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 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two parts.	**Enquiry Number:** **2620900240**	**Enquiry Date:** **07.11.2009**	**Due date for submission of quotation:** **14.12.2009**

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
10	**Orbital TIG Welding Machine** as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**2 Nos**

Important points to be taken care during submission of offer

1. **Delivery required 8 months from the date of purchase order.**
2. **Grace period of 2 months beyond the above delivery period will be considered.**
3. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**

BHEL's General guidelines / instructions (refer MM/CE/GT/001) 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 the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620900240".

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 Sr. Manager / MM / Capital Equipment

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF ORBITAL TIG WELDING MACHINE

SECTION – I

The BIDDER is expected to give complete details against each clause in the table given below, with additional sheets those may be attached (giving clear reference number) to furnish and cover the requisite details / documents.

S. No.	PARTICULARS	VENDOR's RESPONSE
1	VENDOR to provide the Profile of their Company	
2	The Bidder / Vendor (OEM) shall have a minimum of TEN Years of Continuous Experience in the field of Design, Manufacture and Supply of ORBITAL TIG WELDING EQUIPMENT used for welding Boiler Tubes	
3	List of customers to whom ORBITAL TIG WELDING EQUIPMENT were supplied, installed and commissioned till date, highlighting the customers who are in the field of Power Utility Boilers manufacturing (of High Pressure Ratings). The sizes of machines supplied may be furnished.	
4	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India.	
5	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the Orbital TIG Welding Machine.

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	Only those vendors (OEMs), who have supplied and commissioned at least **ONE complete ORBITAL TIG WELDING EQUIPMENT of the offered Model** in the past ten years (on the date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender), should quote. However, if such machine (s) has/ had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of Tender) in BHEL. Performance certificate from the customers regarding satisfactory performance of **ORBITAL TIG WELDING EQUIPMENT** supplied to them in attached format to be enclosed along with technical offer.	
	The vendor should submit following information where similar machine has been supplied:	
1.1	Name and postal address of the customer or company where similar equipment is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the equipment.	
1.5	Application for which the equipment is supplied	
2	Along with the Technical offer, the Vendor should submit the Performance certificate from the customer for the satisfactory performance of the equipment supplied as per clause 1.0 above. (For obtaining the Performance certificate, a suggestive format is provided in **SECTION – IV**)	
3	Offers of only those vendors who meet the above Qualifying Criteria will be considered for further evaluation.	
4	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

S. No.	REQUIREMENTS	VENDOR's RESPONSE
5	**DELIVERY** - The bidder shall quote the best possible delivery. However the delivery period shall not exceed **8 months** from the date of Purchase Order. A grace period of 2 months in addition is provided. The additional grace period will attract loading, which is explained in the commercial terms of the enquiry. The delivery period is reckoned from the date of purchase order to date of despatch from the vendor works.	

SECTION – III

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser:

S. No.	REQUIREMENTS	VENDOR's COMPLIANCE
1	The BIDDER / VENDOR shall submit the offer in TWO PARTS-Technical **[with PART A & PART B]** & Commercial and Price Bid.	
2	The offer shall contain a comparative statement of Technical Specifications given by BHEL and the offered details submitted by the Bidder, against each clause. Merely stating 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words wherever 'Vendor to Specify' details in the technical comparative statement may lead to disqualification of the Technical Offer.	
3	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
4	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 of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
5	BIDDER has to indicate the Country of Origin for the supply of equipment.	

SECTION – IV

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the machine :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application for which machine is used :

5. Sizes of Jobs Performed in the machine
   a. Tube diameter :
   b. Tube thickness (maximum) :
   c. Tube material :

6. Performance of the Machine : Satisfactory / Good / Average / Not Satisfactory
   (Strike off whichever is not applicable)

