

PART B– TECHNICAL SPECIFICATION

Supply, Interfacing, commissioning and prove out of 100kW Induction Heating Unit for Induction pressure welding machine

Scope of Supply

Sl. No.	Description	Vendor Response
1.1	Vendor Shall Supply a Solid State Induction Heating System & HF transformer with control system, which is Equivalent to existing in the Machine. Vendor Shall Supply & Revamp Complete Induction Circuit to Suit Our Special Designed Inductor (Removing of the existing system and fixing the new system shall be of supplier scope). This machine is used for welding of tubes for various diameter.	
1.2	1. Solid State Induction Heating System for 100 KW with HF transformer 1. All items are Solid State Devices. 2. Output Frequency Shall Automatically Track the Better Frequency for Effective coupling of Energy by Phase Lock Loop. 3. More Efficient Around 95%(Power factor should be more than 0.95) 4. Remote Control of Operation with touch screen. 5. Display for Operation Parameter in Remote. 6. Closed loop Water Cooling system for Effective Cooling of All Systems. 7. Input Supply: 415V, 3 Ph, 50 Hz, 8. Output • 100KW, with suitable current and voltage • Output Adjustable Range 10 to 100% • Stability +or- within 1% 9. Output Frequency Shall be 9.9 KHz + / - 10% 10. Safety Protection • Earth Leakage Breaker • Input Over Current Breaker • Output Over Voltage & Over current Breaker. • Cooling water flow relay • Element Temperature Relay • Door Open/ Close Switch 11. Environment • Ambient Temperature Max. 45 Degree C • b. Humidity 15 to 85%	

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1.3	General Specification of panel – Height of the panel should be suitably selected, since machine is having constrain over the height with respect to job movement. Existing Height of the panels less than 900 mm and width is 1600mm. Suitable modification should be carried out by vendor. Vendor should study the existing location and should offer suitable height of the panel. Offered Items Should have the following Accessories with IP54 or Equivalent. Enclosure Panel of Industrial type with free standing , Dust and Moisture Proof with louvers and cooling fans/A/c unit.	
1.4	Inductor - Inductor shall be Supplied By BHEL. - It is a Special Type Inductor With two C-Section. One at bottom Fixed & Second at Top is Removable and filled by Hydrogen gas during welding. Hence Vendor shall get acquaintance of the inductor before quote the offer.	
1.5	Interfacing with Existing System. Induction Heating System shall be Erected, Interfaced & Commissioned by the Vendor and the materials required for the erection, commissioning shall be of contractor's scope. - HF transformer should be selected with suitable rating and dimension to suit with existing location. - Operator Shall Set the Parameter Once for a Particular Job. - Complete Induction System shall work in Machine Auto Cycle without any Manual Intervenes. - The System Shall be Interfaced with the Existing Machine. Machine Will Give Start & Stop. Duration of heating was fixed according to Welding Quality. - For Obtaining the Required Temperature, power output of the System Shall be varied. - Operator can set the Value, for required temperature. - Any Fault In the Induction Heating System like Cooling Water Blocked, over heat etc, the same has to be Displayed & the Interlocks Shall Trip the Heating system.	
1.6	Vendor Shall Study the Existing Machine System in our Works & get acquaintance before quoting the offer or otherwise the offer will not be considered for evaluation. Rating and Dimensions of Panels and Transformer are to be submitted.	
1.7	Supply of Transformer assembly and bus bar modification are under vendor scope	
1.8	Chiller capacity should be suitable selected. All interconnections are vendor scope. All water line has to be laid in cable drag chain.	
1.9	The offered system should be commissioned by THE SUPPLIER with the existing system. Accessories required for the commissioning of the system are with supplier's scope.	

