

		BHARAT HEAVY ELECTRICAL LIMITED, PIPLANI, BHOPAL, INDIA		Rev.	00
				Date	02.10.2023
NOTE:-					
1. Vendor must submit complete information against clause Sl. No: 45.0 (Qualifying Condition).The offer meeting this clause would only be processed.					
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.					
3. The offer and all documents enclosed with offer should be in English language only.					
4. All dimensions are in mm unless otherwise stated.					
ADDRESS OF THE SUPPLIER :				ADDRESS OF THE INDIAN AGENTS :	
TELEPHONE NOS.:				TELEPHONE NOS.:	
E-MAIL ADDRESS :				E-MAIL ADDRESS :	
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF TWO -SPINDLE CNC DEEP HOLE DRILLING MACHINE					
SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT			REQUIRED	REMARKS
1	PURPOSE:				
1.1	CNC Deep Hole Drilling machine with Two independent spindles suitable to drill tube sheet of diameter upto 3000mm max, for drilling depths upto 1000mm using BTA drilling system. It shall have easy loading & unloading of the job.			Vendor to confirm	
2	REQUIREMENT:				
2.1	CNC Deep Hole column type drilling machine is required for drilling tube plates for Heat Exchangers.			Vendor to confirm	
2.2	Work piece material: Carbon steel, Alloy steel, Stainless steel, Dual metal (cladding of SS on Carbon steel) etc., Hardness of Material upto 500 BHN Max.			Vendor to confirm	
2.3	Machine shall have Two independent spindles suitable for variable centre distance (pitch) between the two spindles. The drilling carriage shall have BTA drill system configuration.			Vendor to confirm	
2.4	Bed: Machine Bed shall be of cast iron and stress relieved with optimum stiffness, thermal stability to ensure the required accuracy. The bed should be protected by rust proof metallic telescopic cover with heavy duty wipers to prevent ingress of chips and coolant.			Vendor to confirm	
2.5	Column: Column shall be of cast iron or one piece welded steel construction, thermally stress relieved before machining. It shall slide on hydrostatic hardened and ground guide ways of the bed by means of either recirculating ball screw with preloaded double nut or preloaded rack & double pinion gear box with backlash compensation system.			Vendor to confirm	
2.6	Headstock: The headstock (Vertical slide) shall be of cast iron and shall slide on two vertical hardened and ground guideways of the column by means of recirculating ball screw with preloaded double nut. The vertical slide guideways shall be protected by rust proof metallic telescopic cover with heavy duty wipers to prevent ingress of chips and coolant.			Vendor to confirm	

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2.7	Two Drilling Spindle Carriages: Independent Two drilling spindle carriage shall be cast iron constructed or steel fabricated and thermally stablized. The carriage will slide on hardened and ground horizontal ways of the headstock by means of recirculating ball screw with preloaded double nut.	Vendor to confirm	
2.8	Headstock (Two drilling spindle carriage) balancing system: Headstock balancing system shall consist of either a hydraulic counterbalance or dead weight system for balancing of the headstock and ensure positioning accuracy.	Vendor to Confirm and submit the details .	
	BASIC MACHINE : (Minimum Requirements)		
3	AXIS STROKE		
3.1	Longitudinal Travel of column (X Axis): 5000 mm	Vendor to confirm	
3.2	Vertical travel of head (Y axis): 3000 mm	Vendor to confirm	
3.3	Horizontal travel of Spindles (Z1 & Z2 axis): 1000 mm	Vendor to confirm	
3.4	Axis resolution for all axis: 0.001 mm	Vendor to confirm	
4	BTA (STS) DRILLING UNIT		
4.1	No of independent drilling spindles: Two Nos.	Vendor to confirm	
4.2	Spindle orientation: Horizontal	Vendor to confirm	
4.3	Total spindle drive motors: Two nos.	Vendor to confirm	
4.4	Total feed motors (for Z1& Z2 axes): Two nos.	Vendor to confirm	
4.5	Power of each spindle drive motor: ≥ 22KW	Vendor to confirm	
4.6	Torque of each spindle drive motor	Vendor to specify	
4.7	Spindle thrust (Cutting force) each spindle : ≥ 6KN	Vendor to confirm	
4.8	Spindle nose Taper :	Vendor to specify	
4.9	Spindle RPM (Infinitely variable): Min 100 to 3500 or better range	Vendor to confirm	
4.10	BTA hole drilling range diameter: 12.0 to 40 mm or better	Vendor to confirm	
4.11	Deep hole effective drilling depth(Z1& Z2 axis): ≥ 1000 mm	Vendor to confirm	