7. After Sales Service : Satisfactory / Good / Average / Not Satisfactory

8. Any other remarks :

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

PART B

TECHNICAL SPECIFICATIONS FOR ORBITAL TIG WELDING EUQIPMENT

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
1.0	**PURPOSE & APPLICATION**		
1.1	a. The welding station is intended to build up tubular coils (used in high pressure steam boilers) by joining simple loops / circuits of tubes. [**ANNEXURE – 3** give typical loop/circuit and built-up tubular coil] b. The tubular loops or circuits are inter-connected by means of butt welding the tube ends, by keeping the loops/circuits in horizontally flat position. The welds are to meet BHEL Radiographic Test requirements. c. The welding station is expected to carry-out the following operations: i) Butt weld joint fit-up using mechanical fixtures ii) Butt welding of weld joint by automatic orbital GTAW process iii) Weld data logging and report generation		**[VENDOR is expected to give technical write up on welding station design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements]**
2.0	**WORK PIECE / JOB DETAILS**		
2.1	**TUBE DIMENSIONS (General)**		
	a) Range of Diameter [O.D.]	28mm to 76.1 mm	
	b) Range of Wall Thickness	3.2 mm to 12.5 mm	
	c) Width of Coil to be built-up	2750 mm [maximum]	
	d) Length of Coil to be built-up	20000 mm (20 metres)[maximum]	

<table>
<tr><th>S.No.</th><th>PARTICULARS AND BHEL SPECIFICATION</th><th>VENDOR'S OFFER
(with complete Technical Details)</th></tr>
<tr><td>2.2</td><td>TUBE SIZES in detail</td><td></td></tr>
<tr><td></td><td>[NOTE: All are OD (Outer Diameter) controlled tubes with a tolerance of maximum 12% on tube wall thickness.]
<table>
<tr><th>S.No</th><th>OD, in mm</th><th>THICKNESS, in mm</th></tr>
<tr><td>1</td><td>28.0</td><td>3.2 / 5.6</td></tr>
<tr><td>2</td><td>31.8</td><td>3.2 / 3.6 / 4.0 / 5.0</td></tr>
<tr><td>3</td><td>38.1</td><td>3.2 / 4.0 / 5.0 / 6.3</td></tr>
<tr><td>4</td><td>44.5</td><td>4.0 / 4.5 / 5 / 6.3 / 8 / 9 / 10</td></tr>
<tr><td>5</td><td>47.63</td><td>5 / 6.3 / 8 / 10</td></tr>
<tr><td>6</td><td>51.0</td><td>3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td></tr>
<tr><td>7</td><td>54.0</td><td>3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td></tr>
<tr><td>8</td><td>57.0</td><td>4 / 5 / 6.3 / 8 / 10</td></tr>
<tr><td>9</td><td>63.5</td><td>4.8 / 5.6 / 6.3 / 10 / 12.5</td></tr>
<tr><td>10</td><td>76.1</td><td>7.1 / 10 / 12.5</td></tr>
</table></td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>2.3</td><td>MATERIAL SPECIFICATION</td><td></td></tr>
<tr><td></td><td>A) CARBON STEEL : SA 192, SA 210A1, SA 210C [ASTM]

B) ALLOY STEEL : SA 209T1, SA 213T11, SA 213T22, T-23
SA 213T91, T-93

C) STAINLESS STEEL : SA 213 TP304H, SA 213 TP321H,
SA 213 TP347H</td><td></td></tr>
<tr><td colspan="3"></td></tr>
</table>

S.No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)
3.0	**WELD JOINT DETAILS**	
	a. Style of Edge Preparation : 'J' style as per **Annexure–2** b. Tube End Condition : Machined in automatic end preparation line c. Weld Joint Location : Length of straight portion on either side of weld joint ≥ 250 mm c. Preheating Temperature : Max. 250 deg C [for Alloy Steel Tubes only] d. Weldment Testing Modes : Radiography Testing e. Weld Quality Appraisal : As per ASME Section I, V and VIII (Division 1 & 2) for Radiography Test	
3.1	**MACHINE OUTPUT / PRODUCTIVITY**	
	VENDOR has to specify the minimum output of welded joints, possible from the workstation, for the tubes with the following dimensions/details, in a single shift of 8 hrs: a. Built-Up Coil Length : ≥ 20000 mm b. Width of Built-Up Coil : ≥ 3000 mm c. Weld Joint Style as per the EP Sketches : ('J' Style Edge Preparation) **Annexure-2** <u>Expected productivity is as follows in one Eight Hour Shift:</u> d. Tube Size: OD 51mm x Th. 7.1mm / SA213 T91 - **18 Joints** OD 47.63mm x Th. 5mm / SA213 T22 - **20 Joints** e. Welded Joints will be subjected to Radiography test at BHEL works and should pass the test as per Clause 3.0 e. **<u>Note</u>**: All passes have to be welded continuously without interruption. The welding head has to be suitable for welding all passes continuously.	

