

# INTERDISCIPLINARY CENTRE FOR ENERGY RESEARCH

Indian Institute of Science (IISc), Bangalore, INDIA

## Tender Notice

### Local Tender (Indian Bidders and OEM manufacturers in located in India)

Tender Notification Ref No.: ICER/ENQ/TNDR/PK/24-25/01 Date: 15<sup>th</sup> April 2024

The *Interdisciplinary Centre for Energy Research*, Indian Institute of Science Bangalore, invites tenders for supply of “**Modular Vibration Analyzer for Supercritical CO2 Power Block**”. This Invitation for Bids is open to all domestic (India based) manufacturers, Indian OEM or its authorized Indian distributors only. All the bidders are requested to follow below mentioned **Detailed Technical Requirements**, Terms and Conditions for submission of bids.

### 1) Technical Requirements:

Description	Specification
<b>Front end Slots</b>	
1) Dynamic analog inputs	Minimum 2 Slots of 4 Universal inputs
2) Dynamic analog outputs	Minimum 1 Slot of 2 outputs
3) Externals sync	Minimum 1 Slot of 2 Tachometer inputs
<b>Dynamic Inputs</b>	
1) Sampling	Sampling Frequencies: $\geq 3.2\text{kHz}$ , $\leq 102.4\text{ kHz}$
	Converters: 24bit sigma delta ADC
	Sampling should be simultaneous
2) Range (peak)	With amplifier: $\pm 100\text{ mV}$ , $\pm 300\text{ mV}$ , $\pm 1\text{ V}$
	Direct: $\pm 10\text{ V}$
	With attenuator: $\pm 40\text{ V}$
3) Absolute accuracy	Resolution: 24 bits (144 dB) minimum
4) Frequency flatness and phase response	$\pm 0.1\text{ V}$ , $\pm 0.3\text{ V}$ , $\pm 1\text{ V}$ ranges, DC - 20 kHz
	$\pm 0.1\text{ V}$ , $\pm 0.3\text{ V}$ , $\pm 1\text{ V}$ ranges, 20 kHz - 40 kHz
5) Signal to noise ratio	With 50 $\Omega$ terminators
	$\pm 10\text{ V}$ range, 40 kHz bandwidth: $> 100\text{ dB}$ , spurious lines $< -115\text{ dB}$ of full scale
	$\pm 10\text{ V}$ range, 20 kHz bandwidth: $> 104\text{ dB}$ , spurious lines $< -125\text{ dB}$ of full scale
6) Input noise	50 $\Omega$ terminators
	Thermal input noise: 20nV/ $\sqrt{\text{Hz}}$
	$\pm 100\text{ mV}$ and $\pm 300\text{ mV}$ ranges
	$\pm 1\text{ V}$ range
7) Coupling	$\pm 10\text{ V}$ range
	AC: Cut-off frequency 0.35 Hz $\pm 10\%$ (analog filter)
	DC
	ICP: 2 mA or 4 mA power supply with AC coupling ( $\pm 10\%$ )

	ICP + TEDS: ICP + reverse current on TEDS reading operations
	GND: Shortcut to ground - Automatic current limitation to 50 mA
<b>Parametric Inputs</b>	
1) Range(peak)	Direct: $\pm 10$ V
	with attenuator: $\pm 40$ V
<b>External Sync</b>	
1) Sampling	Frequencies: (64 Hz upto 6.4 MHz) Converters: High speed voltage comparator and time counter
2) Ranges	$\pm 300$ mV, $\pm 1$ V, $\pm 3$ V, $\pm 10$ V, $\pm 40$ V
3) Resolution	Amplitude accuracy: $\pm 1\%$ of range
4) Setting	Hysteresis: 1% (of input range) to input range
	Hold off: 0 s to 500 s
	Slope: Rise or fall
	Hardwired pre-divider: 1 to 255
5) Accuracy	Time resolution: $> 160$ ns ( $0.06^\circ$ at 1 kHz and $1.2^\circ$ at 20 kHz)
6) Pulse rate	Minimum 375 kpulse/s
<b>Processor Slots</b>	
1) PC, Disk, Bus Interfaces	1 or more Slots
2) Clock Synchronization	1 or more Slots
3) Tachometer monitoring	Minimum 1 Slot of 1 ForceDSP
4) Real-Time Processing power	Minimum 2 Slots of 1 ForceDSP
<b>Miscellaneous</b>	
1) Internal hard drive	64GB internal SSD
2) High-speed serial ports	1 port for CAN bus probe
3) Remote Control	1 RS232 cable
<b>Network</b>	
1) Connection to PC	Ethernet 1 Gb/s /> 100 m / CAT 5E
2) Security	Support SSH tunneling connections
3) IP Management	TCP/IP/DHCP

