



An ISO 9001
Company

BHARAT HEAVY ELECTRICALS LIMITED

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT/ MATERIALS MANAGEMENT

ENQUIRY NOTICE INVITING TENDER	Phone: +91 431 257 7421/7833 Fax : 431 257 6826 Email : vkarna@bhel.in : vijayak@bhel.in Web : www.bhel.com
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TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two parts	2732000004	18.11.2020	09.12.2020

You are requested to quote the Enquiry number, date and due date in all your correspondences. This is only a request for quotation and not an order.

Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs. on the Date of tender opening.

Item	Description	Qty.	(Indigenous Vendors) Matl. Will be Delivered to
10	Procurement of Pit Type High Temperature Electric Furnace – Rating 800°C as per the technical specification, BHEL commercial terms & conditions applicable (to be downloaded from web site www.bhel.com and https://eprocure.gov.in)	1 No.	FOR, BHEL, Stores, High Pressure Boiler Plant, Trichirappalli - 620014

Important points to be taken care during submission of offer

1. Material shall be delivered to (By indigenous vendors): As stated above.
2. Delivery required 4 Months (Including PDI) from the date purchase order.
3. Erection & Commissioning period required 2 Weeks from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.
4. EMD for this Tender will be (INR): 1,50,000.00.
5. Compliance Form. ATP TRY/IND/02A to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
6. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (Refer MM / CE / GENL /001 – EMD) including bank guarantee formats and list of consortium banks & commercial Terms check list can be downloaded from BHEL web site <http://www.bhel.com> or from Central Public Procurement Portal website <https://eprocure.gov.in> under Enquiry reference "2732000004".

Note: this is not an E-tender, hence Vendors are requested to ensure that the offer is reaching physically at our office before 14:00 Hrs. on the date of tender opening.

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED  V. KARUNAKARAN Dy. General Manager Capital Equipment / MM BHEL / Tiruchirappalli - 620 014
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PART – A: Pre-Qualifying Criteria for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No.	TENDER PARTICULARS	Bidder's RESPONSE
1.0	Qualifying Criteria: The Bidder has to compulsorily meet the following requirements to get qualified for considering the technical offer. Otherwise the technical offer will not be considered.	
1.1	Only those Bidders/OEMs should quote, who have supplied and commissioned in the last 5 years (as on the first date of tender opening) at least ONE number of "PIT TYPE HIGH TEMPERATURE ELECTRIC FURNACE with a TEMPERATURE Rating of 800 Deg. C or above" to any of their end customers in India.	
1.2	Bidder has to submit at least ONE Performance Certificate from their end customer in India, for satisfactory performance of the equipment specified in 1.1 and meeting the following conditions: a) The Equipment must have been supplied within the last 5 years as on the first date of tender opening. b) The Equipment must have performed satisfactorily for at least one year during this period. c) The size of the equipment should be 1.3m dia and 0.85 m height or above. The capacity of the furnace should be 500 kg or above. For obtaining the Performance certificate, a suggestive format for performance certificate is given in Annexure A.	
1.3	BHEL reserves the right to verify the information provided by the Bidder for the referred furnace at their referred customer's works. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works. The Travel, Board and Lodging expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false / incorrect, the offer shall be rejected. BHEL reserves the right to accept or reject the OEM'S based on the assessment of their technical and financial capability.	
2.0	The BIDDER to provide the following information	
2.1	The BIDDER has to furnish Reference List of Customers, with complete address, details of contact person, for whom "Pit Type HIGH TEMPERATURE ELECTRIC FURNACE with rating 800 Deg. C or above" have been supplied in the past.	

