



An ISO 9001
Company

Bharat Heavy Electricals Limited (High Pressure Boiler Plant)

Tiruchirappalli – 620014, Tamil Nadu India

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY	Phone:	91 431 257 7421
	Email	vkarna@bhel.in hemalatha@bhel.in
	Web	www.bhel.com

NOTICE INVITING TENDER

TWO PART BID	Enquiry Number	Enquiry Date	Due date for submission of quotation:
Tender to be submitted in two Parts	2731900010	12.04.2019	03.05.2019

You are requested to quote the Enquiry number date and due date in all your correspondence.
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	Quantity	(Indigenous Vendors) Material shall be delivered to
10	High Temperature Electric Furnace 800° C as per the technical specification & commercial conditions applicable (to be downloaded from web site (http://www.bhel.com) http://www.bhel.com/tender/tender_home.php or https://eprocure.gov.in/epublish/app)	01 no.	FOR, BHEL, stores, High Pressure Boiler Plant, Tiruchirappalli - 620014

Important points to be taken care during submission of offer

1. Delivery required : 4 months including PDI from the date of purchase order
2. Erection & Commissioning period required 5 weeks from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.
3. EMD for this Tender will be (INR) : 150000
4. Compliance Form Nos.: TRY/IND/06 to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
5. 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>) http://www.bhel.com/tender/tender_home.php or from the Government tender website <https://eprocure.gov.in/epublish/app> under above Enquiry reference.

(This is not an E-tender, please submit your offer in hard copies)

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

C. Hemalatha
Sr Manager / Capital Equipment/MM

C. HEMALATHA
Senior Manager
MM / Capital Equipment
BHEL / Tiruchirappalli - 620 014

PART - A: Pre - Qualifying Criteria

The Bidder has to compulsorily meet the following requirements to get qualified for considering the technical offer for the High Temperature Electric Furnace - 800°C. Otherwise the technical offer will not be considered.

S. No.	TENDER PARTICULARS	VENDOR's RESPONSE
1..1	Only those (OEMs), who have supplied and commissioned at least TWO complete "HIGH TEMPERATURE 800 °C ELECTRIC FURNACE" of the offered 800°C furnace in the past Five years (on the date of opening of Tender). Vendor to specify.	
1.2	Only those vendors (OEMs) should quote, who have supplied and commissioned in the last 5 years (as on the original date of tender opening) at least TWO number of "HIGH TEMPERATURE ELECTRICALLY OPERATED FURNACE with a TEMPERATURE Rating of 800 Deg. C and above" in India. The referred furnaces shall be presently working satisfactorily for more than one year from the date of commissioning (as on the date of this tender opening). The name and contact addresses of the customers to whom the above said furnace were supplied to be furnished with details.	
1.3	Vendor has to submit at least ONE PERFORMANCE CERTIFICATE (as per the format provided in ANNEXURE-A). for satisfactory performance of "HIGH TEMPERATURE 800 °C ELECTRIC FURNACE" as referred under clause 1.2 above, for a minimum period of one year from the Date of commissioning (as on the original date of tender opening) from their customers in India, supplied and commissioned in the last 05 years.	
1.4	BHEL reverse the right to verify the information provided by the Vendor for the referred furnace at their referred customer's works. It shall be the responsibility of the vendor to facilitate the	

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

	visit of BHEL's team at their refereed 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/VENDOR are requested to provide the following information	
2.1	The BIDDER / VENDOR to furnish Reference List of Customers, with complete address, details of contact person, for whom "HIGH TEMPERATURE ELECTRIC FURNACE with rating 800 Deg. C and above" have been supplied in the past.	
2.2	Specify details of "HIGH TEMPERATURE ELECTRICALLY OPERATED FURNACE of rating around 800 °C" 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/ Vendor 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	

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

	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 ELECTRICALLY OPERATED FURNACE(s) of Rating around 800 Deg. C.	
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 quote of supply to BHEL units of systems of similar capability.	

ANNEXURE -A

Suggestive Format for Performance Certificate

The Performance should be certified by the customer on Customer's Letter Head and submitted along with the offer/can be sent to BHEL directly (DGM/PURCHASE/MM/CE).

