

# DEPARTMENT OF MECHANICAL ENGINEERING

## Indian Institute of Science (IISc), Bangalore, INDIA

### Tender Notice

**Tender Notification Ref No.: SID/ME/ENQ/TNDR/PK/21-22/02 Date: 20<sup>th</sup> Sept 2021**

The Department of Mechanical Engineering, Indian Institute of Science Bangalore, invites tenders for supply of “**High-temperature vacuum hot press**”. This Invitation for Bids is open to all domestic (India based) manufacturers, Indian OEM or its authorized Indian distributors only.

The scope of bid includes **Design, fabrication, testing, supply, installation, commissioning, and demonstration of high temperature vacuum hot press.**

#### Tender Summary

1.	Tender Number	SID/ME/ENQ/TNDR/PK/21-22/02
2.	Tender Date	20 <sup>th</sup> September 2021
3.	Item Description	High-temperature vacuum hot press
4.	Tender Type	Two bid system: (a) Technical Bid (Part A) (b) Commercial Bid (Part B)
5.	Place of tender submission	Dr. Pramod Kumar Dept. of Mechanical Engineering, Indian Institute of Science, Bengaluru, Karnataka, India 560 012
6.	Last Date & Time for submission of tender	26 <sup>th</sup> September 2021; 5:00 PM

#### To whom it may concern

This is a Request for quote (RFQ) from Indian Agencies for design, fabrication, testing, supply, installation, commissioning, and demonstration of “**High-temperature vacuum hot press**” at the “Department of Mechanical Engineering, 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 4th 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 26th September 2021 by 5:00 PM. Proposals should arrive at the office of **The Chief Executive, SID, Indian Institute of Science, Bangalore, Karnataka 560012, India.**

Direct all questions concerning the acquisition to addresses to Dr. 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 "High-temperature vacuum hot press" 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. Vendors are encouraged to highlight the advantage of their High-temperature vacuum hot press over comparable High-temperature vacuum hot press from the competitors.
14. If needed, a meeting for any technical clarifications can be scheduled with the undersigned by sending an email.
15. **Should the bidder need extension to submit the tender, the same must be requested to Dr. Pramod Kumar, Associate Faculty, Mechanical Engineering department and Mr. Manjunathan, Manager Finance, SID via written e-mail to the following mail address: [pramod@iisc.ac.in](mailto:pramod@iisc.ac.in), [manjunathanm@iisc.ac.in](mailto:manjunathanm@iisc.ac.in)**
16. 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.
17. 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.
18. Terms and conditions for the annual maintenance contract beyond the warranty period should be mentioned.
19. After the award of purchase order, the vendor must provide an Order Acknowledgement within 30 days from the receipt of the Purchase Order.
20. 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.

Description	Specification
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<b>1. Furnace Chamber</b>	
1.1. Design specifications	
1.1.a. Furnace type	Resistance heating, All metal heating zone
1.1.b. Type of design	Horizontally mounted, front loading and rear service door, no. of ports of different size for intended usage.
1.1.c. Vacuum Chamber Type	<ul style="list-style-type: none"> <li>• Cylindrical, water cooled. Appx. 1.5mtr dia inner, 1.5mtr long, Stainless Steel-304L moc, Inner shell 12mm thickness, Outer jacket 6mm thickness.</li> <li>• Front &amp; rear doors are hinged and flange sealing by quick c-clamp for front door and bolted for rear door.</li> <li>• Vacuum seals : Viton O-rings/gaskets.</li> </ul>
1.1.d. Material of construction for Furnace	Stainless steel-304L
1.1.e. Maximum Job weight	200 kgs
1.1.f. Loading trolley	Semi-automatic loading trolley for loading and unloading the Job into the furnace.
1.2. Hot Zone details	
1.2.a. Effective hot zone (maximum Dimensions of the job to be accommodated)	630mm(w) x 630mm(d) x 630mm(h)
1.2.b. Total hot zone	Actual 700mm(w) x 700mm(d) x 830mm(h)
1.2.c. Maximum operating temperature	1450°C
1.2.d. Design temperature	1600°C
1.2.e. Heating rate (° C/min)	1 °C to 15 °C / min (Programmable)
1.2.f. Temperature uniformity	± 5°C in hot zone above 600 °C
1.2.g. Heating elements	MLS (Lanthanum doped moly stress relieved) rod or multi strand wire type
1.2.h. Heater power supply	<ul style="list-style-type: none"> <li>• Appx.360KVA</li> <li>• Appx.:120KVA/Zone</li> <li>• Number of Heating Zones :Three</li> </ul>
1.2.i. Insulation	Molybdenum and stainless-steel radiation shields on all sides surrounding the work piece
<b>2. Vacuum pumping system</b>	
2.1. Vacuum specification	
2.1.a. Ultimate Vacuum	5x10 <sup>-6</sup> mbar