PART – A: Pre-Qualifying Criteria for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No.	TENDER PARTICULARS	Bidder's RESPONSE
2.2	Specify details of “Pit Type HIGH TEMPERATURE ELECTRIC FURNACE” supplied to any other unit of BHEL, if any (Year of commissioning with details etc.).	
2.3	Details on SERVICE–AFTER-SALES Set-up in India including the Address of Agent/Service Centers In India.	
2.4	Any Additional data to supplement the manufacturing capability of the BIDDER for the subject equipment.	
3.0	The Bidder to note.	
3.1	The BIDDER shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid.	
3.2	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just ‘CONFIRMED’ or ‘COMPLIES’ or ‘YES’ or ‘NO-DEVIATION’ or similar words in the technical comparative statement may lead to disqualification of the Technical Offer. In case of any deviations in any of the technical specifications, such deviations should be clearly specified in the comparative statement. All systems and sub systems proposed in the solution should be detailed in description with illustrations/photographs, if required	
3.3	The BIDDER shall assure a continuous support for SPARES and SERVICE for five years, from the date of commissioning of the equipment at BHEL Works.	
3.4	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details / literature on the PROPOSED MODEL of HIGH TEMPERATURE ELECTRIC FURNACE(s)	
3.5	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation for the scope of supply.	
3.6	Earlier performance & field experience (service support) with BHEL (if any) will be a reckoning factor for the technical qualification of the OFFER. Vendor can furnish details of the supply to BHEL units of systems of similar capability.	

Suggestive Format for Performance Certificate

PERFORMANCE CERTIFICATE
on Customer's Letter Head

1.0	Type of the Furnace:	
2.0	Supplier's Name and Address	
3.0	Make & Model Number of the FURNACE Sub-systems and other Major Accessories	
4.0	Month & Year of Commissioning	
5.0	Application for which the Furnace is used	
6.0	FURNACE DETAILS :	
6.1	Size of the Furnace (Dia. X H mm)	
6.2	Electrically operated - Mandatory	
6.3	Maximum Capacity (Tonnage)	
6.4	Maximum Operating Temperature	
7.0	Performance of the Furnace (Please tick the appropriate option)	Satisfactory
		Non Satisfactory
8.0	Service after Sales (Please tick the appropriate option)	Satisfactory
		Non Satisfactory
9.0	Other remarks (if any)	
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

PART - B: Technical Specification

Note: -

1. The Column **“Bidder’s offer with Technical details & Remarks”** of this format shall be filled in by the Bidder and submitted along with the offer. Inadequate / incomplete, ambiguous or unsustainable information against any of the clauses of the specifications / requirements shall be treated as non-compliance.
2. The offer and all documents enclosed with offer should be in **English language** only.

Name & Address of the Supplier:	
Telephone no.:	
Fax no.:	
e-mail:	

SCOPE: -

This technical specification covers the requirements of Design, Manufacture, Supply, Erection and Commissioning of **1 No. of Pit Type Electrically Heated Furnace – 800°C** complete with all the accessories for trouble free operation. This machine shall be supplied along with the necessary mandatory spares and special tools and tackles (if any).

Bidder shall be complying with the technical specification as given below.

