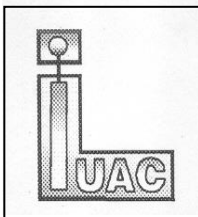


## **NOTICE INVITING TENDER (NIT)**

**TITLE: SUPPLY OF MAGNET RAMPING UNIT FOR  
SUPERCONDUCTING MRI MAGNET AND  
ACCESSORIES**

**NIT NO. : IUAC/NIT/12/SMK/2018-19**

**DUE ON : 26/10/ 2018**



**Inter University Accelerator Centre**

*An autonomous Inter-university Centre of UGC, MHRD, Govt. of India*

*<http://www.iuac.res.in>*

Aruna Asaf Ali Marg, Post Box: 10502, New Delhi, India



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**SECTION –I****TENDER INFORMATION**

1	Technical specifications for <i>Supply of Magnet Ramping Unit for superconducting MRI magnet and accessories</i>	As per Annexure-I
3	Earnest Money Deposit(EMD) in INR Bidder/vendors registered with NSIC and Foreign bidders quoting directly are exempted from paying EMD	INR 75,000/-
3	Availability of tender Documents	<a href="http://www.iuac.res.in">www.iuac.res.in</a>  www.eprocure.gov.in/epublish
4	Cost of tender document	Rs.500/- (Rupees Five hundred in the form of D.D. or Cash) for hard copy. Nil if downloaded from website
5	Last Date and Time of Submission of Tender	3:00pm on 26/10/2018
6	Date & Time for opening of Tender (Technical Bid, Part-I)	3:30 pm on 26/10/2018
7	Date & Time for opening of Tender (Price Bid, Part-II)	The date and time will be intimated to the technically qualified bidders only.
8	Address for submission of Tender	Administrative Officer (S&P),  Inter-University Accelerator Centre, Post Box No. 10502, Aruna Asaf Ali Marg, New Delhi -110067
9	Place of the opening of the Tender	Inter-University Accelerator Centre, Aruna Asaf Ali Marg, New Delhi - 110067

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## SECTION –II

### TERMS AND CONDITION

1. Director, Inter-University Accelerator Centre (IUAC), New Delhi invites sealed tenders for *Supply of Magnet Ramping Unit for superconducting MRI magnet and accessories*. Tender should be submitted directly by the original equipment manufacturer (OEM). In case of bid submitted by sole authorized Indian Agent, a recent authorization letter issued from OEM manufacturer (issued not earlier than 6 month from the date of NIT) should be attached with the technical bid.

#### 2. Submission of Tender

Tenders should be submitted in sealed envelopes in two parts separately, i.e. "*Technical Bid*"(*Part-I*) and "*Price Bid*" (*Part-II*). The *Technical bid* (*Part-I*) need to be sealed in *Envelope- 1* and the *Price bid* (*Part-II*) need to be sealed in *Envelope-II*. Both the envelopes must be super-scribed with the Notice Inviting (NIT) No and Name of the bidder. Both the envelopes need to be further sealed in another envelope super-scribing Notice Inviting Tender (NIT) No. and Name of the bidder . The duly filled need to be sent to the address mentioned in section-I either by post/courier . It can also be hand- delivered in the Tender Box kept in the reception of IUAC, after ensuring that due entries are made in the register kept at the reception counter. It should not be handed over to any employee of the centre. No bid shall be accepted later than the time schedule specified in Section-I.

**I. *Technical Bid (Part-I)*:** The following criteria/information/documents are essential to qualify the technical bid for the said item

**A.** Technical bid should contain the Demand Draft of EMD amount. Vendor registered with NSIC and Foreign vendors quoting directly are exempted from paying EMD.

**B.** The bidder need to submit the copy of Notice Inviting Tender (NIT) duly signed & stamped on each page.

**C.** The bidder need to submit their list of Indian/International clients/research laboratories where similar type magnet ramping units for superconducting MRI magnet have been supplied.

**D.** The bidder need to submit the technical literature/brochures/leaflets/documents with detailed specification of the magnet ramping unit .

**E.** The bidder need to submit a copy of the price bid with *the price columns*

*without any price information.* Bidder needs to put “tick mark” or write “quoted” on the price column for each quoted items. The technical bid should not contain any price information.

