Government eProcurement System

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Organisation Chain :	Council of Scientific and Industrial Research||SERC-Chennai - CSIR||Purchase-SERC - CSIR
Tender ID :	2024_CSIR_201017_1
Tender Ref No :	A3(14536)2024/PUR/SERC
Tender Title :	SUPPLY, INSTALLATION AND COMMISSIONING OF ELECTRODYNAMIC
Corrigendum Type :	Technical Bid

Corrigendum Document Details

Corr.No.	Corrigendum Title	Corrigendum Description	Published Date	Document Name	Doc Size (in KB)
1	REVISED SPECIFICATIONS AND TERMS AND CONDITIONS AFTER PBC	REVISED SPECIFICATIONS AND TERMS AND CONDITIONS AFTER PBC	05-Aug-2024 03:45 PM	Corigendam14536001.pdf	19925.25

CORRIGENDUM/REVISED SPECIFICATIONS AND TERMS & CONDITIONS AFTER PBC (Pre- Bid Conference) on 29.7.2024

(Pointwise Changes to the Specifications and Terms & Conditions of the CPPP Tender Ref.: 2024_CSIR_201017_1 and CSIR-SERC Tender Ref.: A3(14536)2024/PUR/SERC w.r.t. Supply, Installation and Commissioning of Electrodynamic Shaker System with Climatic Chamber)

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
42	Page No. 60, Section 4.2 Specifications and allied technical details	Bare Table resonance	≥ 1000 Hz (nominal)	Bare Table resonance	≥ 700 Hz (nominal)
10.	Page No. 55, Section 4.2 Specifications and allied technical details	Sine acceleration (peak) Rated	≥ 75g	Sine acceleration (peak) Rated	≥ 75 g
		Horizontal with slip table & at max payload:	To be mentioned	Horizontal with slip table without payload & with 10-ton payload	≥10g and ≥0.6g, respectively
		Vertical with head expander & at max payload:	To be mentioned	Vertical with head expander without payload & with 600 kg payload	≥14g and ≥0.6g, respectively
11.	Page No. 56, Section 4.2 Specifications and allied technical details	Random acceleration (peak) Rated	≥ 50g	Random acceleration (rms)Rated	≥ 50 g
		Horizontal with slip table & at max payload:	To be mentioned	Horizontal with Bare table & at Max Payload:	To be clearly mentioned by the bidder
		Vertical with head expander & at max payload:	To be mentioned	Vertical with head Expander & at Max payload:	To be clearly mentioned by the bidder

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
8.	Page No. 55, Section 4.2 Specifications and allied technical details	Max. runtime at full payload capacity	To be mentioned	Max. runtime	24 hours continuous at 80% efficiency
16.	Page No. 56, Section 4.2 Specifications and allied technical details	Armature Power Requirements (based on current drawn to run shaker at full capacity in sine & shock force rating)	To be mentioned in Amps rms Sine: Shock:	Armature Power Requirements (based on current drawn to run shaker at full capacity in sine rating)	≥80 kVA
45.	Page No. 60, Section 4.2 Specifications and allied technical details	Thermal barrier	Thermal barrier for the slip table is required. It should withstand -80 deg C to +200 deg C.	Thermal barrier	Thermal barrier for the slip table is required. It should withstand -80 deg C to +200 deg C. Thermal barrier mass should be ≤ 400 kg
62.	Page No. 62, Section 4.2 Specifications and allied technical details	Type of Amplifier	• IGBT based switching amplifier of Class D (Digitally Modulated Power Amplifier) • Modular in construction and scalable architecture	Type of Amplifier	• IGBT or S-MOSFET based switching amplifier of Class D (Digitally Modulated Power Amplifier) • Modular in construction and scalable architecture
93.	Page No. 66, Section 4.2 Specifications and allied technical details	Hose/Pipe	Appropriate length from shaker to the blower location, (Minimum 20m)	Hose/Pipe	Appropriate length from shaker to the blower location, (Minimum 10m)

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
123.	Page No. 69, Section 4.2 Specifications and allied technical details	Profile (spectrum) inputs	User must be able to enter the profile in the form of break point for acceleration, displacements and velocity and it should be displayed graphically. Values like RMS peak acceleration, velocity and displacement must be displayed when the break point table is being updated.	Profile (spectrum) inputs	User must be able to enter the profile in the form of break point for acceleration, displacements and velocity and it should be displayed graphically. Values like RMS peak acceleration, velocity and displacement must be displayed when the break point table is being updated. User must be able to define the time-history for seismic test in the frequency range greater than 3 Hz
161.	Page No. 76, Section 4.2 Specifications and allied technical details	Rate of change of heating	5 deg C per minute (Linear). Compliance to IEC 60068-3-5 without load and IEC 60068-3-7 With load	Rate of change of heating	5 deg C per minute Compliance to IEC 60068-3-5 without load
162.	Page No. 76, Section 4.2 Specifications and allied technical details	Rate of change of cooling	5 deg C per minute (Linear). Compliance to IEC 60068-3-5 without load and IEC 60068-3-7 With load	Rate of change of cooling	5 deg C per minute Compliance to IEC 60068-3-5 without load
180.	Page No. 82, Section 4.2 Specifications and allied technical details	Multichannel Temperature/ Humidity data logging system	Required	Multichannel Temperature/ Humidity data logging system	Required. With minimum 9 channels.

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
183.	Page No. 83, Section 4.2 Specifications and allied technical details	Instrumentation & Control	• Flame retardant cables shall be used for main and control unit. • USB provision for fast downloads, Data logging information, • Internal memory for data logging (> 50 GB) • Real Time trend graph to be viewed on the screen (temperature, Humidity versus time) • IP65 protected touch panel/touchscreen • PLC based system or equivalent of reputed make • High-end multi-loop PID controller for simultaneous control of temperature and humidity (like eurotherm) • User friendly test programming and test sequence • Instant program profile preview in graphical format • Internal Fault alerts to be displayed on the monitor with HELP menu • Fault diagnostics with	Instrumentation & Control	• Flame retardant cables shall be used for main and control unit. • USB provision for fast downloads, Data logging information, • Internal memory for data logging (> 50 GB) • Real Time trend graph to be viewed on the screen (temperature, Humidity versus time) • IP65 protected touch panel/touchscreen • PLC based system or equivalent of reputed make • High-end multi-loop PID controller for simultaneous control of temperature and humidity (like eurotherm) • User friendly test programming and test sequence • Instant program profile preview in graphical format • Internal Fault alerts to be displayed on the monitor with HELP menu • Fault diagnostics with

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
			history • Low water indication for humidity system on the monitor • Power Resumption Modes : In case of a power failure, option of conditional restart based on temperature/ time or continuous		history • Low water indication for humidity system on the monitor • Power Resumption Modes: In case of a power failure, option of conditional restart based on temperature/ time or continuous • Chamber-shaker interface circuits and interlocks for combined operation.
197.	Page No. 89, Section 4.2 Specifications and allied technical details	Provision for independent operation of Environmental/ Climatic chamber	• Bottom closure plate with dead load capacity of 200 kg (minimum) must be provided for independent operation of the Environmental/ Climatic chamber • Necessary accessories for independent operation shall be listed and provided	Provision for independent operation of Environmental/ Climatic chamber	• Bottom closure plate with dead load capacity of 200 kg (minimum) must be provided for independent operation of the Environmental/ Climatic chamber • Necessary accessories for independent operation shall be listed and provided • Atleast 4 numbers of racks with provision for height adjustment • Each rack should have a bearing capacity of at least 100kgs