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
1.0	Purpose & Work Piece Material		
1.1	Scope of Supply	Design of Furnace, Manufacture, Inspection, Supply, Erection & Commissioning, Performance Prove-Out, Documentation and Performance Guarantee as per BHEL Specification.	
1.2	Basic features	The furnace design is to be in accordance with up-to date standards and special care is to be taken to ensure ease of operation and maintenance, accuracy of heating, safety etc. The Pit type furnace is basically a fabricated mild steel chamber with reinforcements and a lid. Both the chamber and lid are suitably insulated with refractory bricks and ceramic fibre modules.	
2.0	FURNACE CONFIGURATION		
2.1	Furnace Type	Pit type electric Furnace having inner clear dimension of 1300 (Dia.) X 850 (H) mm suitable for handling gross charge load of 500kg and maximum job operating temperature 800°C is required for heat treatments of ferrous and non-ferrous components of various grades and sizes as per the pre-set (adjustable) time-temperature program	
2.2	Application	To carry out 800 ± 10 deg. C heating cycles on ferrous and non-ferrous components. Offered furnace should be sturdy and easy to operate.	
2.3	Loading Capacity	500kg	
2.4	Job Details	Various components & test coupons pertaining to customers. The maximum weight of charge will be 500kg	
2.5	Job Handling system	Loading and unloading of the job will be done manually.	
3.0	FURNACE CONSTRUCTIONAL FEATURES		
3.1	Furnace usage	The furnace cycle shall extend up to 72 Hrs continuously with repeated heating/soaking/cooling.	
3.2	Charge Temperature	The maximum charge (job) temperature shall be up to 800°C, variable based on user requirement. The furnace should be capable of maintaining this temperature as soaking temperature uniformly throughout the soaking period.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
3.3	Furnace temperature	Bidder to specify Maximum temperature (not less than 900°C.)	
3.4	Rate of Heating	Max rate of heating shall be 200 °C/hr. The desired rate of heating shall be adjustable and programmable between 0 – 200°C.	
3.5	Soaking Time	User defined as per the heating cycle requirements ranging from 1 hr to 11 hrs	
3.6	Uniform Soaking temperature	The charge temperature must be uniform during soaking. The maximum variation allowed is $\pm 10^{\circ}\text{C}$ in soaking time. Bidder to specify the mechanism for achieving this uniformity	
3.7	Power Rating	BIDDER to specify the power rating of the furnace in kW. Bidder should submit detailed design calculation sheet for the power rating specified above along with the offer.	
3.8	Furnace Door Construction	a) Door operation shall be of manual cam & lever lift and swing type. b) Locking arrangement (minimum 3 numbers) shall be provided with mechanical limit switch to cut off filament power at door open condition. c) Asbestos rope/Suitable sealing arrangement or superior arrangement should be provided in the door to prevent heat loss. Bidder to specify sealing details d) The circular furnace door/lid should be fabricated out of suitable thickness mild steel plate and should be reinforced with angles and channels. Bidder to specify thickness. e) The inner cover of the door which comes in contact with working temperature of 800 deg. C should be fabricated out of required thickness of AISI 310 quality heat resistant alloy steel material. Bidder to specify the thickness. f) The furnace door should be lined with light weight energy saving ceramic fibre blankets to withstand temperature g) Complete opening at the top should be possible facilitating to load the job from top using cranes. h) Mechanical locking arrangement (Example: Lever type) to minimize the heat loss when the furnace is in operation.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	i) Bidder to furnish Details of the door operating mechanism, sealing and door-locking mechanism. j) Limit switch shall be provided to ensure switching off the heaters once the door is opened.	