2.1.b. Total leak rate	$\leq 1 \times 10^{-3}$ mbar ltr/sec
2.1.c. Individual leak rate	$\leq 3 \times 10^{-9}$ mbar ltr/sec
2.2. Pumping speed	
2.2.a. Diffusion pump	12,000 ltrs/sec
2.2.b. Roots pump	2500 m <sup>3</sup> /hr
2.2.c. Rotary pump	250 m <sup>3</sup> /hr
2.2.d. Turbomolecular (Optional to be quoted)	
2.3. Vacuum measurement	
2.3.a. Pirani Gauge	
<ul style="list-style-type: none"> <li>➤ Measuring range</li> <li>➤ Response time</li> <li>➤ Quantity</li> </ul>	1 x 10 <sup>-3</sup> milli bar to 999 milli bar. 200 milli sec 2 nos
2.3.b. Penning Gauge	
<ul style="list-style-type: none"> <li>➤ Measuring range</li> <li>➤ Response time</li> <li>➤ Quantity</li> </ul>	5 x 10 <sup>-3</sup> milli bar to 1 x 10 <sup>-8</sup> milli bar 0.5 sec 1 nos
2.3.c. Dial Gauge	
<ul style="list-style-type: none"> <li>➤ Type</li> <li>➤ Measuring range</li> <li>➤ Quantity</li> </ul>	6" compound pressure dial gauge -1 to +2 bar 1 nos
<b>3. Hydraulic press</b>	
3.1. Press capacity of cylinder	200 Tons (Note: Cylinder should be designed for 400 Tons)
3.2. No. of Cylinders (Top + Bottom Ram)	2nos
3.3. Ram Stroke (Top)	300 mm
3.4. Ram Stroke (Bottom)	300 mm
3.5. Load cell accuracy (attached to the bottom ram)	$\pm 0.03\%$ of the measured weight of the pressing force
3.6. Approach speed (top ram)	<ul style="list-style-type: none"> <li>• Fast down speed:5 mm/sec</li> <li>• Pressing speed:1mm /sec</li> <li>• Return up speed:6 mm/sec</li> </ul>
3.7. Approach speed (bottom ram)	<ul style="list-style-type: none"> <li>• Fast up speed:5 mm/sec</li> <li>• Pressing speed:1 mm/sec</li> <li>• Return down speed:6 mm/sec</li> </ul>
<b>4. Platen</b>	
<b>Option-1:</b> 4.1. Platen MOC (Top and bottom)	High density graphite with Molybdenum lining plate ~5mm thickness.
<b>Option-2</b> 4.2. Platen MOC (Top and bottom)- <u>Optional to be quoted</u>	TZM platen