4.12	Pitch between spindles should be adjustable type in the range of Min. 200 to 300 mm or better range	Vendor to confirm and specify	
4.13	Min. and Max. distance between spindles	Vendor to specify	
4.14	Motorised/ Programmable hole pitch adjustment (Infinitely variable)	Vendor to confirm	
4.15	Pump delivery pressure (for each spindle): ≥ 75 Bars	Vendor to confirm	
4.16	Pump delivery flow (for each spindle): ≥ 150 L/min	Vendor to confirm	
4.17	Machine Z1& Z2 axis drilling spindle shall also be suitable to successfully drill corner (Last hole/ Outer tube hole) having Tube sheet collar projection). Pl refer Annexure A. (Imp Note: Drilling shall be done from Channel side)	Bidder to note & confirm,	

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5	AXIS FEED RATES		
5.1	Feed rate of X-axis (Infinitely variable): ≥ 5000 mm/min	Vendor to confirm	
5.2	Feed rate of Y-axis (Infinitely variable): ≥ 5000 mm/min	Vendor to confirm	
5.3	Feed rate of Z1& Z2 -axes (Infinitely variable): ≥ 3000 mm/min	Vendor to confirm	
6	AXIS RAPID TRAVERSE		
6.1	Rapid traverse of X-axis: ≥ 10000 mm/min	Vendor to confirm	
6.2	Rapid traverse of Y Axis: ≥ 10000 mm/min	Vendor to confirm	
6.3	Rapid traverse of Z1& Z2 Axis: ≥ 6000 mm/min	Vendor to confirm	
7	SPINDLE MOTOR, DRIVE & FEEDBACK SYSTEM		
7.1	Spindle Motor & Drive Make: FANUC αi or SIEMENS 1PH series spindle motors with matching spindle drives	Vendor to confirm	
7.2	Spindle Encoder: FANUC/SIEMENS/HEIDENHAIN rotary encoders for actual spindle rpm	Vendor to confirm	
8	FEED MOTOR, DRIVE & FEEDBACK SYSTEM FOR X, Y, Z1& Z2		
8.1	Feed motors & drives: FANUC αi or SIEMENS 1FT/1FK series AC servo motors with matching AC servo drives.	Vendor to confirm	
8.2	Feed back system for X & Y axes: Heidenhain/Fagor/Renishaw sealed linear scales (Details to be submitted by the vendor)	Vendor to confirm	
8.3	Feed back system for Z1&Z2 axes: Fanuc/Siemens/Heidenhain Rotary Encoders (Details to be submitted by the vendor)	Vendor to confirm	
8.4	Mechanism for locking X, Z1& Z2 axis : Servo lock	Vendor to confirm	
8.5	Mechanism for locking Y axis : Servo lock + Motor Brake	Vendor to confirm	
9	DRILLING ACCURACY		
9.1	Hole True position (Positional accuracy of Hole): Max. 0.05 mm Radially	Vendor to confirm	
9.2	Error between the spindle (Pitch accuracy between the holes):Max ±0.05	Vendor to confirm	
9.3	Roundness of drilled holes: max. ±0.02mm	Vendor to confirm	
9.4	Hole diameter quality: IT7-IT9	Vendor to confirm	
9.5	Drill surface finish with BTA (STS) drill system: Ra 3.0 μm or better	Vendor to confirm	
9.6	Hole deviation(Drill drift diametrically) measured from starting drill face: a) Max 0.08 mm/100 mm depth. b) Max 0.15 mm/500 mm depth. c) Max 0. 30 mm/1000 mm depth.	Vendor to confirm	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
10	Work Table Cast Iron (Bed Plate / Floor Plate) (Indigenous make is also acceptable)		
10.1	Dimensions: Length=5000mm, Width=3000mm	Vendor to confirm	
10.2	Capacity of Floor plate: 50 Tons/sqm or more	Vendor to confirm	
10.3	Cast iron construction with Size of T-slot (Parallel to X axis): 28 H 8 according to DIN 650 H12	Vendor to confirm	
11	JOB HOLDING FIXTURES: (Indigenous make is also acceptable)		
11.1	Two Nos Square Angle Plates: suitable for holding job of size 3m X 3m X 1m and weight up to 20 Tons, are to be supplied with the machine. It should have 28 H8 T-slots according to DIN 650 H12 or equivalent. Sufficient quantity of job holding studs, T nuts shall be supplied with the angle plates for holding the job .	Vendor to confirm	
11.2	'V' Shape work piece support: 1No. Capacity: Min 25 Ton. Universal size to hold jobs of dia 800 to 3000mm. Imp Note:(Under BHEL scope , however Vendor shall submit the detail drg after placement of order for in house manufacture of "V" Block	Vendor to confirm & Note	
12	COOLANT SYSTEM		
12.1	Oil tank capacity : \geq 7000 Litres	Vendor to confirm	
12.2	Degree of filtration: 20 microns or less	Vendor to confirm	
12.3	Filtering capacity: \geq 700 LPM	Vendor to confirm	
12.4	Discharge shall be infinitely variable & controlled at operator panel	Vendor to confirm	
12.5	Tanks shall have Min & Max oil level indication	Vendor to confirm	
12.6	Coolant specification (Preferably Indian equivalent shall also be specified)	Vendor to specify	
12.7	Inter locks shall be provided to protect over flow of the coolant oil from tanks	Vendor to confirm	