PERFORMANCE CERTIFICATE

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 (L X W X H mm)	
6.2	Maximum Capacity (Tonnage)	
	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 "**Vendor's offer with Technical details & Remarks**" of this format shall be filled in by the Vendor 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:	Name & Address of the Indian agent:
Telephone no.:	Telephone no.:
Fax no.:	Fax no.:
e-mail:	e-mail:

SCOPE: -

This technical specification covers the requirements of Design, Manufacture, Supply, Erection and Commissioning of **1 No. of SINGLE BIGIE CAR BOTTOM ELECTRIC FURNACE** complete with all the accessories for trouble free operation. Also, Scope to include job positioning facility – One 2 Ton Capacity reputed make battery operated mini forklift with battery charger. 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.

S. No	Technical Specification		Vendor'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. Scope to include job positioning facility (viz., one 2 Ton Capacity reputed make battery operated mini forklift with battery charger) – to load and unload jobs onto & from the furnace bed.	
2.0	FURNACE CONFIGURATION		
2.1	Furnace Type	Electrically Operated Car Bottom (Bogie Hearth) Furnace having usable dimension of 1500 (L) X 1500 (W) X 1500 (H) mm suitable for handling gross charge load of 2 MT and maximum 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 675 ^{+0/- 10} deg. C heating cycles on ferrous and non-ferrous components.	
2.3	Loading Capacity	2 Metric Tons (excluding job supports)	
2.4	Job Details	Various components & test coupons pertaining to customers. The maximum weight of charge will be 2 Metric Tons.	
2.5	Job Handling system	Loading and unloading of the job will be done always when the Bogie is outside the Furnace. For this, considering the workstation configuration, it is warranted to supply a 2 Ton Lifting Capacity GODREJ / VOLTAS/TOYOTA / HYUNDAI make ready to use electrically charged battery operated mini forklift with min 1500 mm lift (including the battery charger) along with the furnace.	
3.0	FURNACE CONSTRUCTIONAL FEATURES		
3.1	Furnace usage	The usage of furnace shall extend up to 120 Hrs continuously with repeated heating/soaking/cooling.	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
3.2	Charge Temperature	The maximum charge (job) temperature shall be up to 675°C. The furnace should be capable of maintaining this temperature as soaking temperature uniformly throughout the soaking period.	
3.3	Furnace temperature	Vendor to confirm. Maximum temperature 800 ° C.	
3.4	Rate of Heating	Max rate of heating shall be 120 ° C/hr beyond 350 ° C. The desired rate of heating shall be adjustable and programmable.	
3.5	Soaking Time	User defined as per the heating cycle requirements	
3.6	Uniform Soaking temperature	The charge temperature must be uniform during soaking. The maximum variation allowed is +0/-10°C for 675 °C cycle in soaking time. Vendor 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 design calculation sheet for the power rating specified above.	
3.8	Heating Chamber Dimensions	Effective loading area on the bogie (i.e. furnace working zone) shall be 1.5 M x 1.5 M, with a clear height of 1.5 M from the bogie surface. Vendor to specify the Chamber dimensions to suit the effective loading area of bogie.	
3.9	Furnace Bogie	The furnace shall be provided with a Single Bogie. Bogie drive mechanism shall have the forward and reverse movement of the Bogie on rails. Rails will be grouted flush with the floor level in the shop. BOGIE FRONT WIDTH=1.5 M and BOGIE LENGTH=1.5 M with a clear height of 1.5M from bogie surface.	
3.10	Bogie Construction	1. The bogie shall be driven by motorized drive mechanism through a suitable reduction gearbox. Bidder to specify travel speed of the bogie. 2. The drive mechanism and gearbox are to be located on the side of the furnace for ease of maintenance. 3. Drive transmission from gearbox to car bottom bogie shall be of Rack & pinion type.	

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

S. No	Technical Specification	Vendor's offer with Technical details and Remarks
	4. Provision shall also be made to move the bogie manually (using other vehicle) during power failure. BIDDER has to provide details on this offered arrangement. 5. Rails for bogie movement, to specification CR 80, IS 3443, with centre to centre distance 1676 mm (BG) to be provided by supplier 6. Bogie shall be provided with refractory hearth suitable to withstand the job load and maximum furnace temperature. 7. Provision shall be included in the design to provide double sand sealing between the furnace shell and on both sides of the bogie. 8. The bogie shall be designed in such a way that perfect matching between the bogie refractory and furnace hearth refractory is ensured / maintained, in order to minimize the heat loss. Bogie and Furnace hearth shall have refractory retainer castings facing each other with minimum gap 9. The bogie shall have top layer lined with IS 8 quality firebricks backed by lightweight firebricks of suitable thickness. 10. BIDDER has to furnish technical details of bogie from the design point of view, to meet the above listed requirements.	
3.11	Furnace Door Construction a) A vertical Sliding Door shall be on the front side of the furnace chamber. b) Structural design to take care of strength and anti-buckling quality features of the Furnace Door under high temperatures. c) Opening & Closing of Door shall be motorized with suitable sprocket-chain drive mechanism, gear reduction and counter balance. d) Mechanical locking arrangement (Example: Lever type) to minimize the heat loss when the furnace is in operation. e) Provision should be made on the door for sand sealing at the roof and bottom in the bogie in closed position of the door	