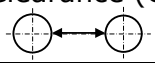
S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
4.0	**Orbital TIG Welding Sets – Scope of Supply of equipment:**		
	Orbital TIG Welding sets and accessories consisting of the following:		
	1. Welding Power Source with Controls	2 Nos	
	2. Orbital TIG Welding head and its related accessories	2 Sets	
	3. Welding head Control Unit	2 Nos	
	4. Pendant Controller	2 Nos	
	5. Tube Butt Joint Fit-Up Fixture / Job Clamping Unit	4 Nos	
	6. Portable Tungsten Electrode Grinder	2 Nos	
	7. Inter-connecting Cables and Hoses	2 sets	
	8. Operating and Service Tool Kit	2 sets	
	9. Non Contact type temperature sensor (optional)	2 Nos	
	10. Pen drive / Memory stick – 1 GB	2 Nos	
	11. Spares	1 Set	
	12. Documents	2 Sets	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
5.0	**WELDING POWER SOURCE AND CONTROLLER**		
5.1	**Type**	Micro-processor controlled, Programmable, Inverter type-Constant current.	
5.2	Make & Model	Vendor to specify	
5.3	Switching Frequency	Vendor to specify	
5.4	Welding Process	GTAW, DCEN with Current Pulsing option.	
5.5	Memory	99 Welding Programs or more	
5.6	External Memory Equipment to have provision to transfer welding programs from and to Pen drive (Memory stick)?	Vendor to Confirm	
5.7	Each weld program for a unique combination should allow a minimum of 6 passes each pass with different parameters.	Vendor to specify the Maximum number of passes that can be written in a program.	
5.8	Different Parameter Values for a minimum of 6 position based levels/sectors within a pass of 360 de° should be programmable enabling position based level/sector vise parameter change within each pass.	Vendor to specify the Maximum number of sectors that can be programmed per pass of 360 deg.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
5.9	For each program the following parameters should be programmable. common to all Passes – Vendor to Confirm with details.	Program Number.	
		Number of Passes.	
		At the beginning of welding/Start sequence:	
		a) Pre purge time	
		b) Upslope time	
		c) Wire start delay	
		d) Rotation start delay	
		At the end of welding/Stop sequence:	
		a) Post purge time	
		b) Down slope time	
		c) Wire stop delay	
5.10	Following parameters should be programmable for each pass. Vendor to Confirm with details.	a) Pulsing On/Off	
		b) Oscillation On/Off	
		c) Current	
		d) Wire Feed speed	
		e) Travel Speed	
		f) Oscillation speed	
		g) Oscillation width	
		h) Oscillation dwell In	
		i) Oscillation dwell Out	
		j) Base Current- % of Peak Current	
		k) Peak Time - %	
		l) Base Time - %	
		m) AGC/AVC sensitivity	
		n) AGC/AVC Speed	
		o) Synchronized Travel with Pulsing	
		p) Synchronized Wire feed with Pulsing	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
5.11	It should be possible to manually over ride the following parameters during welding within a pre-set range. Vendor to Confirm with details.	a) Current	
		b) Travel speed	
		c) Wire feed speed	
		d) AGC/AVC	
		e) Oscillation speed	
		f) Oscillation Amplitude	
		g) Torch Cross beam centering	
5.12	Welding Data Entry on Controller / Power Source	Through a 'dust & moisture proof' Membrane Key Pad – Rugged Type	
5.13	Front Panel Display (in English)	Vendor to describe	
5.14	Output Current Range	3 to 300A. [D.C.]	
5.15	Current Duty cycle	250A or more DC @ 100 %	
5.16	Current Accuracy	±1% of setting	
5.17	Welding Voltage Range	Vendor to Specify	
5.18	Gas Pre-flow / Gas Post-flow Time	Vendor to Specify	
5.19	Current Pulse Frequency	Vendor to Specify	
5.20	Pulse Current Time	Vendor to Specify	
5.21	Background Current Time	Vendor to Specify	
5.22	Current Up-slope / Down-slope Time	Vendor to Specify	
5.23	Rotation Start / Stop Delay	Vendor to Specify	
5.24	Wire Feed Start / Stop Delay	Vendor to Specify	
5.25	Torch Rotation Speed	Vendor to Specify	
5.26	Torch Rotation Speed Regulation	±1% of setting	
5.27	Filler Wire Feed Speed	Vendor to Specify	
5.28	Filler Wire Feed Speed Regulation	±1% of setting	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
5.29	Synchronization of functions with Current Pulsing should be possible on selection.	Wire feed. Oscillation dwell. AGC/AVC. Torch/Head Rotation	
5.30	Torch Oscillation Speed	Vendor to Specify	
5.31	Oscillation Dwell Time at both ends (independently adjustable)	Vendor to specify	
5.32	AVC Function	±1% regulation	
5.33	Programming increments for welding current & time parameters	0.5 Amp / 0.1 Sec.	
5.34	Welding parameter override during welding	Programmable limits (Vendor to specify range)	
5.35	Arc Starting (Features like hot start etc)	Vendor to explain how arc starting is achieved.	
5.36	Arc Sensing	Vendor to specify means & modes for arc initiation and sensing	
