

							
<u>BHARAT HEAVY ELECTRICALS LIMITED</u>				Enquiry No. :			
<u>UNIT'S ADDRESS:</u>				Due Date :			
<u>UNIT'S PHONE NO.:</u>				Supplier Qtn. No.:			
<u>CONTACT PERSON'S NAME/DESGN./PHONE NO./E-MAIL</u>				Date :			
<u>(FROM PURCHASE DEPT.)</u>							
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR</u> <u>"T" TYPE SINGLE COLUMN CNC HORIZONTAL BORING MACHINE (130 MM SPINDLE DIA) WITH ROTARY TABLE</u>							
NOTE:- 1. Vendor must submit complete information against clause no. 23 (Qualifying conditions) . 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.							
ADDRESS OF THE SUPPLIER :				ADDRESS OF THE OEM :			
TELEPHONE NOS.:				TELEPHONE NOS.:			
FAX NOS.:				FAX NOS.:			
E-MAIL ADDRESS :				E-MAIL ADDRESS :			

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF "T" TYPE SINGLE COLUMN CNC HORIZONTAL BORING MACHINE (130 MM SPINDLE DIA) WITH ROTARY TABLE AS SPECIFIED BELOW.

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose : The CNC Horizontal Boring Machine with a rotary table is required for heavy duty machining operations like milling, drilling, tapping and boring etc. The machine is mainly intended for machining of trunnions for Runner/B.F. valve, By pass valve body, Link plate, Guide bearing components, Shaft seal components, Injector, Nut guard, Oil tube, MIV & BFV body (smaller size), MIV door (smaller size), Pelton runner of smaller size, Hub shaft (Kaplan runner) & many other components of Hydro Turbine.	Vendor to Confirm			
1.2	Work Piece Material: Alloy Steel, Forged steel, Stainless steel AISI 304/316, Mild steel. Ultimate Tensile Strength (UTS) up to 755 N/mm² Maximum Hardness up to 350 BHN .	Vendor to Confirm			
1.3	Material Removal capacity : While roughing the machine should be able to take a depth of cut of 6 mm at a feed rate of 0.15 mm/tooth with a 45 degree Face milling cutter of diameter 250 mm at 100 % engagement of cutter having latest generation of coated carbide insert at a cutting speed of 90 m/min on stainless steel AISI 304 . Material removal capacity test will be done with above cutting parameters on S.S. AISI 304 block.	Vendor to Confirm			
1.4	Surface finish : In finishing operation, the achievable surface quality on finished surface should be Ra 1.6 µm (microns) or better for Stainless steel AISI 304 block.	Vendor to Confirm			

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2.0	MACHINE SPECIFICATION (Minimum requirements)				
2.1	MACHINE CONFIGURATION: Machine shall be "T" type single column CNC horizontal boring machine with rotary table.	Vendor to Confirm			
2.1.1	Spindle Orientation: Horizontal	Vendor to Confirm			
2.1.2	Table longitudinal traverse: X Axis	Vendor to Confirm			
2.1.3	Head stock vertical traverse on column: Y Axis	Vendor to Confirm			
2.1.4	Column cross traverse: Z Axis	Vendor to Confirm			
2.1.5	Spindle axial traverse: W Axis	Vendor to Confirm			
2.1.6	Rotary Table : B Axis	Vendor to Confirm			
2.2	SPINDLE:				
2.2.1	Boring spindle Diameter : 130 mm	Vendor to Confirm			
2.2.2	Spindle Motor Power at 100% Duty Cycle (AC Continuous Duty S1) : 37 KW or more.	Vendor to Confirm & Specify			
2.2.3	Spindle Motor & Drive Make : FANUC α / βi series or SIEMENS 1PH series spindle motor with matching spindle drive. (Details to be given)	Vendor to Confirm			
2.2.4	Spindle Encoder : FANUC/SIEMENS/HEIDENHAIN rotary encoders for direct reading of actual spindle rpm. (Details to be given)	Vendor to Confirm			
2.2.5	Spindle Bearings (Radial/ Axial/ Angular) : Type / class / accuracy. Make : INA/ NTN/ SKF/ NSK/ Timken only	Vendor to Confirm & Specify			
2.2.6	Taper in Spindle : ISO 50 (DIN 69871) / BT 50 (JIS B 6339)	Vendor to Confirm			