3.9	Furnace Shell a) The shell should be cylindrical shape fabricated out of minimum 5 mm thick rolled mild steel plates and should be suitably reinforced with rolled steel sections like angles and channels to make the structure robust. b) The construction of shell should be self-supporting type so that the shell can be placed on the shop floor directly. c) The furnace shall be rigid enough to withstand distortions due to thermal & mechanical stresses, to house the insulation and refractory brick work, to hold other related structures and components and shall have a prolonged life span. d) Two openings for 50mm dia holes equally spaced on the walls of furnace to facilitate any purging through pipe shall be provided. Plugs to be provided to close the unused holes e) Suitable provision for furnace thermocouple shall be provided f) The wall insulation shall be with suitable density and thickness to maintain the charge (job) temperature at 800 °C. g) Ceramic fiber blanket shall be used for the door. h) Max. skin temperature of chamber should not exceed 60 °C. i) The supplier should submit the heat balance calculation for proof of achieving the skin temperature as per BHEL specification. j) Wall insulation design details with drawings shall be submitted along with offer. k) Collar should be provided around the lid of at least 200 mm so as to prevent the cold air from creating thermal shock for the ceramic (fibrothal) panels	
3.10	Bottom surface a) Bottom surface shall be provided with refractory hearth suitable to withstand the job load and maximum furnace temperature.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
		b) Hearth should be lined with IS-8 refractory bricks backed up with suitable insulation bricks. c) BIDDER has to furnish technical details of bottom surface from the design point of view, to meet the above listed requirements.	
3.11	Provision for thermocouple	Provision should be given for thermocouple connections near the top cover or as preferred by the vendor for easy connections (job thermocouple connections will be done outside the furnace and will be placed inside the furnace). Provision for thermocouple connections to the recorder to be provided.	
3.12	TERMINAL COVER	This should be fabricated out of mild steel sheet and should cover the heating elements terminals. Louvers should be provided for heat dissipation.	
3.13	Heating Elements	a) Material: Kanthal make heating elements. A1/Nikrothal-80/APM or better. b) Type and Size of the heating element: wire/strip elements based on RoB/meander module design fixed over ceramic panels/modules (preferably Fibrothal – low shrinkage grade) mounted on side walls. Bidder to specify. c) Heating Elements supporting system shall be suitable for freely radiating the heat. The supporting system must be compatible with heating elements in respective with heat conduction/dissipation etc. to avoid any hot zone areas. d) Heating elements should be of embedded type and of Advanced Powder Metallurgy. Bidder to specify tensile and creep strengths at various temperatures. e) Heating elements shall be suitable for operation in various user selectable soaking temperatures as per clauses 3.1 to 3.6 f) The Vacuum Formed Panels should be of Low Shrinkage Grade with Classification temp of 1260 Deg C or better with a Linear Shrinkage of <1% for 24hours continuous duty. Bidder to mention chemical composition of the panels.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	g) The Make of the Fibre used for Vacuum Formed Panels should be Rath - Germany / Zircar Zirconia - USA h) The Thermal Conductivity of the Module with temperature variation– Vendor to specify. i) Original Test Certificates of Kanthal Designed, Manufactured and Formed Heater along with Fibrothal Panels to be mandatorily furnished along with the documentation. j) The heating elements shall be arranged or supported on the circumferential walls of the furnace. Heating elements shall not be located on the lid and bottom surface. k) The vacuum boards with coils shall be easily dismountable/replaceable (preferably in separate segments) without having to disturb other sections during maintenance. l) If Refractory are used for supporting the heating elements, then they shall be kept at a minimum and the complete arrangement drawings shall be submitted to BHEL for approval prior to taking up the manufacture. m) The heating elements holding arrangement should be rigid, easy for maintenance in due course of furnace operation. The rigidity of the supports has to be ensured from the furnace wall. Also, the heating elements shall be safely mounted to avoid short circuits, damage during loading/unloading of jobs. Safety Rim Guards to be provided at regular intervals – to prevent Charge from hitting the Panels and Heaters while Loading and Unloading the Furnace n) GA drawing, sub-assembly drawing, heat load calculations, Heating element assembly drawing with termination drawings shall be submitted to BHEL for approval within 1 month from the date of receipt of PO prior to taking up the manufacture. BHEL shall approve the drawing within 15 days' time.	
3.14	Temperature Control Zones	The furnace shall have one temperature control zone.