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
221.	Page No. 94, Section 4.2 Specifications and allied technical details	Delivery Period	15-16 weeks from the date of issuing the PO	Delivery Period	20 weeks from the date of issuing the PO
	Page No. 54, Clause 4.1 of Chapter-4	Minimum Eligibility Criteria	The bidder should have supplied and commissioned atleast (i) five numbers of Electrodynamic Shaker System of same (or) similar capacity (ii) Two numbers of combined Electrodynamic Shaker with Climatic Chamber System in Govt. Institutes/Research Organizations in India in the last 10 years. The bidder should have the turnover of minimum Rs. 20.00 Crore per year in the last three financial years.	Minimum Eligibility Criteria	The bidder should have supplied and commissioned atleast (i) five numbers of Electrodynamic Shaker System of same (or) similar capacity (ii) Two numbers of combined Electrodynamic Shaker with Climatic Chamber System in Govt. Institutes/ Research Organizations/ NABL accredited testing labs in India in the last 10 years. The bidder should have the turnover of minimum Rs. 20.00 Crore per year in the last three financial years.

Note: Bidders are requested to refer the above and the hosted tender in CPP Portal and CSIR – SERC website (CPPP Tender Ref.: 2024_CSIR_201017_1 And CSIR-SERC Tender Ref.: A3(14536)2024/PUR/SERC) and submit the bid as per the following revised specifications and terms & conditions of Chapter - 4 (Changes are highlighted for easy reference). All other terms & conditions of the tender except the above remain unchanged.

CHAPTER - 4

REVISED ELIGIBILITY CONDITIONS, SPECIFICATIONS AND ALLIED TECHNICAL DETAILS

Eligibility Conditions for Supply, Installation and Commissioning of Electrodynamic Shaker System with Climatic Chamber

4.1

Minimum Eligibility Criteria for Supply, Installation & Commissioning of Electrodynamic Shaker System with Climatic Chamber

Format for declaration by the Bidder for Code of Integrity & conflict of interest (AnnexureII) (.pdf)

- **Format for Affidavit of Self Certification regarding Local Content (Annexure XII) (.pdf)**
- **Certificate with regard to the bidder not having a land border with India (Annexure XIV or Certificate with regard to the bidder having a land border with India (Annexure XV) (.pdf)**
- **The bidder should have supplied and commissioned atleast (i) five numbers of Electrodynamic Shaker System of same (or) similar capacity (ii) Two numbers of combinedElectrodynamic Shaker System with Climate Chamber System in Govt. Institutes / Research Organisations / NABL accredited testing labs in India in the last 10 years. The bidder should have the turnoverof minimum Rs.20.00 Crore per year in the last three financial years.**

(Note: Firms not meeting the minimum eligibility conditions will not be considered for technical evaluation.)

4.1.1 **General Criteria: -**

1. List of installations of similar work with contact details should be provided. (Annexure - VIII)
2. The bidder shall furnish documentary evidence to demonstrate that the bidder satisfies the bidders' eligibility criteria.
3. Bidders shall invariably furnish documentary evidence (client's certificate) in support of the satisfactory operation of the similar plants executed by him.
4. Spares and service support for the instrument for the period of 10 years from the date of installation.
5. Details of make, model, service support for the outsourced items/ supporting accessories (Technical details in Technical bid)
6. Details of Service Centre and information on service support facilities that would be provided after the warranty period (in the Service Support Form).

4.2 REVISED SPECIFICATIONS AND ALLIED TECHNICAL DETAILS

Detailed Specifications for Electrodynamic Shaker with Climatic Chamber

CSIR-SERC is planning to setup a test facility which includes an Electrodynamic Shaker with Climatic Chamber system. The required system includes an electrodynamic shaker, head expander, slip table on a common base with air isolation configurations, power supply amplifier, vibration controller, hydraulic power supply, armature cooling blower with silencer and standard accessories. Additionally, a climatic chamber and its subsystems that work in tandem with the electrodynamic shaker system are needed to simulate various vibration testing conditions in a controlled environmental condition. The detailed technical specifications for the Electrodynamic Shaker with Climatic Chamber system is as follows:

