1.0 PURPOSE & BASIC FEATURES

**Purpose:**
Electrically heated sealed retort pit type furnace for gas nitriding furnace shall be used for gas nitriding of alloy and creep steels such as mandrel, cover, threaded ring, pilot valves, etc. using dissociated ammonia. Usable internal dimensions shall be Dia. 1500 mm x 2000 mm depth, suitable for handling gross charge load of 2000 kg (including fixtures) and 560°C operating temperature.

**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 furnace is basically of a fabricated mild steel chamber with reinforcements and a lid. Both the chamber and lid are suitably insulated with refractory bricks and ceramic fiber modules. The furnace should have one recirculating Fan for temperature uniformity and gas circulation in the retort.

2.0 SPECIFICATIONS:

### 2.1 TECHNICAL DATA

- **Electrically heated pit type sealed furnace.**

### 2.2 GENERAL PARAMETERS

- **Batch capacity (Gross Load including fixtures):** 2000 kg.
- **Useful retort dimensions:**
  - Depth: 2000 mm
  - Diameter: 1500 mm
- **Over all dimensions (Indicative):** Vendor to specify
- **Depth:** Vendor to specify
- **Diameter:** Vendor to specify
- **Working Height:** Vendor to specify
- **Heating rate:** 200°C/hr. in full load (Vendor to confirm)
- **Cooling Rate:** max. 50°C/hr (Vendor to specify)
- **Maximum Temperature:** 650°C (Vendor to specify)
- **Temperature Uniformity in the zone:** ± 5°C of set value
- **Mode of Temperature control:** Proportional through Thyristor controllers (Vendor to specify)
- **Make of Thyristor Controller:** Siemens / Eurotherm (preferably) (Vendor to specify)
- **Model of Thyristor controller:** Vendor to specify
- **No of control zones:** Minimum 2
- **Power rating:** Approx. 120KW (Vendor to specify)
- **Furnace outer wall temperature:** 40°C above ambient temperature (approx.) (Vendor to specify)

### 2.3 MECHANICALS

- **Casing plate material & thickness:** 5 mm (minimum) (Vendor to specify)
- **Retort material & thickness:** 6 mm (minimum), AISI 304
- The retort shall have a dished bottom reinforced with strong ribs to support the charge weight. The retort shall have a suitable charge grid to support the charge load. The retort shall be supported on the furnace casing and the sealing between the furnace and the retort shall be by asbestos rope.
- **Gas guide cylinder:** 1 no. AISI 304, 6mm. (Vendor to confirm)
- **One no. centrifugal type recirculating fan:** 7KW on the retort cover. The fan impeller and shaft shall be of AISI 304.
- **Insulation details:** Furnace shall be provided with ceramic fibre modules of adequate thickness along with stainless steel sheath and carbon firebricks. The furnace hearth shall be lined with firebricks backed with insulating bricks. The basin of the retort cover shall be filled with ceramic fibre.

### 3.0 ELECTRICAL & DATA FEATURES

- **Electrically heated sealed retort pit type furnace for gas nitriding furnace shall be used for gas nitriding of alloy and creep steels such as mandrel, cover, threaded ring, pilot valves, etc. using dissociated ammonia. Usable internal dimensions shall be Dia. 1500 mm x 2000 mm depth, suitable for handling gross charge load of 2000 kg (including fixtures) and 560°C operating temperature.**

### 4.0 ADDRESS OF THE SUPPLIER:

- **Bharat Heavy Electrical Limited**
- **Address:** Haridwar, Uttarakhand, India
- **Contact Details:**
  - **Name:**
  - **Designation:**
  - **Phone No.:**
  - **E-mail:**

### 5.0 ADDRESS OF THE INDIAN AGENTS:

- **Address:**
- **Contact Details:**
  - **Name:**
  - **Designation:**
  - **Phone No.:**
  - **E-mail:**

### 6.0 SUPPLY, ERECTION & COMMISSIONING OF ELECTRICAL HEATED PIT TYPE GAS NITRIDING FURNACE COMPLYING WITH SPECIFICATIONS AS BELOW.