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

S. No	Technical Specification	Vendor's offer with Technical details and Remarks
	f) The Door shall be provided with facilities for manual operation in case of power failure or failure of the motorized system. g) Vendor to furnish Details of the door drive system, sand sealing and door-locking mechanism. h) Limit switch shall be provided to ensure switching off the heaters once the door is opened.	
3.12	Furnace Wall Insulation a) The wall insulation shall be of ceramic fiber blanket of suitable density and thickness to maintain the charge (job) temperature at 675 °C. b) Ceramic fiber blanket shall be used for the sliding door and for all sides of the furnace. c) Max. skin temperature of chamber should not exceed 80 ° C. d) The supplier should submit the heat balance calculation for proof of achieving the skin temperature as per BHEL specification. e) Wall insulation design with ceramic fiber blankets shall be submitted along with offer. f) The interfacing surfaces of the furnace shell and the bogie shall have shaped hard refractory bricks (IS 8) suitably arranged and matched to minimize the heat loss from the furnace. Bogie and Furnace hearth shall have refractory retainer castings facing each other with minimum gap. g) The wall insulation shall be of ceramic fiber blanket of suitable density and thickness to maintain the charge (job) temperature at 675 °C. h) Ceramic fiber blanket shall be used for the sliding door and for all sides of the furnace. i) Max. skin temperature of chamber should not exceed 80 ° C. j) The supplier should submit the heat balance calculation for proof of achieving the skin temperature as per BHEL specification. k) Wall insulation design with ceramic fiber blankets shall be submitted along with offer.	

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		l) The interfacing surfaces of the furnace shell and the bogie shall have shaped hard refractory bricks (IS 8) suitably arranged and matched to minimize the heat loss from the furnace. Bogie and Furnace hearth shall have refractory retainer castings facing each other with minimum gap.	
3.13	Furnace Shell	a) The bottom side shall have bogie and the front side shall have a vertical Sliding Door. b) Except bottom and front sides, all other sides of the furnace chamber shall be permanently closed. c) The furnace shell shall be built using at least 10 mm thick mild steel plates. d) Proper reinforcements using rolled sections of suitable dimensions shall be introduced to provide a rigid and sturdy construction. e) 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. f) Additional provisions of 20mm dia holes 2 Nos in each side of the walls of furnace (total 4nos) for insertion of thermocouples inside the furnace for job temperature measurement. Additionally, two more opening for 50mm dia holes at equally spaced on back side of furnace to facilitate any purging through pipe shall be provided. The thermocouple insert holes shall be properly insulated to avoid any contact of thermocouples with the heating elements inside the furnace.	
3.14	Heating Elements	1. Material: Kanthal make heating elements. A1 grade or better. 2. Type and Size of the heating element: vendor to specify. 3. 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.	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		- Test Certificate for Kanthal heating elements is to be furnished by the supplier, along with the documentation of the Furnace. - The heating elements shall be arranged or supported on the side walls of the furnace. - Heating elements shall not be located on the doors or the bogie. - 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. - The heating elements holding arrangement should be rigid, easy for maintenance and avoid sagging of the elements in due course of furnace operation. The rigidity of the supports has to be ensured from the furnace wall. Heating element assembly drawing with termination drawings shall be submitted to BHEL for approval prior to taking up the manufacture.	
3.15	Temperature Control Zones	The furnace shall have two temperature control zones.	
3.16	Ventilation/Blower	Air circulation fans (of SS 310) with bearing cooling arrangement (water) will be provided along with suitable baffle plates (of SS 310).	
3.17	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. - The final coat of finish painting shall be done at BHEL Works, before handing over the Furnace after the successful commissioning and performance prove-out.	
4.0	DIGITAL PROGRAMMABLE TEMPERATURE CONTROLLER		
4.1	Make	Eurotherm /Honeywell/Yokogawa/Chino/Fuji – (Eurotherm 2404 preferable)	