- II. Price Bid (Part II): In this bid, the bidder is required to quote the price according the suitable price bid format given in Annexure-II for the *Supply of Magnet Ramping Unit for superconducting MRI magnet and accessories* of technical specifications given in the Annexure-I. The foreign bidder is required to quote their price on FOB basis. No overwriting on Price bid is allowed and it should be duly signed by authorized person & stamped on all the pages.
- III. Earnest Money: EMD of ₹ 75,000/- has to be enclosed along with the Technical bid (Part-I). The EMD shall be only in the form of Bank Draft in the name of “Inter-University Accelerator Centre”, payable at “New Delhi”. No cheque / cash shall be accepted as EMD. EMD of technically disqualified bidders will be returned within 30 days from the date of evaluation of the technical bids. EMD of successful bidder will be released on successfully delivery of the cryocooler system at IUAC, Delhi. **NSIC/SME certified bidder and foreign bidders are exempted from depositing the earnest money .**
- IV. Validity of Tender: Tender shall be valid for a minimum period of 120 days from the date of opening of price bid.
- V. Delivery Period :The items needs to delivered within 120 days from the date of receipt of purchase order. Vendors should mention their tentative delivery schedule in the technical bid. Under the force majeure conditions or delay due to reasons beyond control of the contractor, IUAC may grant suitable time extension for which the contractor has to request along with the justification/ reasons well in advance to the Director, IUAC for approval without any prejudice to price escalation. The decision of the Director, IUAC will be final and binding on the bidder/contractor
- VI. Escalation: No escalation over and above items rates quoted by the bidder shall be paid during the execution of contract.
- VII. Strict compliance with these contract documents is required unless otherwise specifically agreed in writing.
- VIII. Correspondence: All the commercial correspondence in respect of tender/contractual obligation shall be made to A.O. (S&P), Inter University



Accelerator Centre, Aruna Asaf Ali Marg, New Delhi-110067, India (Email: [joseph@iuac.res.in](mailto:joseph@iuac.res.in)).

- IX.** Interested bidders need to contact to Dr. Soumen Kar ( kar.soumen@gmail.com) for any technical queries related to the specification of the Magnet ramping unit for bidding purpose.
- X.** In case bidder needs the quench simulation and tentative circuit details , may contact to Dr. Soumen Kar ( kar.soumen@gmail.com) .The bidders need to sign a non-disclosure certificate before availing the quench simulation for the bidding purpose.
- XI.**The successful bidder needs to agree to, if required, to have regular communication through e-mail with IUAC personnel to discuss the technical issues regarding the magnet ramping unit.
- XII.** The successful bidder needs to agree, if required, to have Video chat (SKYPE/Google) with IUAC personnel at mutually convenient time during the contract tenure on technical issues regarding the magnet ramping unit.
- XIII.** The successful bidder needs to execute the factory acceptance test of the magnet ramping unit to the IUAC personnel at the factory site prior to its shipment. In addition, the bidder needs to provide necessary operational training and acquittance to IUAC personnel for troubleshooting of MRU at the factory site.
- The successful bidder needs to provide the local hospitality for two persons free of cost including accommodation for the period of acceptance test and training.
- XIV.** In the technical bid, the bidder must provide maintenance procedures and required spares list for future maintenance and repair purpose. The bidder should include one set of essential spares along with the MRU.
- XV.** In case of Indian vendor, the technical service has to be provided at IUAC site. In case of Foreign vendor, sufficient technical details /input has to be provided to IUAC personal for servicing.
- XVI.** Prior to the shipment of the consignment, the vendor shall make sure that all the items in the scope of the supply are fully included in the packing boxes. Packing cases must be robust enough to take care of the impact during handling and transportation. Suitable stiffener and cushion should be provided to arrest any movement and vibration during the transportation.