### 7.0 CONTACT PERSON FROM PURCHASE DEPTT.:

- **Name:**
- **Designation:**
- **Phone No.:**
- **E-mail:**

### 8.0 NOTE:

1. Vendor (OEM) must submit complete information against each clause of this specification. The offer, complying with this clause, would only be considered.
2. The vendor (OEM) should fill the "Offered" column in compliance to specified requirements and also "Deviations" column, where there is deviation from the requirements. Any filled specification or compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or inexecutable information against any of the clauses of the specifications / requirements shall be treated as non-compliance.
3. The offer and all documents enclosed with offer should be in English language only.

### 9.0 TECHNICAL SPECIFICATIONS CUM COMPLIANCE CERTIFICATION FOR "ELECTRICAL HEATED GAS NITRIDING FURNACE":

- **Vendor (OEM) must submit complete information against clause at Sl.No. 1.0. The offer, complying with this clause, would only be considered.**
- **Vendor (OEM) should fill the "Offered" column in compliance to specified requirements and also "Deviations" column, where there is deviation from the requirements.**
- **Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or inexecutable information against any of the clauses of the specifications / requirements shall be treated as non-compliance.**

### 10.0 ADDRESS OF THE INDIAN AGENTS:

- **Address:**
- **Contact Details:**
  - **Name:**
  - **Designation:**
  - **Phone No.:**
  - **E-mail:**

### 11.0 SUPPLY, ERECTION & COMMISSIONING OF ELECTRICAL HEATED PIT TYPE GAS NITRIDING FURNACE COMPLYING WITH SPECIFICATIONS AS BELOW.

### 12.0 CONTACT PERSON FROM PURCHASE DEPTT.:

- **Name:**
- **Designation:**
- **Phone No.:**
- **E-mail:**
2.3.6 Retort cover details. Fabricated with mild steel plate in cold part and AISI304, 6mm thick in the hot part. The hollow is to be filled with ceramic fiber. The retort cover fits into the retort and gas tight sealing is to be ensured by water cooled neoprene sealing with hand wheel locking arrangement. The retort cover shall carry the Recirculating Fan and its drive arrangement. Gas inlet and outlet pipes are to be provided. A flexible exhaust pipe is to be provided. The retort cover shall be hydraulic (working pressure should not exceed 100 bar) lifting type with manual swivel arrangement. (Air filter, regulator, evacuator separator and an orifice to compensate air Good to specify

2.3.7 Heating elements - the furnace shall be provided with approx. 120KW heating capacity with NiCr 80/20 heating elements. They shall be of strip type supported by special heater support arrangements. All the elements shall be controlled by programmable master controller controlling the usual PID controllers through Thyristors. Good to specify

2.3.8 Atmosphere control. The furnace shall be dissociated ammonia and the flow shall be controlled through two separate control valves operated from the control panel. The first valve shall provide normal operating flow and the second shall provide additional flow for purging when required. The gas is to be introduced into the furnace from a single port just under the recirculating fan. One or more orifice meters for flow measurement and pressure drops shall be provided. The heating elements shall be provided for atmosphere control. 2. Two nos. ammonia flow meters. 2. Two nos. shut off valves. Vendor to specify

2.3.9 Furnace Temperature control system. The furnace shall be provided with programmable type master programmable controller which receives input from the retort cover thermocouple and accordingly overrides the zonal PID controllers through the thermocouples in the furnace wall. The heater control shall be thyristorised. Excess temperature protection has to be provided. Temperature recording shall be through six point temperature recorder (see 3.4). Vendor to specify

3.0 INSTRUMENTATION

3.1 Programmable temp. controller (Master)

- Duty: Temp. control of furnace
- Type: P.I.D. Programmable, universal input
- Make: Eurotherm/Chino/Honeywell/Massibus
- Range: 0 – 1000 Deg. C
- Input signal: Universal
- Display: Dual Display, 5 digits
- Input Power: 220 V AC through Isolation Transformer.
- Output Signal: 4 – 20 mA DC
- Accuracy: ± 0.1% FSD
- Control Accuracy: ±1% FSD
- Temp. Repeatability: ± 0.5 Deg. C
- Alarm setting: ±2 Deg. C
- Size: 96 X 96 mm
- Memory: EEPROM
- Ambient Temperature: 0 - 50 Deg.C
- Tuning: Auto Tuning
- Other features: Display of Heating/cooling curve & actual furnace temperature graphically, Minimum 10 Ramp/Sock programming and store option should be available.
- Communication: RS 485 communications to be provided
- Qty: 02 Nos.

