



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 7653
Email : vkaruna@bhel.in
ajayasalkar@bhel.in
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Web : www.bhel.com

TWO PART BID

Tender to be submitted in two Parts

Enquiry
Number:

2731800001

Enquiry
Date:

19.07.2018

Due date for submission
of quotation:

10.08.2018

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) Matl. will be Delivered to
10	Tube to Tube Sheet Welding Machine 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)	1.00 No.	FOR, BHEL Stores, High Pressure Boiler Plant, Tiruchirappalli - 620014

Important points to be taken care during submission of offer

1. Material shall be delivered to: Indigenous Vendors: As stated above.
Foreign Vendors: CFR Chennai Seaport / CFR Chennai Airport
2. Delivery required 5 Months including PDI from the date of purchase order.
3. Erection & Commissioning period required 3 Weeks from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.
4. EMD for this Tender will be (not less than): INR 1,50,000/-
5. Compliance Form Nos.: TRY/IMP/02 & TRY/IND/02A to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
6. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (refer MM / CE / GENL / 001 - EMD) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site (<http://www.bhel.com>) 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
Ajay Vasalkar
for DGM / Capital Equipment / MM
AJAY VASALKAR

Sr. MANAGER

MM / Capital Equipment

BHEL, Tiruchirappalli - 620 014

PART-A

TUBE TO TUBESHEET WELDING MACHINE

SECTION- 1: Qualifying Criteria.

The BIDDER has to compulsorily meet the Qualifying Criteria indicated in **Section 1** to get qualified. Otherwise the technical offer will not be considered.

SRL. NO.	REQUIREMENTS	VENDOR'S RESPONSE
1.1	Only those vendors (OEMs), who have supplied and commissioned at least ONE complete TUBE TO TUBESHEET WELDING MACHINE for titanium welding applications of the offered Model in the past ten 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 10 years (as on the original date of tender opening) at least ONE "Tube to Tubesheet welding machine for titanium welding applications of the quoted weld head". EITHER (i) In at least one country other than the country of origin to establish vendor's global business activity. OR (ii) In India; and the referred machines are presently working satisfactorily for more than one year from the date of commissioning (as on the original date of tender opening). The name and contact addresses of the customers to whom the above said machines were supplied to be furnished with details.	
1.3	Vendor has to submit at least ONE PERFORMANCE CERTIFICATE for satisfactory performance of Tube to Tubesheet welding machine for titanium welding applications of the quoted weld head 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 or in any other country outside the country of origin, supplied and commissioned in the last 10 years. Performance certificate as Original Certificate or E-mail directly from the customer may be submitted. The original certificate may be returned after verification by BHEL, if required. For obtaining the Performance certificate, a suggestive format is provided at the end of Part A.	
1.4	BHEL reserves the right to verify the information provided by the Vendor for the referred Machine at their referred customer's works. 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 OEMs based on the assessment of their technical and financial capability.	

SECTION- 2:

The BIDDER / VENDOR are requested to provide the following information: -

SRL. NO.	REQUIREMENTS	VENDOR'S RESPONSE
2.1	The BIDDER / VENDOR to furnish Reference List of Customers, with complete address, details of contact person, where Tube to Tubesheet welding machine for titanium welding applications have been supplied in the past.	
2.2	Specify details of Tube to Tubesheet welding machine for titanium welding applications supplied to other units 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 Agents / Service Centres in India.	
2.4	Any Additional data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION- 3:

The BIDDER to note:

SRL. NO.	REQUIREMENTS	VENDOR'S RESPONSE
3.1	The BIDDER / VENDOR shall submit the offer in TWO parts. 1. Technical Offer [with PART A & PART B] 2. Commercial Offer and Price bid.	
3.2	The Technical Offer shall contain complete details against all clauses of Technical Specifications given by BHEL.	
3.3	The Technical Offer shall be supported by copies of product Catalogues, Datasheets and technical details of Bought- Out- Items.	
3.4	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.	

