

**BHARAT HEAVY ELECTRICALS LIMITED**

**Heavy Power Equipment Plant, Ramachandrapuram,
Hyderabad - 502 032. INDIA.**

Phones : _____ FAX: _____

E-mail : _____

**Date : _____
Due Date : _____
Supplier Qtn. No.: _____
Date : _____**

**TENDER DOCUMENTS TO BE FILLED BY THE SUPPLIER FOR SUPPLY OF
TUBE TO TUBE SHEET FULL LENGTH DIRECT HYDRAULIC EXPANSION UNIT - Quantity: ONE No.**

Note : 1. Vendor must submit complete information against each and every clause no. : The offers meeting this clause will only be considered.

2. Inadequate/Incomplete, ambiguous or unsustainable information against any of the causes of the specification/requirements shall be treated as non-conformance and are liable for rejection without further correspondence or intimation to the vendor.

3. The offer and other documents shall be in english language only.

Address of The supplier	Email-Id:
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TELEPHONE NOS.:

FAX NOS.:	phone numbers:
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Clause	Description	Required	Vendor response
1.0	PURPOSE : Direct Hydraulically Tube Expansion machine to expand various sizes of tubes(Seamless & Welded) for feed water heaters in supercritical application.	Vendor to confirm	
	Job Detatils:		
	Tube and Tubesheet Details-1(for mockup test)		
1.1	Max. OD of tube to be expanded : 15.875 mm	Vendor to confirm	
1.2	Tube ID : 9.775 mm	Vendor to confirm	
1.3	Thickness of tube to be expanded-2nd set : 3.05 mm (Tolerance on tube thickness= -0,+20%)	Vendor to confirm	
1.4	Start point of expansion =12mm after start of tubesheet thk End point of expansion =12mm before end of tubesheet thk (length of expansion=tubesheet thk-24	Vendor to confirm	
1.5a	Tube wall reduction (1-3%)	Vendor to confirm	
1.6	Tube and Tubesheet Material (as per 1.6.a and 1.6.b)		
1.6.a	Tube : Stainless Steel (SA 213 TP 304N)	Vendor to Note & confrim	
1.6.b	Tubesheet :Carbon Steel	Vendor to Note & confrim	

1.7	Tubesheet thickness 630 mm , Tube hole size : Ø16.13±0.05mm	Vendor to confirm	
1.8a	No. of tubes to be expanded on mock-up =40(for tube ID 9.775 mm)	Vendor to confirm	
1.8b	Mandrels, O-rings and all the other consumables/parts required to complete the expansions mentioned against clause no. 1.8a for expansion length : 606 mm shall be part of this machine.	Vendor to confirm	
2.0	Technical Information		
2.1	Machine should be capable of performing full length expansion in ONE step.	Vendor to confirm	
2.2	Max length of expansion, smallest tube ID (i.e. maximum tube thickness) that can be handled by this machine shall be mentioned by the vendor for information. Tube OD is 15.875mm (fixed)	Vendor to specify	
2.3	Measuring device/instrument used for inspection of tube thinning (i.e. % tube wall reduction) and length of expansion mentioned against clause no: 1.8 b shall be supplied along with the machine.	Vendor to confirm	
2.4	Expansion is carried out from front face of tube sheet leaving 12mm from the face of tube sheet after tube-to-tube sheet welding. Mandrels shall be suitable for expansion after tube-to-tube sheet welding. Drawing attached as per Annexure-A.	Vendor to Note & confirm	
2.5	Pressure required and holding time required for tube expansions mentioned against clause nos 1.8a, to be mentioned	Vendor to Specify	
2.6	Vendor to share the calculation of pressure required and holding time required for tube expansion for a given tube thickness, expansion length, tube material, tubesheet material, tube-to-tube sheet weld joint for details other than mentioned in this specification.	Vendor to specify	
2.7	Life of a mandrel for a fixed tube OD and tube thickness in terms number of expansions.	Vendor to specify	
2.8	Life of O-rings for a fixed tube OD and tube thickness in terms of number of expansions.	Vendor to specify	
2.9	Life of flexible hose pipe connecting expansion gun and control unit.	Vendor to specify	
3.0	Machine features:		
3.1	<u>Expansion gun shall have the following minimum features:</u>		
3.1.1	START button to start expansion	Vendor to confirm	
3.1.2	Emergency STOP button	Vendor to confirm	