2.3.9 Furnace Temperature control system. The furnace shall be provided with programmable type master programmable controller which receives input from the retort cover thermocouple and accordingly overrides the zonal PID controllers through the thermocouples in the furnace wall. The heater control shall be thyristorised. Excess temperature protection has to be provided. Temperature recording shall be through six point temperature recorder (see 3.4). Vendor to specify

3.2 Programmable temp. controller (Slave)

- Duty: Temp. control of furnace
- Type: P.I.D. Programmable, universal input
- Make: Eurotherm 2704/Chino/Honeywell/Massibus
- Range: 0 – 1000 Deg. C
- Loops: 3
- Input signal: Universal
- Input Power: 220 V AC through Isolation Transformer.
- Display: Dual Display, 4 digits
- Input Power: 220 V AC through Isolation Transformer
- Accuracy: ± 0.1% FSD
- Control Accuracy: ±1% FSD
- Temp. Repeatability: ± 0.5 Deg. C
- Cascade or 2 loops control option to be available
- Sensor break protection must be provided (upscale or downscale)
- Communication: RS 485 communications to be provided
- Qty: 02 Nos.

3.3 Incubator temperature controller (Master)

- Duty: Temp. control of incubator
- Type: P.I.D. Programmable, universal input
- Make: Eurotherm/Chino/Honeywell/Massibus
- Range: 0 – 1000 Deg. C
- Loops: 0
- Input signal: Universal
- Input Power: 220 V AC through Isolation Transformer
- Display: Dual Display, 5 digits
- Power: 500 W
- Alarm Settings: High/Low, Ambient Temp., Auto-Tuning, Minimum 10 Ramp/Sock programming and store option should be available.
- Communication: RS 485 communications to be provided
- Qty: 02 Nos.
<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>DESCRIPTION OF BHEL REQUIREMENT</th>
<th>REQUIRED</th>
<th>OFFERED</th>
<th>DEVIATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td>Over temperature controller</td>
<td></td>
<td></td>
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<td>Vendor to specify</td>
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<tr>
<td></td>
<td>Duty: Protection against over temp.</td>
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<tr>
<td></td>
<td>a) Type: Digital solid state P.I.D. Programmable</td>
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<td></td>
<td>b) Make: Eurotherm/ Chino/Honeywell/Massibus</td>
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<td>c) Range: 0 – 1000 Deg. C.</td>
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<td>d) Loops: 02</td>
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<td>e) Input signal: Universal.</td>
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<td></td>
<td>f) Output Signal: On / Off (Relay; 5 Amps, 230 V AC)</td>
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<td></td>
<td>g) Accuracy: ± 0.1% FSD</td>
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<td></td>
<td>h) Control Accuracy: ±1 Deg.C</td>
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<tr>
<td></td>
<td>i) Temp. Repeatability: ± 0.5 Deg.C</td>
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<tr>
<td></td>
<td>j) Size: 96 X 96 X 200 mm</td>
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<td></td>
<td>k) Display: Dual display 7 Digit</td>
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<tr>
<td></td>
<td>l) Alarm setting: 02</td>
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<tr>
<td></td>
<td>m) Memory: EEPROM</td>
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<tr>
<td></td>
<td>n) Ambient Temperature: 0 - 50 Deg. C.</td>
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<tr>
<td></td>
<td>o) Qty: 02 nos.</td>
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<tr>
<td></td>
<td>p) Vendor to specify</td>
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</tbody>
</table>

3.4 Temperature recorder
Duty: Recording of process temp.

a) Type: 6 Point Graphical Recorder (Requires recorder Which, professional time display, trend data on a chart, memory card and end display).
b) Range: 0 - 1000 Deg. C.
c) Input signal: Universal Field Programmable

d) Input Power: 220V AC

e) Duty: Continuous

f) Make: Eurotherm / Chino/ Honeywell

g) Response time: 100 ms

h) No. of inputs: 06

i) Data Memory: Compact flash card of minimum 1 GB (Memory card to be supplied by party)

j) Accuracy: ±0.1%

k) LAN Network Capability: Inbuilt

l) No. of Colour: Six different for all different inputs

m) Data Screen: User Programmable-Real-Time Trends or Data Screen or Bar graph screen or Dual end screen etc.

n) Burn Out: Up/Down

o) Scale & Range: Field Selectable

p) Power Supply: 230 Volt AC

q) Qty: 02 Nos

r) Vendor to specify

3.5 All the above instruments will be housed in an attractively finished sheet steel fabrication stand alone panel cubicle excepting the thermocouples which will be field mounted. The panel will be fully wired up internally.