Revised Technical Specifications for Electrodynamic Shaker

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
1.	Shaker Type	Electro Dynamic			
2.	Sine Force Rating (peak)	≥ 6800 kgf			
3.	Random Force Rating (rms.)	≥ 6800 kgf			
4.	Shock force	≥ 14000 kgf			
5.	Displacement (continuous)	≥ 75 mm (peak to peak, sine)			
6.	Velocity of bare table	≥ 1.75 m/sec. peak (sine) ≥ 2 m/sec. peak (shock)			
7.	Static Payload support	≥ 800 kg			
8.	Max. runtime	24 hours continuous at 80% efficiency			
9.	Frequency range	Range Min: ≤ 5 Hz Range Max: ≥ 2500 Hz			
10.	Sine acceleration (peak) Rated	≥ 75 g			
	Horizontal with slip table without payload & with 10-ton payload	≥10g and ≥0.6g, respectively			
	Vertical with head expander without payload & with 600 kg payload	≥14g and ≥0.6g, respectively			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
11.	Random acceleration (rms)Rated	≥ 50 g			
	Horizontal with Bare table & at Max Payload:	To be clearly mentioned by the bidder			
	Vertical with head Expander & at Max payload:	To be clearly mentioned by the bidder			
12.	Type of Cooling	Air-cooled			
13.	Total Armature moving mass	≤ 80 kg			
14.	Total Armature Diameter	≤ 500 mm			
15.	Fundamental Armature Resonance Frequency	>1600 Hz			
16.	Armature Power Requirements (based on current drawn to run shaker at full capacity in sine rating)	≥80 kVA			
17.	Field Coil Assembly Current rating in Amps DC: Voltage rating in V DC:	 To be mentioned To be mentioned			
18.	Suspension Cross Axial Stiffness	≥15 kN/mm			
19.	Suspension Rotational Stiffness	≥ 150 kNm/rad			
20.	Stray Magnetic Field	≤ 1.5 mT			
21.	Armature Inserts	Metric coarse threaded, M8 or M10 or M12 type with center, 3",6",12", PCDs. Inserts should be equally spaced.			
22.	Auto centering of armature	Auto centering of the armature for the rated static load should be provided. Please share the mechanism or technology used.			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
23.	Armature over travel interlock	Armature over travel should be sensed using applicable sensor. Armature over travel interlock should trip the power amplifier.			
24.	Geared shaker rotation	Easy rotation of the shaker to 90 deg using manual effort rotation or better. Electrical cables, flexible hoses and hydraulic hoses are to be properly guided and secured during shaker rotation.			
25.	Armature Suspension	Rolling strut assembly or copper beryllium or carbon-carbon flexures or better. Fatigue life of the flexures with bare table should be estimated experimentally and details may be provided.			
26.	Air Isolation Trunnion	Required			
27.	Armature Guidance	Required			
28.	Shaker Cooling unit	The shaker should be provided with air blower with silencer of suitable capacity. The acoustic noise during the cooling unit			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		operation should not exceed 120 dBA at a distance of 1 meter. Rating and technical details of the blower and silencer should be provided along with technical quote.			
29.	Provision for different armature sizes	The bidder must provide a shaker capable of accommodating various armature sizes. It should be able to perform high-g tests on small payloads and support large-diameter armatures for direct mounting of the Device Under Test (DUT). The different armatures should be user-replaceable in the field.			
SLIP TABLE					
30.	Type	• Common base type: Shaker trunnion and guiding system and slip table, mounted on a common steel structure providing permanent alignment with shaker and slip			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		table • Combo Base Isolation: The shaker unit along with common base should be isolated from floor by the use of air mounts of appropriate capacity. • Oil film guided type or equivalent • Slip plate supported by granite base with oil film and hydrostatic journal bearings or equivalent.			
31.	Slip Table Dimension & Material	Minimum 2000mm (L) x 2000mm (W) x 50mm (Thk) Material: Magnesium or equivalent			
32.	Slip table mass	< 500kg			
33.	No of hydrostatic bearings	Minimum 4			
34.	Surface Finish	Roughness average ≤ 0.5 micron			
35.	Pitch	350 kN-m or better			
36.	Yaw	80 kN-m or better			
37.	Roll	280 kN-m or better			
38.	Flatness	≤0.2mm per meter			
39.	Maximum Stroke	Atleast 75 mm			
40.	Maximum load on the table	≥ 10000kg			
41.	Useful frequency range of shaker	Range Min: ≤ 5 Hz			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
	combined with slip table	Range Max: ≥ 2000 Hz			
42.	Bare Table resonance	≥ 700 Hz (nominal)			
43.	Mounting hole pattern	To be provided. Should be with standard type and grid hole pattern with SS inserts.			
44.	Driver Bar	• Tension bolt type • All welded construction			
45.	Thermal barrier	Thermal barrier for the slip table is required. It should withstand -80 deg C to +200 deg C. Thermal barrier mass should be ≤ 400 kg			
HYDRAULIC POWER SUPPLY					
46.	Hydraulic Power Pack (Reputed Make)	Suitable for the bearing slip table.			
47.	Sound Pressure level of Hydraulic Power Pack	≤ 100 dB A at a distance of 1m from the outer periphery of the HPP.			
48.	Hydraulic Power Supply	Suitable for the slip table operating at 380-480V AC, 50Hz, 3 Phase			
49.	Motor	Fully enclosed, fan-cooled Minimum 1 kW; 50 Hz			
50.	Pressure pump	Type Gear; Operating pressure ≥ 150 bar Delivery rate 50 Hz: ≥ 2 liters/min @ 150 bar			
51.	Filtration	≤ 15 microns			
52.	Oil tank capacity	≥ 30 liters			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
HEAD EXPANDER					
53.	Type	Table with additional frame for extra load support			
54.	Head expander table dimensions	≥ 1500mm x 1500mm with suitable thickness			
55.	Head Expander table material	Magnesium alloy or equivalent			
56.	Head Expander table mass	≤ 400kg			
57.	Useful frequency range	5Hz to 2000Hz or better			
58.	Top face flatness tolerance	≤ 0.2 mm/m			
59.	Thermal barrier	Thermal barrier for the head expander is required. It should withstand -80 deg C to +200 deg C			
60.	Head Expander table hole patterns and inserts	To be provided. Should be with standard type and grid hole pattern with SS inserts.			
61.	Head expander bottom dia. should be suitable to armature dia.	Should be satisfied			
AMPLIFIER					
62.	Type of Amplifier	• IGBT or S-MOSFET based switching amplifier of Class D (Digitally Modulated Power Amplifier) • Modular in construction and scalable architecture			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
63.	Amplifier Capacity	a) Total capacity shall be suitable to run the shaker a the maximum rated capacity for sine and shock. b) Number of power modules to be specified.			
64.	Full Power Bandwidth	Range Min: ≤ 20 Hz Range Max : ≥ 2000 Hz			
65.	Frequency response	± 1.5 dB 20 Hz to 2500 Hz or better			
66.	Power Range	Atleast 120 kVA. Should be compatible with shaker for sine and shock rating			
67.	Rated Output Voltage	100 Vrms Should be compatible with shaker			
68.	Input Sensitivity	1 Vrms input for 100Vrms output. Compatible with all reputed make controllers.			
69.	Continuous output current in Amps for sine and random Per power module: Total power range of amplifier:	 To be mentioned To be mentioned			
70.	Transient Output current in Amps (peak) for 100ms Per power module: Total power range of amplifier:	 To be mentioned To be mentioned			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
71.	Amplifier Efficiency	> 90%			
72.	Signal to Noise Ratio	> 50 dB			
73.	Input Impedance	≥ 50 kΩ			
74.	Switching Frequency	>100 kHz			
75.	Modulation range	DC to 10 kHz			
76.	Total Harmonic Distortion	< 0.9 % when measured with matched resistive load at rated output			
77.	Field power supply voltage	≥ 150 V DC			
78.	Maximum no-load voltage	Should not be more than 10% of the shaker rated capacity			
79.	Length of the cable between power amplifier and shaker	Atleast 10 meters			
80.	Peak current handling	Approximately 3 times or more than the continuous sine current rating for a period of 100ms			
81.	Amplifier Gain Control	Amplifier gain control should be available in continuous mode or in steps			
82.	Soft start and stop	Soft start and stop to avoid transients due to switching ON & OFF of the amplifier.			
83.	Electrical wiring & Mains power	All tropicalized wiring suitable for 415VAC ±10%, 50Hz. 3 Phase. Lower tappings for operation at 380VAC to be provided.			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
84.	Power amplifier acoustic noise level	≤ 80dBA at 1 meter distance from the amplifier.			
85.	Controls to be provided	ON/OFF controls from amplifier, local and remote panels for the following. • Field power supply • Cooling unit • Hydraulic Oil Supply Unit • Amplifier Gain.			