12.8	In case of filter failure over flow connection back to the tank shall be provided	Vendor to confirm	
12.9	In case of variable speed of coolant system through VFD , then the coolant motors should be with matching drives of the same make and adequate capacity.	Vendor to confirm	
12.10	Coolant system should be switchable through program as well as manually by push buttons provided on the Operator's control panel.	Vendor to confirm	
12.11	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.	Vendor to submit	
12.12	Magnetic filter shall be provided to arrest the chips to the mudtank	Vendor to confirm	
12.13	Coolant collection and recirculation system should be leak proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc. In no case the coolant oil mix up with hydraulic/Lubrication oil.	Vendor to confirm	
12.14	Provision of separate pump for drainage of dirty coolant from coolant tank.	Vendor to confirm	

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13	CHIP CONVEYOR:		
13.1	A suitable chip conveyor system with the machine for chip removal up to the chip bin during operation as well as after drilling of workpiece shall be provided. The chip bin is to be located on the floor at the side of one end of the machine. Two chip bins with wheels and handle for movement, should also be supplied.	Vendor to confirm	
13.2	Type of chip conveyor	Vendor to specify	
13.3	Length of the chip conveyor	Vendor to specify	
13.4	Width of the chip conveyor	Vendor to specify	
13.5	Speed of conveyor	Vendor to specify	
13.6	Elevation of chip conveyor for chip bin	Vendor to specify	
13.7	Material of chip conveyor to be rust resistant	Vendor to confirm	
13.8	Provision for smooth flow of chips to the conveyor.	Vendor to confirm	
13.9	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to confirm	
14	LUBRICATION SYSTEM		
14.1	Automatic lubrication system for all axes slides, ball screw nuts, linear way bearings , etc. Oil level and pressure sensors of the lubrication system should be suitably interlocked for alarms/messages.	Vendor to confirm	
14.2	Grade of Lubricating oil and its Indian equivalent.	Vendor to specify	
15	HYDRAULIC SYSTEM:		
15.1	Hydraulic system should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to confirm	
15.2	All Hydraulic pump , controls ,hydraulic components shall be of reputed make only.Latest version of pump ,valves accessories to be supplied.	Vendor to confirm	
15.3	Power pack should be energy efficient (Hi-low system, proper unloading during idling etc).Suitable standby pump unit, filter etc, shall be provided for critical area.	Vendor to confirm	
15.4	Technical specification and make of all the hydraulic component like pump, valve, hydraulic cylinder, pressure switches, flow switches, pressure relief valve ,hose pipe etc to be specified.	Vendor to specify	
15.5	Filtration System.	Vendor to specify	
15.6	Failure indication	Vendor to specify	
15.7	Air cooling/ Refrigerated type cooling system of sufficient capacity to maintain cooling of Hydraulic oil at machine required temperature.	Vendor to confirm	
15.8	Each pump should have an independent motor.	Vendor to confirm	
15.9	Standby pump & filter unit with quick change over arrangement shall be provided.	Vendor to confirm	

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16	OPERATOR'S PLATFORM:		
16.1	Closed Independent Operator Room with Glass sliding window with perimeter safety railing shall be provided. Adequate protection from coolant and chips should be ensured during actual machining operation.	Vendor to note & confirm	
16.2	Independent operator Room shall move along X- axis and will be fixed to the column carriage. The vertical movement of Operator room shall be Min. 2 meter & will be independent from machine movement	Vendor to note & confirm	
17	OPERATOR'S PANEL:		
17.1	Swivelling type air conditioned operator's pendant of Rittal/Schneider make (preferable) or equivalent internationally reputed make with complete CNC operator panel (OP) and machine control panel (MCP) of required configuration shall be provided on the operator's side for safe, convenient and efficient operation. All switches should be within reach of operator of average height (170 cms) for easy operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details should be submitted.	Vendor to confirm & submit Photographs & Layout.	