4.0 ELECTRICALS

4.1 The complete electricals will be designed for 415 V ± 10%; 3 phase, 3 wire 50 Hz A.C.

Vendor to confirm

4.2 SCR Controller:
Zero fired thyristor controller with phase angle control to control heater power infinitely

Vendor to specify

4.3 Ammeter:
2 (two ) nos minimum. With selector switch for measuring line current. Make: AEPL /equivalent make

Vendor to specify

4.4 Energy Meter:
1 (one) Energy meter to monitor power consumption

Vendor to specify

4.5 Voltmeter:
1 (one) no. with selector switch. Make AEPL /equivalent make

Vendor to specify

4.6 Motors for recirculating fan drive:
TEFC, squirrel cage induction motor, SI duty , class 'F' insulation with single phase preventor

Vendor to specify HP and RPM of motor

4.7 Electrical panel:
One no. Mild steel fabrication separate electrical panel will house SCR controllers, Ammeter, Voltmeter, switches, including all necessary wiring. The panel will be fully wired up internally.

Vendor to confirm

4.8 Cabling:
To provide all the power and control cabling except as stated under clause 7.3.

Vendor to confirm

4.9 Earthing:
Earthing of equipment will be done with GI/MS Flat/Wire and will be connected to existing earthing system.

Vendor to confirm

5.0 SAFETY INTERLOCKS:

5.1 Heating element cannot be switched ON unless the recirculating fan is ON and door is closed.

Vendor to confirm

5.2 Heaters and circulating fan shall be put OFF in case either of them fails or the retort cover is open.

Vendor to confirm

5.3 Door cannot be lifted unless heating element is OFF. Vendor to confirm

5.5 All motors will be provided with thermal overload relays along with single phase preventor

Vendor to confirm

5.6 Over temperature controller will switch OFF the heating element in case of failure of main controller

Vendor to confirm

6.0 ALARM COMMUNICATION:
In the event of fault condition viz., over temperature or motor failure an audiovisual alarm communication system comprising hooter and indicating lamps will activate

Vendor to confirm

7.0 SERVICES PROVIDED BY BHEL

7.1 Input Power Supply: 415 volt ± 10 %; 50 Hz, 3 phase, 3 wire A.C. supply.

Vendor to accept & offer

7.2 Compressed air at a pressure of 3 - 5 kg/cm2 gauge Vendor to accept & offer
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description of BHEL Requirement</th>
<th>Required</th>
<th>Offered</th>
<th>Deviation</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3.1</td>
<td>Relays (2 Nos each type) Vendor to offer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2.3</td>
<td>All types of O-rings &amp; Hydraulic/Pneumatic Hoses (1 set of each type)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2.2</td>
<td>All types of filter inserts of disposable type (20 nos. each type) Vendor to offer</td>
<td></td>
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</tr>
</tbody>
</table>

9.00 Safety Arrangements

11.3

8.00 Requirement for Electrical Equipment

11.2

11.1 Itemised breakup of mechanical, hydraulic / pneumatic, electrical...

8.00 Spare Parts:

10.5 Paint of the furnace should be oil / heat resistant and should not get peeled off and mixed up with oil.

10.4 If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.

10.3 No hazardous chemicals shall be required to be used in the furnace. Vendor to confirm...

10.2 There shall not be any hazardous emissions from the furnace during operation and sealing should be gas tight to prevent leakage of oil. Vendor to confirm...