SECTION- 4:

The performance certificate should be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

1.	Supplier of the machine	
2.	Make & Model of the M/C	
3.	Month & Year of Commissioning	
4.	Application for which M/C is used	
5	a) Tube Sheet Hole Size b) Size of Tube ID c) Material of Tube Sheet & Tube d) With Torch Tilting Arrangement e) With AVC f) With Pulsing g) Sector programming h) Tube Sheet Position	Yes/No Yes/No Yes/No Yes/No Vertical/Horizontal
6. Performance of the Machine		Satisfactory / Good / Average / Not Satisfactory
7. Any Other remarks		
• (Strike off whichever is not applicable)		
Date: Authority Issuing the Performance Certificate Signature & Seal of the		

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
1 . 0 . 0	PURPOSE & APPLICATION		
1.1.0	Job Description: a. The proposed welding machine shall be suitable for Titanium welding of tube to tubesheet joints in Heat Exchangers as shown in Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02. b. The Titanium tube to tubesheet welding shall be done by pulsed TIG welding process - Down hand (1G) position - first fusion pass and second pass with filler wire, by the use of a semi-automatic welding gun. c. Filler Wire Diameter is 0.8 mm.		BIDDER to give technical write up on welding machine design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements
1.2.0	JOB DETAILS:	Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02	Bidder to confirm
	Tube OD x 't' (mm)	(13.8 x 1.35)	
	Tolerance on 't'	±5%	
	Tube Material	Titanium	
	Tube sheet material	Titanium	
	Tube sheet Hole Diameter (mm)	13.9	
	I.D weld projection (C-Value)	C = 0 to 0.3mm max. Refer Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02	
	WELD JOINT DETAILS :		
	a. Style of Edge Preparation	As given in Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02	
	b. Tube End Condition	Edge prepared by special tool having form profile.	
	c. Production Process	First Fusion pass and then Automatic single/ multi pass tube to tubesheet welding. Welding head is to be suitable for both Vertical and Horizontal position during welding.	
	d. Weldment Testing	Radiography / LPI, Helium & Hydro tests.	
	e. Weld Quality Appraisal	As per ASME Section I, V. VIII Division 1 & 2 for Radiography Test and 100 % RT.	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
2.0	SCOPE OF SUPPLY: Design, Manufacture, Supply, Installation and Commissioning of the following mentioned items as per the Speciation and details provided in subsequent clauses:		
	Description of Item	Qty	Bidder's offer
2.1.0	Tube to Tube sheet welding machine Power Source as per the specifications described in the Sub Clauses of 3.0.0, 5.0.0 & 6.0.0	1 No.	
2.2.0	Tube to Tube sheet Welding Head as per the specifications described in the Sub Clauses of 4.0.0, 5.0.0 & 6.0.0	1 No.	
2.3.0	Trolley with caster wheels: To accommodate Power source along with arrangement to handle two bottles of Argon gas .	1 No.	
2.4.0	Suitable Spring Balancer to mount the Welding head in the required position (Capacity minimum: 9 KG)	1 No.	
2.5.0	Tool Kit with essential tools for the above items (Bidder to give detailed break up)	1 Set	
2.6.0	Additional Accessories as specified below:	Bidder to confirm	
2.6.1	Centering Shaft & centering mandrel suitable for weld joints as given in Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02	4 Set	
2.6.2	Argon gas protection casing for Titanium welding	2 Set	
2.6.3	Silicone gasket for Argon gas protection casing.	60 No.	
2.7.0	Spares shall be supplied as per Cl. 2.7.1 to 2.7.34: 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.		
2.7.1	Water Cooling Pump	1 No.	
2.7.2	Wire feed Roller(Feeding and pressing rollers)	5 Sets	
2.7.3	Wire feed roller bearing (all types of bearings)	2 Sets	
2.7.4	Weld head rotation drive gear and Pinion (if applicable)	1 Set	
2.7.5	Solenoid valves (1 No. in each type)	1 Set	
2.7.6	Electrode Holder for varying angles (as applicable)	1 Set	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
2.7.7	PCBs in Power source (1 No. in each PCB)	1 set	
2.7.8	LCD display for power source.	1 No.	
2.7.9	Cooling fan for power source.	2 No.	
2.7.10	Fuses in power source & remote pendant (1 No in each type =1 set).	1 Set	
2.7.11	Push-buttons, toggle switches, emergency switch etc. on remote pendant (1 No in each type = 1 set).	2 Set	
2.7.12	Male end connectors of ground, control and motor power cables(1 No in each type = 1 set).	3 Set	
2.7.13	Wire feed Motor	1 No.	
2.7.14	Motor for AVC	1 No.	
2.7.15	Motor for Weld head Rotation .	1 No.	
2.7.16	Proximity switch -1 No. in each type (if applicable)	1 Set	
2.7.17	Micro limit switch - 1 No. in each type (if applicable)	1 Set	
2.7.18	Set of interconnecting cables from welding head to Power source. (Minimum length of 7 mtrs.). Protective sheathing to be provided for the entire length of cables & Hoses, to withstand shop floor rough usage.	1 No.	
2.7.19	Remote Control Unit .	1 No.	
2.7.20	Control cable for Remote control Unit.	1 No.	
2.7.21	Set of Wire Guide Tubes used in welding head (i.e. from wire spool exit to wire nozzle)	15 Sets	
2.7.22	Wire Nozzle Dia 0.8 mm	15 No.	
2.7.23	Paper Roll for Printer (as per MOQ)	75 No.	
2.7.24	Tilted AVC Kit	1 No.	
2.7.25	Collet holder for Tungsten Electrode	20 No.	
2.7.26	Diffuser / Gas lens for Tungsten Electrode holder	20 No.	
2.7.27	Wire feed Hose	10 m	
2.7.28	Bearings used in weld head- 1 no in each size	1 Set	
2.7.29	Cooling Water and Gas flow sensors/switches (1 no in each type=1 set)	1 Set	
2.7.30	Gas and liquid transmission rotating couplings used in head (If applicable)	1 No Each	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
2.7.31	Gas flow filter element	5 No.	
2.7.32	Cooling water filter element	5 No.	
2.7.33	Set of all fasteners used in welding head	15 Sets.	
2.7.34	Coolant	10 Ltrs.	
2.7.35	Other essential spares / consumables (if any) for two years trouble free operation & maintenance. (Bidder to specify and give detailed break up)	1 Set	
2.8.0	Complete set of Documentation as described in the Sub Clauses of 10.0.0 (In 3 hard copies and one pen drive)	1 Set	
3.0.0	POWER SOURCE SPECIFICATIONS:		Bidder to confirm
3.1.0	Type	Microprocessor controlled programmable (inverter based) pulsed GTAW Welding Power source-DC straight polarity. (Bidder to specify)	
3.2.0	Make	Polysoude / ESAB / Lincoln / Miller/ or any other reputed make which shall be acceptable to BHEL. (Bidder to specify)	
3.3.0	Output Current Rating	160 Amps. minimum @ 100 % duty cycle for 10 minutes duty cycle.	
3.4.0	Operating Current	5 to 160 Amps with stepless variation	
3.5.0	Open Circuit Voltage	60 Volts Minimum.	
3.6.0	Switching Frequency	Bidder to specify	
3.7.0	Memory	99 Welding Programs (minimum). (Bidder to specify)	
3.8.0	TIG Arc Ignition	By means of an in-built high frequency unit	
3.9.0	Power Input	415 V +/- 10% ,50 hz, 3 phase, 3 wire system.	
3.10.0	Current Accuracy	±1% of setting	
3.11.0	Welding Voltage Range	5 to 30 V DC	