86.	Power Amplifier operation	The user shall be able to operate, change settings or enable/disable interlocks in the power amplifier without intervention of the bidder. Passwords, licenses, if any for the above should be shared with the user during the supply and should not require any update later.			
87.	Protection	Amplifier should have all standard safety interlocks and monitoring. **a) Interlocks** 1) Amplifier Cooling 2) Vibrator Cooling			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		3) Vibrator Over travel 4) Field Failure 5) Module Over Current 6) Cabinet door open **b) Metering** 1) Amplifier Output Voltage 2) Amplifier Output Current 3) Field Voltage & Current **c) Indication System level** 1) Output over current. 2) Output over voltage. 3) Output short circuit. 4) Output DC fault. 5) Aux power supplies ON 6) Amplifier cooling failure 7) Amplifier over temperature 8) Vibrator cooling 9) Vibrator over travel 10) Vibrator cooling failure 11) Vibrator over temperature 12) Field failure 13) Supply low / high voltage 14) Cabinet door open 15) Emergency stop			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
88.	Power module	The power module should have independent cooling unit and RFI Filters.			
89.	Power Loss Protection	The amplifier should include synchronized loss protection to ensure a smooth shutdown in the event of a power amplifier failure.			
90.	System Interface	The amplifier should feature a microprocessor-based user interface to enhance system reliability and facilitate fault diagnosis.			
COOLING SYSTEM					
91.	Type of Cooling	Forced air cooling blower with silencer.			
92.	Capacity of the blower	Suitable to the shaker to remove the heat generated efficiently.			
93.	Hose/Pipe	Appropriate length from shaker to the blower location, (Minimum 10m)			
94.	Electrical power cable	Appropriate length from blower to the input power supply point at the installation site.			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
DIGITAL VIBRATION CONTROLLER					
95.	No of input & output channels	Min. 8 channels with possibility for future expansion. All simultaneous input. Min 2 output channels.			
96.	Resolution for Input channels	24 bit ADC (individual ADC for each input channel)			
97.	Input Voltage range	± 10 V (p-p), with input impedance >500 kΩ			
98.	Control signal checks	Input over load, open loop, loss of control signal etc.			
99.	Input Sensitivity	Programmable from 10mV/g to 1000mV/g			
100.	Input Signal Type/Coupling	AC/DC/IEPE/ICP/ICP+TEDS/GND/Float			
101.	TEDS Standards	IEEE 1451.4.2001 or latest version			
102.	ICP Power Supply	1mA to18mA			
103.	Input Connector Type	BNC			
104.	Signal to noise ratio (Input)	Minimum 100 dB			
105.	Cross channel talk (Input)	< -100dB			
106.	Harmonic distortion (Input)	Less than 105 dB			
107.	Frequency Range	Min DC to 4 kHz or better			
108.	Output Channel Resolution	24 bit Digital to Analog converter (DAC)			
109.	Output Voltage Range	± 10 V (p-p)			
110.	Output impedance	< 100Ω			
111.	Harmonic distortion (output)	< -95 dB			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
112.	Continuous time domain data recording for Sine, Random, Classical shock & replaying and create data files for post-test analysis or post processing. Recorded time data should be exportable.	Required in software/ hardware			
113.	Vibration Controller Software	Professional type, latest version compatible with latest version of leading OS. License type: Perpetual validity.			
114.	Vibration Controller Signal Types	The controller should have following signals. • Sine vibration • Random Vibration • Sine on Random (SoR) • Random on Random (RoR) • Sine and Random on Random (SRoR) • Classical Shock • Resonance Search, Track & Dwell • Field Data Replication • Shock Response Spectrum • Transient Time History (TTH) • Sine Tracking, Analysis and			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		Generation • Self-Calibration Software			
115.	Controller and control software version & year of launch.	The controller has to be latest model/ version, launched after 2018. Mention the controller model version and year of launch.			
	Random vibration control				
116.	Frequency range	100Hz, 200, 400, 800, 1000, 2000, 4000Hz			
117.	Frequency bins (lines)	100, 200, 400, 800 lines			
118.	Dynamic range	≥ 95 dB			
119.	Loop time	≤ 100msec			
120.	No of degrees of freedom	2 to 1000			
121.	Control accuracy	± 1dB at 200 DOF			
122.	Control strategy	Single channel, multiple channel			
123.	Profile (spectrum) inputs	User must be able to enter the profile in the form of break point for acceleration, displacements and velocity and it should be displayed graphically. Values like RMS peak acceleration, velocity and			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		displacement must be displayed when the break point table is being updated. User must be able to define the time-history for seismic test in the frequency range greater than 3 Hz			
124.	Number of break points	More than 100, with right and left slopes (dB/Octave)			
125.	Signal display	Real time display of control spectrum/ drive spectrum/ drive signal/ control signal			
126.	Number of windows	The user must be allowed to open a number of windows and monitor the desired signal			
127.	Test status display	Parameters like target grms, actual grms, dB ratio of full test level, total test time, elapsed test time etc. should be displayed during the test			
128.	Compliance	ISO, DIN, MIL- STD 810 and other relevant standards			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
	Sine Vibration Control				
129.	Frequency range:	0.5 to 3000 Hz			
130.	Dynamic Range:	Excess of 95 dB			
131.	Control accuracy:	+ 1 dB through a peak notch of 50, at one octave/min			
132.	Control Strategy:	Single channel, multiple channel Notch channel programmable for different levels at different sectors for each channel			
133.	Profile inputs:	User must be able to enter the spectrum in the form of break point tables. Values like RMS, acceleration, velocity, and displacement must be displayed when break point table is being updated. (Number of break points > 100)			
134.	Abort:	Upper and lower abort level (Programmable for different sectors)			
135.	Signal display:	During the test, the user must be able to see the real time			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		display of the signal (A,V and D)			
136.	Sine Mode:	• Sweep (single, cycle, dwell) • Linear / log sweep • COLA (a fixed output at test frequency) • TIP (test in progress signal) • Level program abilities for acceleration, velocity displacement and sloped acceleration)			
	Sine on Random (SoR)/ Random on Random (ROR)				
137.	Frequency range:	0.5 to 4000 Hz			
138.	Dynamic Range:	Excess of 95 dB			
139.	Control accuracy:	± 1 dB through a peak notch of 50, at one octave/min			
	Resonance Search, Track & Dwell (RSTD) Vibration Control				
140.	Transmissibility	Measurement shall be between any pair of inputs or an input and the control signals			
141.	Search range	User shall select Start and end frequencies			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
		within the frequency range defined by the Reference profile			
142.	Sweep rate	Default to the sweep rate for the referenceprofile or user shall specify special sweep rate.			
	Resonance Dwell and Tracked Dwell				
143.	Test modes	• Search and dwell as each resonance is detected during the sweep. • Search then automatically dwell using the generated dwell list • Search, pause for users review and editing of the dwell list, thenautomatically dwell using the edited Dwell list			
144.	Dwell modes	Fixed frequency or tracked resonance dwell. Tracked dwell shall adjust the drive frequency to track the resonance as its frequency changes during dwelling.			
145.	Dwell duration	Time or cycles using true cycle counting			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
	Classical Shock Transient Control				
146.	Frequency range	0 to 22 kHz			
147.	Frame size	128 to 16384 points or automaticallyoptimized. Linear filter design minimizes distortion and preserves the true waveform shape.			
148.	Transfer function	Measure during pre-test or, for quickest test start-up, recall a function from disk			
149.	Averaging	User-specified coefficient from 1 to 500			
150.	Filtering	User specifies cut-off frequency for lowpass filtering applied to the reference waveform, drive, and all input channels.			
151.	Pulse delay	User-specified delay between pulses from 0 to 1000sec			
152.	Reference waveform	Convenient pulse selection from a waveform library. User-specified duration and peak acceleration			