10.1 Maximum noise level shall be 85 dB(A) at normal load condition, 1... Vendor to confirm...

9.00 Environmental Performance of the Machine:

10.0 Furnace should have adequate and reliable safety interlocks /... Vendor to confirm...

9.9 A detailed list of all alarms / indications provided on furnace system... Vendor to submit.

9.8 Emergency Switches at suitable locations as per International norms should be built in the machine by the vendor.

9.7 Oil & water pipe lines should not run with electrical cable in the same trench. Vendor to confirm...

9.6 All motors shall conform to IEC or Indian Standards Vendor to offer...

9.5 All electrical / electronic panels to be provided with adequate door seals. All electrical & electronic peripherals/accessories. Any material requirement for the same should have compatibility with Indian equivalents. Vendor to offer...

9.4 All electrical & electronic control cabinets & panels should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical & electronic components in the cabinets should be mounted on DIN Rail and should be of standard make such as Siemens, L&T etc...

9.3 All the rotating parts used on furnace should be statically & dynamically balanced. Vendor to confirm...

9.2 A detailed list of all alarms / indications through lights/ alarm on the control panel and the operator due to the malfunctioning or mistakes. Vendor to confirm...

9.1 Furnace should have continuous monitoring and alarm / warning indications through light alarms on the control panel.

8.3 All electrical & electronic control cabinets & panels should be dust and vermin proof. Vendor to confirm...

8.2 Power Supply will be provided by BHEL at a single point near the furnace, as per layout recommended by Vendor. All types of electrical, controls, connecting wires, terminal blocks etc. required by connecting BHEL's power supply point to different parts of the mechanical, hydraulic / pneumatic, electronic equipment used in the furnace (including Voltage Stabilizers, Voltage Transformer etc.). Shall be supplied by the vendor. Vendor to accept & offer...

8.1 Vendor to confirm...

7.3 Following Spares are to be offered. Vendor to offer...

5.0 Environmental Impact Assessment:

2.2 All types of Electrical (including, Earthing, Grounding, Lightning, Substation etc.) and electronic spares including heating elements used in the furnace to sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. One ear retort and one ear cover must be offered by vendor. The list is conclusive in addition to other recommended spares. Final Price of each item of spare should be offered. Vendor to offer...

2.1 Vendor should ensure the proper earthing for the machine and its peripherals/accessories. The essential equipments for the machine such as Earthing connection from the nearest column of the production shop should be built in the machine by the vendor. Vendor to confirm...

1.8 Tropicalisation:

1.7 Power Supply

1.6 Vendor to confirm...

1.5 Vendor to confirm...

1.4 Vendor to confirm...

1.3 Vendor to confirm...

1.2 All types of hydraulic (pneumatic) controls, pressure switch and flow switch (i.e. each type)... Vendor to offer...

1.1 Termination of electric power cable to incoming of furnace, as per layout recommended by Vendor. Vendor to offer...

1.0 Vendor should ensure the proper earthing for the machine and its peripherals/accessories. The essential equipments for the machine such as Earthing connection from the nearest column of the production shop should be built in the machine by the vendor. Vendor to confirm...

0.1 Vendor to offer...
<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>DESCRIPTION OF BHEL REQUIREMENT</th>
<th>REQUIRED</th>
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<th>DEVIATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3.16</td>
<td>Complete drive controller (1 no)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.10</td>
<td>Thermocouple (2 nos each type), Programmable temperature recorder</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.9</td>
<td>Circuit Breakers (1 No each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.8</td>
<td>Special Fuses (5 Nos each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.7</td>
<td>Semiconductor Fuses (5 Nos each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
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</tr>
<tr>
<td>11.3.6</td>
<td>Indicating Lamps (10 Nos each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
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<tr>
<td>11.3.5</td>
<td>Push Buttons (5 Nos each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
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<td></td>
</tr>
<tr>
<td>11.3.4</td>
<td>Main Switch (1 Nos)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.3</td>
<td>RTD temperature transmitter (1 No each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3.2</td>
<td>Contactors (2 Nos each type)</td>
<td>Vendor to offer</td>
<td>Vendor to offer</td>
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</tr>
</tbody>
</table>

### 14.00

13.2 Vendor shall be responsible for any deviation/rejection in proveout.

13.1 Vendor shall be fully responsible for heat treatment of proveout.

### 12.6

One additional set of all the above documentation on CD ROM.

### 12.5

Complete list of parts/items (Bill of materials) used in the furnace.

### 12.4

Detailed specification of all rubber items and pneumatic fittings Vendor to offer

### 12.3

Catalogues, Operation & Maintenance Manuals of all bought out components.