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1.10	CONDITIONS: • Inspection will be carried out at suppliers works prior to despatch. (with ELECTRICAL CIRCUITS AND DRAWINGS). • Training should be given for 2 of our engineers at suppliers works on free of cost. • Guarantee certificate, operation and maintenance manual as specified above shall be sent along with the material. • Supplier Should be able to supply spares for a minimum period of 5 years. • PLC system make shall be Siemens S7/Mitsubishi Q series/ABB, ALSO SUPPLY PLC SOFTWARE ALONG WITH DATA CABLE. • Contactors and relays shall be of Mitsubishi / Siemens/L&T/Telemecanic make. • HMI shall be of size 5.7" or above COLOUR DISPLAY of make Siemens / Mitsubishi / ABB. • The inverter should have only one main control card. • The control card should withstand 40-degree ambient temperature. • Starting and stopping of inverter at any power level should be possible without any tripping. (min or maximum) • From starting to reach the maximum set power the time taken should not be more than 0.5seconds. • The inverter should be operated at constant output power regulation mode according to the set value of the potentiometer / PLC. • The control card/inverter control circuit should accept 4-20mA input as external control of power if required. • Nearest service centre office should be available in India so that the breakdown/service calls shall be attended immediately. Supplier should submit service centre details.	

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1.11	1. Vendor Should Study the Operation and performance of Existing machine & the same should be incorporated /achieved after Retrofitting. Operation Sequence is given below:- - Cycle start command given by operator - Heat on (Weld on/ power on) with Hydrogen flow valve open signal and the voltage level 220 to 270V, 9.9KHz - First choke power level change after receiving the upset limit input - First choke power level 180 to 230V for 45 sec. - Second choke power level 160 to 200V for 15 sec. - After completion of heating/ welding Hydrogen flow stopping signal and simultaneously Nitrogen gas flow starting signal for a set time. - Auto cycle stop. 6 different set of power levels with different time settings. Pre-set voltage and frequency provision for each set of powers. - Carbon steel, Alloy steel, Stainless steel all dissimilar material weld provision. - Indicating parameters like weld voltage, weld current, power and Frequency display to be provided. - Equipment power factor should be 0.95 and above. - Power supply input range shall be 380 V to 440V - Single Main control card. - MMI is capable of accepting all the operator input data and capable to display errors. - Energy monitoring system with alarm for the process energy measurement. - Remote control 0-10V or 4 -20 mA. - Inductor Matching Shall be of Self tuning type. - Output Voltage Variation Shall be within + or - 1% for + or - 10% input voltage variation. - Digital Display for Input Voltage, Line Current, Energy Consumption, Power factor. - Digital Display for High Frequency, HF Voltage & HF current	
1.12	All the control elements, switchgears, contactors, indicating elements, terminal blocks, and control and power wirings shall be accommodated in the new panel. Rating Main contactor should be suitably selected with respect to existing hydraulic power pack current rating. Power for hydraulic power pack should be fed from main contactor.	
1.13	Height of the control panel and operator panel should not be more than 900 mm. Vendor should study the existing location and suitably modify the base plate if required. Vendor should note that machine will move along with control panel and height will be major constrain in the location.	
1.14	The control panel should be of suitable size to accommodate all the above items and it should be suitable dimension to mount in the machine as existing in the machine.	