3.12.0	Gas Pre-flow / Gas Post-flow Time& Feature	0 to 99 sec. Gas pre-flow, post-flow in the chamber shall be controlled by program.	
3.13.0	Current Pulse Frequency	0.5 to 50 Pulses / sec	
3.14.0	Pulse Current Time	0 to 2 seconds	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
3.15.0	Background Current Time	0 to 2 seconds	
3.16.0	Current Up-slope / Down-slope Time required during welding	0 to 3 seconds	
3.17.0	Time setting for each current level required during welding	0 to 3 seconds	
3.18.0	Rotation Start / Stop Delay required during welding	0 to 45 secs	
3.19.0	Wire Feed Start / Stop Delay required during welding	0 to 45 secs	
3.20.0	Torch Rotation Speed & variation	(Bidder to specify)	
3.21.0	Filler Wire Feed & Speed	(Bidder to specify)	
3.22.0	Filler Wire Feed & Speed variation	± 1 % of setting	
3.23.0	AVC Function	± 1 % of setting	
3.24.0	Programming increments for welding current & time parameters	0.1 amps / 0.1 sec	
3.25.0	Ambient Condition	Temperature range 20°C to 30° C	
		Humidity 70 % (maximum)	
3.26.0	Auto-Tripping	Tripping facility by means of an automatic circuit breaker, in case of electrical short circuit, overloading, over-heating, single phase protection.	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
3.27.0	POWER SOURCE FEATURES:		Bidder to confirm
3.27.1	Display Unit	A digital display unit to indicate all the working parameters (viz., voltage, current, pulsing time, wire feed, speed, etc.)	
3.27.2	a. Gas Flow Setting	Gas flow meter with gas solenoid operating push button switch for pre-setting gas flow rate, provided on the Front Panel	
	b. Gas hose with end fittings — Gas cylinder to power source	(Bidder to specify)	
3.27.3	Water Cooling Unit for Torch	Built-in and of suitable capacity for the weld head and torch for continuous operation without overheating. Coolant to be specified.	
3.27.4	Arc Sensing	Means & modes for arc initiation and sensing. (Bidder to specify)	
3.27.5	Arc Voltage Control function	± 1 % variation	
3.28.0	WELD PROGRAMMING UNIT:		Bidder to confirm
3.28.1	Type	A microprocessor based weld program control unit with digital display unit, key-board, etc., and provided with the option of remote function control through a Remote Operator's Pendant.	
3.28.2	Programming Level	A multi-level programming capability.	
3.28.3	Weld Report Generation	Weld Programming Unit to facilitate easy output generation and on-line plotting of wave form through the external Chart Recorder (Optional).	
3.28.4	Program Processing & Integration	Facility for integrating an external PC (Computer) to the Weld Programming Unit, through an Off-Line Programming-software to facilitate editing and storing of weld programs.	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
3.28.5	Auto-diagnostic System	Built-in error display provision in both power source and remote pendant.	
3.28.6	Weld programming	Parameters like pre-gas / post-flow, start / end current, up and down slope, etc. have to be set individually for each program	
3.28.7	Sectoral Programming	Possibility for setting welding current, voltage, rotation speed, wire speed, pulsing time, etc. for each sector. (one weld cycle has to be split into a minimum of 6 sectors).	
3.28.8	Dry Run	Before welding, a test run has to be performed by Using the simulation operation mode	
3.28.9	Safety Lock	Key lockable switch-Programming/operation/lock	
3.29.0	Data transfer	USB port for Data Transfer & 2 Nos. of 2 GB pen drive.	
3.30.0	REMOTE CONTROL UNIT:		Bidder to confirm
3.30.1	Type	Compact, lightweight & hand-held remote function unit connected to the power source / programming unit with minimum 9 m long control cable with protective sheathing & quick-fix end connectors.	
3.30.2	Display Unit	LCD Screen	
3.30.3	Process / Selection Control	Push-buttons to select/control	
3.30.3	Process / Selection Control	Welding program	
		Weld cycle start and weld cycle stop	
		Emergency stop	
		Manual movement control for torch position	
		Manual control for wire feeder	
		Manual control of start of down slope	
		Gas and water flow control	
		Real time modification of welding parameters	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
3.30.4	Operating Voltage	The remote control unit shall function on a low voltage (24 volts).	
3.30.5	Heat resistant	The remote operator pendant shall have proper cooling provisions so that the electronic components / processors housed inside the pendant do not get heated up. The temperature shall not exceed 5 °C above ambient temperature.	
4.0.0	TUBE to TUBESHEET WELDING HEAD:		Bidder to confirm
4.1.0	Type	Tube to Tubesheet Welding Head, with axial (minimum three) & angular adjustment to the wire feed nozzle, Angular / tilted AVC and rotating wire feeder.	
4.2.0	Mounting and clamping arrangement	Mounting and clamping of welding head shall be of mechanical type (Non-hydraulic & Non-Pneumatic) with pilot/Centring mandrel. (Vendor to provide details of locating of weld head and clamping arrangement).	
4.3.0	Application -Joint Design	The Welding Head design shall be suitable for welding the tube to tubesheet joints with Extended, Flush and Recessed tube ends.	
4.4.0	Weld Orientation	All (Vertical & Horizontal Gravity Positions)	
4.5.0	Tubesheet Hole Pitch	Pattern : Triangular (refer Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02)	
4.6.0	Torch/Wire Nozzle Adjustment	Angular & 3 - Axis Adjustment	
4.7.0	Wire feed angle & adjustment distances along the three axis.	(Bidder to specify)	
4.8.0	Electrode Angle adjustments	(Bidder to specify)	
4.9.0	Head Rotation speed	0.2 to 6.0 rpm (approx)	
4.10.0	Wire Feed Speed	(Bidder to specify)	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
4.11.0	Wire Spool Weight & size.	Weight= 0.5 KG Size= Dia. 100 mm & width of spool 50mm	
4.12.0	Argon gas protection casing	Argon gas protection casing should suit the geometry of the tube sheet as per Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02. (Vendor to specify)	
4.13.0	Argon gas flow rate for protection casing	Vendor to specify Max. and Min. flow rate.	
4.14.0	Current Rating	160 Amps. @ 100 % duty cycle for 10 minute duty cycle	
4.15.0	Tilted / Angular AVC Control	To be provided with Arc Voltage Control	
4.16.0	AVC Stroke	10 mm (minimum)	
4.17.0	Wire Spool & Feeder Location	Wire Spool & Wire Feeder shall be integral with the welding head.	
4.18.0	Cable Length & Type	Minimum length of 7 mtrs. Required.	
4.19.0	Tungsten Electrode	Tungsten Electrode 2.4 mm dia.	
4.20.0	Wire Size	Dia. 0.8 mm Titanium wire. (Bidder to confirm & give details.	
4.21.0	Application	To position the Tube-to-Tubesheet Welding Head, concentric to the tube-to-tubesheet joint to be welded in Vertical/Horizontal position	
4.22.0	Locator/Collet Assembly	To form part of the supply and shall be suitable for Tube Size : (13.8 OD x 1.35 THK). with $\pm 5\%$ tolerance on wall thickness & weld protrusion as indicated in Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02	
4.23.0	Fasteners used in weld head shall be preferably of ISO/METRIC standard	(Vendor to specify)	

