



An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

Corrigendum 1	Phone: +91 431 257 7421/ 7360 Fax : +91 431 257 6826 Email : vkarna@bhel.in : ajayasalkar@bhel.in Web : www.bhel.com
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NIT No. 39648	Enquiry Number: 2601800025	Enquiry Date: 05.07.2018	Due date for submission of quotation extended to: 20.08.2018
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You are requested to quote the Enquiry number, date and due date in all your correspondences. This is only a request for quotation and not an order.

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

Item Description: Laser Hybrid Welding Machine For Tube To Fin Welding

Details of Corrigendum

- 1) Changes in the technical specification as per the annexure.**
- 2) Due Date extended upto 20.08.2018.**

All other terms and conditions and specifications as published in the
NIT No. 39648 remains unaltered.

Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2601800025".

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 V. ASALKAR
Sr. MANAGER
MM / Capital Equipment
BHEL, Tiruchirappalli - 620 014

Details of Corrigendum		
The following clauses of Part-B of the tender has been revised as follows:-		
Sl.no	Clause No	BHEL Specification Particulars (amended and should be read as)
1	1.0	Continuous laser/laser hybrid welding of Super critical / Sub Critical High Pressure Power Boiler Membrane Wall Panels formed by welding of seamless tubes with intermediate flats. The offered system shall be a special purpose machine consisting of automatic laser hybrid welding system with all the accessories and capable of doing the following: • Laser/laser hybrid welding from one side to achieve full penetration in tube to fin assembly made of exotic materials like T/91 with tube ODs 38.1 mm, 41.2 mm, 42.4 mm & 44.5 mm and fin dimensions of 12.7 (W) x 6 -8 (T) mm in single pass at a welding speed of 2.5 m/min or above for every tube to fin welding • A system comprising of at least six welding torches capable of welding at six locations across the width of the panel with a laser power of 8 kW supplied to each torch • Mechanism to control the torches together and also independently • Necessary mechanism for fin straightening before going to the feeding mechanism • Necessary feeding mechanism to feed the tube and fin in assembled condition to the welding station • A system for tack welding multiple tube to fins before feeding to the welding station • Laser/laser hybrid welding of tube to fin assembly with multiple tubes and fins for making panels of length 25000 mm and width 2500 mm (max.) • Necessary preheating system (induction based) for preheating the panels upto 350 °C
2	2.12	Tolerance on Width: +0mm /-3mm Bow: 3 mm max allowed in transverse direction
3	3.1	CNC/ PLC Controlled Push-Through (moving tube) Stationary Welding Machine
4	3.8	Simultaneous Welding with six torches only from top side of the panel.

5	3.9	Welding with any one torch or with any number of torches in combination upto 6 torches at a time through operator selection.
6	3.18	➤ A suitable preheating system of induction type for preheating the entire assembly just before feeding to the welding zone ➤ The maximum temperature shall be 350°C ➤ Automatic external control ➤ Bidder to specify the following for the induction preheating system ➤ Output capacity in terms of kW ➤ Duty cycle ➤ Output frequency ➤ Range of output control – preferably 0 -100% ➤ Oscillator ➤ Cooling method ➤ Timer setting suitable for the requirement ➤ Kind of protection with interlocking mechanisms to prevent over heating/ over current, etc. ➤ Type of temperature control ➤ The construction and arrangement of preheating system and its suitability for sub panel welding and assembly welding
7	3.25	Welding components / equipment arrangement are to be of rigid and solid design, self-guiding/holding type and user friendly to avoid welding related problems (due to fragile arrangement of wire feeders, guides & controllers, torch assembly & positioning, devices with respect to feeding rollers, etc.). The torch vertical up & down and lateral adjustment to be integrated with the seam tracker through PLC/CNC and the details to be provided by the bidder.

8	4.1.7.	• Compatible optical fiber to achieve a spot size of 200-300 μm with a minimum focal length of the focal lens for the laser at 200 mm. • Optical fiber shall be of sufficient length for connecting the laser and the welding head and for free movement across the width of the panels (2500 mm) • The core diameter of the optical fiber and the length of the fiber offered to be clearly mentioned • Required fiber protection sheath/cover to be provided for all the optical fibers • Required optical coupler to be supplied • Necessary leak detector for detecting any leaks in the fiber to be included • Safety interlocks in case of any fiber damage to cut off the laser power to be included • Safety features to avoid back reflections damaging the resonator to be included in the optical circuit
9	4.2.6	Welding power source shall have digital control/ display/ Setting features. Type of digital control shall be clearly mentioned. Remote control may be provided for easy operation.