18	CNC SYSTEM AND FEATURES		
18.1	Make: FANUC / SIEMENS	Vendor to confirm & specify	
18.2	Details of the standard features.	Vendor to specify	
18.3	The system should have full alphanumeric keyboard, TFT colour display (10.4" or larger), Machine Control Panel (MCP), RS232C serial interface, USB port for data input/output, network ready, graphic simulation and on-screen PLC Ladder display. All PLC input/output modules should be of FANUC/SIEMENS make. (Latest hardware & software versions, as available at the time of delivery, should be supplied).	Vendor to confirm	
18.4	Details of other CNC features:		
18.4.1	Axes Interpolation: Linear, circular	Vendor to confirm	
18.4.2	Max Number of simultaneous interpolation: 2	Vendor to confirm	
18.4.3	Part Program Storage: 2 MB or more	Vendor to confirm	
18.4.4	Technology Cycles: Drilling cycles.	Vendor to confirm	
18.4.5	Graphics simulation of Part Programs	Vendor to confirm	
18.4.6	Co-ordinate Transformation: Datum shift, rotation, mirror image, scaling factor.	Vendor to confirm	
18.4.7	Pitch Error compensation	Vendor to confirm	
18.4.8	Backlash error compensation	Vendor to confirm	
18.4.9	Zero Offset for all axes	Vendor to confirm	
18.4.10	Feed override switch 0-120% for all axis	Vendor to confirm	
18.4.11	Spindle speed override switch 50-120%	Vendor to confirm	
18.5	Provision for automatic safe shut down of CNC control in case of power failure (Only in case of PC Based System)	Vendor to confirm	
18.6	In case of PC based CNC systems, UPS of 15 minutes backup for CNC system with inbuilt cooling and charge status display is to be supplied	Vendor to confirm	

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18.7	During the drilling, display of spindle speed, feed rate, and current of the spindle and feed motors are displayed on the panel.	Vendor to confirm	
18.8	The machine should be OPCUA/FOCAS compliance with necessary license if required.	Vendor to confirm	
18.9	Complete manual control of machine with required control elements that include spindle override switch for spindle speed variation, feed override switch for feed variation, potentiometer for coolant regulation, Mode selector switch, Axes selector switch, Jog keys for axes and spindles, Push button for chip conveyor on and off, Emergency stop switch, Push button with lamp for coolant on and off. Diagram/ Sketches for switches/ keys provided on operators pendant to be submitted.	Vendor to confirm	
18.10	Hand Held unit, alongwith sufficient length of interfacing cable is to be offered for handwheel (MPG) operation of individual axis in jog & increment mode and provision for spindle inch in c.w & c.c.w directions	Vendor to confirm	
	DIAGNOSTIC SYSTEM:		
19	FAULT DIAGNOSTIC SYSTEM:		
19.1	All alarms and messages should be displayed on the CNC monitor with device ID numbers .	Vendor to confirm	
19.2	Softcopy and hardcopy of all alarms and messages with cause and remedial measures must be supplied.	Vendor to confirm	
20	AMBIENT CONDITIONS & THERMAL STABILITY :		
20.1	Total machine should work trouble free and efficiently under following operating conditions. Power Supply: Voltage: 415 V +10% / -15% Frequency: 50Hz \pm 3% No. of phases = 3 Ambient Conditions: Temperature = 4 to +46 degrees Celsius Relative Humidity = 95% max.	Vendor to note & confirm	
20.2	Weather conditions are tropical, atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition. Max. diurnal temperature variation is up to 25 deg Celsius in 24 hours. Vendor to ensure that the machine is suitable for above mentioned temperature variations, specified ambient conditions, accuracy requirement of BHEL components and trouble free operation of the machine.	Vendor to note & confirm	
20.3	The machine, including attachments and accessories etc., should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week .	Vendor to note & confirm	

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21	AIR CONDITIONERS / REFRIGERATION UNITS		
21.1	<p>Door mounted Air Conditioners with Dehumidifiers of make Advance/Werner Finley/Rittal/Bluestar/Voltas or other international reputed make having spares and service support in India, for all Electrical/ Electronic Panels/ Cabinets including Operator's Panel (One no.of sufficient capacity for each cabinet/ panel considering continuous operation at ambient temperature of 45 degree C).</p> <p>Following are to be confirmed & Details to be given by the vendor:</p> <p>a) Make & rating along with detailed tech. catlaog</p> <p>b) Panel AC must have Condensation free feature.</p> <p>c) The blow of cool air from the air conditioners shall not fall directly on the electrical & electronic circuits/ modules. ACs must be incorporated with electrical/ refrigeration interlocks.</p> <p>d) Panel AC should be progammble and there should be Provision of Interlock with Machine PLC controls</p> <p>e) Energy-efficient HFC-based Hermetically-sealed Compressors</p> <p>f) OEM of the Supplied panel ACs must have established Company Service Centre and should ensure spares availability in India. Contact details for the same are to be provided. The Vendor has to ensure maintenance of the AC units in working condition through-out its guarantee period. They have to respond within 48 hours of complaint. Vendor to submit details.</p>	Vendor to confirm	
21.2	<p>AC unit mounted on the movable pendent must be well-supported universal-head bolt. Two sets of cut-out labels are mandatory to be supplied with the units. The electrical connection of the AC unit must be with male-female connector, easily disconnected from the AC unit side. There has to be a MCCB to isolate the AC unit from the electrical panel.</p>	Vendor to confirm	