5.37	Refrigerant type water chiller	Refrigerant type water chiller having suitable capacity to cool the weld head and torch while welding tubes with 250 C preheat involving 5 continuous passes without stop for inter-pass temperature Vendor to provide details.	
5.38	Gas hose with end fittings – Gas cylinder to power source	Length to suit long travel on cable festoon	
5.39	Fault Protection Sensors	For gas & cooling water flow	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
5.40	Maximum Number of Data Log Files in Memory	Vendor to specify	
5.41	Data logger connectivity to PC	Vendor to confirm	
5.42	EMI Interference Suppressor	Vendor to specify the details for EMI suppression in input supply line	
6.0	**ORBITAL TIG WELDING HEAD**		
6.1	Type	Low profile tube orbital welding head of rugged construction	
6.2	Rating	200A 100% duty cycle	
6.3	No.of passes of welding	Five Continuous Passes without interruption	
6.4	Cooling for Torch & Body	Water cooled	
6.5	Clamping Type / Weld Head Mounting on Tube - For easy mounting / dismounting of head	Vendor to Provide complete details on clamping system of Orbital Weld Head on the tube.	
6.6	Axial Clearance	250 mm	
6.7	Radial Clearance (Clear gap between tubes) 	100mm	
6.8	Servo controlled Oscillation & Dwell Stroke Length Speed Dwell Time – In & Out independently variable.	16mm (minimum) Vendor to specify the actual stroke	
6.9	Servo Controlled AVC	13mm stroke	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
6.10	Servo Controlled Rotation Motor: Travel speed	Speed - Vendor to specify	
6.11	Servo controlled Wire feed speed	Speed – Vendor to specify	
6.12	Cross Seam Adjustment	Vendor to specify range	
6.13	Servo Controlled Synchronized Pulsed or Continuous Wire Feed Motor (on board)	Vendor to specify	
6.14	Wire Size	0.8mm (Standard)	
6.15	Wire Nozzle Adjustment (Manual)	Vertical, horizontal & angular	
6.16	Torch Lead / Lag angle adjustment	Vendor to specify	
6.17	Torch Tilt In / Out	Vendor to specify	
6.18	Wire Nozzle and its mounting arrangement	Shall be capable of withstanding the high temperatures without loosening	
6.19	Wire Spool Carriers	Head mounted type (On board mounted). The on board mounted wire spool to rotate along with the head during welding. Complete details of mounting wire spool to be provided with drawing / photographs. Wire spool mounting on extended frame is not acceptable.	
6.20	Wire Spools size and specification	Weight: 1 Kg (Details of Spools attached in Annexure-1) Only these spools will be used. Spool mounting to be suitable for this.	
6.21	Tungsten Electrode Size	Ceriated Tungsten Electrode Size 2.4mm	
6.22	Tungsten Tip included angle	15 Deg. to 30 Deg.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
6.23	Cable and Hose Package	The cable and hose package for the welding head shall be adequately sheathed with heat and abrasion resistant material. It shall withstand repeated winding / rewinding while in operation. It is proposed to mount the equipment on a mobile platform and suspend welding head, controller, job clamps etc from top supporting rail. Hence, the length of the cable and hose package should have sufficient length to reach the Weld Joint location. Length of Cable and Hose required is **8 metres** minimum. Joints not preferable.	
6.24	Number of Coiling Required	Cable and hose winding shall be of sufficient length for continuous operation of **6 passes** on the tube without interruption.	
6.25	Thermal Stability	All the metallic and non-metallic components of the welding head shall withstand the intense heat radiation during above welding.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
7.0	**REMOTE OPERATOR PENDANT**		
7.1	Features	Pendant shall contain the following controls: a. Selector Switch: Weld / Setting b. Welding Program Access & Selection c. Display screen for welding parameters d. Emergency stop e. Sequence Start / Stop f. Gas flow switch g. Inching operation (by toggle switch control or joystick control) for the following functions: i) AVC function ii) Torch oscillation amplitude iii) Torch Centering iv) Wire feed speed v) Head travel speed vi) Welding current up/down (manual override)	
7.2	Cable to Remote Pendant	The cable to be firmly fixed to the pendant and shall not loosen and disconnect from the pendant during usage in shop floor. Necessary joint protections to be provided.	
7.3	Heat resistant	The remote operator pendant shall have proper cooling provisions so that it does not get heated up due to the electronic components / processors housed inside the pendant. The temperature shall not exceed 5 deg above ambient temperature.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
8.0	**TUNGSTEN ELECTRODE GRINDER**		
8.1	Type	Portable, Electric Motor operated	
8.2	Electrode to be ground	Ceriated Tungsten	
8.3	Tungsten Diameter	2.4mm	
8.4	Tungsten Grinding angle	15 to 30 degrees	
8.5	Make & Model	Vendor to provide details	
9.0	**NON CONTACT TYPE TEMPERATURE SENSORS (OPTIONAL)**		