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
3.15	Painting	The furnace shall be painted with rust preventive coat, one coat of Zinc Chromate Primer and two coats of Heat Resistant Aluminium Paint, with suitable Dry Film Thickness (DFT) and curing time. Furnace Door Counter Weights are to be painted with yellow and black zebra strips.	
4.0	DIGITAL PROGRAMMABLE TEMPERATURE CONTROLLER		
4.1	Make	Eurotherm / Honeywell / Yokogawa / Chino – <i>(Eurotherm 2404 preferable)</i>	
4.2	Technical Details	a) Display: Minimum 4 digit display (range for 0-1000°C) b) Display Parameter: Simultaneous colour display of Process Value(PV) and Set Value(SV) with units and output c) Input: Universal (Thermocouple inputs, RTD, mA, mV etc.) with user selectable d) Scale and Unit: User selectable e) Dimensions: 96 x 96mm f) Panel cut out size: 92X92 mm g) No. of output: Two h) Control Output: 4-20 mA & Relay Output (User selectable.) i) Alarm output: Relay output. j) Operating ambient temperature: 0 to 50 ° C, k) Configuration and programming: Through Front panel key. l) Accuracy: 0.25% of FSV m) Program pattern: Configurable for Ramp, Soak & cool (Min 9 steps/ program) n) Manual control provision shall be available o) Manual intervention provision during auto mode shall be available p) No of program: Capable for loading 5 programs or better q) Should be capable running 3 different cycles continuous in a single program r) Cold junction compensation: Automatic s) Input Power supply: 230 +/- 10%, Single phase 50hz AC supply t) Auto tuning: To be provided to perform precision control setting	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	u) Standard Calibration facility: Standard error adjustment facility to be provided through front panel key. v) Front Panel key: Membrane keypad/ Bezel keypad w) (Miniature switch cover with sheet is not acceptable.)	
5.0	POWER CONTROLLER	
5.1	Type The Controller shall be of Thyristor type (Three Legged Branded Thyristor (preferably Eurotherm)) and Contactor (ON/OFF) type. Selector switch should be provided to select the type of controller. It should be suitably designed for automatic heating requirements/ cycles, without any manual intervention.	
5.2	Controller Unit a) The furnace temperature shall be controlled by Thyristor Controller through Programmable Controller in auto / manual mode. b) The furnace temperature shall also be controlled by Contactor through Programmable Controller in auto / manual mode as secondary control in case of any breakdown. The mode of operation shall be user-selectable before start of the cycle. c) The Thyristorised Power control shall be through a system consisting of Power Pack and Control Cards. d) The power controller shall be of EURO THERM/SIEMENS/CHINO make and contactor shall be SIEMENS/ MITSUBISHI/ABB/ SCHNEIDER make. Offered controller shall be compatible with temperature controller. Note: The power controller being offered shall be of latest type and service/spares support shall be available in India for the next 10 years. Details of Service Centre available in India to be furnished.	
5.3	Control Panel a) Panel to house the Programmable temperature controller, Temperature recorder, Safety Controller, Power controller, MCB, indicating lamps, Energy meter, Digital ammeter and voltmeter, auto/manual selector, input/output terminals, starters for all drives, over-load relays, On/Off controller. 3 pin socket, Panel lighting.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	Suitable transformer shall be used for 415/230V and 415/24 V. Panel AC with suitable rating shall be provided. b) Separate partitions shall be provided for instrument and power sides for safe working. c) Panel shall be of suitable dimensions to ensure that all components can be easily accessed for maintenance. d) Panel dimension details to be provided along with the offer	
5.4	Energy meter	Provision for monitoring the electrical parameters like current for each phase, voltage, kWh, etc. through a LCD Multi-Function True RMS energy meter. The make shall be SCHNEIDER or equivalent. Bidder to quote Make & Model. The offered model shall have RS485 communication facility. Detailed product catalogue to be enclosed.
6.0	TEMPERATURE RECORDER	
6.1	Make	EUROTHERM/YOKOGAWA/CHINO Make
6.2	Technical Specification	
	1. Description: Digital Strip Chart Recorder 2. Chart Width: 180 mm calibrated 3. Chart-type: Z-fan fold 4. No. of Channels: 12 5. Type of Inputs: Thermocouples (types K, R, S), RTD, DC voltage, DC current. Bidder to specify others, if any 6. Calibration temperature range: 0 to 1200°C 7. Scale and Unit: Configurable 8. Accuracy: Better than +/- 0.2% for K-type thermocouple. Bidder to provide accuracy ranges for different inputs 9. Power Supply: 100 to 240 V AC, 50 Hz. Power cord to be provided 10. Mounting: Flush panel mounting 11. Scanning Rate per Channel: Bidder to specify 12. Dotting interval: 5 seconds/point, 2.5 seconds/point. Interlocked to chart speed 13. Burnout: Burnout detection function for thermocouple input	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	14. Display: Clear LCD/LED display for viewing the measured parameters. Bidder to provide details. 15. Printing System: Sharp dot matrix print with multicolour disposable ribbon cartridge 16. ON/OFF of display and recording: To be provided 17. Periodic Text Print Output: User selectable 18. Alarm/Date/Message Print: To be provided, user selectable 19. Error Adjustment during Calibration: To be provided 20. Configured Data Memory Protection: To be provided 21. Paper Transportation Mechanism: Suitable for 20 m Z-fan fold chart paper 22. Chart Speed: 1 to 1,500 mm/Hr, user configurable 23. Chart Illumination: Sufficient illumination must be provided to view trace on chart, preferably white light source 24. Reference junction compensation accuracy: Bidder to specify 25. Adjustment Keys: Soft touch keys for programming parameters to be provided 26. Alarm Display: Any faults in the system should be displayed clearly for easy identification. Bidder to provide details 27. Dimensions and Weight: Bidder to provide details 28. Standards: CE marking, EN61326-1 or equivalent standard compliance. Bidder to specify others, if any 29. Case material: Door - Aluminium die-casting, Front panel - Glass, Case - Cold-rolled steel plate 30. Ribbon Cassette and Chart paper: 1 no. to be provided (installed) in the recorder	
7.0	SAFETY TEMPERATURE CONTROLLER	
7.1	Make	Eurotherm/Honeywell/Yokogawa/Chino/Fuji
7.2	Technical Specification	1. Type of control: ON/OFF control. 2. Display: minimum 4-digit display