21.3	<p>Oil chiller system shall be supplied to generally maintain temperature (IN M/C TANK) at 20°-25° C & used for following systems</p> <p>(A) Spindle cooling system</p> <p>(B) Hydrostatic System</p> <p>(C) Lubrication Sytem (If applicable)</p> <p>(D) Various hydraulic clamps and actuators</p> <p>(E) Other appropriate places suitable for the machine</p> <p>Oil chillers should be supplied considering continuous operation and ambient temperature of 45 degree C.</p>	Vendor to confirm	
21.4	<p>For the offered Oil Chiller system Following are to be confirmed & Details to be given by the vendor:</p> <p>a) Make & rating along with detailed tech. catalogue</p> <p>b) Oil chiller system should have minimum 50% standby with multiple refrigeration circuits having Energy-efficient HFC-based Hermetically-sealed Compressors with independent refrigeration circuits having SS-brazed Plate-type Heat Exchanger, Air-cooled Condenser, Thermostatic Expansion Valve, HP/ LP Switch, Oil Flow/ Anti Freeze Cut-out, etc.</p> <p>c) The units must have In-line Multistage Pumps (with 100% standby), Valves, NRVs, Filters, Automatic Microprocessor-based Controller with LCD Display, Safety Interlocks, etc. in one complete package. The unit must operate continuously with equal-run-time of Compressors.</p> <p>d) Oil chiller system shall have features like independant HP & LP Cut outs, Oil sight glass, EXP Valve, Filter Drier, Shut off valve , Charging Port, Antifreeze Thermostat, Solenoid valve, Required guages, ETC.</p> <p>e) Oil chillers should be progammble and there should Provision of Interlock with Machine PLC controls</p> <p>f) OEM of the Supplied panel ACs must have established Company Service Centre and should ensure spares availability in India. Details for the same is to be provided. The Vendor has to ensure maintenance of the AC units in working condition through-out its guarantee period. They have to respond within 48 hours of complaint. Vendor to submit details</p>	Vendor to confirm	

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21.5	Vendor to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine: - Type of Air Conditioning/ Chiller Unit. - Capacity of the Unit. - Type of Compressor with complete specifications. - Type of Thermostatic Expansion Valve with complete specifications. - Fan size and flow in CFM (cubic feet meter) of the Condenser unit. - Specifications of the Evaporator Unit.	Vendor to submit	
21.6	O&M manual of the Panel A.C. / Chiller system including electrical circuit diagrams, item parts list are to be provided. Vendor has to give training to operate, maintain & repair of Chiller/ AC Unit .	Vendor to confirm	
22	ELECTRICAL SYSTEM :		
22.1	415V +/- 10%, 50HZ +/- 3 %, 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. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details should be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm & specify	
22.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm	
22.3	Electrical cabinets should be of Rittal/Schneider/ABB/Siemens make or any other equivalent from reputed international make, properly air conditioned and sealed from ingress of liquids and encroachment of rodents	Vendor to confirm	
22.4	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
22.5	Motors shall conform to IEC or Indian Standards	Vendor to confirm	
22.6	All cables outside the electrical cabinets and operator pendant must be routed through flexible conduits capable of withstanding stress, chip hazard and ingress of oil/coolant. Additionally, all cables moving with traversing axes should be of trailing type and installed in caterpillar / cable drag chain.	Vendor to confirm	
22.7	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
22.8	The drives for the motors, their setting and control systems, all protection and error diagnostic shall be placed in electric cabinet.	Vendor to confirm	
22.9	All the electrical component shall be preferably of internationally reputed make . The electric system shall be in accordance with IEC or equivalent standard.	Vendor to confirm	
22.10	The electric cabinets have air conditioner with protection class IP54	Vendor to confirm	
22.11	In-cycle hour counter with reset facility.	Vendor to offer	
23	MACHINE LIGHTS:		
23.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to offer & specify details	

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23.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer & specify details	
23.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to confirm	
23.4	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm	
24	ULTRA ISOLATION TRANSFORMER		
24.1	Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be offered with complete details.	Vendor to confirm	
24.2	Make:	Vendor to specify	
24.3	Model and Rating:	Vendor to specify	
24.4	Catalogue of the Isolation Transformer shall be submitted with the offer.	Vendor to submit	
24.5	The supplied transformer should have spares and service support in India.	Vendor to confirm	
25	SAFETY ARRANGEMENTS:		
25.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm and messages (with device identification) on CNC display and panels should be available.	Vendor to confirm	
25.2	A detailed list of all alarms / indications provided on machine along with cause and remedy should be submitted by the supplier.	Vendor to submit	
25.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hinderance to machine operator's movement for effective use of machine.	Vendor to confirm	
25.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to confirm	
25.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to provide	
25.6	Oil & water pipe lines should not run with electrical cable in the same trench.	Vendor to confirm	
26	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :		
26.1	Maximum noise level shall be 75 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm	
26.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm	
26.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm	

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26.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm	
