Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
An ISO 9001 Company
CAPITAL PURCHASE / MATERIALS MANAGEMENT / MANUFACTURING

ENQUIRY	Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : rrmanohar@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620700015	**04.06.2007**	**18.08.2007**
Your 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			

Item	**Description**	**Quantity**	**Delivery Schedule**
10	Friction Stir Welding System as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com)	1 No.	15.04.2008

Note:

(1) Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620700015". Your offer should be based on all the above documents.

(2) Also, you are requested to fill in the Supplier Registration formats available in www.bhel.com (under Advancement – Supplier Registration) and send it along with your offer.

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. Dy. Genl. Manager / Capital Purchase / MM / Manufacturing

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF FRICTION STIR WELDING MACHINE

SECTION – I

The BIDDER / VENDOR has to compulsorily meet the following requirements to get Qualified for submitting an offer for **Friction Stir Welding machine**

S. No.	**REQUIREMENTS**	**Vendor's RESPONSE**
1	The BIDDER shall have a minimum of THREE Years of Continuous Experience in the field of Design, manufacture and supply of similar machines.	
2	Only those vendors, who have supplied, and commissioned at least one such machine for similar applications in the past five 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).	
2.1	The vendor should submit the following information where similar machines have been supplied, for qualification of their offer.	
2.2	Name and postal address of the customer / company where similar machine is installed.	
2.3	Name and designation of the contact person of the customer.	
2.4	Phone, FAX no. and email address of the contact person of the customer.	
2.5	Month and Year of commissioning	
2.6	Application for which the machine is supplied.	
2.7	One Performance certificate from the customers regarding satisfactory performance of machine supplied to them. The certificate should be current and on the letterhead of the Customer. It should contain information regarding model / Size of machine, year of commissioning and performance of M/c.	
3.0	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.	

SECTION – I 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
4	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of design, manufacture, integration and supply of **Friction Stir Welding machine**	
5	Number of **Friction Stir Welding machines** supplied, installed and commissioned till date for **similar applications** (with details on machine type / model, configuration, customer and quantity)	
6	YEAR of supply of latest, **Friction Stir Welding machine** for welding applications and the Technical Specifications of the Machine supplied [Details to be furnished]	
7	Details on the Firm's Registration and the FINANCIAL STRENGTH of the COMPANY (Balance Sheet for the last **3** years) shall be submitted with the TECHNICAL OFFER	
8	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment.	
9	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centers in India. Competency & Experience of the Local Service Agency are to be provided	
10	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment	

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SECTION – III

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

S. No.	REQUIREMENTS	VENDOR's RESPONSE
11	The BIDDER / VENDOR shall submit the offer in TWO PARTS-Technical [with PART A & PART B] & Commercial and Price Bid.	
12	The Technical Offer shall be supported by Product Catalogues and description.	
13	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement [without any supporting technical write-ups, photos and datasheets] may lead to disqualification of the Technical Offer.	
14	The BIDDER / VENDOR shall assure a continuous support for the supply of SPARES and SERVICE for TEN Years, from the date of commissioning of equipment at BHEL Works.	
15	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, tooling, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
16	Soft copy if any, giving the salient features of the proposed machine with all sub-systems and auxiliaries, and /or showing live-demo of an existing and working machine of similar configuration and capacity may be provided.	
17	BIDDER has to indicate the Country of Origin for the supply of equipment.	
18	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
19	In case of preliminary qualification of the offer, on technical grounds, the BIDDER may be called for a detailed technical discussion on the original technical offer at BHEL Works, with a sufficient notice period.	

PART-B
Technical specifications of friction stir welding machine

Purpose:

The friction stir-welding machine with high stiffness and robust design is meant for welding of aluminum & its alloys, copper and its alloys, titanium, steel and high temperature alloys. This machine is to be used as a research facility for demonstration of FSW technology for various products. The machine is to be equipped with the suitable tool holder to hold tools made from different materials including poly crystalline cubic boron nitride (PCBN) and provided with temperature telemetry system and full-fledged data acquisition system for recording of all significant parameters.

Machine Specification:

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH COMPLETE TECHNICAL DETAILS
1	**Welding machine**	Friction stir welding machine of gantry type with the table, having a provision to give X – axis movement through movement of table or gantry	
1.1	**Weld Process**	Friction Stir Welding	
1.2	**Application**	Longitudinal welding of plates and shell long seams made of various materials including capability of using different tool adapters & use of PCBN tools	
1.3	**Job to be welded**: Thickness range Length Material Job shape	 Up to 15 mm in single side/pass welding 2000 mm (Maximum) Aluminum & its alloys, copper and its alloys, titanium, steel and high temperature alloys Longitudinal seam of shell and plate	
1.4	**Machine requirements**		
1.4.1	**Construction**	Robust construction with easy access for job mounting & dismantling, inspection, tool	