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
4.2	Technical Details	1. Display: Minimum 4 digit display (range for 0-1200°C) 2. Display Parameter: Simultaneous colour display of Process Value(PV) and Set Value(SV) with units and output 3. Input: Universal (Thermocouple inputs, RTD, mA, mV etc.) with user selectable 4. Scale and Unit: User selectable 5. Panel cut out size: 92X92 mm 6. No. of output: Two 7. Control Output: 4-20 mA & Relay Output (User selectable.) 8. Alarm output: Relay output. 9. Operating ambient: 0 to 50 ° C, 10. Configuration and programming: Through Front panel key. 11. Accuracy: 0.25% of FSV 12. Program pattern: Configurable for Ramp, Soak & cool (Min 8 steps/ program) 13. No of program: Capable for loading 2 programs 14. Cold junction compensation: Automatic 15. Input Power supply: 230 +/- 10%, Single phase 50hz AC supply 16. Auto tuning: To be provided to perform precision control setting 17. Standard Calibration facility: Standard error adjustment facility to be provided through front panel key. 18. Front Panel key: Membrane keypad/ Bezel keypad 19. (Miniature switch cover with sheet is not acceptable.)	
5.0	POWER CONTROLLER		
5.1	Type	The Controller shall be of Thyristor type 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	1. The furnace temperature shall be controlled by Thyristor Controller through Programmable Controller in auto / manual mode.	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		- The furnace temperature shall also be controlled by Contactor through Programmable Controller in auto / manual mode. - The Thyristorised Power control shall be through a system consisting of Power Pack and Control Cards. - The power controller shall be of EUROTHERM / JELTRON / CHINO / SIEMENS make. Note: The power controller being offered shall 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	Two control panels shall be provided. - One panel to house the Programmable temperature controller, Temperature recorder, Safety Controller. - Second panel to house 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. Suitable transformer shall be used for 415/ 230V and 415 / 24 V. Panel AC with suitable rating shall be provided.	
5.4	Display	Provision for monitoring the electrical parameters like current for each phase, voltage, kWh, etc. through a LCD Multi-Function True RMS meter. The make shall be SCHEINDER or equivalent. Vendor to quote Make & Model. The offered model shall have RS485 communication facility	
6.0	PAPERLESS TEMPERATURE RECORDER		
6.1	Make	EUROTHERM Make (Model - 6100A preferable)	
6.2	Technical Specification	- No. of channels: 12 - Input: Universal input (T/c. types K, R, S, RTDs, mV & mA etc.) - Calibration temperature range: 0 to 1200 °C	

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

S. No	Technical Specification	Vendor's offer with Technical details and Remarks
	4. Specific working trend speed: Initial set speed will be 20 mm/Hr (Speed A) up to 100°C then speed should be automatically selected to 60 mm/Hr (Speed B) above 100°C up to end of the process. When the temperature is below 100°C or sensor open, automatically trend speed should be selected to 20 mm/Hr. (Configurable). 5. Trend speed: 1 to 1500 mm/Hr. (configurable). 6. Display: size 5inch (minimum), Colour TFT Display & Touch screen type. 7. Display requirement: Bar graph, digital display and Strip chart background with major minor divisions (configurable) 8. Power: 180 to 260 V, 50 HZ. 9. Communication: Ethernet and serial port. 10. Upload/download function: To be provided to upload/download data backup with necessary software. 11. Protocol: TCP /IP. 12. Display: 100mm VGA for Trend, Digital & Bar graphic display. 13. Cold junction compensation: Off, Internal, external (user selectable) 14. Calibration facility: Provision for error adjustment and touch screen calibration facility to be provided. 15. Internal memory: Minimum 96 MB 16. Removable media memory: Minimum 8GB Memory capacity USB memory stick to be provided. 17. Software: Suitable software to be provided to configure recorder from remote location through on line, to view the Trend history in XY strip chart background with major & minor divisions(Configurable) and to take print out of temperature data on specific date & time through PC. PC shall be provided by BHEL with windows7/8 64-bit loaded software.	