10	4.3.1	Laser hybrid welding torch suiting the laser model, preferably compact type from internationally reputed suppliers like Fronius or ESAB or Cloos or Highyag or IPG or Precitec or Reis or the laser welding head from any of the above mentioned suppliers integrated with the GMAW torch and shall meet the following • The torch can work upto a laser power of upto 10 kW and MIG welding current of up to 350 A @ 100 % duty cycle • Capable of carrying out welding at high speed upto 10 m/min • Synchronised laser focusing with GMAW arc • The required connections for integrating with the laser, MIG power source through main control system • Provision for supply of different shielding gases like Ar/He/CO₂/N₂/O₂ • The torch shall be water cooled • Required water cooling connections with protected hoses (as necessary) for continuous operation to be provided. Details to be mentioned • Cover slides for protecting the focus lens from spatters and fumes. • Cross jet/air knife for protecting the optics from damage • Provision for feeding different type of wires of different diameters ranging from 0.8-1.2 mm. The required contact tips to be supplied with the machine. The required contact tip handling tool to be supplied along with the machine. • Suitable mechanism for trouble free feeding of filler wires • The required holding systems (pneumatic or mechanical) to fix the welding torch sturdy for continuous operation • An inline sensing system for taking care of positioning, variation in fit up, etc. to be quoted as an option • Torch cables to be provided with protective sheathing that is fire proof • Torch mounting guide to be provided for welding 2500 mm wide panel • The torch assembly shall be sturdy and should be with fool proof system for maintaining the distance between laser and GMAW arc during welding without any interruption. • Easily mountable/detachable nozzle cup for GMAW torch
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11	4.4.1.	• Optical triangulation using structured laser illumination based seam tracking system for positioning the welding torch at desired location and to trace the desired welding path • The seam tracking system shall be capable of adjusting the torch at a speed > 25 m/min. The exact speed of adjustment to be clearly mentioned • Seam tracking system should be suitably integrated for laser hybrid welding. • Option to work offline without seam tracking, if required • Bidder to specify the following ➤ Kind of detector ➤ Stand-off distance ➤ Depth of field ➤ Field of view for close plane and far plane ➤ Average depth resolution ➤ Average lateral resolution ➤ Sampling rate ➤ Laser safety class ➤ Dimensions and weight of the tracker
12	4.6.1.	• Laser power meter preferably from M/s Primes for measurement of laser power upto 10 kW • The power meter shall be hand held with the digital display • The calibration certificate of the power meter to be provided
13	6.1	1. Should be suitable for welding at welding speeds as mentioned before. 2. Made of Wear Resistant but Smooth (not to make impressions on the tubes of the panels) Steel Rollers. 3. Position of Idler & Motorized Rollers are to be so designed such that the Panels of all Dimensions (within the range specified) are handled smoothly. 4. Each Cross Conveyor Unit shall be made of minimum six numbers of cross-transferring arm assemblies. Bidder to specify the no. of cross conveyor arms.
14	6.5	Provided with all motorized Steel Rollers Stand, suitable for transporting sub-panels / full panels (with width upto 2500 mm) from outfeed conveyor to infeed conveyor.
15	6.8	Stoppers and Aligning system shall be provided in the infeed conveyor for aligning and positioning of tubes/formed mini panels together for welding sub-assemblies and final assembly welding for full panel fabrication of 2500 mm width.

16	7.3	Bidder to explain the construction of Panel tacking table, having a fixture for arranging the tubes & fins including automatic feeding of tubes & fins to the Panel tacking table. The table to be suitable for a sub-panel of 10 tubes and 12 fins of 25000 mm length.
17	7.6	The tack welded sub-panel to be shifted from the panel tacking table to the machine In-feed table by means of Cross Transport Conveyor. Bidder to ensure uniform lifting of walker beams for continuous trouble free operation in three shifts. Bidder to explain the construction.
18	8.6.1	The proposed machine shall be capable of cleaning the rust, scales, protective film coats etc. from the surface of the fins.
19	8.8.3	The width of the fin storage rack on the out feed side shall have enough width to store atleast 50 fins of 12.7 mm width. For 110 mm fin width to store at least 15 fins .
20	9.1.1	Control shall be PC based CNC /PLC control.
21	9.2	PC based CNC /PLC SYSTEM & FEATURES
22	9.2.1	Make : Fanuc / Siemens / Mitsubishi/Beckhoff
23	9.2.8	Dell New Inspiron 15 5570 laptop or comparable with pre-loaded software for CNC/ PLC maintenance to be supplied with the machine. The details of the required configuration are given below • 8th generation Intel core i7-8550U processor (8MB cache, upto 4 GHz) • Windows 10 operating system with complete MS office • Memory – 16 GB, DDR4, 2400MHz • 2TB 5400 RPM Hard Drive • Video card – AMD Radeon 530 Graphics with 4G GDDR5 graphics memory • 15.6" FHD (1920 x 1080) Anti-glare LED-Backlit Display • English backlit keyboard • Tray load DVD drive • 802.11ac + Bluetooth 4.1, Dual Band 2.4 & 5 GHz, 1 x 1 • 42WHr,3-cell integrated battery • Necessary ports for USB 3.1 Gen 1 Type – C with power delivery and video, 2 USB 3.1 Gen 1, 1 USB2.0, 1 HDMI 1.4b, 1 Noble lock, 1 3-in-1 SD media card reader • Kaspersky/Symantec/Mccafee or any other internationally reputed brand antivirus with 2 years' subscription