<b>Cascade</b>	
1) Configuration	Switchless daisy-chain/ 30+ cascaded analysers/ Mixed analyser's type
2) Accuracy	Phase : > $\pm 0.2^\circ$ @ 20 kHz / > 8 ns @ 51.2 kS/s / Amplitude: > $\pm 0.02$ dB
<b>Power Supply</b>	
1) External AC Power supply	Voltage: 100 to 240 VAC / 1.7 A max Frequency: 50/60 Hz
2) DC in	Range: 10 V to 28 V Overload protection: Absolute maximum < 40 V / > 31 V
3) Battery	Type: Built-in 89 Wh Li-ion 8 modules Autonomy: 3 h Charge Time: 3 h (typical) Charge conditions: DC power supply > 12 V
<b>Expander Modules</b>	
1) Bridges	Mounting: Full, Half and quarter Excitation Voltages: 0 to 10 V Excitation Currents: 0 to 4 V: < 30 mA - 4 V to 10 V: < 12 mA Sensing: Negative and positive probes
2) Amplifiers	Type: Differential - DC capable Gains: 10 or 100 Error: < 0.01 dB
3) Protection	Overvoltage: Device on: max $\pm 30$ V - device off: max $\pm 15$ V
4) Connectors	Type: Mini Thermocouple/RTD type Pins: 3 polarized pin - spring-loaded Non grounding enclosure
5) Thermocouples	Type J: -210 °C to +1 100 °C Type K: -200 °C to +1 300 °C Type T: -200 °C to +390 °C Type N8: -200 °C to +1 200 °C Type E: -200 °C to +800 °C Cold Compensation with Integrated - 2 sensors - user on/off Absolute temperature error: > -150 °C : $\pm 0.9^\circ\text{C}$ / < -150 °C : $\pm(0.4^\circ\text{C} + 0.1\%$ of MT range)
6) RTDs	PT 100: -190 °C to +880 °C PT 1000: -190 °C to +880 °C Absolute temperature error: $\pm(0.4^\circ\text{C} + 0.3\%$ of of MT range) Current: PT100: 500 $\mu\text{A}$ to 4 mA - PT1000: 500 $\mu\text{A}$ to 1 mA Wires: 3/4 wire
<b>Digital Computation</b>	
1) Narrow band analysis (FFT)	Real-time FFT analysis 20 kHz bandwidth (Requested SPU are proportional to bandwidth)

	0% overlap
	Single channel processing
2) Synchronous Order Analysis	Real-time order spectrum analysis
	20 kHz bandwidth
3) Time Domain analysis	Real-time time domain monitor and statistical analysis with:
	Simultaneous time view and statistical extraction. Any duration of visualization, any averaging
	20 kHz bandwidth
	1 channel processing
<b>DSP Modules</b>	
1) Type	Sample Size: 32 bit floating
	Internal memory: 16 Msample
2) Power	Computation capability: Up to 4810 SPU / DSP module
3) Input Sharing	Inputs per DSP: 8 max