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

S. No	Technical Specification	Vendor's offer with Technical details and Remarks
	18. Scale & unit print: Should print at intervals of 1Hr at 30 mm trend speed. 19. Real time data Print: Trend print and digital print in EXCEL Format for a specified period of time. 20. Note function: To be provided to enter the job details with alphanumerical character. 21. Message capacity: Minimum 60 character for Message print. 22. Message print: Batch description, Machine name, location, and job details at start up time. 23. Back up battery: For Real time clock and to retain real time data in case of electrical power failure and internal & external alarm event function to stop recording in case of backup battery low/ failure. 24. Data protection: Facility to be provided to retrieve the data in case of backup battery low / failure. 25. Power cord: To be provided.	
7.0	SAFETY TEMPERATURE CONTROLLER	
7.1	Make	Eurotherm /Honeywell/Yokogawa/Chino /Masibus / Fuji
7.2	Technical Details	1. Type of control: ON/OFF control. 2. Display: minimum 4-digit display 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.

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		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. Panel cut out size: 92 W X 92H 17. Thermocouple burnt out protection: Up scale 18. Standard Calibration Facility: Standard error adjustment facility to be provided through front panel key.	
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 – 2nos Simplex type thermocouple for Safety Controller – 2nos	
9.0	GENERAL POINTS		
9.1	Input Power Supply	1. 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) 2. 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. 3. Supplier has also to specify the means & mode of giving power supply to the heating elements.	
9.2	Pneumatic air supply	If any pneumatic 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 Vendor.	
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.	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
9.4	Make of Motors	Motors shall be of M/s Siemens / KEC / ABB / BBL / Crompton makes. Single phasing preventers shall be incorporated for all the motors. All motors should be energy efficient – IE2 or better.	
9.5	Control Elements	The electrical switch and control elements shall be of Siemens / L&T / GEC Alstom / Telemechanique / Mitsubishi 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.	
9.7	Cabling Code	All wires, cables, instrument tapings, etc. shall be terminated at components / devices / terminals using suitable number ferrules.	
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. Compensating cables shall be routed through separate cable trays.	
9.9	Safety Systems	a) Heating element cannot be switched ON unless the bogie is fully inside the furnace and door is closed. b) Bogie cannot be moved unless the door is open at least 500mm. c) Door cannot be lifted unless heating element is OFF. d) Door can be operated only when the bogie is fully inside e) All motors will be provided with thermal overload relays along with single phase preventer f) Over temperature controller will switch OFF the heating element in case of failure of main controller. g) 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 vendor's scope	
10.0	SPARES		
10.1	OPERATING SPARES	1. K-type Duplex Thermocouple -1 no 2. K-type Simplex Thermocouple- 1 no	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		3. Programmable Temperature Controller – 1 no 4. Heating elements - 06 No's of each type. 5. Power controller – 1 Set. 6. Contactors, push buttons, limit switches – 2 Sets of each type. 7. One set of ceramic materials (like ceramic tubes, cup locks, washers etc. as applicable) used in holding of the electrical coils. 8. Twenty percent of ceramic fibre insulation materials and refractory bricks.	
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	FURNACE INSPECTION AT SUPPLIER'S WORKS		
11.1	Inspection at Supplier's Works	1. The supplier has to offer, for inspection at Supplier's Works by BHEL Officials, all the furnace components (structures, ceramic fiber insulation material, refractory bricks, etc.), mechanical sub-assemblies, heating elements, accessories & attachments forming part of the electrical and control systems, spares, anchoring & supporting materials, etc., which are in individual despatch able consignments. 2. Temperature Program Controller, Safety Temperature Controller, Temperature Recorder and Thermo-Couples shall be supplied with Calibration certificate traceable to national/International standards	
12.0	ERECTION & COMMISSIONING		
12.1	Erection	1. Erection of Complete furnace and its auxiliaries - is under supplier's scope. 2. Suitable foundation bolts / anchoring materials shall be supplied by the supplier.	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		3. Civil foundation Work will be under BHEL scope. 4. The vendor shall provide the foundation drawing / detail to BHEL in advance for preparation of foundation. 5. BHEL will provide electricity, water and crane for handling and lifting of furnace components / materials at erection site (free of cost). However, welding machines, accessories and consumables will be under the scope of supplier for erection and commissioning.	
12.2	Commissioning	Commissioning of the Equipment 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.	
12.3	Acceptance at BHEL Works	1. 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. 2. Minimum two heat-treatment cycles shall be run and proved out for the cycle/s 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) Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls	

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

S. No	Technical Specification		Vendor's offer with Technical details and Remarks
		e) Specifications / Ratings of All Bought-Out-Items f) Trouble Shooting Chart for Main and all Sub-Systems g) Drawings of all the refractory components with specifications. h) O&M manual of Temperature controllers & recorder	
14.0	TRAINING	a) The Supplier's Service Engineer shall train BHEL Staff in the Operation, Trouble Shooting and Maintenance of the Furnace for a period of 3 Working Days, after the SUCCESSFUL COMMISSIONING of the furnace, at BHEL Works.	
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.	