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1.15	There should not be any component /elements mounted on the base, doors and side covering sheets of the control panel.	
1.16	Fluorescent tube light fittings or CFL fittings shall be provided inside the panels for sufficient illumination during maintenance.	
1.17	A 230volt, 5 amps, 3 pin, flush type switched wall socket shall be provided in the panel.	
1.18	MCCB of suitable rating for incoming supply, MCBs for control circuits and MPCBs at incoming supply for protection of all the motors other than spindle and axes.	
1.19	Suitable rating of Control transformer for 24V power supply.	
1.20	Suitable capacity PANEL AC UNIT that shall be mounted on the side of the control panel for cooling the power supply module, drive module, PLC and associated components.	
1.21	Supply of new OPERATING PANEL (free standing type) for all controls of the machine with suitable capacity Panel AC cooling system.	
1.22	Supply of remote pendant for emergency, cycle start and reset comment.	
1.23	Supply of OIL LEVEL, FILTER CLOG INDICATOR AND TEMPERATURE SENSORS for the existing hydraulic power packs. Necessary alarm indications and interlocks to be provided. All hydraulic valves are to be interfaced with PLC (suitable numbers of I/Os are to be selected).	
1.24	Supply of NEW CABLES for all controls in place of old cables. Old cables for power, control, feedback and signal in the machine, as applicable for these motors, shall be replaced with new FRC (fire retardant) grade cables. PVC sheathed flexible metal hoses (Anagonda hose) of appropriate capacity and sizes are to be used.	
1.25	Supply of appropriate INTERFACE CABLES for power, control, feedback and signals as required for the controls. These cables are to be connected between operating panel and hand held remote control push button station.	
1.26	Supply of SOCKETS for hydraulic solenoid valves (rated for 24V DC). These sockets shall have indicating LEDs.	
1.27	Supply of DIGITAL ENERGY METER (three phase) at the incomer of the machine panel	
1.28	Supply of a PROGRAMMING HARDWARE (a standard laptop PC) of latest version for trouble shooting, up loading, down loading and editing the PLCsystem parameters, machine parameters, axis parameters. The PC shall have standard features such as PCMCIA, USB, Ethernet ports, DVD(R/W), licensed Windows (LATEST Professional OS), etc. Licensed OEM software for editing and programming ladder logic is to be supplied with necessary hardware interface cables, connectors and carrying case.	

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1.29	Existing Cable drag chain can be used for this machine.	
1.30	Supply and installation of Hydrogen and nitrogen gas valve with interfacing with PLC.	
2.0	General	
2.1	Supply of THREE sets of the following DOCUMENTS along with the system	
2.2	Commissioning and troubleshooting manuals including ladder diagram, parameter list and documents in English	
2.3	Interface wiring drawings, circuit diagrams for the new panels, bought out items including part number	
2.4	Detailed Electrical drawings, PCBs, PLC, Catalogues, Part dimension, Specification with part number of all electrical and mechanical items are to be submitted.	
2.5	Supply of TWO sets of MANUALS in the form of hard copy for Electrical circuit diagram, Heating unit, PLC for description, maintenance, parameter, operation and interface of PLC system and description, parameter, maintenance manuals are to be supplied.	
2.6	Supply of ONE set of SOFT COPY in CD(s) for all the above documents and software + backups.	
2.7	TRAINING for two persons on the maintenance of Heating Unit and programming aspects of PLC system are to be arranged.	
3.0	GENERAL FEATURES AND CONDITIONS	
3.1	Before submitting offer the vendor shall visit BHEL shop to study the existing working machine, its functions and the quantum of work required for retrofitting.	
3.2	The complete electrical shall be designed to suit 3 phase, 3 wire system (No neutral connection).	
3.3	The rating and type number of all the components selected shall be indicated in the offer and the technical leaflet showing the parameters and dimensional details shall be enclosed.	
3.4	All the existing INTERLOCK features to be retained	
3.5	PLC, I/O modules and Power supply units shall be M/s. Siemens/ Fanuc / Allen Bradley / Mitsubishi/Yaskawa make only.	
3.6	The control panel shall be of Rittal or Hoffman make or approved by bhel. Panel AC unit shall be of Rittal / Werner Finley	