26.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm	
26.6	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm	
26.7	Suitable arrangement for recovery of oil mist as per ISO 14001 and OHSAS 18001	Vendor to confirm	
27	LEVELING & ANCHORING SYSTEM		
27.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to confirm	
28	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :		
28.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm	
29	SPARES (Optional : To be quoted seperately)		
29.1	Itemised breakup with unit prices of all mechanical, hydraulic, electrical and electronic components are to be offered. The spares will be ordered as per requirement. Note: The price of the spares will not be considered for the evaluation of the machine cost (L1 criteria).	Vendor to submit	
29.2	All types of spares for total machine and accessories should 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 in advance and provide drawings of parts/details of spares & suppliers to enable BHEL to procure them in advance, if required	Vendor to confirm	
29.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification/type/model etc shall be furnished along with documentation to be supplied with the machine.	Vendor to confirm	
30	DOCUMENTATION : Three sets of Hard Copies (Print form) and three sets of soft copies (on CD/DVD) of the following documents in English language should be supplied along with the machine	Vendor to offer	
30.1	Operating manuals of Machine & CNC system	Vendor to offer	
30.2	Programming manuals of machine & CNC system	Vendor to offer	
30.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly / Sub Assembly Drawings shall be supplied with part list also.	Vendor to offer	
30.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives and position feedback system.	Vendor to offer	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
30.5	Operating Manuals, Maintenance Manuals & Catalogues for all the bought out items that include Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.	Vendor to offer	
30.6	Electrical Schematics of the machine with comments in English.	Vendor to offer	
30.7	PLC program with symbols & comments in English.	Vendor to offer	
30.8	Soft copy of complete machine data and PLC project with symbols and comments in English	Vendor to offer	
30.9	Complete software back-up (Ghost) of hard disk (only in case of PC based CNC system) on DVD	Vendor to offer	
30.10	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer	
30.11	Complete list of parts/items used in the machine in English language.	Vendor to offer	
31	ERECTION & COMMISSIONING		
31.1	Commissioning : Complete Erection & Commissioning of machine and demonstration of all its features, control system & accessories at BHEL works is the sole responsibility of Vendor.	Vendor to confirm	
31.2	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other items supplied by them. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm	
31.3	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to confirm	
31.4	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause 34.0 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to confirm	
31.5	Tools, Tackles, Test mendrals, instruments and other necessary equipment required to carry out all above activities should be brought by the supplier.	Vendor to note	
31.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
32	ACCURACY TESTS / GEOMETRICAL ACCURACIES :		
32.1	Geometrical Accuracy Tests shall be in accordance with ISO 3070 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be submitted with the offer.	Vendor to confirm	
32.2	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor to confirm	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
33	MACHINE POSITIONING & REPEATABILITY ACCURACIES : SHOULD BE MEASURED AS PER VDI/DGQ 3441 /ISO 230-2 (LATEST REVISION) USING LASER INTERFEROMETER.		
33.1	Positional deviation (Pa) in X / Y axis per 1000 mm: 0.015mm	Vendor to confirm & Specify	
33.2	Positional deviation (Pa) in (Z1 & Z2) axis per 1000 mm: 0.015mm	Vendor to confirm & Specify	
33.3	Positional Scatter (Ps) in X / Y axis: 0.015mm	Vendor to confirm & Specify	
33.4	Positional Scatter (Ps) in (Z1 & Z2) axis: 0.015mm	Vendor to confirm & Specify	
33.5	Backlash on Reversal error (U) in X / Y Axis: 0.010mm	Vendor to confirm & Specify	
33.6	Backlash Reversal error (U) in (Z1 & Z2) Axis: 0.010mm	Vendor to confirm & Specify	
33.7	Positioning uncertainty (P) for entire traverse of X Axis : 0.030mm	Vendor to confirm & Specify	
33.8	Positioning uncertainty (P) for entire traverse of Y, Z1 & Z2 Axis: 0.020mm	Vendor to confirm & Specify	
33.9	All the above to be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works. Imp: All above accuries shall be demonstrated in normal shop floor condtion as per clause No. 20.1 & 20.2 At supplier work as per their shop floor condition	Vendor to confirm	
33.10	LC of scale should be taken to achieve above	Vendor to note	
34	MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)	Vendor to confirm	
34.1	Tests/Activities should be carried out at supplier's works on the machine before dispatch : (Pre-dispatch Inspection)	Vendor to confirm	
34.2	Geometrical accuracies as per clause no. 32.1	Vendor to confirm	
34.3	Machine positioning & repeatability accuracies as per Clause No. 33	Vendor to confirm	
34.4	The machine should be tested for continuous running of 12 hrs. If any break down occurs during this test, the test should be repeated for 12 hrs from that time.	Vendor to confirm	
34.5	Drilling of test piece at Vendor works. Hole Size : 40 mm (as specified clause No. 4.10) Material : Austenitic Stainless steel Thickness : Min 500 mm Drill : BTA/STS Nos of holes to be made during PDI : Min 15 holes (with utilization & combination of all Two spindles) Note: 1. BHEL prefer to perform the demonstration as much as higher thickness. 2. Drilling pattern shall be Triangular pitching .	Vendor to confirm	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