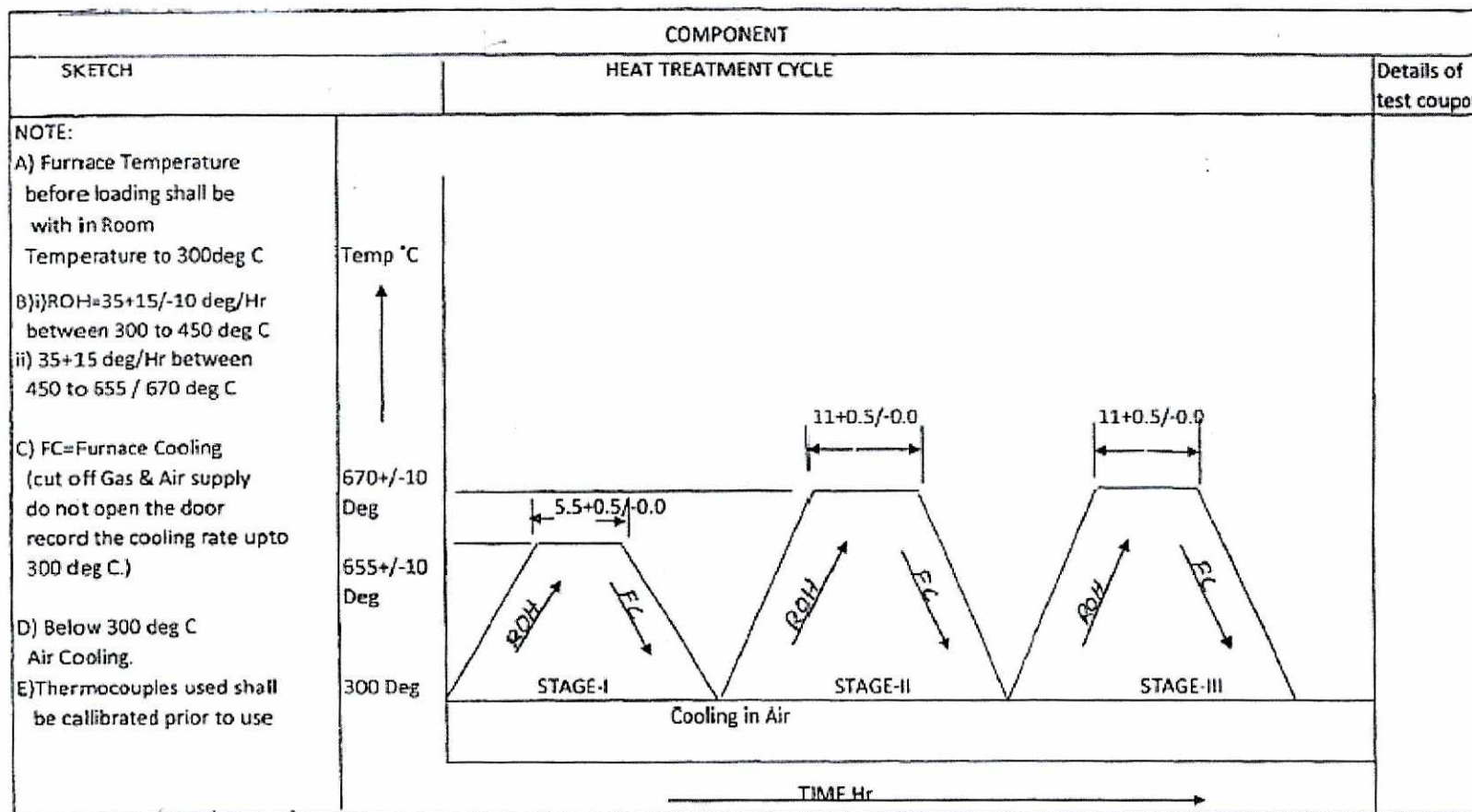
1. HT Cycle - I

ANNEXURE - A

OP&C / ATP

Sketch - 1

HT PLAN FOR PROVE OUT BY S/Cr



2. HT Cycle - II

ANNEXURE - A

ADVANCED TECHNOLOGY PRODUCTS
OPERATION PLANNING AND CONTROL

Sketch-2

HT PLAN FOR PROVE OUT BY SUB-CONTRACTOR