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3.7	Control panel, Operator pedestal and Push button control station shall confirm to the IS / BS/ EN / Indian electricity Regulations from safety aspects. The panels shall be of indoor floor mounting type with IP 54 enclosure and made of 1.6mm/ 2mm sheet steel for the non-load bearing/ load bearing sheets with necessary MS angles/ sections includes the suitable size "EYE bolts for lifting. It shall undergo full degreasing, derusting, phosphating treatment process before painting with red oxide and two coats of Siemens / Apple green enamel paints outside and white enamel painting inside for better visibility.	
3.8	All control elements like contactor, relay, push buttons, MCCB, MCB, MPCB, Proximity switches and limit switches shall be M/s. Siemens / L&T / Telemecanique / Technik make only (with DIN rail mounting).	
3.9	All the control and power wires shall be M/s. Igus or Lapp makes only or BHEL approved make. Cable drag chain shall be of IGUS/Kablescheelp/Tsubaki only	
3.10	All the control and power wiring from control panel to field elements shall be protected with suitable sizes of PVC sheathed flexible metal hoses and ducts.	
3.11	The proposed electrical circuit diagram, component lay out, panel drawings with dimension, Bill of Materials, shall be submitted to BHEL officials for approval before starting manufacturing. Supplier shall submit these details for approval to BHEL engineers within 8 - 10 weeks from the date of PO/LOI.	
3.12	All the materials as per scope of supply shall be offered for Stage/Final inspection at supplier's works before dispatch. Recommended to call for pre-dispatch inspection on or before 18 weeks after PO/LOI placement.	
3.13	Before dismantling the existing wiring & drive, the vendor should check and record the performance of the m/c like i) operation of machine ii) output iii) Accuracy and Quality of job etc.	
3.14	The vendor shall give guarantee for trouble free operation for the period of one year after commissioning of the machine.	
3.15	The offer shall clearly indicate the list of material to be supplied under scope of supply and the list of activities to be carried out under scope of work with break up details	
3.16	Vendor is to submit the offer in TWO parts separately. Part-1: TECHNICAL BID having complete technical details, catalogues and point wise confirmation & deviations if any. Part-2: PRICE BID.	
4.0	<u>Scope of Work</u>	
4.1	Scope of work includes complete installation of supplied items machine with prove out.	
4.2	Integration of all the subsystems with the machine	

Sl. No.	Description	Vendor Response
4.3	Commissioning of the new control panels including programming of PLC suit the present job conditions	
4.4	Prove out of the machine performance - including verification of all functions of the machine, interlocks, testing the machine with no load and with full load. The machine performance is to be better than or at least the same as the previous performance level before retrofitting in all respects.	
4.5	Training for Maintenance staff at OEM works of 2 Engineers	
4.7	Training the operators and maintenance staff at BHEL works after commissioning for minimum three days	
4.8	Required cleaning materials like cotton waste, kerosene shall be issued by BHEL at free of cost.	
4.9	All the removed waste materials are to be moved to the respective bins as per instruction of Maintenance in-charge.	
4.10	Shop Compressed air Pressure shall be 4 - 4.5 bar at 1" line.	
4.11	Supplier shall indicate the any additional required components/systems which are required to make the system functional (if required) one.	
4.12	MAKE OF THE BOUGHT OUT ITEMS "Makes of all bought out items shall be as follows unless otherwise specified elsewhere 1. ALL COUPLINGS WITH GUARDS: SKF/FENNER/HYDAX 2. HYDRAULIC FITTINGS: PARKER/SWAGELOC/HYLOC" 3. CONTACTORS: SIEMENS/L&T/SCHENIEDER/TELEMECHANIC 4. PUSH BUTTONS AND SELECTOR SWITCHES: SIEMENS/TELEMECHANIC 5. TEMPERATURE GAUGE: WIKA/WARRE/REXROTH/EATON VICKERS 6. MOTOR: Siemens/ MISTIBUSHI/Yaskawa/Rexroth ANY OTHER MAKES RECOMMENDED BY THE SUPPLIER SHALL BE APPROVED BY BHEL ENGINEERS BEFORE MANUFACTURING.	
4.13	PACKING: Sea worthy & rigid packing for all items of complete machine and all accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in trailers, all small loose items shall be suitably packed in boxes.	
4.14	Delivery: Shall not exceed 20 weeks from date of Purchase order /LOI.	
4.15	GUARANTEE: 12 months from the date of acceptance of the machine at BHEL or 18 months from dispatch whichever is earlier.	