34.6	Following shall be recorded: 1. Drilling accuracy of test piece mentioned in clause No. 34.5 should be checked as per clause No.9 (except for point No. c of clause No. 9.6) Drill drift(Back side) & positional accuracy of holes(Front face) shall be checked and measured by optical instrument during PDI. Imp Note: Optical instrument & its Target holder for drill drift measurement at back side,Tooling ,measuring instrument (Three point micrometer, Surface finish tester), comparator ,Test piece etc.will be under vendor's scope .	Vendor to note & confirm	
35	Tests/Activities should be carried out at BHEL works while commissioning the machine :	Vendor to confirm	
35.1	Geometrical accuracies as per clause no. 32.1	Vendor to confirm	
35.2	Machine positioning & repeatability accuracies as per Clause No. 33	Vendor to confirm	
35.3	The machine should be tested for continuous running of 12 hrs. If any break down occurs during this test, the test should be repeated for 12 hrs from that time.	Vendor to confirm	
35.4	Full load test to demonstrate the maximum power & cutting capacity of the machine.(Max. drilling size 40 mm in BTA as specified in clause No. 34.5)	Vendor to confirm	
35.5	Drift measurement by optical instrument, and drilling accuracy as per clause No. 9 (except for point No. c of clause No. 9.6) Imp Note: 1. Optical instrument , Measuring instrument will be under BHEL Scope. 2. Tooling under vendor scope. 3. Material / Test piece will be under BHEL Scope. 4. BHEL will share the detail of of optical instrument available with them (After placement of order).	Vendor to confirm & note	
35.6	Job material description :For drilling demonstration BHEL will inform to vendor in advance about Test block material details , drilling size etc. will be use during erection and commissioining of machine.	Vendor to confirm	
35.7	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to confirm	
35.8	Proveout drilling of BHEL component as per Clause No: 37	Vendor to confirm	
35.9	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm	
36	PRE-DESPATCH INSPECTION:	Vendor to note	
36.1	Pre-despatch inspection at vendor's works by BHEL personnel	Vendor to note	
36.2	Pre-despatch inspection will be carried out as mentioned at clause 34	Vendor to note	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
37	PROVEOUT OF BHEL COMPONENTS :	Vendor to note	
37.1	<p>Tentative Drawing is attached for ready reference & will be likely proveout component. For prove out of the component, vendor shall submit final job setting plan, drilling process plan, tools layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Job setting plan, drilling process plan & requirement of Tools etc. for drilling of proveout components shall be discussed and mutually agreed with BHEL (Final proveout component drawing, Hole size, Nos of holes, pitch etc. may change. However, the drilling features of the changed components shall be in line with the original component drawing).</p> <p>Imp Note: 1. Toolings for drilling will be under vendor's scope. 2. Since drawing is tentative, any changes in the prove out component will be informed to vendor saperately in advance. 3. Job Workpiece will be under BHEL scope. 4. All measuring instrument, Optical instrument etc. under BHEL scope. PI refer attached annexure for more details. i) Annexure A ii) Annexure B</p>	Vendor to offer & confirm	
37.2	Vendor shall be fully responsible for drilling of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.	Vendor to confirm	
37.3	Vendor shall be responsible, financially or otherwise, for any deviation/ rejection in proveout component to the extent of cost of Casting/Forging, due to wrong drilling or malfunctioning of the machine during proveout drilling and also for the delay in drilling due to improper recommended tooling etc..The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.	Vendor to confirm	
38	TRAINING		
38.1	<p>Training should be arranged at vendor's works for each of the areas mentioned below:</p> <p>(a) CNC Part Programming / application of all CNC Features / Cycles for the machine & other supplied accessories- 1person. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments - 1person (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments - 1person (d) Operation of the machine & other supplied accessories / equipments - 1person Imp : Vendor to specify minimum training days.</p>	Vendor to confirm & Specify	
38.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm	
38.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm	
38.4	Vendor should commit to organize and quote for training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL.	Vendor to confirm	
38.5	Demonstration of all features of the machine, CNC system & all accessories to the satisfaction of BHEL for their efficient and effective use.	Vendor to confirm	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
38.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm	
38.7	Minimum one week of independent operation of machine under manufacturer's supervision after job proveout at BHEL works.	Vendor to confirm	
38.8	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts/engineers during their stay at BHEL works	Vendor to confirm	
38.9	Break up of training charges per person per day basis (if any)	Vendor to specify	
39	FOUNDATION:		
39.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI)/ P.O., whichever is earlier. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details, like Static/ Dynamic load details etc. and final Layout Drawings shall be submitted by the supplier within three months after getting BHEL's approval. The Layout should consist of all requirements pertaining to complete machine and all accessories, including space requirement for Voltage Stabiliser, Isolation Transformer, Air Compressor, Chip Bin & any other accessory. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for grouting of foundation bolts of the machine.	Vendor to confirm	