- XVII.** IUAC reserves the right to accept or reject any tender without assigning any reason and does not bind himself to accept the lowest tender and the decision of the centre in this regard will be binding on all the bidders. Tenders not complying with any of the provisions stated in this tender document are liable to be rejected.
- XVIII.** The guarantee period for the MRU is one year after delivery.
- XIX.** Terms of Payment: All Payment shall be made by bank transfer for the Indian bidder or through the Letter of Credit (LC) in case of foreign bidder, on submission of bills by the vendor after due certification by the IUAC personnel. For Indian suppliers, 90% payment will be made on receipt of item at IUAC. 10% payment will be released on completion of guarantee period of one year. However, 100% payment will be released if the supplier provides a Performance Bank Guarantee equivalent to 10% value for the guarantee period. For foreign suppliers, 90% payment through LC will be made against shipping documents and 10% payment against a Performance Bank Guarantee of 10% for the guarantee period.
- XV.** Liquidated damages: In case the work is delayed beyond the specified completion period for reasons attributable to the bidder, deductions on account of liquidated damages @ 0.5% of the order value per week will be deducted subject to a maximum of 5% of the total works.
- XVI.** Tender once submitted will remain with the centre and never be returned to the bidders.
- XVII.** The Director, IUAC reserve the right to terminate the contract on account of the failure, poor workmanship, non-compliance of set norms/ specifications for the works, delay in progress of work, violation of any contract provisions by the Bidder. The contract can also be terminated at the request of bidder. In such cases the supplier is liable to pay liquidation damages @ 5% of tendered value besides security deposit.
- XVIII.** In case of any ambiguity / dispute in the interpretation of any of the clauses in this Tender Document, the decision of Director, IUAC shall be final and binding on all parties.
- XIX.** Any dispute arising out of this contract will be subjected to jurisdiction of New Delhi/Delhi.

Accepted

(Bidder's Signature)

Place:

Date:

Name:

Seal:

**Section-III****Annexure-1****Technical Specification of Magnet Ramping Unit**

The MAGNET RAMPING UNIT (MRU) would be used to charging/ discharging (ramping up/down) of the superconducting MRI magnet through the programable ramp algorithm. The MRU also needs to energize persistent current switch or superconducting switches of the magnet system. The MRU needs to have a complete operational protection mechanism including quench. All sub-systems to be integrated in a single cabinet fitted with wheels and lockable doors.

The MRU will consist of the following sub-systems:

- Constant current/Voltage regulated DC power supply for magnet
- Switch Heater power supplies
- Quench detection Unit
- Safety and Protection system
- Energy Absorber Unit (EAU)
- Control panel/port
- Accessories and spares

**A. Magnet Parameter**

Magnet Operating Current	400-500A (DC)
Inductive Load	40-50H
Stored Energy	4-5MJ

**1. DC power supply unit**

Power Input	3-phase AC, 400V $\pm$ 10%, 50 Hz
Output current (DC)	0 to 600 A
Operation mode (DC)	<ul style="list-style-type: none"> <li>• Constant Current with Voltage limit</li> </ul>
Output voltage (DC)	+12 V to 0 ( Charging) 0 to -8V (Discharging)

Current Stability (drift including line and load variation)	<ul style="list-style-type: none"> <li>• Less than <math>1 \times 10^{-4}</math> A over 8 hours @ 600 A output after the set value is reached/Not in HOLD mode</li> <li>• <math>&lt; 5 \times 10^{-4}</math> for 10min at HOLD mode</li> </ul>	
Current setting resolution	$\leq 10$ mA	
Current Ripple	40 mA pp at 600A	
Current sweep rate	<ul style="list-style-type: none"> <li>• Ramp rates adjustable up to 50 A/min in 1 A/min increments</li> <li>• Ramping by a programable ramp algorithm through computer. Features should be available for user to define its ramp algorithm i.e. Option for selecting different ramp rates for different current range between 0-600A.</li> </ul>	
Sweep linearity	2% or better	
Accuracy of sweep speed	5% or better	
Sweep mode	SET	Ramp UP/Down to a Set value of current in a set sweep time
	HOLD	Temporarily holds the current at any time
	DOWN	Ramps down to 0A in a set sweep time
Inductive Load	Max 50H	
Control system and User Interface	Computer control through Ethernet based interface	
Cooling system	Forced air cooling and self-powered fans for Energy Absorber Unit	

## 2. Switch (PCS) Heater Power Supply

Number of PCS	PCS 1 PCS 2 PCS 3
Output current	0 to 500 mA DC

Output voltage	0 to 24 V DC
Adjustable range of output current	5 to 100%
Current stability	Better than $1 \times 10^{-2}$ @10 min
Control	<ul style="list-style-type: none"> <li>Adjustable current/voltage through software or manual option</li> <li>Independent control of power supplies of PCS</li> </ul>