S.No.	Parameters	SERC Requirements	Offered Specification by the Bidders	Compliance (Yes/No)	Page No. Reference in the Technical Document/ Brochure
153.	Pulse types	Half sine, haversine, initial and terminal peak sawtooth, triangle, rectangle and trapezoid			
154.	Pulse duration	From 0.5 to 3000ms or better			

Technical Specifications for ENVIRONMENTAL/CLIMATIC CHAMBER

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
	GENERAL SPECIFICATIONS				
155.	Environmental/ Climatic chamber integrated with electrodynamic shaker	Required. It is the responsibility of the bidder to integrate with the electrodynamic shaker system, along with slip table, head expander etc. Required interfacing elements such as Temperature membrane cloth barrier has to be listed and supplied.			
156.	Parameters	Temperature, Humidity			
157.	Test Space Dimensions & Volume	Dimension: Atleast 2000mmx2000mm and the dimensions should compatible with slip table and head expander. Volume: Min 4500 Liters			
158.	Temperature Range	-70 to 180 deg C or better			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
159.	Temperature Fluctuation	$\leq \pm 1$ deg C			
160.	Temperature Gradient	< 1.5 deg C			
161.	Rate of change of heating	5 deg C per minute Compliance to IEC 60068-3-5 without load			
162.	Rate of change of cooling	5 deg C per minute Compliance to IEC 60068-3-5 without load			
163.	Humidity Range	10% to 95% RH or better			
164.	Humidity fluctuation	1% to 3% RH or better			
	Test Space Details				
165.	Test Space	• Pre-polished stainless steel or equivalent • 18SWG stainless steel with reinforced bottom floor to withstand a distributed load up to 500kg/m^2. (for standalone applications) • TIG welded seams to ensure vapor tight enclosure. • Double continuous seal rings of silicone rubber shall be mounted on a thermal breaker strip as the gasket to ensure complete sealing and zero conduction from the test space to the exterior.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
166.	Insulation	Low 'k' factor, high density and non-hygroscopic nature. Asbestos free mineral fiber insulation.			
167.	Thickness of insulated material	Minimum 75 mm			
168.	Thickness of Inner & outer stainless-steel sheet	Minimum 1.2 mm			
169.	Test Space Conditioning	• The air circulation within the chamber shall be as close to laminar ensuring uniform airflow all across the workspace. • Standard frame TEFC motors shall be used with a detachable extended shaft • Only the co-axial fan blades shall be exposed in the conditioning plenum ensuring the drive motor will be placed outside. • The conditioning plenum shall be covered with a removable sheet providing easy access for maintenance.			
	Heating & Cooling System				
170.	Heating System	• Stainless steel sheathed air heaters to achieve the desired positive set temperature.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		• The heaters shall be placed in the conditioning plenum such that there is no direct radiation from the heaters onto the test specimen. • Heater outputs shall be controlled for superior stability and control in temperature using suitable relays and thyristors.			
171.	Refrigeration System	• Anti-corrosive components should be used. • The compressor shall be mounted on anti-vibration pads. • Eco-friendly Non-CFC refrigerant. • Oil return system for protection against oil migration from the compressor, with sight glass to monitor oil level • The heat exchanger coils with Inner grooved copper tubes, finned for maximum heat transfer • The cooling in the chamber shall be			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		accomplished by a cascade system (low stage, high stage). • All the refrigeration components shall be fixed in a separate compartment. The whole area shall be given adequate ventilation to avoid excess heat build-up inside the compartment.			
172.	Type of Refrigerant	CFC free; Eco Friendly (Suitable refrigerant type to be mentioned, for high and low stage, in case of cascade refrigeration system)			
173.	Compressor type	• Low Noise Type Suitable reciprocating low-temperature application compressors, preferably suction gas cooled, capable of operating in the entire temperature envelope. • Compressor should be with suitable oil type (like POE) compatible with eco-friendly refrigerants.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
174.	Condenser type	• Water cooled • Preferably stainless brazed plate heat exchanger construction with suitable working pressure for waterside and refrigerant side • A water flow switch shall be provided to ensure adequate flow to the condenser • All the accessories such as Chiller, pipelines or pump that are required for operating the condenser/chamber in the specified working range should be listed and provided by the bidder			
	Humidity System				
175.	Humidification	• A low-pressure droplet free vapor boiler using direct vaporization system or equivalent • Reservoir shall be provided at the side of the chamber with a PU tube quick connector and water level is automatically controlled through a water-in solenoid valve.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
176.	Dehumidification	• Refrigeration based de-humidification coils. • The desired level of lower humidity shall be achieved by maintaining the precise dew point temperature. • The output shall automatically be activated based on the set point as well as in ramp up mode after a low-temperature cycle.			
177.	Climatic Range	Atleast between +10 deg C to +85 deg C			
178.	DM water tank with water level indicator	Required capacity need to be supplied			
	Instrumentation, Controller and Display Unit				
179.	Sensors	• All required sensors for measurement and control of temperature, RH etc., should be of reputable make (like Vaisala). Type and make with accuracy levels should be compatible with chamber operation requirement and need to be mentioned.			
180.	Multichannel Temperature/ Humidity data logging system	Required. With minimum 9 channels.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
181.	Remote access/control of the controller from the software for temperature/humidity inputs and changes	Required. It is the responsibility of the bidder.			
182.	Display Unit	• Min 7" • WVGA 800 x 480 LCD 6.1 Display Type or better • Atleast 16M color touch screen type			
183.	Instrumentation & Control	• Flame retardant cables shall be used for main and control unit. • USB provision for fast downloads, Data logging information, • Internal memory for data logging (> 50 GB) • Real Time trend graph to be viewed on the screen (temperature, Humidity versus time) • IP65 protected touch panel/touchscreen • PLC based system or equivalent of reputed make • High-end multi-loop PID controller for simultaneous control of temperature and humidity (like			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		eurotherm) • User friendly test programming and test sequence • Instant program profile preview in graphical format • Internal Fault alerts to be displayed on the monitor with HELP menu • Fault diagnostics with history • Low water indication for humidity system on the monitor • Power Resumption Modes: In case of a power failure, option of conditional restart based on temperature/ time or continuous • Chamber-shaker interface circuits and interlocks for combined operation.			
184.	Test Profiles	• Temperature cycling: Possible to set different temperature profile/cycle. • Humidity Testing: Possible to set different humidity profile/cycle.			