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
5.0.0	ELECTRICAL & ELECTRONICS SYSTEM:		Bidder to confirm
5.1.0	415V $\pm$ 10%, 50HZ $\pm$ 3 Hz, 3 Phase AC [3 wire system without neutral] power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor.		
5.2.0	Tropicalization: All electrical / electronic equipment shall be tropicalized.		
5.3.0	Vendor to specify protection class (IP class) for power source and remote pendant.(Bidder to specify)		
5.4.0	Control circuit voltage shall be 24 V.		
5.5.0	Fault diagnostics and alarm display provisions to be available in power source and remote pendant.		
5.6.0	Drive motors. (Bidder to specify& provide details.)		
5.7.0	Vendor should ensure the proper earthing for the machine and its peripherals.		
5.8.0	All solenoid valves should have light indicating solenoids.		
6.0.0	IN-BUILT SAFETY ARRANGEMENTS:		Bidder to confirm
6.1.0	Following safety features in addition to other standard safety features should be provided on the machine:		
6.2.0	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.		
6.3.0	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.		
6.4.0	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.		
6.5.0	Emergency Switches at suitable locations as per International Norms should be provided.		
7.0.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE: The Vendor shall bring special tools and equipment required for erection of the machine. Necessary tools like Spanners, Keys etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer.		