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2.2.7	Spindle speed (Infinitely variable) rpm : From ≤ 10 RPM to ≥ 2000 RPM	Vendor to Confirm & Specify			
2.2.8	Oriented Spindle Stop (Any position)	Vendor to Confirm			
2.2.9	Coolant through spindle as well as external coolant for cooling of cutting tool / machining zone.	Vendor to Confirm			
2.2.10	Spindle lubrication system (Details to be given). Make : Cenlub/ Vogel/ Rexroth/ Dropsa/ Bijur Delimon only	Vendor to Confirm			
2.2.11	No. of speed ranges.	Vendor to Specify			
2.2.12	Max Spindle Torque at 100 % duty cycle.	Vendor to Specify			
2.2.13	Torque/Power/Speed diagram of spindle motor is to be submitted with the offer.	Vendor to Confirm			
2.3	TRAVERSES:				
2.3.1	TABLE LONGITUDNAL TRAVERSE (X Axis)				
2.3.1.1	Table longitudinal traverse (X-Axis): 2500 mm	Vendor to confirm			
2.3.1.2	X-axis feed rate (Infinitely variable) : 5000 mm/min	Vendor to confirm			
2.3.1.3	X-axis rapid traverse rate: 10000 mm/min	Vendor to confirm			
2.3.1.4	Axis Resolution: 0.001mm	Vendor to confirm			
2.3.2	HEADSTOCK VERTICAL TRAVERSE ON COLUMN (Y Axis)				
2.3.2.1	Headstock vertical travel (Y-Axis): 2000 mm	Vendor to confirm			
2.3.2.2	Y-axis feed rate (Infinitely variable): 5000 mm/min	Vendor to confirm			

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2.3.2.3	Y-axis rapid traverse rate: 10000 mm/min	Vendor to confirm			
2.3.2.4	Axis resolution: 0.001 mm	Vendor to confirm			
2.3.2.5	Lowest position of Spindle Centre from Table Top : ≤ 50 mm	Vendor to confirm			
2.3.3	COLUMN CROSS TRAVERSE (Z Axis)				
2.3.3.1	Column cross traverse (Z -Axis): 1500 mm	Vendor to confirm			
2.3.2.2	Z-axis feed rate (Infinitely variable) : 5000 mm/min	Vendor to confirm			
2.3.3.3	Z-axis rapid traverse rate: 10000 mm/min	Vendor to confirm			
2.3.2.4	Axis Resolution: 0.001mm	Vendor to confirm			
2.3.4	SPINDLE AXIAL TRAVERSE (W Axis)				
2.3.4.1	Spindle axial traverse (W -Axis): 800 mm	Vendor to confirm			
2.3.4.2	W-axis feed rate (Infinitely variable) : 5000 mm/min	Vendor to confirm			
2.3.4.3	W-axis rapid traverse rate: 10000 mm/min	Vendor to confirm			
2.3.4.4	Axis Resolution: 0.001mm	Vendor to confirm			
2.3.4.5	Total travel of Column (Z axis) + Spindle travel (W axis) : 2300 mm	Vendor to confirm			
2.3.4.6	Nearest position of Spindle face from Table Centre : ≤ 50 mm	Vendor to confirm			
2.3.4.7	Column & Spindle Axes should be independently programmable CNC Axes with individual Drives, Motors and Feed back systems.	Vendor to confirm			

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2.4	TABLE :				
2.4.1	Rotary Table: 360 Degree rotation (B Axis)	Vendor to Confirm			
2.4.2	Table size (LxB): 2200mm x 1800 mm	Vendor to Confirm			
2.4.3	Load carrying capacity: 12 Tons	Vendor to Confirm			
2.4.4	Rotary Table shall be capable of eccentric loading of jobs. Maximum tilting moment to be specified. Chart showing relation of weight and distance of c.g. from centre of Rotary Table (loading chart of table) to be submitted.	Vendor to Specify			
2.4.5	Maximum torque on B-axis (N-m)	Vendor to Specify			
2.4.6	Rapid Traverse Rate for Rotary Axis: 2 rpm	Vendor to Confirm			
2.4.7	Size of T-slots: 22 or 28 mm H12 as per DIN 650 / IS-2013 / ISO-299 standard.	Vendor to Specify & Confirm			
2.4.8	T-slots pitch : 160 mm as per applicable DIN / IS-2013 / ISO-299 standard.	Vendor to Confirm			
2.4.9	Surface flatness of table to be as per DIN 876 grade 2 or better	Vendor to Confirm			
2.4.10	Central bore tolerance : H7 or better	Vendor to Confirm			
2.4.11	Perpendicular Lateral slot size and tolerance, if provided.	Vendor to Specify			
2.4.12	Centre bore runout: 0.01 mm or better	Vendor to Confirm			
2.4.13	B-Axis lubrication system. (Details to be submitted). Make : Cenlub/ Vogel/ Rexroth/ Dropsa/ Bijur Delimon only	Vendor to Confirm			
2.4.14	Feed motors & drives: FANUC or SIEMENS AC servo motors with matching AC servo drives (Details to be given)	Vendor to Confirm			