<b>5. Gas cooling system</b>	
5.1. Argon Gas, pressure	1.4 bar. absolute (1400 mbar. absolute)
5.2. Cooling temperature	From 1450 °C to 200 °C Cooling rate : 25-30Deg.C
5.3. Heat Exchanger type	Finned tube , copper fins and SS304L tubes/pipes
5.4. Argon pumping system	<ul style="list-style-type: none"> <li>• Blower fan coupled to a canned motor. Motor rating as per design</li> <li>• Gas plenums / nozzles for closed loop gas circulation</li> </ul>
<b>6. Control Instrumentation and software</b>	
6.1. Temperature control	
6.1.a. Digital temperature programmer and control	
6.1.b. Over temperature controller to be provided with a relay output which must be interlocked with furnace power supply, which cuts off the power supply to the furnace heater if reached beyond set point	
6.1.c. R-Type thermocouples of <b>quantity 2 nos</b> to be provided for temperature measurement and control up to 1600 °C	
6.1.d. The furnace to be equipped with programmable infrared temperature measurement and controller from 1000 °C to 1600 °C	
6.2. Control system	
6.2.a. Siemens/Allen Bradley make PLC for auto operation of vacuum cycle, temperature cycle and press operation.	
6.2.b. Siemens/Allen Bradley make SCADA software with 10.5 inch or larger industrial touchscreen display	
6.2.c. PLC Control software should store and retrieve previous data	
6.3. Control cabinet	
6.3.a. Mild steel cabinet, with powder coating of RAL 7035 (Rittal Make)	
6.3.b. PLC, temperature programmer controller, over temperature controller, gas pressure indicators and all electrical switch gear (transformers, contactors, relays, fuses, timers etc to be installed in the cabinet	
6.3.c. Control cabinet to be fully wired to operate 415V AC, 3 phase, 50Hz with power neutral and ground connection	
6.3.d. Cabinet to be provided with complete control wiring and interlocks with audio visual alarm	
6.3.e. Cabinet to be actively cooled by air conditioner	
6.3.f. To be equipped with Digital Multifunction Panel Meter (Voltage/Current/Power Meter) indicator with mains ON-OFF contactor, manual override switch and emergency push button and other safety equipment as deemed necessary by the manufacturer	
6.3.g. Shall have suitable MCCB as incomer, MCCB with trip option for control	

<p>circuit etc with twice the capacity of load (Schneider/Siemens/ABB) .</p>
<p>6.3.h. Shall be provided with double earthing interconnections with suitable copper cables/wires with Earth Bus with all terminations and connections coming to Earth Bus.</p>
<p>6.3.i. All copper cables/wires shall be of minimum twice the capacity of the furnace electrical load.</p>
<p>6.3.j. The vendor shall also supply a 4 core copper cable of 15 meter long for incoming power including incoming earth connections (Lapp Make).</p>

**Other Requirements:**

1	Specify suitable or required tools for the product, if any.
2	Please provide Assembly and maintenance instruction documents.
3	Please provide the performance certificates ensuring the integrity and quality of the components.
5	Should include the cost of shipping to IISc.
6	Provide list of acceptance tests for on-site (vendor) inspection.
7	The payment terms will be specified in the commercial proposal and is subject to negotiations.
8	Please provide details of the number of trained personnel in India, number in southern region or in Bangalore who can service the instrument.
9	The order should be completed within 16-24 weeks from the date of release of the Purchase Order.
10	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.
11	Additional Warranty to quoted separately.
12	AMC for 5 Years (Optional to be quoted).

Note: 1) Approval of all the drawings must be taken prior to start of manufacturing.

2) Approval for Make of all bought out items/instruments etc before procurement.

**Supply and Commissioning Requirements:**

1	Pre-dispatch inspection and testing in presence of IISc/ADA personnel
2	Installing commissioning and demonstration of the complete system must be done at IISc, Bangalore
3	Training on operation and troubleshooting of the complete vacuum system must be provided at IISc, Bangalore

**Test Certificate:**

The following certificates to be provided prior to dispatch

- a) Calibration certificate for the temperature sensor
- b) Transformer test report
- c) Material test certificate from approved Government Laboratory
- d) X-Ray, weld test report and dimensional check report
- e) Temperature control test report
- f) Power controller performance test report
- g) Heater performance evaluation
- h) Furnace calibration report
- i) Operation, maintenance and service manuals

**Inspection and Acceptance**

- a) The vendor shall provide general assembly drawing of the high temperature vacuum hot press indicating the location of each component and detail drawing of all components along with their catalogues for approval before commencement of work.
- b) The high temperature vacuum hot press would be inspected by IISc representatives before dispatch to IISc, Bengaluru. The vendor shall arrange for demo of the high temperature vacuum hot press operation as per specification with and without furnace load.
- c) The vendor shall dispatch and commission the test facility at IISc, Bengaluru and train three personnel for its operation and maintenance, for 3 days.