		and machine setting, control of machine parameters during welding, job welding, machine cleaning and maintenance	
1.4.2	**Work table size**	Minimum length of 2600 mm and width 720 mm provided with T slots Maximum weight carrying capacity to be indicated by the supplier	
1.4.3	**Tooling**	General purpose tooling for Aluminium& its alloys, Copper & its alloys, to be quoted	
1.4.4	**Movements**		
1.4.4.1	**X axis**		
	Guidance system	Precision linear bearing with hardened and ground rails	
	Drive	AC servo with ball screw	
	Control mode	Closed loop Position control with Adaptive control for force	
	Stroke	2000 mm(maximum)	
	Speed	3000 mm/min (Max.) step less	
	Force	45 kN	
1.4.4.2	**Y axis**		
	Guidance system	Robust system to provide smooth lateral movement of the tool head.	
	Clamping	Provision of pneumatic / hydraulic locks for prevention of movement during welding	
	Stroke	Manual / optional motorized 200mm(approx)movement with the suitable position indicators.	
1.4.4.3	**Z axis**		
	Guidance system	Precision linear bearing with hardened and ground rails	
	Drive	Robust system to provide smooth vertical movement of the tool head for entire range of design loads	
	Control mode	Closed loop Position control with Adaptive control for force	
	Stroke	500 mm(minimum)	
	Speed	1500 mm/min	
	Force	100 KN	

1.4.5	**Provision for tilting the tool** **Drive** **Angle indicator**	± 0 to 10 deg. tilt to be provided Manual setting with suitable provision for lock during welding Machine mounted digital inclinometer	
1.4.6	**Spindle Speed** **Torque** **Power** **Tool interface** **Run out**	100–3000 rpm (Infinitely variable & in two steps) 400 Nm@ 1770 rpm Minimum 37 kW ISO 50 taper with power draw bar < 15 μm measured on spindle taper	
1.4.7	**Working envelope Maximum height with the job**	800mm	
1.5.0	**Welding Controllers**		
1.5.1	**Controls**	Operator control panel and pendent for independent setting and control of parameters. The equipment shall have control features for programming of the individual axes, sequencing of operations, interlocking, troubleshooting, etc. The Reliable control system shall be used.	
1.5.2	**Data acquisition system**	The data acquisition system shall collect the information from various sensors for measurement of force, torque, travel speed, feeding rate, etc and provide suitable feed back control to ensure proper weld quality. Both position and force control modes shall be available.	
1.6.0	**Electrical service data & Compressed air requirements**	440 volts, three phase, 50Hz Available compressor air line pressure: 5.5 bar. Requirement of air volume and cooling water quantity and temperature to be	

		indicated by supplier.	
1.7.0	**UPS**	A backup UPS for storing of captured data in case of power failure.	
2.0	**Acceptance criteria of the machine** **At Supplier works** **At BHEL, Trichy**	Complete operational features and welding capabilities to be demonstrated on aluminum & its alloys up to 15 mm thickness, Cu and its alloys up to 15 mm and ferrous material of each of length 400 mm (minimum) Welding to be demonstrated for atleast one metre length for three different material	
3.0	**Installation & commissioning of the equipment**	To be carried out at WRI, BHEL, Trichy, India	
3.1	**Mechanical Erection**	Erection of the Equipment will be done by BHEL under the supervision of SUPPLIER's SERVICE ENGINEERS and as per the guidelines furnished in the Erection Manual given by the Supplier	
3.2	**Commissioning**	Commissioning of the Equipment and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier.	
3.3	**Performance Prove-Out**	After the successful commissioning of the machine and sub-systems, the COMMISSIONING ENGINEER or the APPLICATION ENGINEER of the Supplier have to establish the Performance Prove –Out for the Machine's Capability and the Production Rate from the Machine, as given under the **Clause Sl.No. 2.0.**	
4.0	**Documentation**	Three sets of following documents (3 Hard copies) in English language should be supplied along with the machine	
4.1	**Machine Operation manuals**	• Operating manuals of Machine & CNC system with machine specifications, detailed	

		operating instructions for machine operation, setting of machine parameters, precautions, and machine safety details. • Programming Manuals of Machine & CNC system	
4.2	**Maintenance and trouble shooting manuals**	• Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts, Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also • Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives • Manufacturing drawings for all supplied tool holders, adapters, sleeves, fixtures etc. • Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable. • Detailed specification of all wear items and hydraulic / lube fittings • PLC program printouts with comments in English. • PLC program on CD, NC data & PLC data on CD • Complete back up of hard disk on CD and clear written Instructions to take back up and reloading of a new hard disk. • The vendor shall submit complete Master List of parts used in the machine. • One additional set of all the above documentation on CD • On line fault diagnostic system	
5.0	**PERFORMANCE**	The Performance of the total	

	GUARANTEE	equipment and / or the components / sub-assemblies / bought-out-items shall be guaranteed for a minimum period of twelve months from the date of commissioning at BHEL Works.	
6.0	**GENERAL POINTS**		
6.1	Make and Model of the machine to be mentioned. Detailed catalogs of the machine to be sent with the offer.		
6.2	Complete description of all systems & sub-systems shall form part of the technical bid		
6.3	A schematic diagram showing the layout of the machine & associated systems with salient dimensions shall be submitted along with the offer.		
6.4	The operating sequence of the machine with broad outline of various operations involved should be furnished with the offer.		
6.5	Standards for Design, Manufacture and testing of the machine shall be in accordance with internationally accepted standards.		
6.6	Total weight of the Machine & Sub-Systems. Weight of the heaviest part of the machine		
6.7	Total connected		

	load KVA		
6.8	Painting of machine and Electrical panel	RAL6011 Apple green (Polyurethane paint)	
6.9	Floor area required (Length x width x height) for complete machine and accessories		
7.0	Spares required for 2 years trouble free operation		