9.1	Type	Portable – Infrared sensing	
9.2	Temperature range	20 deg C to 400 deg C	
9.3	Display	Digital	
9.4	Unit of display	Degrees Centigrade	
9.5	Accuracy	+/- 0.5 deg C	
9.6	Make & Model	Vendor to provide details	
10.0	**TUBE BUTT JOINT FIT-UP FIXTURE / JOB CLAMPING UNIT**		
10.1	Type	Portable – Manually operated	
10.2	Clamping	Clamping on Outer diameter	
10.3	Tube clamping range	28mm to 77mm	
10.4	Axial Alignment	No mismatch at the root for welding	
10.5	Suspension hook	Hook for suspending the fixture to be provided	
10.6	Gap	Clear Gap suitable to mount Orbital Weld head and rotation during welding	
10.7	Make & Model	Vendor to provide details	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
11.0	**ELECTRICAL & ELECTRONICS SYSTEMS**		
11.1	415V ± 10%, 50HZ +/-3 Hz, 3 Phase AC **[3 wire system without neutral]** power supply will be provided by BHEL at a single point near the machine. All cables, connections, circuit breakers etc. required for connecting BHEL's power supply to the machine shall be in the scope of vendor.	Vendor to confirm	
11.2	Tropicalization**:** All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
11.3	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
11.4	Control circuit voltage shall not exceed 110 V.	Vendor to confirm	
11.5	All motors shall be conforming to IEC standards. Type of motors may be specified.	Vendor to Specify	
11.6	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to confirm	
11.7	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
12.0	**FAULT DIAGNOSTIC SYSTEM**		
12.1	Vendor's own diagnostic system with required hardware & software shall be supplied and installed in the Control System. This shall include customized auto-diagnostic system, which shows detailed cause and remedy for the fault on the display for faults related to mechanical and electrical maintenance.	Vendor to confirm	
12.2	Help guide shall be provided to use both diagnostic systems	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
13.0	**IN-BUILT SAFETY ARRANGEMENTS**		
13.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
13.2	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
13.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm	
13.4	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes.	Vendor to specify	
13.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
13.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
14.0	**MACHINE SPARES**		
14.1	Itemized break-up of mechanical, electrical and electronic spares used in the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be offered by vendor. The list is to include following, in addition to other recommended spares: **(Unit Price for each item of spare shall be offered)**	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
14.2	**Mechanical Spares:** All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Water cooled Hoses.	Vendor to confirm	
14.3	**Electrical / Electronic:** All types of Printed Circuit Boards, Relays, Contactors, Proximity Switches, Push Buttons, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Indicating Lamps, Spares for Micro processor based System, Servo Motors for Feed Drives, Power Module & Control Cards for Drives etc.	Vendor to confirm	
14.4	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	
14.5	All types of spares for total machine and accessories shall be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to confirm	
14.6	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)
15.0	**DOCUMENTATION:** The following documents in English language should be supplied along with the machine: **Hard Copies - 3 Sets** **Vendor to confirm** **In CD form - 1 Set** 1. Operating manuals of Weld Head, Controller, Welding Power Source. 2. Operating and Maintenance manuals of all Accessories 3. Programming manuals of the Machine 4. Maintenance manuals with all assembly drawings of machine assemblies / sub-assemblies with parts list 5. Electrical Wiring Drawings – Power & Control Circuits 6. Maintenance & Interface manuals for Machine Control System 7. Microprocessor / Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls. 8. Complete list of Alarm log, Error code, error messages & remedies and on line fault diagnostics to be provided by the vendor. 9. Specifications/Ratings of All Bought-Out-Items. 10. Warranty / Guarantee Card for all Bought-Out-Items. 11. Catalogues, O&M manuals for all Bought-Out-Items used in the machine. 12. Trouble Shooting Chart for Main and all Sub-Systems. 13. Parameters Selection Software, File Handling and Display Recording. Serial and USB Ports to be ensured. 14. Preventive Maintenance check list for Electrical and Mechanical System 15. Complete list of spares for machine, along with item part no / specification / type / model and make & address of the sub-vendor.	

