भारतीय प्रौद्योगिकी संस्थान पालक्काड
Indian Institute of Technology Palakkad
अहलिआ एकीकृत कैम्पस, कोज़्हिपारा
Ahalia Integrated Campus, Kozhipara
पालक्काड- 678557
Palakkad – 678 557

दूरभाषसंख्या/ Phone no:
04923 – 226300/590/586

ईमेल/ Email :
purchase@iitpkd.ac.in

Ref No: IITPKD/ELE/AR/ 041 /2017 **Date: 04.10.2017**

Due Date of the tender: 20.10.2017 @ 3 PM

TENDER FOR INVITING QUOTATIONS

Dear Sirs,

On Behalf of Indian Institute of Technology Palakkad quotations are invited for **"4 Phase Inverter unit for Power Electronics Teaching Lab**" confirming to the specification in the Annexure.

This tender deals with the following four main items:

A. **Supply of Inverter module, related circuit boards and accessories for the power electronics laboratory as per the plans provided in this document.**
B. **Installation and commissioning of inverter module.**

1. **Preparation of Bids**: - The tenders should be submitted **under two-bid system** (i.e.) Technical bid and Financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. No prices should be included in technical bid. Financial Bid should indicate item – wise prices for the items mentioned in the technical bid. The technical and the financial bids should be put in separate cover and sealed. Both sealed covers should be put into a bigger cover.

2. The Quotations duly sealed and superscribed on the envelope **with the reference No. and due date, should be addressed to the undersigned so as to reach him on or before the due date stipulated above. Fax and Email quotation are not acceptable.**

3. The price should be quoted per unit and packing and delivery charges should be indicated separately. The offer/bids should be exclusive of Taxes and Duties, which will be paid by the purchaser as applicable. However the percentage and of taxes and duties as on date should be clearly indicated.

4. The Quotations should be valid for **sixty days** from the due date and the period of delivery required should also be clearly indicated.

5. If the item is under DGS&D Rate contract No. and the price must be mentioned. It may also please be indicated whether the supply can be made direct to us at the Rate contract price (Please note that we are not Direct Demanding Officers). If so please send copy of the RC.

6. **Local Firms**: Quotations should be for free delivery to this Institute. If Quotations for Ex-Godown delivery charges should be indicated separately.

7. Outside Palakkad: Quotations should be for **F.O.R. at IIT Palakkad**. If F.O.R. consignor station, freight charges by passenger train / lorry transport must be indicated. If Ex-Godown, packing, forwarding and freight charges must be indicated.

8. Goods shall not be supplied without an official supply order.

9. **Custom Duty:** Custom Duty which will be paid at a concessional rate against duty exemption certificate.

10. **Payment:** Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later. No advance payment will be made. The Tenderer have to furnish the bank details along with tender like Account No, Account Name, IFSC Code, Bank address etc.

11. **Submission of Bids**: Quotation should be sent to the following address "**The Registrar, Indian Institute of Technology Palakkad, Ahalia Integrated Campus, Kozhipara, Palakkad -678 557, Kerala", Phone No: 04923 226 586/590, Email: purchase@iitpkd.ac.in.**

12. Delivery Period: The quotation should indicate clearly when delivery and installation to be made.

13. **Delay in Supply or Liquidate damages**: If the supplier fails to deliver the stores within the time specified in the purchase order, the purchaser will recover from the supplier as liquidated damages a sum of one- half of one percent (0.5%) of the P.O value of the undelivered stores for each calendar week of delay. The total liquidated damages shall not exceed five percent (5%) of the P.O price of the unit or units so delayed. Stores will be deemed to have been delivered only when all their component parts are also delivered. If certain components are not delivered in time, the stores will be considered as delayed until such time as the missing parts are delivered.

14. **Late offer**: The quotation received after due date will not be considered. Please ensure that your offer is sent well in advance to reach the Institute by the due date.

15. **Loading and unloading charges will be borne by the supplier**.

16. **Warranty**: Warranty Clause should be indicated clearly.

17. **Acceptance and Rejection**: IIT Palakkad has the right to accept the whole or any parts of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

Yours faithfully,

Encl: Specifications

Registrar, IIT Palakkad

i. Technical Specification

	Four phase Inverter Unit - 15 numbers needed	
1.0	**Overview**	
1.1	**Four phase inverter Description** The four phase inverter should contain four Insulated Gate Bipilar Transistor (IGBT) half bridge inverter modules with proper protection features and independent functionalities and a 3-phase uncontrolled bridge rectifier. The complete module should be provided in a single enclosure constructed with proper mechanical strength and proper insulation. 3-phase 415 V input is applied to the uncontrolled rectifier (SKD100/16) using an auto-transformer. The DC output of the Rectifier is given to the input of the IGBT based inverter.	
2.0	**Detailed Technical Specifications**	
	Components of Inverter	**Requirement and specification**
2.1	**Inverter Unit**	
	The inverter unit should contain four IGBT half bridge inverter modules with the following specification	
a	Half bridge device used	IGBT module based (not connected induvidual devices)
b	Number of half Bridge legs needed in an inverter module	4
c	Voltage rating of IGBT	1200 V or higher
d	Current rating of IGBT	75 A or higher
e	IGBT manufacturer	Semikron, Infineon, ABB,
f	Gate driver circuit board(s) for triggering all IGBTs.	It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Need fully isolated gate drive for each devices in the IGBT module
g	Input signal level to the gate driver from the external controller	Logic high is 3.3V or 5V, logic low 0V