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
8.0.0	MACHINE SPARES: 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.		
9.0.0	PRE-DESPATCH INSPECTION OF MACHINE:		
9.1.0	The machine along with spares, accessories and necessary documents are to be offered for BHEL Inspection at Suppliers work. Necessary demonstrations of the functions of the machine and weld trials (minimum of 6 joints as per Sketch No. SK:4:OP&C:01 & 6 joints as per Sketch No. SK:4:OP&C:02, all 12 joints should pass Liquid Penetration test) shall be conducted at the supplier's works . All materials and consumables required shall be arranged by the BHEL. Bidder has to clearly provide the details of trials and tests being planned to be performed.		Bidder to provide details
9.2.0	Airfare, boarding & lodging for the BHEL Officials shall be borne by BHEL.		Bidder to Note.
10.0.0	MACHINE DOCUMENTATION:		Vendor to confirm
10.1.0	O&M Manuals: a. THREE Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with ONE copy in pen drive. b. One Hard Copy of O & M Manual as per clause 10.2.0 shall be submitted at the time of inspection of the tube to tube sheet Welding Machine by BHEL Officials, at the Supplier's Works. to check the sufficiency of documents provided. If any additional details are required, it should be submitted.		
10.2.0	Documents and Technical Details		
	a. Write-up on the Operation and maintenance of the machine.		
	b. Complete specification of the machine.		
	c. Preventive maintenance Check list		
	d. GA Drawing of the tube to tubesheet welding machine		
	e. GA Drawing of Individual Sub-Systems and Mechanisms with major dimensions and weights.		
	f. Sub-Assembly Drawings with cross sectional details and major/critical dimensions for all sub systems maintenance purpose.		