40	AFTER SALES SERVICE:		
40.1	Vendor should provide prompt after sales service to ensure smooth trouble free working of the machine and spares availability during and after guarantee period.	Vendor to confirm	
41	PACKING:		
41.1	Sea worthy & rigid packing for all items of complete machine, all accessories and other supplied items to avoid any damage/loss in transit.	Vendor to confirm	
42	GUARANTEE :		
42.1	24 months from the date of acceptance of the machine.	Vendor to confirm	
42.2	Vendor shall provide free servicing of the machine once in 6 months during guarantee period.	Vendor to confirm	
43	GENERAL :		
43.1	Machine Model	Vendor to specify	
43.2	Total connected load (KVA):	Vendor to specify	
43.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
43.4	Painting of machine/electrical panels: As per Vendor standard (Polyurethane paint)	Vendor to specify	
43.5	Total weight of the machine	Vendor to specify	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
43.6	Manufacturer (OEM) cannot source the machine from other countries.	Vendor to confirm	
43.7	Machine should be officially certified for its specification, parameter & performance.	Vendor to confirm	
43.8	First filling of any oil, lubricant , grease, hydraulic oil etc.indian equivelent shall be supplied by vendor.	Vendor to confirm	
44	TOUCH-UP PAINTS: Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor.	Vendor to confirm	
45	QUALIFYING CONDITIONS :		
45.1	The vendor must be an Original Equipment Manufacturer (OEM)		
45.2	The vendor must have supplied and commissioned at least one number CNC Deep Hole drilling Machine of same or higher sizes (Independent Spindle: 2 Nos , X axis: 5000 mm , Y axis: 3000 mm , Drilling Depth: 1000mm , & Drilling range: 12.0mm to 40mm for BTA/STS drills) in the past 10 years (on the date of opening of Tender) either (i) In at least one country other than the country of Origin or (ii) in India and referred machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender). Vendor should submit proof of the same.	Vendor to confirm	
45.3	NOTES: 1. Indian Machine Tool manufacturers who do not meet the qualifying criteria as mentioned in sub clauses 45.2 , can be considered, if a) They have running Collaboration/ Joint Venture/ Joint Working Arrangement with a foreign partner who meets all of the qualifying criteria as mentioned in sub clauses 45.1 & 45.2 b) The Collaboration/ Joint Venture/ Joint Working Arrangement of the Indian Machine Tool manufacturer with its foreign partner should be of at least 2 years old (on the date of opening of tender). c) The Indian Machine Tool manufacturer should have supplied and commissioned at least one such machine (Refer clause 45.2) after Collaboration/ Joint Venture/ Joint Working Arrangement. d) The Indian Machine Tool manufacturer shall submit from their foreign partner a back to back guarantee for performance of the machine. 2. BHEL reserves the right to assess the OEM with respect to their technical and financial capability. In respect of Indian Machine Tool manufacturers as noted above, BHEL reserves the right to assess the Indian Vendor & their foreign Partner with respect to their technical and financial capability.	Vendor to confirm	
46	For MSME & Start Ups: Only financial PQC relaxation is to be given to MSMEs and Startup vendors	Vendor to Note	

SL.NO.	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	REMARKS
46.1	The following information should be submitted by the vendor about the companies where same or higher sizes machine(s) as per clause 45.2 have been supplied and installed. This is required from all the vendors for qualification of their offer.	Vendor to confirm	
46.2	Name of the company(s) where referred machine is installed.	Vendor to specify	
46.3	Complete postal address of the company(s).	Vendor to specify	
46.4	Year of commissioning	Vendor to specify	
46.5	Brief specification of the machine(s) supplied .	Vendor to specify	
46.6	Name and designation of the contact person of the company(s).	Vendor to specify	
46.7	Phone and email address of the contact person of the company(s).	Vendor to inform	
46.9	Performance certificate (As per the format enclosed Annexure C) issued by customer of machine supplied to them (Original Certificate or through E-mail directly from the company). Indian machine tool manufacturers having Collaboration/ Joint Venture/ Joint Working Arrangement with foreign partner who meet qualifying requirement should submit . Performance certificate of at least one machine supplied by them after Collaboration/ Joint Venture/ Joint Working Arrangement. The original certificate may be returned after verification by BHEL, if required.	Vendor to confirm	
46.10	BHEL reserves the right to verify the information provided by vendor at their referred customer's works including machining accuracies. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer's works. In case the information provided by vendor is found to be false / incorrect, the offer shall be rejected.	Vendor to Note & confirm	
	OTHER FEATURES:		
47	NETWORKING:		
47.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer for Industry 4.0 application. This network to be connected to wide area network/Internet. The networking should have following capabilities.	Vendor to confirm	
47.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm	
47.3	The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.	Vendor to confirm	
47.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm	
48	POINTWISE CONFIRMATION:		
48.1	Vendor should confirm/clarify pointwise (all the points) as per specification and provide original technical leaflet, technical details, photographs, scope of supply etc. at the first instance.	Vendor to note	