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification	Bidder's offer with Technical details and Remarks
	3. Display Parameter: simultaneous colour display of PV and SV 4. Type of Input: Universal input T/c inputs, RTD, mA, mV etc. (User selectable) 5. Working range: 0-1200°C (User selectable) 6. Accuracy: 0.25 % of FSV 7. Hysteresis setting: $\pm 5^{\circ}\text{C}$ 8. Ambient temperature: up to 50°C 9. No. of output: Two 10. Control Output: Relay. 11. Alarm output: Relay. 12. Relay output capacity: 230V AC, 2A 13. Power supply: 230V +/- 10%/50 HZ 14. CJ Compensation: To be provided 15. Temperature and Hysteresis setting: Front panel 16. Display dimensions: 96 x 96mm 17. Panel cut out size: 92 W X 92H mm 18. Thermocouple burnt out protection: Up scale 19. Standard Calibration Facility: Standard error adjustment facility to be provided through front panel key. 20. Temperature input to the controller shall be taken from a separate thermocouple output (simplex/duplex) 21. The controller shall be configured to prevent temperature overshoot in case of failure of the main power controller circuit 22. The controller shall be configured to prevent temperature overshoot in case of failure of the main power controller circuit 23. Dedicated safety contactor shall be provided in addition to the control circuit. Contactor shall be SIEMENS/ MITSUBISHI/ ABB/ SCHNEIDER make	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
8.0	THERMOCOUPLE		
8.1	Type	K – Type thermocouple with protective sheath (Inconel preferable) with terminal head and ceramic connectors.	
8.2	Number of Thermocouple (TC)	Duplex for the Temperature Controller & Recorder – 2 nos Simplex type thermocouple for Safety Controller – 2 nos	
8.3	Provision for insertion	Provision shall be available for insertion of thermocouple inside the furnace to connect to the job. Preferably slots to be provided at the edge of top cover lid. Suitable plugs to be provided to close the unused slots	
9.0	GENERAL POINTS		
9.1	Input Power Supply	a) The furnace shall be suitable for an input supply through a $415 \pm 10\%$ V, $50 \pm 3\%$ Hz. 3 Phase AC, 3ph wire system. (No neutral) b) BHEL will provide the input power supply at one point only and further tapings (for sub-systems) are to be managed by the Supplier, through suitable step-down transformers and proper internal wiring. c) Supplier has also to specify the means & mode of giving power supply to the heating elements.	
9.2	Pneumatic air supply	If any pneumatic air is required, BHEL will supply air at 60 – 70 psi at one point. Distribution from BHEL terminal point, including filter – regulator shall be in the scope of Bidder.	
9.3	Ambient Conditions	The control elements shall meet all the specified requirements while working in an ambient temperature of maximum 50°C and 90 % of relative humidity.	
9.5	Control Elements	The electrical switch and control elements shall be of Siemens / L&T / GEC Alstom / Telemechanique / Mitsubishi / Schneider make.	
9.6	Gear Boxes	The gearboxes are to be of Greaves / Radicon / Elecon / Shanthi Gears make only and necessary Test and Guarantee Certificate are to be submitted, if applicable.	
9.7	Cabling Code	All wires, cables, instrument tapings, etc. shall be terminated at components / devices / terminals using suitable number ferrules.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
9.8	Inter-Connecting Cables	The required length of Power and Control (Copper) Cables to inter-connect the Power Controller and Terminals, Field Instruments, Motors etc. with Panel shall be quoted. Thermocouple ompensating cables shall be routed through separate cable trays.	
9.9	Safety Systems	a) Heating element cannot be switched ON unless the door is closed. Interlock provision shall be provided. b) Door cannot be lifted unless heating element is OFF. Interlock provision shall be provided. c) Over temperature controller will switch OFF the heating element in case of failure of main controller. d) Other necessary safety interlocks incorporated for the safe operation of the furnace shall be elaborated in the offer.	
9.10	First fill of Oil	In bidder's scope if required	
10.0	SPARES		
10.1	OPERATING SPARES	a) K-type Duplex Thermocouple - 1 no b) K-type Simplex Thermocouple - 1 no c) Programmable Temperature Controller – 1 no d) Safety controller – 1 no e) Heating elements - RoB modules – 20% of installed quantity f) Thyristor Power controller – 1 Set g) Thyristors – 1 set h) Contactors (incl. main contactor), push buttons, limit switches – 2 Sets of each type. i) One set of ceramic materials (like ceramic tubes, cup locks, washers etc. as applicable) used in holding of the electrical coils. j) Twenty percent of ceramic fibre insulation materials and refractory bricks. k) Door sealing rope – 3 nos l) Recorder – 1 no	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
		m) Recorder chart paper – 12 no n) Recorder ribbon cartridge – 4 no o) Any other spares found necessary – to be quoted with unit price and quantity	
10.2	COMMISSIONING SPARES	Bidder to List Down the items with the TECHNICAL OFFER, which are likely to be replaced during the erection & commissioning, where these items are likely to be replaced due to damage or failure. THESE ITEMS ARE TO BE REPLACED AT THE COST OF THE SUPPLIER.	
11.0	PRE-DISPATCH INSPECTION AT SUPPLIER'S WORKS		
11.1	Inspection at Supplier's Works	a) The supplier has to offer furnace, for pre dispatch inspection at Supplier's Works by BHEL Officials. b) Temperature Program Controller, Safety Temperature Controller, Temperature Recorder and Thermo-Couples shall be supplied with Calibration certificate traceable to national/International standards c) Heating of test block upto 800°C and soaking upto 6 hrs will be checked during inspection.	
12.0	ERECTION & COMMISSIONING		
12.1	Erection & Commissioning	a) Erection of Complete furnace and its auxiliaries - is under supplier's scope. b) BHEL will provide electricity, water and crane for handling and lifting of furnace components / materials at erection site (free of cost). However, accessories and consumables will be under the scope of supplier for erection and commissioning. All consumables required during operation shall be indicated by vendor. c) Commissioning of the Furnace and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier, including the performance prove-out heat-treatment cycles as per Annexure A.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