### 12.2

Detailed Maintenance manual of the furnace with all drawings of components (f) Water table = 25 meter below ground level (d) Coefficient of elastic uniform compression "Cu" = 3.0 Kg/cubic cm (c) Angle of internal friction = 35° (up to 3.0 m depth) (b) Average density of soil = 1.8 T/cubic m (a) Soil strata : Silty sand up to 2.5 meter depth

### 12.1

Operating manuals of Gas Nitriding furnace. Vendor to offer

### 12.0

DOCUMENTATION:

- Vendor to confirm that complete list of spares for Furnace and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with the proveout.
- All types of spares for total Furnace and accessories should be available for at least ten years after supply of the machine. If component or control is likely to become obsolete in this period, the vendor should inform BHEL, and endeavor to advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.
- Vendor to confirm
- Vendor to confirm
- Vendor to confirm
- Vendor to confirm
<table>
<thead>
<tr>
<th>S. No</th>
<th>Description of BHEL Requirement</th>
<th>Required</th>
<th>Offered</th>
<th>Deviation</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.1</td>
<td>Demonstration of all features of the furnace, control system &amp; its sub-systems onto all sections &amp; commissioning activities to be organised and brought by the supplier</td>
<td>Vendor to accept</td>
<td></td>
<td>Vendor to accept</td>
<td></td>
</tr>
<tr>
<td>19.0</td>
<td>MACHINE ACCEPTANCE</td>
<td>Vendor to accept</td>
<td></td>
<td>Vendor to accept</td>
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</tr>
<tr>
<td>18.6</td>
<td>The complete furnace system should be suitable for continuous operation and performance of the furnace and all sub systems</td>
<td>Vendor to accept</td>
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<tr>
<td>18.5</td>
<td>Vendor to offer &amp; confirm</td>
<td>Vendor to accept</td>
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</tr>
<tr>
<td>18.4</td>
<td>Job Proving: Successful proving of BHEL components by the supplier shall be considered as part of commissioning for the machine. All features and functions, as mentioned at Sl. No. 19.0 (Machine Acceptance) shall also be part of the commissioning activity.</td>
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</tr>
<tr>
<td>18.3</td>
<td>Ambient Operating Conditions:</td>
<td>Vendor to accept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.2</td>
<td>Vendor to offer &amp; confirm</td>
<td>Vendor to accept</td>
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<td></td>
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<tr>
<td>18.0</td>
<td>AMBIENT CONDITIONS &amp; THERMAL STABILITY</td>
<td>Vendor to accept &amp; confirm</td>
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<td>18.4</td>
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<td>Vendor to accept &amp; confirm</td>
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<tr>
<td>18.1</td>
<td>Service Acceptance: The complete furnace system should be suitable for continuous operation for its full capacity for 24 hours a day and 7 days a week during some part of the year. Machine shall be kept in the normal day-to-day condition without any temperature control. In case, the furnace is to be stored for long duration, the furnace should be properly insulated and should be kept in the normal day-to-day condition.</td>
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</tr>
<tr>
<td>17.7</td>
<td>Training of BHEL maintenance personal in maintenance of the complete furnace &amp; accessories etc by the supplier's experts/engineers during their stay at BHEL works.</td>
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<td>17.6</td>
<td>Terms &amp; conditions for Erection &amp; Commissioning should be submitted with offer.</td>
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<td></td>
</tr>
<tr>
<td>17.5</td>
<td>Commissioning spares, required for commissioning of the complete furnace, shall be brought by the supplier on returnable basis.</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>17.4</td>
<td>Training of BHEL furnace operators in operation of complete furnace</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>17.3</td>
<td>Commissioning of complete furnace and all supplied accessories/equipments/items for 24 months from the date of acceptance of the machine.</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
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<td>17.2</td>
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</tr>
<tr>
<td>17.0</td>
<td>GUARANTEE</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
</tr>
<tr>
<td>20.1</td>
<td>Sea worthy &amp; rigid packing for all items of furnace, controls, mechanical movement System, all Accessories and other supplied items to avoid any damage during transit. When machine is dispatched to customer, all small loose items shall be suitably packed besides. In case machine is despatched in container, the container shall be brought open by BHEL, Haridwar. The packing of machine shall be as furnished in detail separately by vendor along with offer.</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>PACKING</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
</tr>
<tr>
<td>19.3</td>
<td>Calibration spares required for commissioning of the complete furnace, shall be brought by the supplier on available basis.</td>
<td>Vendor to accept &amp; confirm</td>
<td></td>
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<td>19.2</td>
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</tr>
<tr>
<td>19.1</td>
<td>Demonstration of all features of the furnace, control system &amp; its sub-systems onto all sections &amp; commissioning activities to be organised and brought by the supplier</td>
<td>Vendor to accept</td>
<td></td>
<td>Vendor to accept</td>
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</tr>
<tr>
<td>19.0</td>
<td>MACHINE ACCEPTANCE</td>
<td>Vendor to accept</td>
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<td>18.6</td>
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</tr>
<tr>
<td>S. No.</td>
<td>Description of BHEL Requirement</td>
<td>Required</td>
<td>Offered</td>
<td>Deviation</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
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</tr>
<tr>
<td>22.5</td>
<td>Total weight of the Furnace after erecting at BHEL, Hardwar. Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.6</td>
<td>Weight of the heaviest assembly of the Furnace system. Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.7</td>
<td>Dimensions of largest part of the Furnace System. Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.8</td>
<td>Vendor to submit reference list of customers where similar furnaces have been supplied mentioning broad specifications of the supplied furnace i.e. Model, Furnace size, pay load, maximum temperature, year of supply and customer feedback, if any, etc.</td>
<td>Vendor to submit</td>
<td>Vendor to submit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.9</td>
<td>Detailed catalogues, sketches/drawings/photos pertaining to the offered furnace system and accessories/accessories</td>
<td>Vendor to submit</td>
<td>Vendor to submit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.10</td>
<td>Hydraulic, Pneumatic &amp; Oil pipings should be preferably metallic except where flexible pipings are essential. All the pipes intended for the same shall be supplied by the vendor.</td>
<td>Vendor to confirm</td>
<td>Vendor to confirm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.11</td>
<td>All Cables and Hoses etc. should be well supported &amp; protected in trays/brackets/drag chains etc. All the power/control cables laid in the furnace should be of copper and of stranded type.</td>
<td>Vendor to confirm</td>
<td>Vendor to confirm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### QUALIFYING CONDITIONS