S.No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)
16.0	**EQUIPMENT INSPECTION & ACCEPTANCE**	
16.1	**AT VENDOR'S WORKS**	
	1. The Orbital TIG welding equipment and Accessories shall be tested for its performance prove-out as per BHEL Specifications, at the Supplier's Works prior to despatch. 2. Welding trials have to be conducted on short length sample tubes, in presence of BHEL Engineers, at Supplier's works, for a minimum of 10 Joints in each of the tube sizes given below: a) Tube Dia 51mm x thick 7.1mm / SA213 T91 b) Tube Dia 54mm x thick 4mm / SA213TP347H c) Tube Dia 38.1mm x thick 5mm / SA213 T22 The tubes shall be supplied by BHEL. Welding consumables are to be arranged by the supplier. The Welded samples have to be returned to BHEL along with the equipment for conducting further tests. 3. The supplier to program the welding parameters for the above joints and weld samples. 4. The sample welded joints should pass through the Radio-graphic Test and satisfy the requirements of BHEL as per Clause 3.0 e. 5. Supplier to provide necessary arrangements for recording the programmed process parameters.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
16.2	**AT BHEL WORKS**		
	1) The prove-out trials of the welding operation shall be for the tubular coils / circuits with the sizes/ specifications mentioned under Clause 15.1. 2) The supplier to program the welding parameters for the above joints and weld samples. 3) The machine output / productivity has to be proved out on each machine, as detailed under Clause No. 3.1. 4) The materials will be supplied by BHEL. 5) Welded joints should pass through the Radio-graphic Test and satisfy the requirements of BHEL as per Clause 3.0 e.		
17.0	**TRAINING:**		
17.1	The supplier shall train TWO BHEL Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and Programming) of the Machine for FIVE working days at supplier's works after the pre-dispatch inspection.	Vendor to confirm	
17.2	Vendor to clearly mention whether the training is offered free of cost or chargeable. If chargeable, the vendor has to quote on manday basis.	Vendor to Specify	
17.3	Airfare, board & lodging for the BHEL Engineers who will be visiting supplier's works for pre-dispatch inspection and training, shall be borne by BHEL.	Vendor to note	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
17.4	The Supplier shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance (Mechanical, Electrical/ Electronics and PC based control System) during commissioning of the Machine at BHEL works for 10 working days.	Vendor to confirm	
17.5	The training shall include specialized coaching in i) Safety ii) Operation of the machine iii) PC based System & Operation, iv) Trouble-Shooting, v) Software Application vi) All special features of the machine vii) Electrical / Mechanical / Electronics systems	Vendor to Confirm	
17.6	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to Confirm	
18.0	**MACHINE ERECTION & COMMISSIONING**		
18.1	Vendor to take full responsibility for supervision of the erection, vendor shall start up, test the machine, it's control & all types of other supplied equipment, carrying out welding of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL.	Details of these requirements should be informed by Vendor in advance	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
18.2	Successful proving of BHEL Requirements by the Vendor shall be considered as part of commissioning. All tests, as mentioned in Clause No. 15.2 shall form part of commissioning activity.	Vendor to confirm	
18.3	Tools, Tackles, Test Mandrels, instruments and other necessary equipment required to carry out all above activities should be brought by the Vendor.	Vendor to confirm	
18.4	The Vendor shall bring special tools, tackles, Test Mandrels, Instruments and any other necessary equipment required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm	
18.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm	
18.6	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor shall supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
19.0	**THERMAL STABILITY FOR AMBIENT CONDITIONS & ENVIRONMENTAL PERFORMANCE OF THE MACHINE:**		
19.1	The Orbital Welding heads, Pendant Controller, Main Controller and Welding Power Source shall be suitable for an ambient temperature of +45 deg C and relative humidity of 90 % respectively, but both do not occur simultaneously.	Vendor to confirm	
19.2	The vendor should ensure trouble free operation of the machine with Thermal Stability of the complete machine and accuracy requirements of BHEL components, keeping in view of ambient conditions as mentioned above.	Vendor to confirm	
19.3	The machine, including attachments and accessories, should be suitable for 24 hrs. Continuous operation to its full capacity for 24 hour a day and 7 days a week throughout the year.	Vendor to Confirm	
19.4	If any safety / environmental protection enclosure is required it shall be built in the machine by the vendor.	Vendor to confirm	
19.5	Paint of the machine should be oil / coolant resistant and should not peel off	Vendor to confirm	
19.6	There shall not be any emissions from the machine except fumes of welding during butt welding.	Vendor to confirm	
19.7	The Machine should conform to following factors related to environment: Maximum noise level shall be 85 dB(A) at normal load condition, 1meter away from the machine with correction factor for back ground noise. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to Confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
20.0	**MACHINE PACKING**		
20.1	Sea worthy & rigid packing for all items of complete machine, control system, all accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
21.0	**GUARANTEE:**		
21.1	Performance Guarantee to be given for 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.	Vendor to confirm	
22.0	**GENERAL POINTS**		
22.1	Machine Model Number and other related details	Vendor to provide	
22.2	Total Connected Load (in kVA)	Vendor to specify	
22.3	Total Weight of the Machine & Accessories	Vendor to specify	
22.4	General Arrangement drawing of the Weld Head to be submitted with the offer.	Vendor to provide	