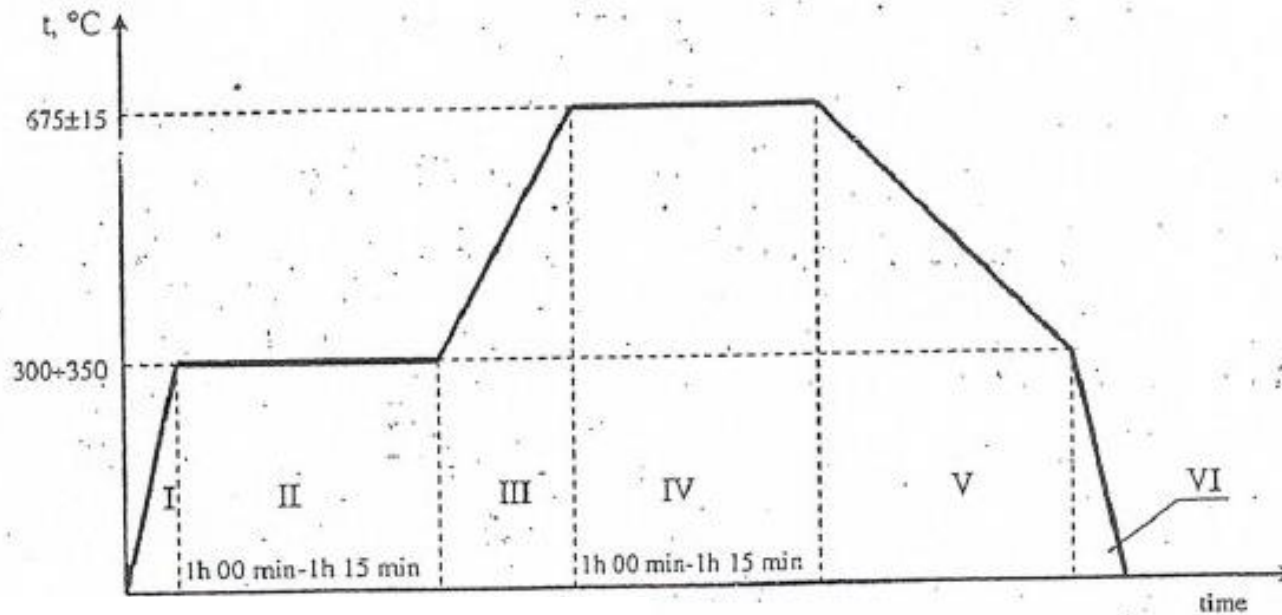
S. No	Technical Specification	Bidder's offer with Technical details and Remarks
12.3	Acceptance at BHEL Works a) The acceptance of the Furnace in Total will be only after the testing for its performance prove-out as per BHEL Specifications, at BHEL Works, after the completion of erection and commissioning activities. b) Two heat-treatment cycles shall be run and proved out as given in ANNEXURE-A.	
13.0	FURNACE DOCUMENTATION	
13.1	O & M Manuals a) Three hard Copies of the Operation & Maintenance Manual to be supplied along with the supply of the furnace. b) Two soft copy of all documentation including Operation & Maintenance Manual shall be supplied in pen drive c) The following documents and details (as given under Clause No. 13.2 shall form part of the Operation & Maintenance Manual	
13.2	Documents and Technical Details a) GA Drawing of the Furnace in Total. b) Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose. c) Electrical Wiring Drawings – Power & Control Circuits d) Detailed final heat load calculations e) Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls f) Specifications / Ratings of All Bought-Out-Items g) Trouble Shooting Chart for Main and all Sub-Systems h) Drawings of all the refractory components with specifications. i) O&M manual of Temperature controllers & recorder, thyristors and power controllers.	
14.0	TRAINING The Supplier's Service Engineer shall train BHEL Staff in the Operation, Trouble Shooting and Maintenance of the Furnace for a period of 2 Working Days, after the SUCCESSFUL COMMISSIONING of the furnace, at BHEL Works.	

