

Date: 09/12/2025

**Minutes of Pre-Bid Meeting**

फाइल क्र.: PUR/EQP/82/(2025-26)

**विषय: Design and Fabrication of Czochralski Single Crystal Growth System.**

A Pre-bid meeting regarding the procurement of instrument was held on 09/12/2025 from 11.00 AM onwards in Saranjamshala.

The following committee members have attend the meeting:

1. Dr. Mohd. Akram Khan, Chief Scientist, Head EESD
2. Dr. Rajesh Patidar, Principal Scientist, Chairman TSC
3. Mr. Nikhil Rajendra Gorhe, Principal Scientist, Member TSC
4. Dr. Mohd Shafeeq M, Senior Technical Officer II, Member TSC
5. Dr. Vandana, Sr. Principal Scientist & PI, Domain expert
6. Dr. Shabi Thankaraj Salammal, Principal Scientist, Indenter


Only Mr. Aadil Khan and Mr. Aakash Abrol from M/s ETL Industrial Heating Systems, Bhopal has attend the pre-bid meeting:

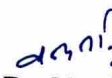
During the pre-bid meeting, firms raised the following queries that have been replied by the committee member:


S/No.	Annexure Points	Request for amendment	Response
1	-	No tolerance is given in the technical specification such as travel length, chamber dimension, pulling rate. etc	Agreed and tolerances are included throughout the specifications wherever required.
2	Point Number 7: Qualification criteria	Proven expertise in manufacturing single crystal growth systems under high vacuum ( $10^{-4}$ mbar)/ high-vacuum hot presses/ high-vacuum stirrers to be made mandatory as the vacuum leak expected through vacuum seal during pulling along with rotation.	Agreed and the qualification criteria was modified as follows: 1. The firm should have prior experience in making single crystal growth systems under high vacuum ( $\geq 10^{-3}$ mbar) or high-vacuum hot presses ( $\geq 10^{-3}$ mbar) or high-vacuum stirrers ( $\geq 10^{-3}$ mbar). Relevant Indian state government/central government/PSUs work order/PO to be enclosed. The operating

			<p>temperature of those systems to be <math>\geq 1000^{\circ}\text{C}</math>.</p> <p>2. No exemption/relaxations will be given in the qualification criteria to MSME's and startup's as this equipment will have high temperature and high vacuum system and safety related issues with public safety, health and its operation.</p>
--	--	--	--

Other Technical Specifications and terms and conditions of the tender document will remain the same.


  
 Dr. Shabi Thankaraj Salammal  
 (Indenter)

  
 Dr. Vandana  
 (Internal Domain Expert)

  
 Dr. Mohd. Akram Khan  
 (HOD)

  
 Dr. Mohd. Shafeeq M  
 (Member)

  
 Mr. Nikhil Rajendra Gorhe  
 (Member)

  
 Dr. Rajesh Patidar  
 (Chairman, TSC)