24	10.2.1	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied PC based PLC/CNC system for remote diagnosis and correction of the problems in PC based PLC/CNC System of the machine. The tele-diagnostic service shall be provided free of charge for the guarantee period. BHEL will provide the necessary telephone line near the machine. GSM connection not acceptable.
25	13.2	Pumps, valves, accessories, etc. shall be of Bosch-Rexroth /Eaton-Vickers / Parker/Kawasaki. (Details to be submitted).
26	13.4	Suitable filtration system should be provided with Duplex / standby filter units. It is preferable to use re-usable type of filter elements in the system. The filter unit shall be of Hydac / Parker / Rexroth/Pall/ Filtrec/Eaton-internormen/Hydax.
27	13.15	All hydraulic cylinders used in the machine should be standard cylinders have standard bore and rod sizes. The piston rod shall be hard chrome plated. Latest wear resistant standard size, seals and O rings of Hunger/ Hallite/Parker/James Walker/Merkel/ Simrit/ Busak & Shamban (Trelleborg) only Shall be used. Cylinder shall be provided with cushioning. Make of hydraulic cylinder: Parker/Rexroth/ Milwaukee/Atos/Hydoring only
28	14.1	Suitable Capacity Refrigerant Chilling Units are to be provided for the cooling of Power Transformers, Hydraulic Power Pack Oil etc. Make: Werner Finley / Rite-Temp/Daikin/ ASA Hydrauliks or any other reputed international make with service centres in India. Bidder to give Complete technical Details on these Chilling Units
29	17.10	Motors and drives shall be of Fanuc / Siemens / Allen Bradley / ABB / Indramat / SEW / Mitsubishi/Beckhoff/VEM conforming to IS / IEC Standards (Vendor should indicate make and type in the offer)
30	17.11	All electrical items shall be of from SEW / ROCKWELL / Allen Bradley / Telemecanique / Delta / Siemens/ Mitsubishi / Fanuc /Honeywell / Sick/IFM/Balluff/Omron/Datalogic /Leuze /Keyence /SMC/ Schneider Electric.

31	21.3	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. GA Drawing of the complete Panel Welding station. 2. GA Drawing of Individual Mechanisms 3. GA & Sub-Assembly Drawings for sub-systems for maintenance purpose. 4. Operating manuals of Machine & its PLC System 5. Programming manuals of Machine & its PLC System 6. Operating manuals of Machine & its CNC System (if provided) 7. Programming manuals of Machine & its CNC System (if provided) 8. Maintenance and spare part manuals with all drawings of machine assemblies / subassemblies with parts list 9. All Electrical circuit diagrams with bill of materials 10. Hydraulic circuit diagrams with bill of materials 11. Pneumatic circuit diagrams with bill of materials 12. Maintenance & Interface manuals for Machine Control System 13. Preventive Maintenance check list for Electrical and Mechanical System 14. Trouble shooting chart for Main and all sub systems 15. Complete PCB Schematics indicating check points for Electronic controls. 16. Complete list of Bought out items with make and model number. 17. Catalogues, O&M manuals for all bought out items used in the machine. 18. Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories. 19. Detailed specification of all rubber items / hydraulic / lubrication fittings 20. PLC program print-outs with comments in English 18. PLC program and data on CD, Flash Memory Card. 21. Complete back up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back up and reloading of a new hard disk. 22. Complete list of Alarm log, Error code, error messages & remedies and on line fault diagnostics to be provided by the vendor. 23. Complete list of spares for machine, along with item part no /specification / type / model and make & address of the sub-vendor. 24. Part drawings of sub systems installed in machine
32	22.2.2	25000 mm long and 2500 mm wide panels shall be welded and proved out with 15 Kg spools & 300 Kg Jumbo Coils with wire specification ER90S-B9 – 1.2mm Solid wire in T91 panels at welding speed ≥ 2500 mm/min for fin thickness of 6 mm.

33	24.4	Laser calibration or suitable calibration method for CNC/PLC axis are to be carried out by the vendor after installation of the machine. Necessary backlash and pitch error compensation values in the PLC/CNC system after calibration are to be provided. Required instruments are to be carried by the supplier for calibration. Calibration reports are to be submitted for repeatability and accuracy of each axis. Details of the calibration method that shall be followed to be mentioned in the offer.
34	25.1	Laser Safety Enclosure • A class 1 safety enclosure with double stage protection with full steel cover and hanging flexible laser shields suiting the laser wavelength (if feasible) to confine the scattered laser radiation to the enclosure • LED lighting with VGA based CCTV camera and LCD screen with 17" monitor viewing arrangement for monitoring the welding process • Two laser viewing windows from Laser Vision of dimensions 18" x 18" suiting the laser wavelength with L5 protection and with damage protection mechanism positioned at suitable places of the enclosure. Damage protection mechanism can be glass shields on both to protect both inside and outside surfaces of the laser viewing window with steel covering opening for mounting • Safety interlocks at multiple locations to cut off the laser power in case of defeat • Required guarding and access panels shall be provided and the details to be mentioned clearly • Ladders shall be provided where ever required.
35	<i>The due date for submission of quotation has been extended to 20.08.2018</i>	
All other terms and conditions and specifications as published in the NIT_39648 remain unaltered.		