**3) Vendors scope of supply for the above Modular Noise and Vibration Analyzer:**

- a) Pre-dispatch inspection and testing report.
- b) Installing commissioning and demonstration of the complete system must be done at IISc, Bengaluru
- c) Training on operation and troubleshooting of the product must be provided at IISc, Bengaluru

**4) Mandatory non-technical requirements:**

- a) The bidders must enclose a client list, contact details, relevant brochures and compliance certificate (Annexure I) with the tender.
- b) The bidders should be well established firm preferably leaders in the application stated above and must have a proven track record.
- c) Authorization from the OEM/ Principals as in Annexure II
- d) The order should be completed within 16-24 weeks from the date of release of the Purchase Order.

**5) Optional requirements**

- a) Extended Warranty: 2 years additional Warranty (Standard: 1 year, Additional: 2 years, Total-3 years) to be provided from the date of delivery at IISc, Bangalore.
- b) AMC for 5 Years

## TERMS AND CONDITIONS FOR SUBMISSION OF BIDS

Both the Technical and Commercial bid should be put in separate sealed envelopes and both the envelopes should be put in another cover subscribing “**Modular Vibration Analyzer for Supercritical CO2 Power Block**” and should reach “*The Chairman, Interdisciplinary centre for Energy Research, IISc, Bangalore-560012* on or before **Wednesday, 6<sup>th</sup> May 2024**.”

### Tender Summary

1.	Tender Number	<b>ICER/ENQ/TNDR/PK/24-25/01</b>
2.	Tender Date	<b>15<sup>th</sup> April 2024</b>
3.	Item Description	<b>Modular Vibration Analyzer for Supercritical CO2 Power Blocks</b>
4.	Tender Type	Two bid system: (a) Technical Bid (Part A) (b) Commercial Bid (Part B)
5.	Place of tender submission	Prof. Pramod Kumar Interdisciplinary Centre for Energy Research, Indian Institute of Sciences, Bengaluru 560012
6.	Last Date & Time for submission of tender	6 <sup>th</sup> May 2024, 5:00 PM

### To whom it may concern

This is a **Request for quote (RFQ)** from **Indian Agencies** for supply and installation of “**Modular Vibration Analyzer for Supercritical CO2 Power Block**” at the “**Interdisciplinary Centre of Energy Research (ICER), Indian Institute of Science, Bangalore.**”

This Invitation for Bids is open to only domestic (India based) manufacturers, Indian OEM or its authorized Indian distributors. All interested vendors shall submit a response demonstrating their capabilities to produce the requested equipment to the primary point of contact listed below.

With respect to this tender, the rules laid out by the Government of India in order No. P45021/2/2017-pp-BE-II issued by the Public Procurement Section, Department or Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, dated 4<sup>th</sup> June 2020 will be followed. As per the order the government has defined a ‘Class-I local supplier’ as “a

supplier or service provider whose goods, services or work offered for procurement, has local content equal to or more than 50%”. A ‘Class-II local supplier’ is “a supplier or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%”. **Only Class-I and Class-II local suppliers are eligible to participate** in this open domestic tender. Any “Non-local supplier” i.e. “a supplier or service provider, whose goods, services or works offered for procurement, has local content less than 20%” is ineligible to participate in this tender.

The deadline for submission of proposals is **6<sup>th</sup> May 2024, 5:00 PM**. Proposals should arrive at the office of **The Chairman, Interdisciplinary Centre of Energy Research (ICER), Indian Institute of Science, Bangalore, Karnataka 560012, India**.