**Annexure -II**

**Revised Specification after pre-bid held on 09/12/2025**

**Design and Fabrication of Czochralski Single Crystal Growth System**

S.No.	Parameter	Technical Specification
1	Furnace	<ol style="list-style-type: none"><li>1. Number of zones : 2</li><li>2. Continuous operating temperature: 1550°C or more</li><li>3. ID of furnace : 20 cm <math>\pm</math> 1cm</li><li>4. Temperature accuracy: <math>\pm 0.5^\circ\text{C}</math> or less</li><li>5. Temperature controller type: PID (Branded)</li><li>6. To be controlled using: Thyristers (Branded)</li><li>7. Heating element: Graphite (suitable for vacuum)</li><li>8. Height of each zone: 20 cm <math>\pm</math> 5cm</li><li>9. Distance between the zone: 2cm <math>\pm</math> 0.5cm</li><li>10. Working atmosphere: <math>10^{-5}</math> to <math>10^{-6}</math> mbar vacuum and inert atmosphere (Ar or N<sub>2</sub>)</li><li>11. Thermocouple: B type</li><li>12. Additional B thermocouple to measure the seed temperature which has to move with the seed up and down</li></ol>
2	Crucible	<ol style="list-style-type: none"><li>1. Capable of making controlled wobble free rotation</li><li>2. Direction of rotation: both clockwise and anticlockwise directions.</li><li>3. Stepper motor controlled with gears/similar systems</li><li>4. RPM: 0.1 to 100 or wider</li><li>5. High-purity silicon within a fused quartz (SiO<sub>2</sub>)</li><li>6. Capacity: 1 kg (Silicon)</li><li>7. Quantity : 1</li><li>8. The crucible height to be adjustable for 15 cm <math>\pm</math> 1cm</li></ol>
3	Growth Chamber	<ol style="list-style-type: none"><li>1. Body: Water cooled and double jacketed corrosion resistant SS 304</li><li>2. Vacuum tight with double set of O-rings</li><li>3. Level of vacuum: <math>10^{-5}</math> to <math>10^{-6}</math> mbar</li><li>4. Inlet and outlet valve to be provided for inert gas purging and to grow crystals under various inert atmosphere</li><li>5. Glass viewing window (To observe melt, crystal growth and seed-melt interface during dipping): 2</li><li>6. Diameter of viewing window: 10 cm or wider</li><li>7. Chamber, doors and vacuum seals to be water cooled</li></ol>
4	Crystal Puller	<ol style="list-style-type: none"><li>1. Pulling rate: Variable from 50<math>\mu\text{m/hr}</math> to 1mm/hr or wider</li><li>2. Wobble free rotation</li><li>3. Direction of rotation will be with respect to the direction of pulling.</li><li>4. Controlled movement towards up and down.</li><li>5. Stepper motor/equivalent motor based pulling system with gears.</li><li>6. Travel length: 30 cm <math>\pm</math> 1 cm</li><li>7. Option to move entire pulling assembly 20cm <math>\pm</math> 1cm up and down to handle easily the seed crystals.</li></ol>



amc



21/12/2025



		8. Puller rod to be made of high temperature resistant steel with high alumina/graphite rod at the bottom (move inside furnace).
5	Gas and Pressure Control	<ol style="list-style-type: none"> <li>1. Solenoid based inlet and outlet valves to be provided to grow crystal under various inert ambient.</li> <li>2. A digital flow meter to be provided to control gas flow.</li> <li>3. Crystal growth pressure will be 2-5 bar.</li> </ol>
6	Vacuum system	<ol style="list-style-type: none"> <li>1. Should be made using the following pumps: Rotary oil pump: 500 L/min capacity or better Booster pump: <math>\geq 4000</math> L/min Diffusion pump (ID): 20 cm or wider</li> <li>2. Pirani (3 numbers) and penning gauges (one number) to be provided.</li> <li>3. Liquid nitrogen trap to be provided ahead of DP to avoid oil back-streaming.</li> <li>4. Level of vacuum <math>\approx 10^{-6}</math> mbar at the DP mouth.</li> <li>5. Chamber vacuum: <math>10^{-5}</math> mbar – <math>10^{-6}</math> mbar</li> </ol>
7	Qualification criteria	<ol style="list-style-type: none"> <li>1. The firm should have prior experience in making single crystal growth systems under high vacuum (<math>\geq 10^{-3}</math> mbar) or high-vacuum hot presses (<math>\geq 10^{-3}</math> mbar) or high-vacuum stirrers (<math>\geq 10^{-3}</math> mbar). Relevant Indian state government/central government/PSUs work order/PO to be enclosed. The operating temperature of those systems to be <math>\geq 1000^{\circ}\text{C}</math>.</li> <li>2. No exemption/relaxations will be given in the qualification criteria to MSME's and startup's as this equipment will have high temperature and high vacuum system and safety related issues with public safety, health and its operation.</li> </ol>