Enclosures:

ANNEXURE - 1 : Wire Spool Size and Specification

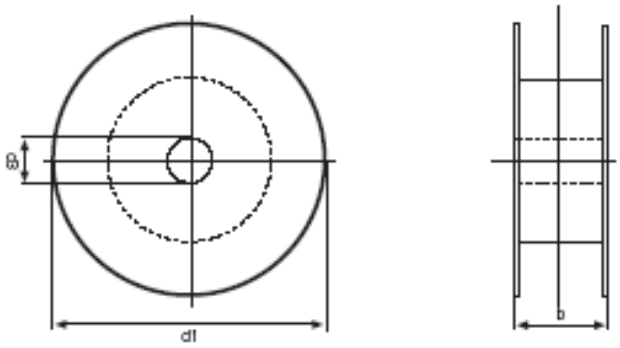
ANNEXURE - 2 : Tube End Edge Preparation Styles

ANNEXURE – 3 : Typical Coil to be built-up by Orbital Welding

ANNEXURE - 1

WELDING WIRE SPOOL DETAIL

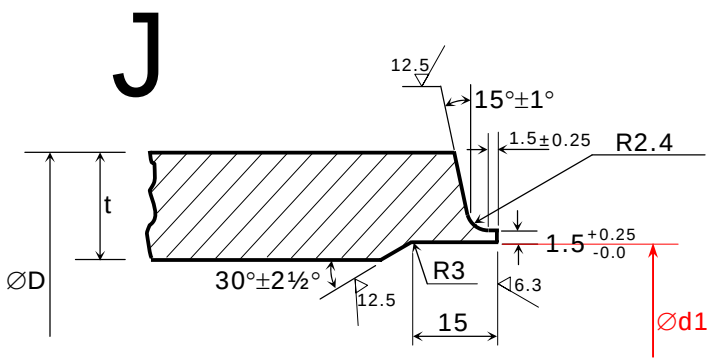
plastic spool



ENISO 544	outside dia-meter d_1	spindle hole d_3	external width b	tapped hole dia-meter d_4	tapped hole distance from center e_1	kg wire
S 100	100	16,5	45	–	–	1,0