Direct all questions concerning the acquisition to addresses to **Prof. Pramod Kumar** at: [pramod@iisc.ac.in](mailto:pramod@iisc.ac.in)

### **General Terms and Conditions**

1. The bid should be submitted in the two-cover system, i.e. technical bid and commercial bid separately in sealed covers. The technical bid should contain all commercial terms and conditions, except the price.
2. The technical bid must contain a point-by-point technical compliance document. The technical proposal should contain a compliance table that should describe your compliance in a "yes" or "no" response against each of the items in the table listed in this RFQ. If "no" the second column should state, the extent of deviation. The third column should state the reason for the deviation, if any. The fourth column can be used to compare your tool with that of your competitors or provide details as requested in the technical requirement table below.
3. In the commercial bid, the price should be inclusive of all discounts.
4. The quotations should be on FOR-IISc Bangalore basis in INR only. Since IISc is DSIR registered organization, hence it is eligible for GST rate @5% as the equipment is required for research purposes only.
5. The vendor should have qualified technical service personnel for the equipment based in India (preferably in Bangalore).
6. The covering letter should clearly state that whether the vendor is a Class-I or Class-II local supplier. Failing this the bid will be automatically rejected.
7. The vendor to state the percentage of the local content and provide self-certification that the item offered meets the minimum local content requirement. They should also give details of the location(s) at which the local value addition is made.
8. The lead time for the delivery of the equipment should not be more than 3 months from the date of receipt of our purchase order. It should be clearly mentioned in the technical and commercial bids.
9. All the quotations must be valid for at least 90 days at the time of submission.
10. List of customers and references: **The Bidder should have supplied similar equipment in Central Universities, preferably in centrally Funded Technical Institutes (IITs, IISc, IISER, NIT). Please provide the details and contact information.**
11. The Bidder must not be blacklisted/banned/suspended or have a record of any service-related dispute with any organization in India or elsewhere. A declaration to this effect should be provided.

12. Items in addition to that listed in the technical table that you would like to bring to the attention of the committee, such as data sheets, technical plots etc. can be listed at the end of the compliance table.
13. The Bidder should belong to either Class-1 or Class-2 suppliers distinguished by their “local content” as defined by recent edits to GFR. They should mention clearly which class they belong to in the cover letter. a) Class-1 supplier: Goods and services should have local content of equal to or more than 50%. b) Class-2 supplier: Goods and services should have local content of equal to or more than 20 % and less than 50%.
14. Bidders offering imported products will fall under the category of non-local suppliers. They cannot claim themselves as Class-1 local suppliers/Class-2 local suppliers by claiming the services such as transportation, insurance, installation, commissioning, training, and other sales service support like AMC/CMC, etc., as local value addition.
15. Purchase preference as defined by the recent edits to GFR (within the “margin of purchase preference”) will be given to the Class-1 supplier.
16. MSMEs can seek an exemption to some qualification criteria. IISc follows GFR2017 for such details.
17. Vendors are encouraged to highlight the advantage of their Vibration Analysers systems over comparable Vibration Analysers from the competitors.
18. If needed, a meeting for any technical clarifications can be scheduled with the undersigned by sending an email.
19. The Institute reserves the right to accept or reject any bid, or to annul the bidding process and reject all bids, at any time prior to the award of contract without thereby incurring any liability of the affected bidder or bidders.
20. Warranty terms and additional warranty options is a must for all the components. Please specify the service plan like whether the local distributor will address the issue or the parent company.
21. Terms and conditions for the annual maintenance contract beyond the warranty period should be mentioned.
22. After the award of purchase order, the vendor must provide an Order Acknowledgement within 30 days from the receipt of the Purchase Order.
23. Please quote the price of each optional line item, separately.

**Technical requirements:** Please note that the requirements listed below are only guidelines. It does not disbar bids that do not meet the criteria listed. Vendors are requested to quote for equipment that meet the criteria to the best extent possible and list deviations. Deviations are NOT an automatic reason for disqualification. They will be discussed by the technical committee prior to making an informed decision.