## Annexure-I

**Note:** Compliance Certificate must be enclosed with the Technical bid. Non submission of Compliance Certificate will lead to disqualification of the bidder.

Description	Specification	Comply	Non comply	Deviation	Remarks
<b>1. Furnace Chamber</b>					
1.1. Design specifications					
1.1.a. Furnace type	Resistance heating, All metal heating zone				
1.1.b. Type of design	Horizontally mounted, front loading and rear service door, no. of ports of different size for intended usage.				
1.1.c. Vacuum Chamber Type	<ul style="list-style-type: none"> <li>Cylindrical, water cooled. Appx. 1.5mtr dia inner, 1.5mtr long, Stainless Steel-304L moc, Inner shell 12mm thickness, Outer jacket 6mm thickness.</li> </ul>				
	<ul style="list-style-type: none"> <li>Front &amp; rear doors are hinged and flange sealing by quick c-clamp for front door and bolted for rear door.</li> </ul>				
	<ul style="list-style-type: none"> <li>Vacuum seals : Viton O-rings/gaskets.</li> </ul>				

1.1.d. Material of construction for Furnace	Stainless steel-304L				
1.1.e. Maximum Job weight	200 kgs				
1.1.f. Loading trolley	Semi-automatic loading trolley for loading and unloading the Job into the furnace.				
1.2. Hot Zone details					
1.2.a. Effective hot zone (maximum Dimensions of the job to be accommodated)	630mm(w) x 630mm(d) x 630mm(h)				
1.2.b. Total hot zone	Actual 700mm(w) x 700mm(d) x 830mm(h)				
1.2.c. Maximum operating temperature	1450°C				
1.2.d. Design temperature	1600°C				
1.2.e. Heating rate (° C/min)	1 °C to 15 °C / min (Programmable)				
1.2.f. Temperature uniformity	± 5°C in hot zone above 600 °C				
1.2.g. Heating elements	MLS (Lanthanum doped moly stress relieved) rod or multi strand wire type				

1.2.h. Heater power supply	<ul style="list-style-type: none"> <li>• Appx.360KVA</li> </ul>				
	<ul style="list-style-type: none"> <li>• Appx.:120KVA/Zone</li> </ul>				
	<ul style="list-style-type: none"> <li>• Number of Heating Zones :Three</li> </ul>				
1.2.i. Insulation	Molybdenum and stainless-steel radiation shields on all sides surrounding the work piece				
<b>2. Vacuum pumping system</b>					
2.1.Vacuum specification					
2.1.a. Ultimate Vacuum	$5 \times 10^{-6}$ mbar				
2.1.b. Total leak rate	$\leq 1 \times 10^{-3}$ mbar ltr/sec				
2.1.c. Individual leak rate	$\leq 3 \times 10^{-9}$ mbar ltr/sec				
2.2. Pumping speed					
2.2.a. Diffusion pump	12,000 ltrs/sec				
2.2.b. Roots pump	2500 m <sup>3</sup> /hr				
2.2.c. Rotary pump	250 m <sup>3</sup> /hr				
2.2.d. Turbomolecular (Optional to be quoted)					
2.3. Vacuum measurement					
2.3.a. Pirani Gauge					

➤ Measuring range	1 x 10 <sup>-3</sup> milli bar to 999 milli bar.				
➤ Response time	200 milli sec				
➤ Quantity	2 nos				
2.3.b. Penning Gauge					
➤ Measuring range	5 x 10 <sup>-3</sup> milli bar to 1 x 10 <sup>-8</sup> milli bar				
➤ Response time	0.5 sec				
➤ Quantity	1 nos				
2.3.c. Dial Gauge					
➤ Type	6" compound pressure dial gauge				
➤ Measuring range	-1 to +2 bar				
➤ Quantity	1 nos				
<b>3. Hydraulic press</b>					
3.1. Press capacity of cylinder	200 Tons (Note: Cylinder should be designed for 400 Tons)				
3.2. No. of Cylinders (Top + Bottom Ram)	2nos				
3.3. Ram Stroke (Top)	300 mm				
3.4. Ram Stroke (Bottom)	300 mm				