3.1.3	RESET button	Vendor to confirm	
3.1.4	LED light indication at start of expansion(LED light color-vendor choice)	Vendor to confirm Specify color	
3.1.5	LED light indication through out expansion(LED light color-vendor choice)	Vendor to confirm Specify color	
3.1.6	LED light indication after completion of expansion(LED light color-vendor choice)	Vendor to confirm Specify color	
3.1.7	LED Light indication of incomplete expansion(LED light color-vendor choice)	Vendor to confirm Specify color	
3.1.8	Colors of LED indications asked above shall be different	Vendor to confirm.	
3.1.9	Buzzer at start of expansion(optional)	Vendor to specify	
3.1.10	Buzzer after completion of expansion(optional)	Vendor to specify	
3.1.11	Buzzer in case of incomplete expansion(optional)	Vendor to specify	
3.1.12	Weight of the expansion gun with mandrel in SI units.	Vendor to specify	
3.1.13	Supply voltage to expansion gun	Vendor to specify	
3.1.14	Dimension of expansion gun in SI units.	Vendor to specify	
3.1.15	Provision to be provided for hanging of expansion gun during expansion	Vendor to confirm	
3.1.16	<u>Control Unit shall have the following minimum features:</u>		
3.1.17	Analog display of input Air pressure in bar (If hydraulic pump is driven by electric motor, analog display of input air pressure is not required)	Vendor to confirm	
3.1.18	Analog display of water pressure used for expansion for every tube in bar	Vendor to confirm	
3.1.19	Pressure regulating knob for water pressure	Vendor to confirm	
3.1.20	Pressure regulating knob for input air pressure(If hydraulic pump is driven by electric motor, regulating knob is not required.)	Vendor to confirm	
3.1.21	Alarm when water level falls below minium required quantity	Vendor to confirm	

3.1.22	<u>Digital Output screen shall have following minium features:</u>	Vendor to confirm	
3.1.23	Display of water pre-fill pressure for every tube in bar	Vendor to specify	
3.1.24	Display of water pressure used for expansion for every tube in bar	Vendor to confirm	
3.1.25	To indicate on display screen when water level falls below minimum required quantity with alarm	Vendor to confirm	
3.1.26	Indication of START of expansion	Vendor to confirm	
3.1.27	Indication of completion of expansion	Vendor to confirm	
3.1.28	Indication of incomplete expansion	Vendor to confirm	
3.1.29	Indication of EMERGENCY stop	Vendor to confirm	
3.1.30	Expansion data for minimum 4000 holes to be stored in the machine(optional). Expansion data should have following minimum data: 1) Hole number 2) Expansion pressure 3) Expansion Time	Vendor to specify.	
3.1.31	Provision of USB port to export the recorded data.	Vendor to specify	
3.1.32	Motors and Pumps used in the machine shall be only of reputed make .	Vendor to confirm and specify make	
3.1.33	Felxible hose pipe and power cable connecting expansion gun and control unit shall be 6 mts minimum.	Vendor to confirm & specify	
3.1.34	Input Power cable to control unit shall be 10 mts minimum	Vendor to confirm & specify	
3.1.35	Water reservoir capacity	Vendor to specify	
3.1.36	Quality of water to be used is demineralized	Vendor to confirm	
3.1.37	Oil reservor capacity.	Vendor to specify	
3.1.38	Hydraulic oil used shall be readily available in Indian market. Specify the make and its equivalent.	Vendor confirm & specify	