## Annexure-I

**Note: Compliance Certificate to be enclosed with the Technical Bid**

Description	Specification	Comply	Non-Comply	Deviation	Remarks
<b>Front end Slots</b>					
1) Dynamic analog inputs	2 Slots of 4 Universal inputs				
2) Dynamic analog outputs	1 Slot of 2 outputs				
3) Externals sync	1 Slot of 2 Tachometer inputs				
<b>Dynamic Inputs</b>					
1) Sampling	Sampling Frequencies: $\geq 3.2\text{kHz}$ , $\leq 102.4\text{ kHz}$				
	Converters: 24bit sigma delta ADC				
	Sampling should be simultaneous				
2) Range (peak)	With amplifier: $\pm 100\text{ mV}$ , $\pm 300\text{ mV}$ , $\pm 1\text{ V}$				
	Direct: $\pm 10\text{ V}$				
	With attenuator: $\pm 40\text{ V}$				
3) Absolute accuracy	Resolution: 24 bits (144 dB)				
4) Frequency flatness and phase response	$\pm 0.1\text{ V}$ , $\pm 0.3\text{ V}$ , $\pm 1\text{ V}$ ranges, DC - 20 kHz				
	$\pm 0.1\text{ V}$ , $\pm 0.3\text{ V}$ , $\pm 1\text{ V}$ ranges, 20 kHz - 40 kHz				
5) Signal to noise ratio	With 50 $\Omega$ terminators				
	$\pm 10\text{ V}$ range, 40 kHz bandwidth: $> 100\text{ dB}$ , spurious lines $< -115\text{ dB}$ of full scale				
	$\pm 10\text{ V}$ range, 20 kHz bandwidth: $> 104\text{ dB}$ , spurious lines $< -125\text{ dB}$ of full scale				
6) Input noise	With 50 $\Omega$ terminators				
	Thermal input noise: $20\text{nV}/\sqrt{\text{Hz}}$				
	$\pm 100\text{ mV}$ and $\pm 300\text{ mV}$ ranges				
	$\pm 1\text{ V}$ range				
	$\pm 10\text{ V}$ range				
7) Coupling	AC: Cut-off frequency $0.35\text{ Hz} \pm 10\%$ (analog filter)				
	DC				
	ICP: 2 mA or 4 mA power supply with AC coupling ( $\pm 10\%$ )				
	ICP + TEDS: ICP + reverse current on TEDS reading operations				
	GND: Shortcut to ground - Automatic current limitation to 50 mA				



<b>Parametric Inputs</b>					
1) Range(peak)	Direct: $\pm 10$ V				
	with attenuator: $\pm 40$ V				
<b>External Sync</b>					
1) Sampling	Frequencies: 64 times over-sampling of the current input sampling (up to 6.4 MHz)				
	Converters: High speed voltage comparator and time counter				
2) Ranges	$\pm 300$ mV, $\pm 1$ V, $\pm 3$ V, $\pm 10$ V, $\pm 40$ V				
3) Resolution	Amplitude accuracy: $\pm 1\%$ of range				
4) Setting	Hysteresis: 1% (of input range) to input range				
	Hold off: 0 s to 500 s				
	Slope: Rise or fall				
	Hardwired pre-divider: 1 to 255				
5) Accuracy	Time resolution: $> 160$ ns ( $0.06^\circ$ at 1 kHz and $1.2^\circ$ at 20 kHz)				
6) Pulse rate	375 kpulse/s				
<b>Processor Slots</b>					
1) PC, Disk, Bus Interfaces	1 Slot				
2) Clock Synchronization	1 Slot				
3) Tachometer monitoring	1 Slot of 1 ForceDSP				
4) Real-Time Processing power	2 Slots of 1 ForceDSP				
<b>Miscellaneous</b>					
1) Internal hard drive	64GB internal SSD				
2) High-speed serial ports	1 port for CAN bus probe				
3) Remote Control	1 RS232/485				
<b>Network</b>					
1) Connection to PC	Ethernet 1 Gb/s / $> 100$ m / CAT 5E				
2) Security	Support SSH tunneling connections				
3) IP Management	TCP/IP/DHCP server(non-authoritative)				
<b>Cascade</b>					
1) Configuration	Switchless daisy-chain/ 30+ cascaded analyzers/ Mixed analyzer's type				
2) Accuracy	Phase : $> \pm 0.2^\circ$ @ 20 kHz / $> 8$ ns @ 51.2 kS/s / Amplitude: $> \pm 0.02$ dB				

