



Date:	16/09/2022
Quotation due date:	30/09/2022

To Whom It May Concern

Limited Tender for a High temperature 3 zone horizontal tube furnace

This is an RFQ (Request for Quote) for procurement of a High temperature 3 zone horizontal tube furnace at IISc (semiconducting equipment), Bangalore.

CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. Consequently, any tool in CeNSE receives significant exposure to scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure in to their quotes.

<http://nnfc.cense.iisc.ac.in/>

<http://www.mncf.cense.iisc.ac.in/>

<https://www.inup.cense.iisc.ac.in/>

Procedure

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate sealed envelopes**. Only vendors who meet the technical requirement will be considered for the commercial negotiation.
2. **The deadline for submission of proposals is the Date and Time Indian Standard Time.** Proposals should arrive at the Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bangalore 560012, India, by the above deadline.
3. The decision of purchase committee will be final.
4. The technical proposal should contain a compliance table with 5 columns. The first column must list the technical requirements, in the order that they are given in the technical configuration below. The second column should describe your compliance in a “Yes” or “No” response. If “No” the third column should provide the extent of the deviation (please provide quantitative responses). The fourth column



- should state the reasons for the deviation, if any. The fourth column can be used to compare your tool with that of your competitors or provide details as requested in the technical requirements table below.
5. Any additional capabilities or technical details, that you would like to bring to the attention of the purchase committee, can be listed at the end of the technical table.
 6. Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors.
 7. If multiple systems can fulfill the requirements, vendors can submit multiple bids.
 8. In the commercial bid, please provide itemized cost of the system and required accessories, such as software, power supply, etc.
 9. As an option, please provide itemized cost for any suggested accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the tool. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.
 10. The quotes should include all charges for door delivery.
 11. Please indicate the warranty provided with the tool. **Warrant of 2 years** are preferred.
 12. Provide itemized cost for required spares for 2 years of operation. For sake of this calculation, the vendor may assume active tool usage of 20 hours/ week. This number will be used to estimate the life cycle cost of the tool.
 13. If maintenance requires, as an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post warranty. The **AMC must cover 2 scheduled and 2 emergency visits per year**. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.
 14. Also include CIP/CIF charges, customs duty (exemptions, if any) and IGST charges.
 15. The **RFQ must include references of minimum 5 previous installations, preferable in India**. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
 16. Any technical questions can be directed to Prof. Pavan Nukala, CeNSE, IISc., Bengaluru (pnukala@iisc.ac.in) and Prof. Srinivasan Raghavan, CeNSE, IISc., Bengaluru (sraghavan@iisc.ac.in).

Technical Requirement		
I. Annealing process using 1800 °C single zone horizontal tube furnace.		
1.	Temperature	<ul style="list-style-type: none"> Maximum continuous operation temperature: 1700 °C and Maximum operating temperature: 1800 °C.
2.	Furnace construction /design	<ul style="list-style-type: none"> High temperature tube furnace designed for horizontal mode operation. Rectangular housing with holes for convection cooling. Furnace with separate control box with 3 m cable, plug and socket.
3.	Heating elements	<ul style="list-style-type: none"> MoSi₂ heating elements installed in rectangular housing and hanging vertically that can be easily replaced.
4.	Heating zones	<ul style="list-style-type: none"> Single Zone.
5.	Heating and Colling rates	<ul style="list-style-type: none"> Heating: Minimum 0.5 °C and Maximum 5 °C Cooling: Gradual cooling down
6.	Insulation	<ul style="list-style-type: none"> Low thermal mass ceramic fibre insulation. High grade insulation material with low thermal conductivity consisting of ceramic fibre inner insulation, ceramic fibre case insulation and ceramic fibre end insulation. Installed in a rectangular housing to provide low energy consumption and high heating rates.
7.	Configuration	<ul style="list-style-type: none"> Horizontal mode
8.	Thermocouple	<ul style="list-style-type: none"> High grade type B thermocouple.
9.	Over Temperature Protection Control	<ul style="list-style-type: none"> Over Temperature Protection Control to protect load or furnace during unattended operation.
10.	Programmable temperature controller	<ul style="list-style-type: none"> Colour Touch screen controller offering Setpoint control, Program profile control, 10 unique program profiles saved in memory, 24 segments per unique program, ethernet communication, Panel mounted USB socket, Data logging to a USB memory stick in a .csv file format, Real time clock, Program schedule start, Program status indication with

		estimate end time & date, 2 Events indication, Control power indication, User level security, Single point temperature calibration that can be set as ramp, step or dwell and can be configured to control relays.
11.	Heated length	<ul style="list-style-type: none"> • Heated tube maximum length upto (mm): 300. • Uniform length $\pm 5^{\circ}\text{C}$ (mm): 150.
12.	Dimensions	<ul style="list-style-type: none"> • Furnace external dimensions: H x W x D (mm): $600 \pm 20 \times 600 \pm 20 \times 500 \pm 20$ and weight ≤ 65 kg • Control module dimensions H x W x D in mm: $850 \pm 10 \times 550 \pm 10 \times 500 \pm 10$ and weight ≤ 150 kg.
13.	Work tube package for operation of the furnace in inert atmosphere	<ul style="list-style-type: none"> • Recrystallised Alumina (C799) material work tube with 70 mm outer diameter, 60 mm inner diameter & 1115 mm length. • Radiation shields – 2 Nos. • A set of two insulation plugs. • Insulation sleeves – 2 Nos. • Water cooled high vacuum flanges • Furnace mounted flange holders • Inert gas inlet valve • Flowmeter (argon 2 -20 litres per hour) – 1 No. • Over pressure valve. • Insulation plugs – 2 Nos.
14.	Power supply and maximum power (W)	<ul style="list-style-type: none"> • Three phase, 6400 W
15.	Warranty	<ul style="list-style-type: none"> • 24 months from the date of commissioning and acceptance of equipment.
II. Chemical Vapour Transport (CVT) process using 1200 Degrees C, Three zone Gradient horizontal split tube furnace		
16.	Temperature	<ul style="list-style-type: none"> • Maximum Temperature: 1200°C. Maximum continuous operating temperature: 1100°C.

