

सी एस आई आर- राष्ट्रीय धातुकर्म प्रयोगशाला

जमशेदपुर - 831007

संशोधन /CORRIGENDUM

REFERENCE NO. :- NML/PUR/32/13/21/VP
Tender ID : 2021_CSIR_91216_1

DATE: 29-10-2021

NAME OF EQUIPMENT: SUPPLY, INSTALLATION, COMMISSIONING OF ARGON ARC MELTING FURNACE WITH CASTING FACILITY UNDER HIGH VACUUM

NOTE: The Bids must be submitted in the Central Public Procurement Portal (URL:<https://etenders.gov.in/eprocure/app>) only. Manual/Offline bids shall not be accepted under any circumstances. Bidders should quote in INR only.

CONSEQUENT TO THE PRE-BID MEETING HELD ON 22-10-2021, THE REVISED SPECIFICATION IS GIVEN BELOW:-

SPECIFICATIONS:-

Technical Specification of Argon Arc Melting Furnace with Casting facility under high vacuum.

The Vacuum Arc melting furnace with vacuum suction-casting facility is required for melting 500 gms of metals in Iron standard up to 3000⁰C under an ultimate chamber vacuum of 10⁻⁶ mbar for research and development work. The refractory (e.g- Hf, Ta, Nb) and reactive (Ti, Zr) metals will be used for special alloy development work in a highly inert and oxygen-free atmosphere with a Titanium getter melting facility.

I.1 Furnace Chamber and ball & Socket Seal Assembly:

- Vertically mounted, double-walled, polished, water-cooled chamber made of SS 304 material having hinge supported door for internal access, ports for vacuum/pressure gauges, water cooling systems, two auto-darkening safe-viewing ports (top and front) and light source for internal chamber illumination.
- To achieve a melting temperature of 3000⁰C.
- A Provision is required for easy change of copper hearth assembly at the bottom of the chamber.
- A suitable sample manipulator arrangement with linear shaft seal and ball joint assembly to flip the samples without breaking the vacuum.
- A suitable platform for operator height adjustment.
- Chamber: Circular/cubical shape.

I.2 Electrode Assembly:

- Vertically mounted water-cooled Copper stinger rod, passing through ball and socket seal assembly into the chamber.
- The bottom of the stinger rod is attached with a non-consumable Tungsten electrode through a screw tighten collet/sleeve type fixture for easy removal.
- Bellow-sealed electrode assembly with a pressure regulator to adjust the gap between the electrode tip-bottom hearth plate and Ti-getter melting.

I.3. Power Supply Unit:

- Input Voltage 415V AC, Three-phase 50 Hz supply.
- Forced air-cooled Transformer.
- Compact DC power supply system with Non-contact arc ignition.
- DC Power supply system having in-built high-frequency Thyristor unit, high current rectification, variable current ranging from 100 to 400 Amps or above.
- Arc ON/OFF switch and Power control switch near to electrode assembly.

I.4. Control Panel:

- The front panel with Gauges, Rotary Pump and diffusion pump ON/OFF switches. A rear side door for easy servicing and maintenance.
- Electrical overload switch(s)/emergency switch(s) at the main control panel.
- All controllable, variable parameters/switches etc in the control panel and connected approximately 3 meters from the furnace.

II. Water Cooled Copper Hearth:

- Two separate replaceable water-cooled, electrolytic-copper Hearth having a central circular cavity to melt 100 and 500 grams alloy in Iron standard respectively. Either hearth will operate at a time for melting - 100 gms or 500 gms alloy respectively. Each hearth shall have a small periphery cavity to melt 10 grams of Titanium getter.

- b) The central cavity of both hearths should have a special arrangement to fix a 2 mm thick Tungsten cap, to avoid contamination of special alloys by Copper hearth material.

III. The Detailed Descriptions of Suction Casting Facility:

- a) The suction casting assembly consists of a water-cooled copper hearth enclosed in a SS jacket for melting, supported on replaceable copper mould. The Hearth have a circular hollow cavity for melting 100 g of alloy in Iron standard at the centre and a cavity to melt 10gm of Ti getter at the periphery.
- b) Four copper moulds, each with the cylindrical hole of size i.e. 5, 8, 10 & 20 mm diameter with a tolerance of ± 0.3 mm with a height of 20cm
- c) A symmetrical split copper mould for easy removal of the suction cast specimen.
- d) This entire assembly, copper mould and cup holder with a water-cooled copper hearth
- e) The unit must come with an adjustable throttle/on-off valve and footswitch for suction casting.

IV. Specification of Vacuum Pumping System:

The unit to achieve an ultimate chamber of the vacuum of a minimum of 1×10^{-6} mbar in clean, co^o empty degassed with Liquid Nitrogen trap-filled in 60 mins or better.