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

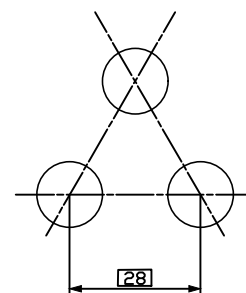
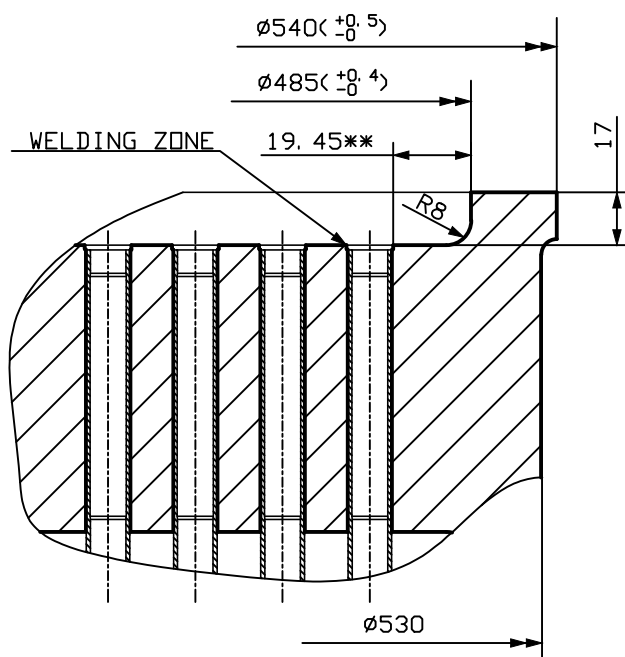
S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
	g. Component drawings with complete dimension & material specification for all wearing components. List of wearing components to be submitted during drawing approval.		
	h. Electrical Wiring Drawings — Power & Control Circuits with BOM		
	i. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls in CD.		
	j. Alarm Log, Error Code, Error Messages & Remedies to be provided.		
	k. List of all bought-out items with make and model no to be provided.		
	l. Catalogues of All Bought-Out Items to be provided.		
	m. Warranty / Guarantee Card for all Bought-Out Items.		
	n. Machine related PC Details — Machine Operating Softwares, Parameters Selection Software, File Handling, and Display Recording. CD Read and Write unit, Serial and USB Ports to be ensured.		
	o. Total weight of the Machine & Sub-Systems.		
11.0.0	TRAINING:		Bidder to confirm
11.1.0	The Vendor shall provide training to BHEL's Engineers in Operation and, Maintenance (Mechanical, Electrical/ Electronics and PLC System) of the Machine during Pre-dispatch inspection.		
11.2.0	Airfare, boarding & lodging for the BHEL Trainees shall be borne by BHEL.		
11.3.0	The Vendor shall impart training to BHEL's Engineers, Machine Operators and Maintenance crew in Maintenance during commissioning of the Machine at BHEL works for not less than 4 working days		
11.4.0	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel		
12.0.0	MACHINE ERECTION & COMMISSIONING :		Bidder to confirm
12.1.0	Vendor to take full responsibility for supervision of the installation and testing of the machine for its functions and its controls. Service requirement like electricity, air & water shall be provided by BHEL at only single point.		
12.2.0	Successful proving out of BHEL requirements by the Vendor shall be considered as part of commissioning (As per Clause 14.0.0).		