17.	Heating elements	<ul style="list-style-type: none"> High quality heating elements with excellent and unsurpassed temperature uniformity along the entire heated length. Fast heat-up and cool-down rates.
18.	Insulation	<ul style="list-style-type: none"> High quality thermal insulation
19.	Heating zones	<ul style="list-style-type: none"> Three independently handling Zone.
20.	Heated zones and unheated zones	<ul style="list-style-type: none"> Three 150 mm long heated zones and two 75 mm long unheated zone barriers.
21.	Heating and Colling rates	<ul style="list-style-type: none"> Heating: Minimum 0.5 °C and Maximum 5 °C Cooling: Gradual cooling down
22.	Furnace type and dimensions	<ul style="list-style-type: none"> Compact, horizontal and split type. Furnace body is split into two halves and hinged at the rear; pneumatic dampening struts at either end provide a smooth opening action. Furnace body dimensions: H x W x D in mm $575 \pm 20 \times 800 \pm 20 \times 500 \pm 20$. Control module dimensions: $225 \pm 20 \times 800 \pm 20 \times 500 \pm 20$. Weight of the furnace: Approximately 55 kg
23.	Furnace design and configuration	<ul style="list-style-type: none"> Flexible design to use a variety of tube diameters with the use of tube adapters. Specifically designed to provide a temperature gradient along the length of the three heated zones. Tube furnace mounted on top of the control box. The furnace body to be easily detached and separated for remote operation. Configuration to include a 2metre cable (including plug and socket) between the furnace body and control box.
24.	Temperature controllers and thermocouples.	<ul style="list-style-type: none"> Programmable temperature controllers to be fitted in three heated zones – 3 Nos. One programmable temperature controller and one thermocouple to be fitted in each heated zone. Programmable temperature controller with 1 program and 24 segments. Each segment can be set as ramp, step or dwell and can be configured to control two relays.

		<ul style="list-style-type: none"> Ethernet communication is fitted as standard and certified for cybersecurity communications robustness.
25.	Temperature Gradients	<ul style="list-style-type: none"> Zone 1: 1100 °C, Zone 2: 950 °C, Zone 3: 800 °C. Zone 1: 1100 °C, Zone 2: OFF, Zone 3: 400 °C. Above temperature gradients are to be achieved in 3 zone gradient tube furnace and graphical documentation confirming above data to be produced along with technical literature.
26.	Heating elements	<ul style="list-style-type: none"> Wire elements in high quality vacuum formed insulation ensure fast heat up, excellent temperature control and short cool down times.
27.	Over Temperature Protection Controller	<ul style="list-style-type: none"> Digital over-temperature protection controllers fitted in all three zones of the furnace. Includes three independent thermocouples fitted in all the three zones.
28.	Work tube package for operation in inert atmosphere	<p>Work tube package for operation of the furnace in inert atmosphere consisting of following items to be included in the furnace.</p> <ul style="list-style-type: none"> Quartz work tube with 60 mm outer diameter, 55 mm inner diameter & 1050 mm length. Insulation plugs – 2 Nos. Work tube end seals: Gas inlet/outlet pipe – 1 No. Gas inlet/outlet pipe + thermocouple gland – 1 No. Probe thermocouple access up to 1200°C: Probe thermocouple gland complete with type N thermocouple.
29.	Standard inert gas package for operation in inert atmosphere.	<ul style="list-style-type: none"> Gas inlet = 6 mm outside diameter push in fitting Manual on/off ball valve Pressure relief valve Pressure gauge Flow meter with flow adjustment knob Non-return valve

		<ul style="list-style-type: none"> Fitting and pipe to connect an additional inert gas package. Gas outlet = 6 mm braided hose with 6 mm union
30.	Tube guards and tube supports	<ul style="list-style-type: none"> Guards and horizontal tube support for extended length work tube for operation in inert gas operation – 1 set.
31.	Max power (W)	<ul style="list-style-type: none"> Single Phase \leq 2000 W
32.	Warranty	<ul style="list-style-type: none"> 24 months from the date of commissioning and acceptance of equipment.
33.	Eligibility Criteria	<ul style="list-style-type: none"> The bidder must have supplied minimum three 1800 °C horizontal tube furnaces and three 1200 °C gradient tube (CVT) furnaces to IITs, IISERs, NITs, Government Institutes, Reputed Process Industries/ Research Institutes preferably in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently. Equipment offered must be a model from the current serial production range of the manufacturer. Customized or One-off Manufactured Model will not be accepted. Offer should be supported with printed catalogue & depiction on company website. System Catalogue should be produced with the Technical Bid. PO copies to be submitted as proof. Manufacturers are requested to provide ISO certificate and Declaration on CE Conformity with minimum 3 valid directives. (The certificates need to be uploaded/submitted in the Statutory Cover.) CE Certification must be provided for the proposed system. The CE certificate should be provided with the Unit. Supplier should support the user with all the spares for a minimum period of 10 years. Details of experienced service engineer including contact detail should be provided in tender document. Supplier should mention the details of



		<p>service setup and man powers who are responsible for after sales support. Response time should be within 24 hrs.</p> <ul style="list-style-type: none">• Up to date sales tax clearance certificate.
--	--	---

Thanking you,

Pavan Nukala