### 3. Quench Protection Unit

Detection system	<ul style="list-style-type: none"> <li>3 -point detection system ( Differential)</li> <li>Noise immune detection system (If necessary for bidding, the FEA simulations of Quench will be shared with the bidder after signing the confidentiality certificate)</li> </ul>
Detection voltage	<ul style="list-style-type: none"> <li>0- 10 V (adjustable using a front panel mounted Potentiometer)</li> <li>Test socket to be provided to measure the set quench voltage level)</li> </ul>
Detection time	<ul style="list-style-type: none"> <li>0-100 mS (adjustable using a front panel mounted Potentiometer dial)</li> </ul>
Functional Test	<ul style="list-style-type: none"> <li>Self/mock test of quench protection circuit</li> </ul>
Quench Protection	<ul style="list-style-type: none"> <li>Necessary protection circuit for magnet and MRU such as output circuit breaker /protective diodes, EAU bypass devices.</li> <li>Output shut off devices of 1000 V DC specification</li> </ul>

### 4. Safety and Protection Unit

Protection Circuit	<ul style="list-style-type: none"> <li>The MRU needs to have the necessary protection circuit for Over-Current/Over- Voltage/Over -heating etc.</li> <li>During ramp up/down, Fail-safe discharge capability in the event of complete power failure/ failure of MRU</li> <li>Necessary safety and protection circuit and indication for internal fault of any sub-systems of MRU</li> <li>Thermal Protection of main power supply and energy absorber unit.</li> <li>Protection for PCS heater overcurrent for load-short</li> </ul>
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	<ul style="list-style-type: none"> <li>• Self-test circuitry for inter-connection cabling, PCS heaters and quench detection system</li> <li>• Fault indication with LED light.</li> <li>• Monitoring of voltage drop across main power leads and necessary Indication in case of excessive voltage drop (<math>\geq 100\text{mV}</math>).</li> <li>• Redundant monitoring/ hard wired test points for various parameters of the magnets e.g. magnet voltage, current and impedances.</li> </ul>
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### 5. Energy Absorber Unit (EAU) or Run Down Unit (RDU)

Energy Absorber Unit	<ul style="list-style-type: none"> <li>• Energy Absorber Unit consisting of high power diodes having total forward voltage drop in the range of 4-6V at 600A.</li> <li>• Suitable forced air cooled heat sink to maintain the EAU temperature within safe operational limit.</li> <li>• Self-powered fans for Energy Absorber Unit in the event of power black out /quench.</li> <li>• High power MOSFET based semiconductor switch or equivalent switch for bypassing EAU or RDL unit path.</li> <li>• Capable of dissipating stored energy of the magnet in case of power failure/failure of MRU</li> <li>• Thermal Protection of EAU</li> <li>• Necessary interlock/protection system for EAU</li> </ul>
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### 6. Accessories

Main AC Cable	<ul style="list-style-type: none"> <li>• One suitable cable of 10m in length</li> <li>• Suitable end -terminals, connectors, mating/interfaces connectors and plugs</li> </ul>
Output Cables ( Ramping Cable)	<ul style="list-style-type: none"> <li>• 10 m in length, pair of positive and negative leads suitable for 600A current</li> <li>• 4 lead assembled with a pair of lead for each terminal.</li> <li>• Suitable end- terminal, connectors mating/interfaces connectors/lugs to be provided with the leads.</li> </ul>
Switch heater cable	<ul style="list-style-type: none"> <li>• 3 Nos for three superconducting switches.</li> <li>• 10 m in length each suitable for rated power for switch heater power supply/</li> <li>• Suitable connectors/end terminal/ plug at the power supply end.</li> </ul>

Quench detection cable	<ul style="list-style-type: none"> <li>• 10m in length suitable for the necessary voltage level</li> <li>• Suitable connectors or plug at power supply end</li> </ul>
PC communication Cable	<ul style="list-style-type: none"> <li>• 3m in length with suitable end-connector/terminal at Power supply end and at the computer end (USB/ethernet)</li> </ul>
Others	<ul style="list-style-type: none"> <li>• Any other cables/connector necessary for the Input/Output, power, communication, interfacing/test cable for the magnet ramping unit. [Bidder can contact the concerned person of IUAC for the required length for such cables]</li> </ul>
Fuses	<ul style="list-style-type: none"> <li>• Spare fuses to be provided.</li> <li>• Five for each type of fuses</li> </ul>