All dimensions are in mm
Drawing No. CABS-3-10N-01
BHEL, TIRUCHIRAPPALLI

'J' STYLE EDGE PREPARATION DETAIL

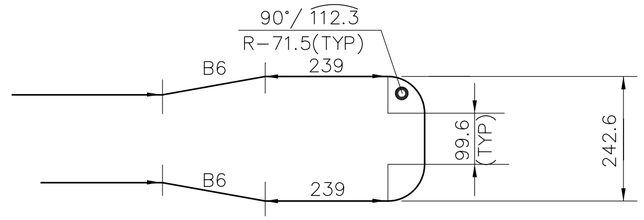


D : Tube OD
t : Tube thickness
d1 : Bore ID

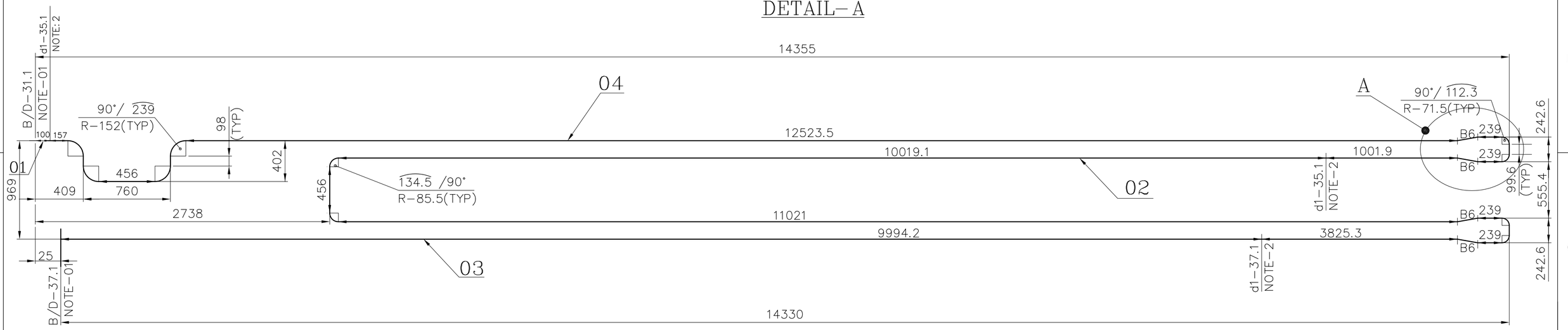
All dimensions are in mm
Drawing No. CABS-3-10N-02
BHEL, TIRUCHIRAPPALLI

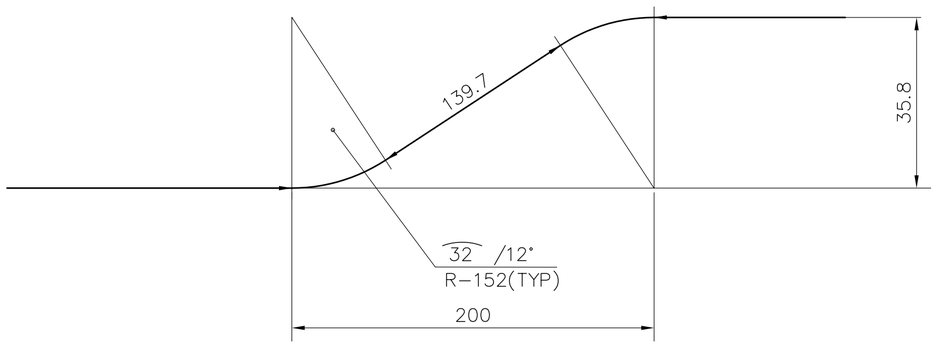
DRAWING NO:

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299



DETAIL- A





DETAIL- B6

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / QUANTITY	UNIT WEIGHT	GS	ZONE
	04	TUBE D47.63x6.0; 16500 LONG				15-092-043	A		107.800		
						SA 213 T91			1		
	03	TUBE D47.63x5.0; 9994.2 LONG				15-189-064	A		152.150		
						SA 213 T22			1		
	02	TUBE D47.63x8.0; 26800 LONG				15-189-076	A		146.950		
						SA 213 T22			1		
	01	TUBE D47.63x8.0; 100 LONG				15-189-076	A		0.830		
						SA 213 T22			1		

CIRCUIT