- a) **Vacuum Pump:** Rotatory pump (450-700) litres/min or more and Root/Booster Pump with pumping speed of (200-300) m^3/hr or more capacity together with evacuation capacity of 1×10^{-3} mbar within 20 mins time
- b) Diffusion Pump: a pumping speed of (650-1000) litres/sec to achieve a minimum vacuum of 10^{-6} mbar or better.
- c) High-quality Vacuum Pump oil for Rotary, Roots and diffusion Pumps and Stainless Steel vacuum Plumbing Lines
- d) A liquid Nitrogen Trap

V. Valves:

- a) Electro pneumatically operated valves.
- b) A suitable vacuum collar for the isolation of the vacuum pump.
- c) Vacuum Collar with Penning and Pirani gauge, gas admittance valve, air admittance valve, roughing line etc.
- d) Two gas inlet systems for filling the chamber with an isolation valve, pressure gauge, pressure switch and pressure relief valve etc.

VI. Vacuum Measuring Gauges:

- a) Mechanical Gauge: in range of 760 mm to 1 mm Hg.
- b) Digital gauge with 2 Pirani sensors and 1 penning sensor in a range from 0.5 mbar to 10^{-6} mbar.

VII. Air Compressor:

A suitable capacity, the silent air compressor for pneumatically operated valves.

VIII. Safety Devices:

- a) Necessary safety arrangements for each system, sub-systems. short-circuit protection of power and electrode assembly
- b) Standard process interlocks water flow, argon-gas flow, vacuum, current, voltage level, cooling water temperature etc.
- c) Alarm and Emergency for the interruption in cooling water for hearth and diffusion pump.
- d) Electrical/Thermal overload switch and over-load protection device.
- e) Water flows control switch in the diffusion pump water circulation line - to switch off in case of water supply failure/low pressure.

IX. Mandatory components to be provided with Equipment:

- a) An Inline Argon Purifier to remove H₂O, O₂, CO, CO₂, H₂ ≤ 100 ppt and Volatile Acids & Organics.
- b) A high-quality Helium gas detector with the lowest detectable leak rate for He: (10⁻¹² -10⁻¹³) Pa m³ /s or less with detectable gases like Helium-3, Helium-4 and Hydrogen.
- c) Two numbers of double-stage Argon gas regulators.
- d) 10 nos of Tungsten electrode, 2 sets of O-rings, oils, basic tools for maintenance and mandatory spares for one year of operation.

X. Vendor Eligibility criteria:

- a) The vendor must have supplied at least one similar Arc melting unit minimum of 100 gms to 1000gms with a suction casting facility within the past 5 years from the date of the tender.
- b) The supplier should be the manufacturer of the furnace or an authorized dealer of OEM.

XI. Scope of Supply by the Vendor

- a) Any other requirement has to be provided by the vendor except for space, three-phase power supply and water supply.
- b) Supply of the design of the equipment for the approval of I/O before final fabrication.
- c) The manufacturer has to certify/guarantee the availability of accessories/spares for a minimum of 10 years after the installation
- d) The list of the customer(s) specifically in Govt. of India/foreign R & D labs/Academic institutions with the recent installation of the similar type of systems along with all relevant documents.
- e) Vendor must ensure the availability of service centre in India with qualified engineers
- f) Certificate from users about equipment performance and services

XII. Installation and Commissioning requirements:

- a) Three successful trials of alloy melting have to be performed at CSIR-NML.
- b) Onsite equipment handling, maintenance training and safety training have to be performed at CSIR-NML during installation & commissioning of the equipment.
- c) The supplier shall demonstrate melting and vacuum capabilities by melting Tantalum and Zirconium at CSIR-NML. The quality of the melted ingots (metallic lustre) compared to standard samples will be considered as an acceptance criterion. The above material will be supplied by CSIR-NML for melting trials.

XIII. Manuals and Documents to be provided:

- a) The Operation and maintenance manuals in English of each component detailed electrical/control system drawing, service manuals with interconnection drawings.
- b) A certificate confirming electrolytic copper grade and its chemical composition

XIV. Warranty: Comprehensive warranty for a minimum of one year.

XV. AMC Rate after Expiry Warranty: vendor must quote 3 consecutive years non-comprehensive AMC rate with (02 preventives+one breakdown) visit per year. This amount will not be considered for price evaluation.

NOTE :

1. Acceptance Criteria : NIT Point No. - XII. Installation and Commissioning requirements.
2. Relaxation of prior turnover and prior experience is applicable only to all startups recognized by Department for Promotion of Industry & Internal Trade (DPIIT) subject to meeting of quality and technical specifications. Startups may be MSMEs or otherwise.

Relaxation of prior turnover and prior experience is applicable only to all MSMEs recognized by Department for Promotion of Industry & Internal Trade (DPIIT) subject to meeting of quality and technical specifications.

The above amendments shall amount to amendments of the relevant terms of our Bid Document for CSIR-NML Tender No. **NML/PUR/32/13/21/VP**.

All other Tender terms and conditions remain unchanged.

Ray
22/10/21

(R. Ray)
Controller of Stores & Purchase

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