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
			history • Low water indication for humidity system on the monitor • Power Resumption Modes : In case of a power failure, option of conditional restart based on temperature/ time or continuous		history • Low water indication for humidity system on the monitor • Power Resumption Modes: In case of a power failure, option of conditional restart based on temperature/ time or continuous • Chamber-shaker interface circuits and interlocks for combined operation.
197.	Page No. 89, Section 4.2 Specifications and allied technical details	Provision for independent operation of Environmental/ Climatic chamber	• Bottom closure plate with dead load capacity of 200 kg (minimum) must be provided for independent operation of the Environmental/ Climatic chamber • Necessary accessories for independent operation shall be listed and provided	Provision for independent operation of Environmental/ Climatic chamber	• Bottom closure plate with dead load capacity of 200 kg (minimum) must be provided for independent operation of the Environmental/ Climatic chamber • Necessary accessories for independent operation shall be listed and provided • Atleast 4 numbers of racks with provision for height adjustment • Each rack should have a bearing capacity of atleast 100kgs

S.No. in Tender (Chapter-4)	Page No.	Parameters as notified in the tender	SERC Requirements as notified in the tender	Revised Parameter after PBC	Revised SERC Requirements after PBC
221.	Page No. 94, Section 4.2 Specifications and allied technical details	Delivery Period	15-16 weeks from the date of issuing the PO	Delivery Period	20 weeks from the date of issuing the PO
	Page No. 54, Clause 4.1 of Chapter-4	Minimum Eligibility Criteria	The bidder should have supplied and commissioned atleast (i) five numbers of Electrodynamic Shaker System of same (or) similar capacity (ii) Two numbers of combined Electrodynamic Shaker with Climatic Chamber System in Govt. Institutes/Research Organizations in India in the last 10 years. The bidder should have the turnover of minimum Rs. 20.00 Crore per year in the last three financial years.	Minimum Eligibility Criteria	The bidder should have supplied and commissioned atleast (i) five numbers of Electrodynamic Shaker System of same (or) similar capacity (ii) Two numbers of combined Electrodynamic Shaker with Climatic Chamber System in Govt. Institutes/ Research Organizations/ NABL accredited testing labs in India in the last 10 years. The bidder should have the turnover of minimum Rs. 20.00 Crore per year in the last three financial years.

Note: Bidders are requested to refer the above and the hosted tender in CPP Portal and CSIR – SERC website (CPPP Tender Ref.: 2024_CSIR_201017_1 And CSIR-SERC Tender Ref.: A3(14536)2024/PUR/SERC) and submit the bid as per the following revised specifications and terms & conditions of Chapter - 4 (Changes are highlighted for easy reference).

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
185.	Test Standards	• All relevant latest international standards like MIL, JSS, RTCA related to environmental testing and vibration testing. Example MIL-STD- 810F, MIL-STD-2164, JSS 55555, JSS 6625, RTCA-DO-160E etc.,			
	Overall Features				
186.	Viewing Window	• A multi pane insulated window for inspection should be provided with minimum dimensions of 400mmx400mm • The multi pane window shall consists of toughened glasses sealed with silicon and separated by spacers to form completely vacuumized window. • Halogen (or equivalent) lighting shall be provided to view the specimen under test.			
187.	Front Door	• The door shall have full access to the test space and shall be hinged to the chamber.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		• The door lock should be pull-action type latch clamp or equivalent. • The door shall be fitted with a limit switch and when ajar shall indicate "door open" in the controller and also be interlocked with the air circulation. • The door shall be fitted with heaters to avoid condensation during low temperature cycles			
188.	Entry Ports / Port Holes	• 2 Nos with suitable sealing gasket/silicones plugs • 1 Nos on LHS, Min Diameter: 50 mm. • 1 Nos on RHS, Min Diameter: 150 mm.			
189.	External Surface Finish	All exposed parts shall be painted with corrosion-resistant paint			
190.	Conditioning Space	• The conditioning space shall be isolated from the test space using a suitable ducting sheet, with easy removal for maintenance. • All allied components such as the air circulation fan, heaters, evaporator, dehumidification and			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		thermostat should be positioned within this space. • There shall be no direct contact to any of these components from the test space			
191.	Mounting	• Chamber with conditioning units should be mounted on the rails, capable of manual or motorized movement in the horizontal space. Suitable installation for rails on the test floor should be done by the bidder. • When not in use, the chamber with conditioning space should be movable to a safer distance (minimum 1m clear distance from slip table), away from the shaker/ slip table area so as to enable the independent functionality of shaker/ slip table.			
192.	Trolley or guideways to the Environmental/ Climatic chamber, to move from head expander to slip table. Rigid	• Chamber / test space unit should have motorized movement for integration with armature/ slip table.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
	stand with height adjustable feature/ provision, so that Environmental/ Climatic chamber can be mounted on head expander and on slip table.	• Required. It is in bidders' scope of supply and erection • Temperature membrane cloth barrier or equivalent should be provided for Armature/Head Expander integration and Slip Table integration bottom panel			
193.	Overall Dimensions	• Overall dimensions of the Environmental/ Climatic chamber unit, with its weight must be provided • Required railing length and area for movement of overall chamber unit must be marked and provided.			
194.	Input Power Supply	• 415V ± 10%, 3 Phase, 50 Hz			
195.	Noise level	< 90 dB			
196.	Safety and Maintenance Features	All necessary safeties for electrical, vacuum, hydraulic systems (if any) are to be incorporated to ensure protection to both system & operator against malfunction. The system must be designed for easy maintenance and accessibility to electrical & other components.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
197.	Provision for independent operation of Environmental/ Climatic chamber	• Bottom closure plate with dead load capacity of 200 kg (minimum) must be provided for independent operation of the Environmental/ Climatic chamber • Necessary accessories for independent operation shall be listed and provided • Atleast 4 numbers of racks with provision for height adjustment • Each rack should have a bearing capacity of atleast 100kgs			
198.	Accessories & others	• Adjustable and removable shelves • O & M (Operation & Maintenance) manual. • Detailed Service manual. • Any special tools required for routine/ preventive & Breakdown maintenance. • All Relevant Software with manuals for control, operation and maintenance.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		• Necessary cables and connectors for interfacing with PC. • Chamber calibration certificate and detailed procedure for recommended routine calibration. • It is the responsibility of the supplier/ bidder/OEM to include all the essential accessories required for proper functioning of the Environmental/ Climatic chamber at CSIR-SERC. List of accessories to be given.			
199.	Water lines, tubing, erection of lines, refrigeration lines/ tubing/ erection, electrical cable/cabling, erection of lines. Refrigeration tanks, any storage tanks. Trolley/Racks, Desiccant humidifier	Supply and installation in scope of the bidder.			