23.1 Only those vendors, who have supplied and commissioned at least one Big size Electrical Gas Nitriding Furnace of same or higher sizes for similar application of Gas Nitriding of alloy steel component in the past ten years (on the date of opening of tender) and such furnace is presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of tender) should quote. However if similar furnace(s) has/had been supplied to BHEL, then the furnace should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of tender) should quote. The following information should be submitted by the vendor about the companies where similar furnaces have been supplied. This is required from all the vendors for qualification of their offer.

Vendor to comply & submit with the offer

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Specification of companies where furnaces are installed</th>
<th>Vendor to inform</th>
<th>Vendor to inform</th>
<th>Vendor to inform</th>
<th>Vendor to inform</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.1.1</td>
<td>Name of the customer / company where similar furnace is installed</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
</tr>
<tr>
<td>23.1.2</td>
<td>Complete postal address of the customer</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
</tr>
<tr>
<td>23.1.3</td>
<td>Month &amp; Year of commissioning</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
</tr>
<tr>
<td>23.1.4</td>
<td>Broad specification of the furnaces supplied (Chamber Size dia x depth, Max. Pay load, Maximum temperature and application for which the furnace is supplied)</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
</tr>
<tr>
<td>23.1.5</td>
<td>Name and designation of the contact person of the customer</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
<td>Vendor to inform</td>
</tr>
<tr>
<td>23.1.6</td>
<td>Phone, FAX no. and e-mail address of the contact person of the customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23.2 Performance certificate from the customers regarding satisfactory functioning of furnace supplied to them (original Certificate or Through E-mail directly from the customer). The original performance certificate may be returned after verification by BHEL, if required.

Vendor to submit

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Specification of companies where furnaces are installed</th>
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<th>Vendor to inform</th>
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</thead>
<tbody>
<tr>
<td>23.3</td>
<td>BHEL reserves the right to verify information submitted by vendors in case the information is found to be false/inaccurate, the offer shall be rejected.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vendor to accept & confirm