET SHOULD BE ENCLOSED WITHOUT FAIL. PROVIDE COMPLIANCE STATEMENT WITH RESPECT TO THE TECHNICAL SPECIFICATIONS MENTIONED ABOVE.

3. PLEASE CONFIRM WHETHER YOU ARE AUTHORISED TO QUOTE ON BEHALF OF YOUR PRINCIPALS AND IF SO, PLEASE ENCLOSE A COPY OF SUCH AUTHORISATION WITH YOUR QUOTATION.

4. PRICE BIDS FOR FOREIGN FIRMS: PRICES ARE TO BE QUOTED ON ‘EX-WORKS’ DULY PACKED OR ON “FCA/FOB” INTERNATIONAL PORT” BASIS AND ALSO INCLUDING AGENCY COMMISSION PAYABLE TO YOUR INDIAN AGENTS, IF ANY SHOWING CLEARLY THE FOLLOWING BREAK UP:-

I) EX-WORKS PRICE
II) PACKING & FORWARDING
III) FREIGHT
IV) ANY OTHER RELEVANT EXPENSES.
V) TAXES PAYABLE BY THE INSTITUTE

INSURANCE WILL BE PAID BY OUR INSTITUTE SEPARATELY AND SHOULD NOT FORM PART OF THE QUOTED PRICE.

PRICE BIDS FOR INDIAN FIRMS: PRICES ARE TO BE QUOTED ON F.O.R., IIT KHARAGPUR, ON DOOR DELIVERY BASIS CLEARLY SHOWING THE BREAK UP.

5. PERIOD OF VALIDITY: BIDS SHALL REMAIN VALID FOR ACCEPTANCE FOR A PERIOD OF 120 DAYS FROM THE DATE OF OPENING.

6. INDIAN AGENTS ADDRESS AND PERCENTAGE OF AGENCY COMMISSION INCLUDED IN ABOVE F.O.B./EX-WORKS PRICE. (THIS WILL BE PAID TO THE INDIAN AGENTS IN INDIAN RUPEES ONLY AND NOT IN FE). PLEASE ENCLOSE COPY OF AGENCY AGREEMENT ENTERED INTO WITH YOUR
PRINCIPALS INDICATING THE NATURE OF AFTER SALES SERVICES OF INDIAN AGENTS, PRECISE RELATIONSHIP & MUTUAL INTEREST IN THE BUSINESS.

7. **MEASUREMENTS/WEIGHT:** NETT/GROSS OF THE CONSIGNMENT. IN CASE OF AN ORDER, YOU SHALL USE AIR WORTHY PACKAGE (AS APPLICABLE) DULY CERTIFIED WITH DOCUMENTS – PLYTO – SANITARY CERTIFICATE (AS PER QUARANTINE ORDER 2003).

8. **SCOPE OF SUPPLY:** SHOULD INCLUDE FREE INSTALLATION AND COMMISSIONING

9. **PAYMENT TERMS** FOR FOREIGN FIRMS

   A) 100% PAYMENT THROUGH SIGHTDRAFT/FORIGN DEMAND DRAFT/LC (EXCEPTIONAL CASES)/SWIFT TELE TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER AND CONDITION.

   B) BANK CHARGES ON LC/SD (WITHIN INDIA APPLICANT ACCOUNT AND OUTSIDE INDIA TO BENEFICIARY ACCOUNT).

**PAYMENT TERMS** FOR INDIAN FIRMS

A) 100% PAYMENT THROUGH CROSSED ACCOUNT PAYEE CHEQUE / ELECTRONIC TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER AND CONDITION.

B) ENSURE MENTIONING

   i) BANK DETAILS OF THE BENEFICIARY AND PAN NUMBER

   ii) FULL NAME AND ADDRESS OF THE BENEFICIARY ON WHOM ORDER HAS TO BE PLACED

10. WHETHER ANY EXPORT LICENCE IS REQUIRED FROM YOUR GOVERNMENT, IF SO, PLEASE CONFIRM WITH DETAILS.

11. COUNTRY OF ORIGIN OF THE GOODS IS TO BE MENTIONED.


13. **LIQUIDATED DAMAGES:** THE STORES SHOULD BE DELIVERED / DISPATCHED TO DESTINATION AND READY FOR OPERATION NOT LATER THAN THE DELIVERY DATE SPECIFIED. IT THE SUPPLIER FAILS TO DELIVER ANY OR ALL THE STORES OR PERFORM THE SERVICE BY THE SPECIFIED DATE, LIQUIDATED DAMAGES AT 1% PER MONTH OR PART THEREOF IN RESPECT OF THE VALUE OF STORES WILL BE DEDUCTED FROM THE CONTRACT PRICE SUBJECT TO A MAXIMUM OF 5%. ALTERNATIVELY, THE ORDER WILL BE CANCELLED AND THE UNDELIVERED STORES PURCHASED FROM ELSEWHERE AT THE RISK AND EXPENSE OF SUPPLIER.