3.1.39	Mandatory spares for 1 year trouble free operation shall be identified by vendor and quoted separately in price bid mentioning item wise price. List of such spares quoted shall be specified in technical bid also.	Vendor to confirm	
3.1.40	Tools/tool kit required for changing of mandrels, O-rings, maintenance and operation of machine shall be part of this machine.	Vendor to confirm	
3.1.41	Hydro Pump maximum output water pressure shall be 50% more than required for expanding thickness mentioned against clause no: 1.4	Vendor to confirm	
3.1.42	Air pressure required for operation shall be indicated. (If hydraulic pump is driven by electric motor then air pressure is not required)	Vendor to specify	
3.1.43	No of stages of the pump, filtration system, details of flexible pipes exposed to operator, pump cooling and lubrication to rotary and reciprocating parts, details of seals used, mounting of pressure switches / transducers/ gauges, and valves.	Vendor to Specify	
3.1.44	If hard disk is present in the machine, then total ghost back to be provided.	Vendor to confirm	
3.1.45	Preventive maintenance plans to be submitted.	Vendor to confirm	
3.1.46	The machine should be in fully enclosed in steel frame chasis	Vendor to confirm	
3.1.47	Industrial wheels to be provided for portability and screw jacks assembly for stability of the machine.	Vendor to confirm	
3.1.48	Detailed catalogue of all the main components, tools(for assembly and disassembly), of the machine with exploded view to be furnished with the offer.	Vendor to confirm	
3.1.49	Dimensions of control unit in SI units.	Vendor to Specify	
3.1.50	Weight without oil and water in SI units.	Vendor to Specify	
3.1.51	Weight with oil and water in SI units	Vendor to Specify	
3.1.52	Make of bought out items with specifications to be submitted with technical bid.	Vendor to specify	
3.1.53	Any other data/information required for user/operator shall be provided.	Vendor to confirm.	
4.0	PREDISPATCH INSPECTION		
4.1	MACHINE ACCEPTANCE: During predispach inspection of the equipment by BHEL Engineers at Vendor's works, the Vendor shall demonstrate the following: a)Visual Inspection b)Dimensional Inspection c)Performance test.	Vendor to confirm	

4.2	Vendor shall carry out commissioning and job prove out of the equipment at BHEL works and shall demonstrate proper functioning of the equipment in all respects. Tube sheet thickness(carbon steel) 630mm minimum, Tube OD 15.875mm(SA213 TP304N), length of expansion 606mm and tube thickness 3.66 mm(3.05+0.61) for the prove-out. Vendor to fulfill the following conditions for successful job prove out: 1) Pneumatic test on a mock-up heat exchanger.(Mock-up heat exchanger is in BHEL Scope) 2) Tube wall reduction percentage shall be as confirmed by the supplier. 3) Length of expansions mentioned in BHEL drawing to be achieved.	Vendor to confirm	
4.3	Packing of the equipment and loose items shall comply with international standards. Packing list shall be affixed to each package and a copy shall be kept inside the package.	Vendor to confirm	
5.0	AMBIENT CONDITION & THERMAL STABILITY		
5.1	Total machine should work trouble free and efficiently under following operating conditions. Input power supply. Voltage : 415 V +/- 10 %, 3 Phase; Frequency : 50 Hz +/- 5 % ; Ambient Conditions: Temperature = 10 to 45 degree celsius, Relative Humidity = 95 % max.	Vendor to confirm	
6.0	ELECTRICAL :		
6.1	All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
6.2	Vendor should ensure proper earthing for the machine and its peripherals	Vendor to confirm	
6.3	Protection and insulation class	Vendor to specify	
7.0	Delivery period in months :	Vendor to Specify	
8.0	SAFETY: The equipment should have adequate safety devices to avoid damage to the equipment, work piece and the operator due to the malfunctioning or mistakes. Also safety manual to be submitted.	Vendor to specify and furnish details	
9.0	DOCUMENTATION:- Five sets (hard copies) of Operation and Maintenance(O&M) manual along with complete set of circuit diagrams / line diagrams to be submitted. Soft copies of O&M manuals along with all the required software installation files in a pen drive should be furnished.	Vendor to confirm	

10.0	COMMISSIONING:- The supplier shall commission the machine at BHEL works .	Vendor to confirm	
10.1	Consumables like hydraulic oil, DM water and any other consumables required to run the machine for commissioning is in vendor scope.	Vendor to confirm	
10.2	JOB PROVE OUT AT BHEL WORKS : Vendor shall prove the performance of the machine at BHEL works on mockup heat exchanger.	Vendor to confirm	
10.3	TRAINING OF BHEL OPERATORS : Vendor shall train four BHEL operators on the proveout job.	Vendor to confirm	
10.4	Training for trouble shooting maintenance (mechanical,electrical and electronics) for two days to be given to BHEL M&S at the time of commissioning and Job proveout.	Vendor to confirm	
10.5	GUARANTEE:- 24 months from the date of commissioning and necessary certificates shall be provided.	Vendor to confirm	
11.0	REFERENCE LIST/QUALIFYING CONDITIONS:		
11.1	Refer Annexure - X for prequalification criteria (part -A)	Vendor to Note	