

Enquiry No.: CESE/PCI/01/2013

Vacuum Arc Melting furnace (Unit) Specifications

We are interested in procuring a Vacuum Arc Melting furnace, which should be custom-designed and fabricated as per the specifications mentioned below. The required functions to be carried out in the unit are (i.e. the design should provide for):

- (i) Melting of multi-component alloys by arc melting either in vacuum or in protective gas atmosphere. Should also be able to melt high melting point metals like Niobium and Molybdenum.
- (ii) The unit should have water cooled OFHC Cu hearth with two separate tungsten electrodes. The electrodes should be easily and independently maneuverable to access all the samples (as below). Only one of the electrodes will be connected to a power supply in the current tender (the unit should be upgradable by the attachment of a second power source to the second electrode- thus making it a double arc melting unit).
- (iii) It should be possible to melt three separate compositions in three separate 'crucibles' in the hearth- in a single evacuation of the chamber (i.e. without the need re-evacuation after each melt). Melting will be in a sequential manner.
- (iv) The sample chamber should also be water cooled (so that the chamber does not heat up during repeated re-melting of the sample).
- (v) The amount of metal to be melted in 'crucible in the hearth' should be 100g (max.).
- (vi) The power source should be able to provide continuous arc for the above- detailed specifications are listed below.
- (vii) Separate mechanism should be provided to 'turn over' the button formed on solidification of the molten alloy, without breaking the vacuum seal (i.e. without opening the chamber and without using the electrodes for turning the 'sample' button).
- (viii) There should be provision for suction casting of the melt into a cylindrical rod of 5mm diameter (at least one).
- (ix) At least 3 view ports should be provided- 2 from the sides and one from the top.

Please note that the technical bid should clearly specify against each of the specification, the value offered by the proposed unit as well as clearly mention whether the unit complies or does not comply with each of the specifications. If any specification is left unaddressed or unspecified, the bid would be considered as unresponsive and would not be considered for further processing.

SYSTEM SPECIFICATIONS

VACUUM PUMPING SYSTEM:

ROTARY VACUUM PUMP

Direct drive Rotary vacuum pump having a displacement capacity of at least 240 lit/min giving a vacuum of 1×10^{-3} milli-bar. This rotary pump is used as roughing pump as well as back-up pump for creating higher vacuum. Pump should be branded (Oerlikon Leybold of Germany, Hind High Vacuum Bangalore, Edwards Limited USA, Pfeiffer Vacuum GmbH Germany).

OIL DIFFUSION PUMP (good quality)

The ultimate vacuum achievable in the arc melting chamber should be 1×10^{-6} milli-bar. For this purpose, an oil Diffusion pump having minimum 150 mm nominal diameter with a minimum effective pumping speed of 750 lit/sec should be provided. A cryo-trap should also be provided. To avoid the back-streaming of diffusion pump oil, liquid nitrogen cryo cooled trap should be provided in the system.

HIGH VACUUM VALVE (high quality)

A high vacuum butterfly valve of around 6" diameter should be provided above the diffusion pump. This should facilitate the isolation of the diffusion pump, even when the chamber is exposed to atmosphere.

CHAMBER, PLUMBING LINES & VALVES

Chamber and plumbing lines made of 316 stainless steel incorporate combination valve for backing and roughing operations. An air admittance valve to release vacuum into the chamber and a fine control needle valve for controlled admittance of inert gas should be provided. Chamber should be mirror finished 316 stainless steel with at least two view ports from sides and one from top. Arrangement for light inside chamber should be provided so that inside of chamber is clearly visible. Chamber should be water cooled.

Branded chiller (only one of the following brands: Voltas, Scanair, Blue Star, Werner Finley, Lauda, Cole-Parmer, Toshiba, Hitachi, Panasonic, Samsung) **of sufficient capacity** (3TR or higher, ambient operating temperature 10-50°C, Rated Cooling Capacity: more than 8000Kcal/hr or more) **should be supplied for cooling of the chamber, electrode, hearth, DP.**

VACUUM MEASURING GAUGES

PIRANI GAUGE

Only Branded (Oerlikon Leybold of Germany, Hind High Vacuum Bangalore, Edwards Limited USA, Pfeiffer Vacuum GmbH Germany) pirani gauges with two pirani gauge heads should be provided to independently monitor the roughing and backing pressure in the range upto 0.001 mbar through independent displays. The gauges should measure vacuum in the chamber.