Features	<ul style="list-style-type: none"> <li>• The MRU should be capable of working in magnetic field of 100G.</li> <li>• Fail safe discharge capability in case of complete power failure or MRU failure during ramp up/down.</li> <li>• Air-cooling system need to be powered using magnet discharge energy in case of black out during operation.</li> <li>• Indicator panel with LED to show status of various parameters not limited to ON, Fault, self- test, switch heater ON( 3 LED separately for 3 PCSs)</li> <li>• Panel mounted test points to monitor Current and voltage and other important parameters of the magnet on a front panel</li> <li>• Full power self test of power supply including the EAU-bypass switch (FET ) and other sub-systems e.g. Quench detection unit, PCS heater power supplies etc prior to ramp of the magnet.</li> <li>• Data logging</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>• All components like power supply unit, switch heater power supplies, programmer, energy absorber unit, quench detection system needs to be integrated in a caster wheel ( <math>\geq 100\text{mm}</math>) mounted rugged lockable rack for rough handling and easy transportation at location.</li> <li>• No deterioration in performance or functionality by road transportation</li> <li>• The rack needs to have a drawer for storing accessories like test cable, instrumentation cable etc.</li> </ul>

Documentation (soft copy/hard copy of documentation needs to be submitted along with the delivery of the MRU)	<ul style="list-style-type: none"> <li>• Complete installation manual ( if any)</li> <li>• Complete operators manual consists of details of the magnet ramping unit not limited to the general guidelines, specification, System Hardware Overview, Operating Instruction, overall System block diagram, control block diagram, block diagram of EAU, troubleshooting guideline, power supply safety precautions of the Magnet ramping unit for ramping up/ down</li> <li>• Performance test report</li> <li>• Simulated test reports (if any)</li> </ul>
Documentations to be submitted along with the Technical bid of NIT	<ul style="list-style-type: none"> <li>• Complete flow chart including self test , functionality during all three regime of operations (Ramp up, quench during ramp up , ramp down) along with all safety conditions.</li> </ul>

## 7. Factory Acceptance Test and Inspection

Functionality and performance testing Without magnet with the best possible test rigs considering all the possible operational conditions	<ul style="list-style-type: none"> <li>• Self-test of MRU and magnet parameters prior to ramp up/down</li> <li>• Ramp Up Sequence</li> <li>• Action Sequence during a quench at Ramp Up</li> <li>• Power Failure during ramp up/down</li> <li>• Quench detector test</li> <li>• Ramp Down Sequence</li> <li>• Output current stability for 8hrs at rated current</li> <li>• Output current ripple at rated current</li> <li>• Current setting resolution</li> <li>• Safety and protection</li> </ul>
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**Section-IV****ANNEXURE-II****PRICE FORMAT ( Foreign Bidder-FOB)****NIT No :****Tender Inviting Authority :** Inter-University Accelerator Centre, New Delhi**Name of Work :** *Supply of Magnet Ramping Unit for superconducting MRI magnet and accessories***Bidder Name :**

S/N	Description	Price in Foreign Currency
1	Supply of one set of Magnet ramping Unit with one DC power supply unit (600A), three PCS power supplies, Energy Absorber unit, Quench Protection system, overall safety and protection system and necessary spares and accessories, operating manual, factory test reports along with local hospitality during operational training and testing at factory site with a warranty for one year	
	Packing charges	
	Total FOB Price ( Foreign Currency)	

**Signature of Bidder****Name:****Seal/Stamp:**

**PRICE FORMAT (Indian Bidder)****NIT No:****Tender Inviting Authority :** Inter-University Accelerator Centre, New Delhi**Name of Work :** *Supply of Magnet Ramping Unit for superconducting MRI magnet and accessories***Bidder Name :**

S/N	Description	Price in ₹
1	Supply of one set of Magnet ramping Unit with one DC power supply unit (600A), three PCS power supplies, Energy Absorber unit, Quench Protection system, overall safety and protection system and necessary spares and accessories, operating manual, factory test reports along with local hospitality during operational training and testing at factory site and warranty for one year	
	Packing and forwarding charges up to IUAC Delhi	
	GST	
	Total Price ( ₹)	

**Signature of Bidder****Name:****Seal/Stamp**