3.5. Load cell accuracy (attached to the bottom ram)	±0.03% of the measured weight of the pressing force				
3.6. Approach speed (top ram)	• Fast down speed:5 mm/sec				
	• Pressing speed:1mm /sec				
	• Return up speed:6 mm/sec				
3.7. Approach speed (bottom ram)	• Fast up speed:5 mm/sec				
	• Pressing speed:1 mm/sec				
	• Return down speed:6 mm/sec				
<b>4. Platen</b>					
<b>Option-1:</b>	High density graphite with Molybdenum lining plate ~5mm thickness.				
4.1. Platen MOC (Top and bottom)					
<b>Option-2</b>	TZM platen				
4.2. Platen MOC (Top and bottom)- <u>Optional to be quoted</u>					
<b>5. Gas cooling system</b>					
5.1. Argon Gas, pressure	1.4 bar. absolute (1400 mbar. absolute)				
5.2. Cooling temperature	From 1450 °C to 200 °C				
	Colling rate : 25-30Deg.C				
5.3. Heat Exchanger type	Finned tube , copper fins and SS304L tubes/pipes				

5.4. Argon pumping system	<ul style="list-style-type: none"> <li>Blower fan coupled to a canned motor. Motor rating as per design</li> </ul>				
	<ul style="list-style-type: none"> <li>Gas plenums / nozzles for closed loop gas circulation</li> </ul>				
<b>6. Control Instrumentation and software</b>					
6.1. Temperature control					
6.1.a. Digital temperature programmer and control					
6.1.b. Over temperature controller to be provided with a relay output which must be interlocked with furnace power supply, which cuts off the power supply to the furnace heater if reached beyond set point					
6.1.c. R-Type thermocouples of <b>quantity 2 nos</b> to be provided for temperature measurement and control up to 1600 °C					
6.1.d. The furnace to be equipped with programmable infrared temperature measurement and controller from 1000 °C to 1600 °C					
6.2. Control system					
6.2.a. Siemens/Allen Bradley make PLC for auto operation of vacuum cycle, temperature cycle and press operation.					
6.2.b. Siemens/Allen Bradley make SCADA software with 10.5 inch or larger industrial touchscreen display					
6.2.c. PLC Control software should store and retrieve previous data					
6.3. Control cabinet					

6.3.a. Mild steel cabinet, with powder coating of RAL 7035 (Rittal Make)				
6.3.b. PLC, temperature programmer controller, over temperature controller, gas pressure indicators and all electrical switch gear (transformers, contactors, relays, fuses, timers etc to be installed in the cabinet				
6.3.c. Control cabinet to be fully wired to operate 415V AC, 3 phase, 50Hz with power neutral and ground connection				
6.3.d. Cabinet to be provided with complete control wiring and interlocks with audio visual alarm				
6.3.e. Cabinet to be actively cooled by air conditioner				
6.3.f. To be equipped with Digital Multifunction Panel Meter (Voltage/Current/Power Meter) indicator with mains ON-OFF contactor, manual override switch and emergency push button and other safety equipment as deemed necessary by the manufacturer				
6.3.g. Shall have suitable MCCB as incomer, MCCB with trip option for control circuit etc with twice the capacity of load (Schneider/Siemens/ABB) .				
6.3.h. Shall be provided with double earthing interconnections with suitable copper cables/wires with Earth Bus with all terminations and connections coming to Earth Bus.				
6.3.i. All copper cables/wires shall be of minimum twice the capacity of the furnace electrical load.				
6.3.j. The vendor shall also supply a 4 core copper cable of 15 meter long for incoming power including incoming earth connections (Lapp Make).				

## **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 Chief Executive, SID, 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]