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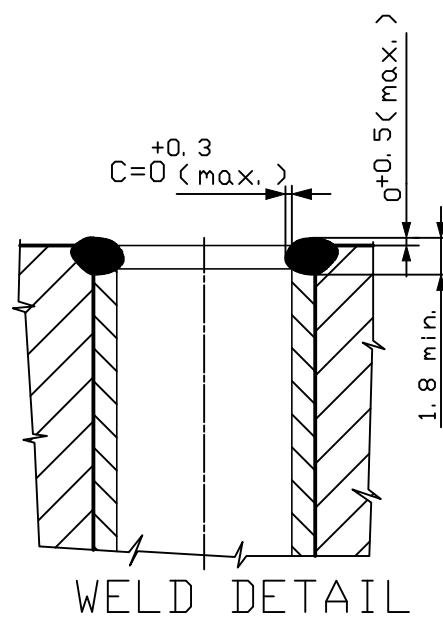
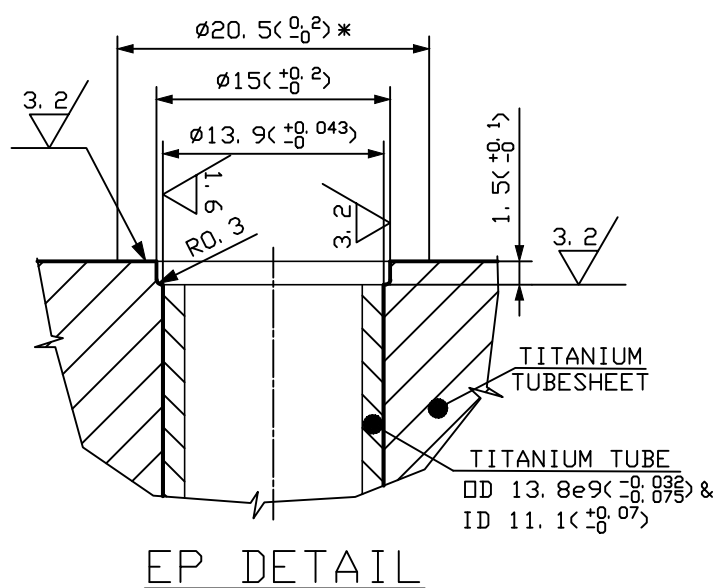
S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
12.3.0	Tools, Tackles, Test Mandrels, instruments and other necessary equipment required to carry out all above activities should be brought by the Vendor.		
12.4.0	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the vendor on returnable basis.		
12.5.0	Charges, terms & conditions for Installation and commissioning shall be given (in detail) separately by Vendor along with offer.		
13.0.0	AMBIENT CONDITIONS & THERMAL STABILITY:		Bidder to confirm
	The Welding Machine with all sub-systems shall be suitable for operation in an ambient temperature of 25 °C to 50°C and with a Relative Humidity of 90% (both higher values do not occur simultaneously).		
	Weather conditions are tropical, atmosphere may be dust laden. Machine shall be kept in the normal shop floor condition. The ENTIRE EQUIPMENT shall be TROPICALISED in Design and CONSTRUCTION. [The offered machine shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Bidder)		
14.0.0	MACHINE PERFORMANCE PROVE-OUT:		Bidder to confirm
	Prove-out trials of the welding operation on tubes as specified in Clause 1.2.0 to be done at BHEL Trichy works. BHEL will provide necessary materials, consumables, conduct NDE & necessary details for commissioning the machine. Commissioning and Prove out of the machine shall be considered only after completing the following activities. a. Minimum of 6 joints as per Sketch No. SK:4:OP&C:01 & 6 joints as per Sketch No. SK:4:OP&C:02 to be welded. b. All 12 joints should pass Liquid Penetration test, Radiography test & should ensure I.D. weld projection (C - value = 0 to 0.3mm max. as per Sketch No. SK:4:OP&C:01 & Sketch No. SK:4:OP&C:02)		
15.0.0	MACHINE PACKING:		Bidder to confirm
	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 despatched in containers, all small loose items shall be suitably packed in boxes.		

PART B: TECHNICAL SPECIFICATIONS FOR TUBE TO TUBESHEET WELDING MACHINE

S No	FEATURES	BHEL SPECIFICATION	BIDDER'S OFFER
16.0.0	GUARANTEE TERMS:		Bidder to confirm
	Performance Guarantee for a minimum period of 12 months (for the machine in total and subsystems or bought-out items in particular) from the date of commissioning of the machine at BHEL works.		
17.0.0	GENERAL POINTS :		Bidder to specify
	Machine Model Number and other related details		
	Total Connected Load (in kVA)		
	Total Weight of the Machine & Accessories.		



PITCH
PATTERN
(NO. OF HOLES - 198)



NOTES:

- ```
* --> SPOT FACING DEPTH < 0.1 mm
** --> MINIMUM DISTANCE TO WALL IS SHOWN. VENDOR TO CONFIRM/MENTION
SPACE REQUIREMENT FOR ACCOMMODATING THE WELDING HEAD & SHIELDING
ARRANGEMENT.
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TITLE:

TUBE TO TUBESHEET WELDING  
DETAILS OF HX-2

SK. NO.

SK:4:P&amp;C:02