h	Protection circuits with indicators for gate drive signal status and faults.	Needed for each devices in the IGBT module
i	IGBT desaturation protection	Must be provided and turn off IGBT when such fault occurs.
j	Desaturation protection indication	LED Indication for desaturation protection must be provided. On detection of error/fault, the gate driver turns off the IGBT.
k	Protection scheme with enabling / disabling feature to prevent simultaneous triggering of both IGBTs in an inverter leg.	A separate shoot through protection should be provided for IGBT legs and should be re-configurable by the user. Preferably a programmable CPLD or FPGA need to be provided with on board programming circuitry.
l	Device status	Device on/off condition must be provided with LED indication
m	Gate driver inputs	8 core shielded cable, (2 meter or more long) of sufficient numbers with proper RMC Male/female connectors
2.2	**Switched Mode Power Supply (SMPS)**	
	Isolated power supply for powering the gate driver cards, sensor cards and all other control circuits.	
a	SMPS input supply	230V with 20% variation, 50Hz
b	SMPS output voltage	12V, +18V, 0, -18V,
c	SMPS output power	>=25W
d	Input supply cable	A 230 V plug with power cable (2m or more long) should be provided for powering both SMPS and cooling fan.
2.3	**Isolated Sensors**	
	Isolated sensors should be provided for voltage and current sensing	
a	Voltage sensor circuit cards comprising of one Hall Effect voltage sensor (1000V) – LEM	0 to 1000V, Hall effect based LEM voltage sensors with necessary signal processing circuit board

b	Current sensor circuit cards comprising of four Hall Effect Current sensor (75A) – LEM	0 to 75A, Hall effect based LEM current sensors with necessary signal processing circuit board
c	Cable for voltage and current sensing	Shielded cable for voltage and current sensor outputs with length 2 meter or more.
2.4	**Three Phase Rectifier Module**	
	For converting input 3 phase AC voltage to DC voltage	
a	3phase diode bridge rectifier	needed one rectifier unit
b	Rectifier unit input voltage rating	440V
c	Rectifier unit current rating	75A
d	Manufacturer	Semikron, Infineon, ABB, International rectifiers
e	Electrolytic Capacitor ratings for DC bus filtering	Two numbers of electrolytic capacitors (preferably Epcos made) with voltage rating 450V, capacitance 2200uF each
f	Bleeder resistor for capacitors	100k, 10W bleeder resistor need for voltage balancing of capacitor (if connected in series)
2.5	**Other Accessories Required**	
a	Heat sink	Both rectifier module as well as the four-leg inverter module should be mounted on heat sink of adequate size based on the ratings of the semiconductor devices.
b	Snubber capacitors	0.001uF, 1200V (or higher) (4 numbers of Alcon make or equivalent) will be placed on the IGBT terminals.
c	Cooling fan	230V, 50Hz, AC, needed for effective cooling of the entire system.
d	Inverter structure	Heat sink, gate driver cards, sensor cards. SMPS, fan etc. will be mounted on a proper structure, duly painted. (Metallic structure should be properly isolated from the electrical terminals)
e	Inverter structure construction	Open type construction should be used to facilitate

		easy interconnection of converter modules. All live parts will be shrouded using acrylic sheets. The structure should also facilitate easy stacking of converter modules.
f	Power connectors	Banana type terminals for input to the rectifier and output from the half bridge modules
g	Digital signals and sensor signals connector	Suitable terminals and connectors should be provided for the gate driver card inputs and sensor card inputs / outputs.
h	Wiring	PVC insulated copper cable of adequate size from the input terminals to the rectifier, from the rectifier output to the DC bus bar of the 4-leg inverter and from the inverter output to the output terminals. Wiring should be provided for SMPS power supply to the gate drivers, and voltage and current sensors. Output cables from the inverter module should pass through the Hall Effect current sensors for measurement of the current in each inverter output.

II. Who can participate?

Only those bidders fulfilling the following criteria should respond to the tender.

1. Bidder should be either an Original Equipment Manufacturer (OEM) or designer of Insulated Gate bipolar Transistor (IGBT) gate drive system or IGBT based inverter module
2. Bidder must be in existence in the business of IGBT gate driver or allied fields for a minimum period of one year (before or since 01-April-2016). Documentary evidence of experience must be provided.
3. The bidder should have implemented orders of IGBT gate driver or allied fields worth exceeding INR 5 lakhs during previous financial years. Purchase orders and certificates of successful implementation must be included.
4. The bidder should have documentary evidence of having supplied and installed power supply at a Centrally Funded Technical Institution (like IIT, NIT, IISc, IIST). Bidder must provide a certificate of satisfactory performance of the installed setup. Contact details of faculty-in-charge of installed setup must also be provided.
5. Compliance sheet for the specification & OEM Brochure has to be attached along with Technical bid. Vendor has to fill the compliance sheet and mention page number or reference number in OEM brochure. The vendor should provide a proper image of completely developed four phase inverter module as per the tender specification along with technical bid. Unfilled / partial filled sheets lead to disqualification.
6. The bidder should ensure that the Inverter modules should be covered by warranty of at least 2 years.

III. Terms and Conditions

a) Transporting, loading unloading and installing the module should bear by the vendor

b) The vendor has to provide the CAD files for the electrical wiring showing input connections, output connections and mechanical setups. The tags used should match the labels on the CAD files.

c) Final acceptance of all units will be after inspection by IIT Palakkad expert.