A High Vacuum Brazing Furnace is going to be built up with two systems/equipments with codes: **HVBF-mod1 and HVBF-mod2. Quotations are invited based on following descriptions and notes.**

- **Vendor MUST consider ALL of the following to quote for HVBF-mod1 (Sr. No 1-6 together, Ref: specification details):**

  (design+fabrication) of HVBF-mod1+integration with HVBF-mod2 + installation of (HVBF-mod1+HVBF-mod2) + demonstration on full functioning of (HVBF mod1+HVBF mod2) as per overall requirements of the high vacuum brazing furnace and warranty on functioning of high vacuum brazing furnace

- **Vendor MUST consider the following to quote for HVBF-mod2 (Sr. No. 1-3 together, Ref: specification details):**

  The specification of the quoted item must satisfy the basic requirement of the HVBF-mod1 (vacuum level at operating temperature, etc)

Specification of the item should be detailed as per the specification table. It is suggested, for each point of our requirement you must respond in your technical bid. Vendors must send a list of companies/organisations, where they supplied similar equipment (mention primary specifications).

Vendors must send their quote mentioning the codename of the equipment on top of a sealed envelope. This **main envelope** should contain **Financial bid and Technical bid, which must be also in separate and sealed envelopes.** All documents should be signed by competent authority and the QUOTATION must reach following address on or before **18.03.2014.** (18th March' 2014)

Dr. Amitava Ghosh
Assistant Professor,
MES, Department of Mechanical Engineering
Indian Institute of Technology Madras
Chennai 600036, Contact No: 09790886257

Amitava Ghosh

Name of the equipment: **HVBF-mod1**

Our Ref: ME/13-14/315/mod1, dtd: 04.03.14

Detailed specification of HVBF-mod1

HVBF-mod1				
Sr No	**Major Parts (with gross specification)**	**Elements under major part**	**Specification of elements**	**Remarks**
1.	**Hot zone** • **working hot zone volume:** Φ125mmx125mm or larger	Heater	• Shape: preferably cylindrical • Dimension: to suite HOT Zone dimension • Material: high density Mo (Molybdenum) • Supported on high alumina ($A1_2O_3$) insulators. • easy interchangeability.	Density and grade of Mo and SS should be mentioned in case of indigenous make of heater/ shield, otherwise the manufacturer's name to be mentioned.
	• **Actual hot zone volume:** (as per your design to suite above) • **Working temperature:** max 1250^{0}C *(at vacuum level better than 5x10(-6) mbar)*	**Multi-layered heat shield** with a provision for **visual inspection of heated samples through visual quartz-port** on chamber	Configuration and material: 6 layers of polished Molybdenum and SS radiation shields are provided on all the sides of the heating element. The three inner most shields are Molybdenum and the three outer most shields are SS. The radiation shields should be separated by Molybdenum/high alumina to avoid conductional heat loss.	
	• **Heating rate:** # 1- 40^{0}C/min (variable) up to 900^{0}C # 1-10^{0}C/min (variable) above 900^{0}C • **Cooling:** natural and argon purging • *Mention approximate Pump down time* from *atmospheric to 5x10(-6)mbar and ability to sustain the vacuum level during heating, in case of no-charge condition, w.r.t the specification of high vacuum system, HVBF-mod2).*	• **Rotary Hearth plate,** • 2 Mo dead weights, each of 5kg (dead weights: may be quoted separately or ignored)	• Dimension: as suitable to hot zone size • Material: High density Mo • RPM: 2-10; programmable from control panel • should support (melting mass is less than 500 gm) at least: # 5kg of metal or ceramic weight during brazing at max operating temperature but [illegible] 20 kg of mass in no-heating condition • provision for parallel stacking of discs	Density and grade of Mo should be mentioned. ***continued on next page....***

Abhitava Singh

HVBF-mod1

Sr No	Major Parts (with gross specification)	Elements under major part	Specification of elements	Remarks
2.	Furnace power, thermocouple, control unit	Furnace Power unit, temperature controller, heating cycles, thermocouple	• Auto/Manual Vacuum Controller (AVC) with fully automatic and manual overriding facility with mimic diagram manually operated ON/OFF Switches with indication lamps. auto/manual/standby selector switch, utility failure indication and alarms. • Furnace power 15 KVA or above; Power rating must satisfy the heating rate • With thyrister, placed on primary side of the transformer, interactive to feed back control • Micro processor based digital temperature programmer, Programmable heating cycle with memories of min 10 cycles • Temperature-overshoot controller-PID based • Over all control : PLC based • Provision for manual control of vacuum and heating cycle in case of electronic failure • Two Pt-Pt-Rh (or better quality; must be justified) thermocouples to monitor temperature of Hot Zone. • Additional precision work-thermocouple of make (brand to be of world repute)- 01no Provision for one more work thermocouple inclusion.	• Thyrister and Digital Temp programmer, [redacted] EUROTHERM-make • Temperature over shooting controller must be from a brand of world repute • **GE FANUC** Make PLC ***continued on next page....***