14. **PATENT RIGHTS:** THE SUPPLIER SHALL INDEMNIFY THE PURCHASE AGAINST ALL THIRD PARTY CLAIMS OF INFRINGEMENT OF PATENT, TRADEMARK OR INDUSTRIAL DESIGN RIGHTS ARISING FROM USE OF THE GOODS OR ANY PART THEREOF IN INDIA.

15. ONLY THOSE BIDDERS WHO’S BIDS HAVE BEEN TECHNICALLY FOUND ACCEPTABLE WILL ONLY BE INVITED FOR PARTICIPATION IN THE PRICE BID.

16. THOSE BIDDERS WHO DO NOT RECEIVE ANY COMMUNICATION FOR PARTICIPATION IN PRICE BID OPENING MEETING MAY PRESUME THAT THEIR BID HAS NOT BEEN ACCEPTED BY THE INSTITUTE.
17. CONDITIONAL OFFER WILL NOT BE ACCEPTED.

18. LATE TENDERS I.E. TENDER RECEIVED AFTER THE DUE DATE AND TIME OF SUBMISSION AS MENTIONED ABOVE SHALL NOT BE ACCEPTED.

19. BIDDERS TO ENCLOSE THE FOLLOWING DOCUMENTS:-

A) CURRENT INCOME TAX AND SALES TAX CLEARANCE CERTIFICATES AND PAN NO.

C) BANKER’S SOLVENCY CERTIFICATE

C) SUMMARY OF AUDITED STATEMENT OF ACCOUNTS FOR THE LAST THREE YEARS TO BE ENCLOSED AND FINANCIAL HIGHLIGHTS AND THE KEY PERFORMANCE DURING THE LAST THREE QUARTERS TO BE ENCLOSED AS PER FORMAT:-

COMPANY’S KEY PERFORMANCE

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>JAN. TO MARCH</th>
<th>APRIL TO JUNE</th>
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<tr>
<td>GROSS REVENUE</td>
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<td>CAPITAL (ROIC)</td>
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D) CUSTOMER SATISFACTION CERTIFICATE FROM ONE SUCH ORGANIZATION IS TO BE ATTACHED WITH THE TECHNICAL BID AND PRICE BID.

E) NAME AND ADDRESS OF MINIMUM THREE CLIENTS TO WHOM SUCH EQUIPMENT HAVE BEEN SUPPLIED SHOULD BE MENTIONED.

20. WARRANTY / GUARANTEE: THIS COMPREHENSIVE WARRANTY / GUARANTEE SHALL REMAIN VALID FOR 60 MONTHS AFTER THE GOODS (OR ANY PORTION THEREOF AS THE CASE MAY BE) HAVE BEEN DELIVERED AND COMMISSIONED TO THE FINAL DESTINATION.

21. THE INSTITUTE DOES NOT BIND ITSELF TO OFFER ANY EXPLANATION TO THOSE BIDDERS WHO’S TECHNICAL BID HAS NOT BEEN FOUND ACCEPTABLE BY THE EVALUATION COMMITTEE OF THE INSTITUTE.

22. ALL TENDERS (UNLESS OTHERWISE SPECIFIED) ARE TO BE SUBMITTED / HANDED OVER TO DR. C. S. KUMAR, DEPARTMENT OF MECHANICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR - 721 302 AND ACKNOWLEDGEMENT TO BE OBTAINED.
IMPORTANT

1. IIT Kharagpur authority may accept or reject any or all the bids in part or in full without assigning any reason and does not bind itself to accept the lowest bid. The Institute at its discretion may change the quantity / upgrade the criteria / drop any item or part thereof at any time before placing the Purchase Order.

2. Promptly make arrangements for repair and / or replacement of any damaged item (s) irrespective of settlement of claim.

3. In case of any dispute, the decision of the Institute authority shall be final and binding on the bidders.

4. For any query pertaining to this bid document correspondence may be addressed to Dr. C. S. Kumar, at the address mentioned above.

LAST DATE FOR SUBMISSION OF SEALED BIDS: 09.04.2015

1) Please Note that the Institute remains closed during Saturdays & Sundays and all specified government holidays.
2) Fax, e-mail Tender will not be accepted.
3) The General Terms and Conditions as stated above relate to supply of stores / equipment /assets etc. and for specific service other terms and conditions of the Institute will apply.

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