Other Requirements

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
	Computer Specifications				
200.	Preferred Make	Reputed Make			
201.	Processor	Intel Core i9 10900X 3.7GHz 2933MHz 10C 165W CPU or better			
202.	Chipset	Intel X299 or better			
203.	RAM	32 GB nECC, DDR4 2933MHz memory support to 256GB; Total 8 DIMM Slots or better			
204.	BIOS	BIOS of the Workstation to have tool for enhanced security features like self- healing, regular checks.			
205.	Drive Controllers	Onboard 6-Channel SATA @ 6Gbps (RAID 0,1,5,10) or better			
206.	Hard Disk	1TB M.2 2280 PCIe NVMe TLC Solid StateDrive & 1 TB SATA 7200 RPM HDD. Option for future expansion of additionalup to 4 SATA/SSD Hard drives or better			
207.	Graphics Card	NVIDIA Quadro P2200 (5 GB GDDRS dedicated or Radeon™ Pro W5500 or better			
208.	Bays	2 x External 5.25" 2 x Internal 3.5" 1 x M.2 PCIe x 4 Gen3 Slot for SSDs Slim Optical Drive bay or better			
209.	Keyboard and Mouse	Minimum USB Keyboard and USB Optical Scroll Mouse of reputed make			
210.	Audio	High-Definition Integrated Audio with internal Speaker			
211.	Operating System	Windows Professional- latest version with MS Office preinstalled (Perpetual license			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
		validity). Bidders should ensure all the software are compatible with the controller provided			
212.	Warranty for Desktop	1 year atleast from the date of commission and installation of the whole system			
213.	Display	Atleast 27 inch FHD Monitor IPS with LED backlight of reputed make			
	Others				
214.	List of deliverables	List of deliverables to meet the functional requirements			
215.	Quality of finish	All equipment should have good finish with anti-corrosive protection			
216.	Utility requirements	Bidder should provide details of the utilities required for operation of the shaker system & Environmental/ Climatic chamber like power requirements, compressed air requirements, space requirements, overall dimension			
217.	Documentation (Two sets of Hard Copies in English). Backup copies of all software's and O.S should be supplied in CDROM / pen drive.	• Operation Manual • Service Manual • Electrical wiring and mechanical schematics, dimensional drawings • Parts list: System specifications including subsystems, subsystems data sheets, interface requirements, calibration requirements and procedures. • Factory acceptance test results.			
218.	Installation and commissioning	The bidder or their representative should take full responsibility for unloading, unpacking, installation, commissioning, carrying out site acceptance tests and handing over the system to CSIR-SERC			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
219.	Integration of Electrodynamic shaker controller and the Environmental/ Climatic Chamber	The bidder or their representative should take full responsibility of integrating electrodynamic shaker controller with the Environmental/ Climatic chamber at CSIR-SERC.			
220.	Training at CSIR-SERC	Bidder should provide mandatory in-person training and demonstration on operation and routine maintenance of the system for atleast 1 week to CSIR-SERC staff (Min. 15 people) as part of installation and commissioning.			
221.	Delivery Period	20 weeks from the date of issuing the PO			
222.	Warranty for Electrodynamic shaker System, controller, Environmental/ Climatic chamber and their sub systems, accessories including its third party items/products.	One-year comprehensive on-site warranty for the complete system including all the equipment, sub systems etc. from the date of installation and acceptance of the system. All spare parts required for the trouble-free operation of the complete system during standard warranty period, needs to be supplied by the bidder, without extra cost. Fault should be resolved on-site within 2 working days of fault reporting.			
223.	Requirement of CAMC & AMC for the period of 3 years after the expiry of warranty period.	CAMC (Comprehensive Annual Maintenance Contract) is required for the complete system including hardware, software, third party items, components etc. after the expiry of warranty period. All the spare parts required for the trouble-free operation of the complete system during the CAMC period needs to be supplied by the bidder with least downtime. Fault should be			

<table>
<tr><th>S.No.</th><th>Parameters</th><th>SERC Requirements</th><th>Offered Specification</th><th>Compliance (Yes/No)</th><th>Page no. reference in the technical document/ brochure</th></tr>
<tr><td></td><td></td><td>resolved on-site within 2 working days of fault reporting.

Similarly, AMC is also required for the maintenance of the complete system including hardware, software, third party items, components etc. after the expiry of warranty period.

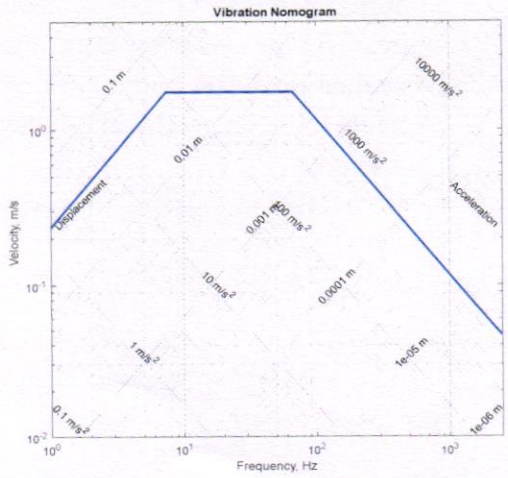
Note: The bidder should necessarily quote separately for the required CAMC & AMC as detailed below:
<table>
<tr><th>Details of Years after the warranty period</th><th>Charges towards CAMC</th><th>Charges towards AMC</th><th>Remarks</th></tr>
<tr><td>1st year</td><td></td><td></td><td></td></tr>
<tr><td>2nd year</td><td></td><td></td><td></td></tr>
<tr><td>3rd year</td><td></td><td></td><td></td></tr>
</table>
But, CSIR-SERC will avail the service towards CAMC & AMC at its discretion. The quoted charges towards CAMC & AMC will not be considered for the evaluation of the bids.</td><td></td><td></td><td></td></tr>
</table>

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
224.	Spare parts and service support	The quoted system should have a minimum product life cycle of 15 years. The OEM has to inform the CSIR-SERC, one year before discontinuing the model/product. The OEM has to provide spare parts and service support for minimum 7 years from the date of discontinuing the model/system.			
225.	Testing and Acceptance at CSIR-SERC	Bidder shall conduct acceptance testing of the shaker and chamber system after installation at CSIR-SERC as per the criteria given in Annexure-I. The bidder may conduct additional tests as per their standard acceptance procedure. Any special equipment required for the installation & acceptance test shall be arranged by the bidder, if required.			
226.	Shifting, Relocation and/or Reinstallation	The bidder should also provide support and associated charges towards shifting, relocation and/or reinstallation of the entire system within 5 years from date of commissioning (if needed) within the campus of CSIR-SERC. But, CSIR-SERC will avail the service towards relocation and reinstallation at its discretion. The quoted charges towards relocation and re-installation will not be considered for the evaluation of the bids.			
227.	Schematic drawing	Schematic diagram of quoted shaker and environmental/ climatic chamber assembly with insert configuration shall be provided along with the quote.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
228.	Supplied software and hardware	All the listed software and hardware items that bidder quotes should be preferably be a catalogue product and proven.			
229.	OEM authorization certificate	If the bidder is not OEM, the OEM authorization certificate has to be submitted along with bidding documents.			
230.	Compliance Statement	• The bidder should meet all the technical specifications to qualify the bid. The bidder has to furnish the values/units/parameters against each CSIR-SERC requirement in the compliance sheet. Offer without this information will be rejected without any further reference. • Merely stating, "comply" does not constitute sufficient information. Exact numerical values are to be specified wherever applicable. Specified technical data should be supported by product catalogues, manuals, test procedures, and test plots etc, along with page number reference to the specified values. In case of insufficient technical data, the quote is liable to be rejected without further intimation. • The bidder has to sign and stamp (company seal) on all the pages of technical compliance sheet.			