<b>Power Supply</b>					
1) External AC Power supply	Voltage: 100 to 240 VAC / 1.7 A max				
	Frequency: 50/60 Hz				
2) DC in	Range: 10 V to 28 V				
	Overload protection: Absolute maximum < 40 V / > 31 V				
3) Battery	Type: Built-in 89 Wh Li-ion 8 modules				
	Autonomy: 3 h				
	Charge Time: 3 h (typical)				
	Charge conditions: DC power supply > 12 V				
<b>Expander Modules</b>					
	Excitation Voltages: 0 to 10 V				
	Excitation Currents: 0 to 4 V: < 30 mA - 4 V to 10 V: < 12 mA				
	Sensing: Negative and positive probes				
2) Amplifiers	Type: Differential - DC capable				
	Gains: 10 or 100				
	Error: < 0.01 dB				
3) Protection	Overvoltage: Device on: max ±30 V - device off: max ±15 V				
4) Connectors	Type: Mini Thermocouple/RTD type				
	Pins: 3 polarized pin - spring-loaded				
5) Thermocouples	Type J: -210 °C to +1 100 °C				
	Type K: -200 °C to +1 300 °C				
	Type T: -200 °C to +390 °C				
	Type N8: -200 °C to +1 200 °C				
	Type E: -200 °C to +800 °C				
	Cold Compensation: Integrated				
	Absolute temperature error: > -150 °C : ±0.9°C / < -150 °C : ±(0.4°C + 0.1% of MT)				
6) RTDs	PT 100: -190 °C to +880 °C				
	PT 1000: -190 °C to +880 °C				
	Absolute temperature error: ±(0.4°C + 0.3% of MT)				
	Current: PT100: 500 µA to 4 mA - PT1000: 500 µA to 1 mA				
	Wires: 3 wires				
<b>Digital Computation</b>					
1) Narrow band analysis (FFT)	Real-time FFT analysis				
	20 kHz bandwidth				
	0% overlap				
	1 channel processing				

2) Synchronous Order Analysis	Real-time order spectrum analysis				
	Any duration of visualization, any averaging				
	20 kHz bandwidth				
	1 channel processing				
3) Time Domain analysis	Real-time time domain monitor and statistical analysis with:				
	Simultaneous time view and statistical extraction				
	20 kHz bandwidth				
	1 channel processing requires 3 SPU				
<b>DSP Modules</b>					
1) Type	Sample Size: 32 bit floating				
	Computation words: 32/40 bit				
	Internal memory: 16 M samples				
2) Power	Computation capability: Up to 4810 SPU / DSP module				
3) Input Sharing	Inputs per DSP: 8 max				

## **Annexure-II**

### **MANUFACTURERS' AUTHORIZATION FORM**

*[The bidder shall require the manufacturer to fill in this form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Manufacturer and should be signed by the person with the proper authority to sign documents that are binding on the Manufacturer.]*

Date: [insert date (as day, month and year) of Bid Submission]

Tender No.: [insert number from Invitation for Bids]

To: **The Chairman, Interdisciplinary Centre for Energy Research, IISc, Bangalore-560012.**

WHEREAS

We [insert complete name of Manufacturer], who are official manufacturers of [insert full address of Manufacture's factories], do hereby authorize [insert complete name of Bidder] to submit a bid the purpose of which is to provide the following Goods, manufactured by us [insert name and or brief description of the Goods], and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty with respect to the Goods offered by the above firm.

Signed: [insert signature(s) of authorized representative(s) of the Manufacturer]

Name: [insert complete name(s) of authorized representative(s) of the Manufacturer]

Title: [insert title]

Duly authorized to sign this authorization on behalf of: [insert complete name of Bidder]