Amritava Ghosh

HVBF-mod1				
Sr No	**Major Parts (with gross specification)**	**Elements under major part**	**Specification of elements**	**Remarks**
3.	Chamber	Chamber, chamber lifting mechanism	• Shape: bell jar type/ cylindrical • Dimension: as suitable to hot zone dimension • Double walled, water cooled • Lifting mechanism: hydraulic/motorised ball-screw lift • Material: stainless steel of suitable grade • visual quartz-port onchamber-01no • additional blind port: 01	Mention the grade of stainless steel
4.	Gauges	Pirani-Penning Gauge	• 1 set of suitable range, penning gauge to be positioned close to hot zone	
5.	Valves	Valves	• All vacuum related valves must be electro pneumatically controlled. • **Provision for water-cooled chevron baffle near turbo inlet so that rotor temperature for the turbopump does NOT exceed its permissible value of 120 °C**	
6.	Others	1. Chiller 2. O-rings **3. Coupling/Flanges**	**1. of suitable capacity (to support the furnace and turbo molecular pump)** 2. viton/Kalrez/equivallent, 4. one set of spares of O-Rings + tool box **3. as per DN/ISO/KF standard**	1. make- standard brand 4. tool box – for maintainance purpose.

Warranty: 1 year comprehensive warranty (service with repair/replacement of affected parts) and additional 2 years of free service

Installation and training: to be detailed in your quote

Payment terms: as applicable

Freight and insurance: to **Dept of Mechanical Engineering, IIT Madras: to be quoted separately**

Taxes and duties: mention in quote as applicable

Amritava Sinha G.E.Samuel

Item - (2)

Name of the equipment: **HVBF-mod2**

Our Ref: ME/13-14/315/mod2; dtd: 04.03.2014

Detailed specification of HVBF-mod2:

HVBF-mod2 (to support HVBF-mod1)				
Sr No	**Major Parts (with gross specification)**	**Elements under major parts**	**Specification of elements**	**Remarks**
1.	**Turbo molecular pump with full accessories:**	•Turbo molecular pump, 200DN, ISO-K with drive unit: 01 no •Display control unit : 01 no •Mains cable length: 3 mm length •Venting valve 24 V, DC, connecting with DRIVE UNIT: 01 no •Centering ring, DN 200 ISO with splinter shield aluminium/equivalent material: 01 no •Straight Reducer, DN 40 ISO-KF DN 40-25 ISO-KF, aluminum, suitable length: 01 no •Flexible metal hose, DN 25 ISO-KF length: 1m or more long stainless steel: 01 no •Clamping Ring, DN 32 / 40 ISO-KF Aluminum based, for Elastomer Seal: 01 no •Clamping Ring, DN 20 / 25 ISO-KF Aluminum based, for Elastomer Seal: 04 nos •Centre ring DN 25 of suitable grade: 02 nos •Centering ring DN40, ISO-KF Aluminium - 01 no. •Double Claw Clamp, DN63-250 ISO-K, SS - 5 nos	• Pumping speed for N_2: more than 1200 lit/s • Throughput for N_2: 20 mbar l/s • Compression ratio for N_2: $>1x10^8$ • Ultimate pressure $<1x10^{-7}$ mbar • Inlet: DN 200 ISO-K Outlet: DN 40 ISO-KF • Bearing system: Permanent magnetic bearing at High-vacuum side with oil lubricated ceramic bearing in low vacuum side • With first fill of lubricating oil • compatible with rotary pump	**After Sale Service requirements**: a. In case of a break down, maintenance of the turbo pump, such as bearing replacement, motor parts replacement, stator/ rotor replacement and overall cleaning of the pump etc. should be possible at purchaser's site. b. The supplier should have Service Centre/ Service Facility and complete infrastructure within India to handle major repair of the turbo pump, such as changing of stator/ rotor assembly, repairs of electronics and availability of critical spares off the shelf, from Indian office. **Both *a&b* should be satisfied for the consideration of the bid.** ***continued on next page...***

Amritansu Sinha

HVBF-mod2 (to support HVBF-mod1)				
Sr No	**Major Parts (with gross specification)**	**Elements under major parts**	**Specification of elements**	**Remarks**
2.	**Rotary Pump**	**Rotary Pump**	• Pumping speed: $20 m^3/hr$ or more • Dual stage • Integrated with gas ballast and HV-safety valve • Ultimate pressure with gas ballast: $1x10^{-2}$ mbar or less • Ultimate pressure without gas ballast: $5x10^{-3}$ mbar or less • motor compatible with Single/three phase, 50Hz freq power line • with first fill of pump oil • Oil-mist seperator, DN25 ISO-KF • compatible with turbo pump and accessories • magnetic coupling between pump and motor	Sr.No Item 1, 2 and 3 should be from same manufacturer of international repute.
3.	**Full-range pressure gauge**		Single Gauge complete measuring: low and high vacuum	
	Mention approximate pump down time in reference with the specification of HVBF-mod1 for no-charge and brazing condition.			

Warranty: 1 year comprehensive warranty (service with repair/replacement of affected parts and additional 2 years of free service)

Installation and training: to be detailed in your quote

Payment terms: as applicable

Freight and insurance: to **Dept of Mechanical Engineering, IIT Madras: to be quoted separately**

Taxes and duties: as applicable.

Amritam Sinh.