PENNING GAUGE

Only Branded (Oerlikon Leybold of Germany, Hind High Vacuum Bangalore, Edwards Limited USA, Pfeiffer Vacuum GmbH Germany) analog penning gauge, with 1 no. metal gauge head is provided to monitor high vacuum upto 1×10^{-6} milli-bar (in the chamber).

ELECTRICAL CONTROLS:

Unit should operate on 220V A.C 50 Hz Single phase power supply.

MOUNTING FRAME:

All the above components should be housed in an aesthetic metal frame with a front panel for mounting gauges and controls. The valve control knobs should be towards the front of the frame. The vacuum unit should be mounted on four castor wheels for mobility and easy maneuverability.

ULTIMATE VACUUM:

The unit should be specified to achieve an ultimate vacuum of 1×10^{-6} milli-bar in clean, cool, empty degassed condition with dry nitrogen back filling.

LEAK TESTING requirements: All individual components as well as total system is leak tested using helium mass spectrometer leak detector to an individual leak rate to 1×10^{-8} std.cc/sec. Leak test certificate should be provided.

POWER SUPPLY TO THE ELECTRODES

Input : as per Indian standards power supply.

Maximum current : 600 Amp (separate quote for 400 Amp power source instead of the 600 Amp should also be included- total cost should be included).

Power factor: 0.99

Provide short circuit protection. The unit should be provided with analog meter for measurement of voltage and current and water cooled cables of 3 M length provided. Foot switch to conveniently control the power supply of the arc should be provided.

Only one of the following branded power sources should be supplied: EWM Hightec Welding GmbH Germany, Longevity Global Inc. USA, Everlast Power Equipment Inc. USA, Mogora Cosmic Pvt. Ltd. Pune, Lincoln Electric Company (India) Private Limited, Kanchipuram.

FREE SUPPLY:

The following material should be supplied free along with the unit:

- a) First charge of molecular distilled oil for vacuum pump.
- b) First charge of silicone oil for diffusion pump.
- c) One set of Instruction Manual.
- d) One set of spares required for next 5 years.

Reputation and Experience of the Supplier

The prospective supplier should have a good experience of manufacturing and installing similar units in recognized laboratories, universities and companies. The supplier should include in the technical bid, a list of various personnel to whom the similar unit (Arc melting unit) has been supplied along with the personnel's affiliation, address and contact numbers. In addition, at least one letter of "satisfactory performance" of the similar unit should be obtained from one of the clients from either a National Laboratory or a Central Government Institution (e.g. to list a few are IISc, IITs, NCL, NML etc.). This letter from the client should clearly mention that the unit has been installed since when and whether it has been performing satisfactorily.

The Name, email address, mobile number, Fax number (all currently valid details), should be clearly mentioned in the letter from the client.

Design or diagram of the system should be given along with the technical bids. All components/parts/equipment should be new.

Method of Submitting Quote:

Submit technical and commercial bid in two separate sealed envelopes. The name “technical bid” or “commercial bid” should be clearly mentioned on each envelope. The technical bid should not mention prices. If the technical bid is found to mention prices, the bid will be disqualified. The two sealed bids (technical and commercial) should then be sealed together in another bigger envelop. All the envelopes i.e. the technical bid envelop, price bid envelop and the main envelop should clearly mention the Tender Number at the top.

Warranty: ONE year onsite warranty required (from date of installation, against all manufacturing defects and faulty workmanship)

Installation: the price should be inclusive of installation on site with full functionality.

Delivery time: 10 weeks maximum from the date of purchase order.

Payment: As per IIT Kanpur Norms.

Quotation should be valid for two months. All envelopes should be marked with enquiry number. All quotes should be in Indian Rupees (INR) with total cost. Quote for: (i) both options 400Amp and 600Amp power source separately and (ii) also for single and double arc options (but only one power source).

Quote: Two bit quote (separate technical and commercial bid in sealed separate covers required) should reach the address as below by 9 Sept 2013 5:00pm:

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