PART – B: Technical Specification for Pit Type High Temperature Electric Furnace 800°C – 1 No.

S. No	Technical Specification		Bidder's offer with Technical details and Remarks
15.0	TECHNICAL OFFER	a) The Technical Offer shall contain the following: b) Complete Scope of Supply, including Main Equipment, Safety systems, All Accessories and Attachments, etc. c) List of Operating Spares, Commissioning Spares, Foundation / Anchoring Materials d) Erection, Commissioning and Performance Prove-Out Details. e) Complete description of all systems & sub-systems forming part of the Furnace. f) A schematic diagram showing the layout of the furnace & associated systems with salient dimensions	
16.0	PERFORMANCE GUARANTEE	The Performance of the Furnace in total and/or the Components / Sub-Assemblies / Bought-Out-Items in particular, shall be guaranteed for a minimum period of 12 months from the date of performance acceptance at BHEL Works or 18 months from supply whichever is earlier.	

ANNEXURE A

HT CYCLE – 1



- I - TIME OF ARTICLE HEATING UP TO $300 - 350^\circ\text{C}$, HEATING RATE IS DETERMINED BY FURNACE CAPACITY;
II - HOLDING TIME;
III - FURNACE HEATING RATE NOT MORE THAN $100^\circ\text{C}/\text{Hr}$.
IV - HOLDING PERIOD AT TEMPERING TEMPERATURE;
V - COOLING TOGETHER WITH THE FURNACE (keeping furnace door in closed condition).
VI - COOLING IN AIR.

HT CYCLE – 2

NOTE:

a) Furnace Temperature before loading shall be within Room Temperature to 300deg C

b)i) ROH=35+15/-10 deg/Hr between 300 to 450 deg C
ii) 35+15 deg/Hr between 450 to 655 / 670 deg C

c) FC=Furnace Cooling (cut off Gas & Air supply do not open the door record the cooling rate upto 300 deg C.)

d) Below 300 deg C Air Cooling.