S.No.	Parameters	SERC Requirements	Offered Specification	Compliance (Yes/No)	Page no. reference in the technical document/ brochure
231.	Eligibility for Participation in tender	The bidder should have commissioned the following (i) atleast five numbers of electrodynamic shaker system of similar capacity (ii) atleast two numbers of combined electrodynamic shaker with climatic chamber system (for which the bid is submitted) in Govt institutes/ research organizations in India in the last 10 years.			
232.	List of Installations	The bidder should submit a list of these installations giving the date of supply and contact details along with the quote, the committee may visit these installations and evaluate the system as part of tender evaluation. Offer without this information is liable to be rejected without any further reference.			

ANNEXURE-I: Criteria for testing and acceptance at CSIR-SERC

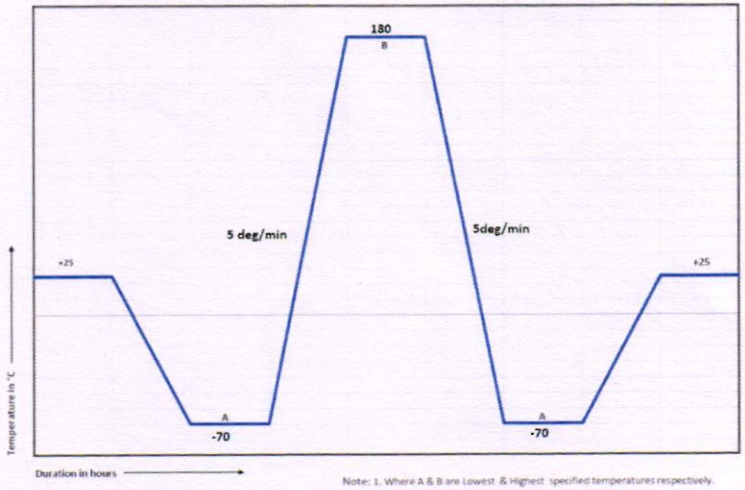
S.No.	Parameters	SERC Requirements
	BARE	
1.	Resonance test (Pre-signature)	1g Constant control. Frequency 5 Hz to 2500 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
2.	Operation at Maximum rated parameter	Max displacement, Max Velocity and Max Acceleration With frequency 5 Hz to 2500 Hz at sweep rate of 1 Oct/min, Multi point maximal Control at the armature top, Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage. Envelope plot given below. 
3.	Resonance test (Post signature)	1g Constant control. Frequency 5 Hz to 2500 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.

S.No.	Parameters	SERC Requirements
4.	Diaphragming and Cross axis response test	5g Constant control from 5 to 2500 Hz with required slopes for Displacement and velocity, with sweep rate of 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
5.	Noise measurement on armature top	With amplifier Set to 100% gain and zero input signal Measure accelerometer output at the armature top for 5 Hz to 20kHz analysis range. (Expected level< 0.2g)
6.	Low g sine test	Constant input acceleration level of 0.3g Frequency 5 Hz to 2500 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
7.	Random rating test	(20-100Hz:6dB/Oct, 100-2500Hz: flat PSD to obtain the max rms acceleration) Multi point maximal Control at armature top Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
8.	Low g -rms random test	Flat PSD from 20 Hz to 2500 Hz 0.3grms test level. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.

S.No.	Parameters	SERC Requirements
9.	Shock Test	50 g, 10 ms half sine with 10% pre and post pulse Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
10.	Resonance test (Post signature)	1g Constant control. Frequency 5 Hz to 2500 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
11.	Wave form distortion tests	With input of 1g between 5 Hz to 100 Hz The THD should be ≤10% between 5Hz – 100Hz THD computation should be carried as per ISO
	LOAD TEST (With payload mass 2 times weight of armature, to be arranged by Bidder)	
12.	Resonance test (Pre signature)	1g Constant control. Frequency 5 Hz to 2000 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
13.	Sine test	Max displacement, max velocity and max acceleration to achieve max sine force rating of the shaker. Multi point maximal Control Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Frequency 5 Hz to 2000 Hz at 1 Oct/ min. Plot Drive, O/P current, and O/P voltage. Check waveform distortion of accelerometer output and Amplifier output using Digital data acquisition system. Acceleration limited to maximum force rating of shaker.

S.No.	Parameters	SERC Requirements
14.	Random test	20-100Hz: 6dB/Oct, 100-2000Hz: flat PSD for full random force rating. Multi-point maximal Control Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot acceleration, Drive, O/P current and O/P voltage.
15.	Endurance test	Shaker should run continuously for 1 hour with maximum displacement, maximum velocity, Acceleration limited to maximum force rating of shaker. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Multi point maximal Control. Plot acceleration, Drive, O/P current and O/P voltage.
16.	Resonance test (Post signature)	1g Constant control. Frequency 5 Hz to 2000 Hz at 1 Oct/min. Control at center of armature. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
	SLIP TABLE	
17.	Resonance test (Pre signature)	1g Constant control. Frequency 5 Hz to 2000 Hz at 1 Oct/min. Control at slip table end along shaker axis Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
18.	Operation at Maximum rated parameter	Max displacement, Max Velocity and Max Acceleration with frequency 5 Hz to 2000 Hz at sweep rate of 1 Oct/min. Control at slip table end along shaker axis Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.

S.No.	Parameters	SERC Requirements
19.	Cross-axis response test	5g Constant control from 5 to 2000 Hz with required slopes for Displacement and velocity Control at slip table end along shaker axis. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations.
20.	Resonance test (Post signature)	1g Constant control. Frequency 5 Hz to 2000 Hz at 1 Oct/min. Control at slip table end along shaker axis. Measurement at four points in outer most PCD/grid point 90^0 apart along mutually perpendicular directions Plot response accelerations for all three axes at locations. Plot Drive, O/P current, and O/P voltage.
	POWER AMPLIFIER	
21.	Noise measurement	Bare table With amplifier Set to 100% gain and zero input signal Measurement of output voltage and current with input shorted and amplifier set to 100% gain
22.	Wave form distortion tests	**Test-A** With an acceleration of 1g on armature bare table top between 5 Hz to 100Hz record output voltage and current wave forms. **Test-B** Record output voltage and current waveforms for • Maximum displacement sine dwell • Maximum velocity sine dwell • Maximum acceleration sine dwell
23.	Shaker system interlocks	Over travel limit by test Cooling unit flow switch Temperature switch Field power supply Emergency Abort switches
	ENVIRONMENTAL/ CLIMATIC CHAMBER	
24.	Tolerance	Check has to be done to know whether the Environmental/ Climatic chamber achieves and maintains the required condition within specified tolerance limits
25.	Humidity and temperature measurement	-70^0C to $+180^0$C & 10% to 95% RH

S.No.	Parameters	SERC Requirements
26.	Typical load test	Calibration of the chamber with a typical load
27.	Repeatability	Demonstrate repeatability of conditions (temperature and humidity) in the chamber during the test
28.	Test profile	Replicate acceptance test profile for high and low-temperature test as given below Replicate profile for combined temperature and Humidity test as per the specifications  Note: 1. Where A & B are Lowest & Highest specified temperatures respectively. 2. Ramp rates will be as mentioned in Scope of Supply. 3. Dwell or soak time is limited to 1 hr. 4. Number of cycles are limited to 2.

Stores & Purchase Officer 5/8/24
(For & Behalf of CSIR-INDIA)

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