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2.4.15	Axis B should be provided with a Fanuc / Siemens / Heidenhain rotary / angle encoder directly mounted on the table.	Vendor to Confirm & Specify			
2.4.16	B Axis Resolution: 0.001 degrees	Vendor to Confirm			
2.4.17	Type of Power transmission for B axis: Backlash free double pinion gearbox system with preloading mechanism, with single motor/direct drive mechanism. Details to be provided along with the offer.	Vendor to Confirm			
2.4.18	B axis locking Mechanism: Servo Lock + Hydro mechanical lock with suitable power pack. Make: Rexroth/Vickers Sperry/Hydac/Yuken/Hawe only. Details to be provided along with the offer.	Vendor to Confirm			
2.4.19	Level of Rotary table should be such that it can freely rotate without interfering with the floor / any other machine parts.	Vendor to Confirm			
2.5	FEEDS AND DRIVE SYSTEM:				
2.5.1	Feed motors & drives: FANUC or SIEMENS AC servo motors with matching AC servo drives (Details to be given).	Vendor to Confirm			
2.5.2	Feed back system for X, Y & Z axes: Heidenhain/Fagor/Renishaw sealed linear scales (Details to be submitted)	Vendor to Confirm			
2.5.3	Feed back system for Spindle Axis (W) : Heidenhain/Fagor/Renishaw sealed linear scale (Details to be submitted)	Vendor to Confirm			

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2.5.4	Type of power transmission for X, Y, Z & W axes: "Backlash free re-circulating ball screw with Pre-loaded double nut" having accuracy grade C3 or better. Make: THK/ NSK/ SKF/ Rexroth/ Korta/ Hiwin/ Shuton make.	Vendor to Confirm			
2.5.5	Mechanism for locking X axis, Z axis, W axis : Servo Lock	Vendor to Confirm			
2.5.6	Mechanism for locking Y axis. Servo Lock + motor brake.	Vendor to Confirm			
2.6	MACHINE GUIDEWAYS:				
2.6.1	X ,Y & Z axis shall be provided with LM / Machined guideways (integrated hardened & ground). LM / Machined guideways & other sub assemblies of machine should be rust free while in contact with coolant /atmospheric moisture. LM guideways shall be preferably of THK/Schneeberger/Rexroth/Hiwin/NSK make only and same to be specified in technical bid.	Vendor to Confirm			
2.6.2	Details of X, Y & Z axis guideways (including hardness of guideways) to be submitted along with the offer.	Vendor to Confirm			
2.6.3	Details for table bearings for B-axis rotation to be submitted with offer. Bearing to be provided of Make : INA/ NTN/ SKF/ NSK/ Timken only	Vendor to Confirm			
2.6.4	Metallic Telescopic covers of rust resistant material to be provided with wipers for X & Z axes. Metallic Telescopic covers / bellow covers to be provided for Y axis. Joints of telescopic covers should be properly sealed in order to prevent ingress of chips, coolants & hydrostatic oils (Details to be submitted).	Vendor to Confirm			

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2.7	CONSTRUCTION:				
2.7.1	<p>All machine elements shall be designed and validated by using finite element analysis (FEA) to arrive at optimum construction, cross-sections and ribbings. The machine structural elements shall be designed to meet the cutting forces generated during heavy-duty machining applications including intermittent/interrupted metal cutting.</p> <p>All machine elements such as bed, column, table , spindle , headstock etc. shall be of proven design. The machine elements shall be made of highest quality, heavily ribbed, rigid grey cast iron preferably or Fabricated Steel Structure with proper stress relieving.</p> <p>The machine elements shall be suitably stress relieved and aged to ensure dimensional stability and freedom from distortion over the entire life of the machine. The machine elements shall have suitable damping characteristics to ensure vibration free machining at full load.</p>	Vendor to Confirm			
2.7.2	Head Stock Counter balancing System. Details of the system to be submitted with the offer.	Vendor to Confirm			
2.7.3	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings of various Components/ Assemblies like Column, various guideways/slides, Head Stock, Spindle, table etc. of the machine. (Full details to be submitted along with the offer)	Vendor to Confirm			

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2.8	OPERATOR'S PLATFORM:				
2.8.1	The stationary operator's platform shall be a robust cabin-type structure featuring high-strength transparent glass for maximum operational visibility and safety. It must be strategically positioned to suit the operation throughout the machine's entire operating range and having load-carrying capacity of min. 500 kg. to safely support personnel and controls.	Vendor to Confirm			
2.9	OPERATION AND CONTROL SYSTEM:				
2.9.1	OPERATOR'S PANEL:				
2.9.1.1	Swivelling type air conditioned Operator's Pendant/Desk of Rittal/Schneider/Siemens make (preferable) or equivalent Internationally reputed make , incorporating the CNC Operator Panel (OP) and Machine Control Panel (MCP) of required configuration shall be provided. All switches on the Operator's Pendant/Desk should be within reach of operator of average height of 170 cm for convenient, efficient & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details of the panel should be submitted.	Vendor to Confirm			
2.9.2	CNC SYSTEM & FEATURES :				
2.9.2.1	Make: Fanuc or Siemens	Vendor to Confirm & Specify			

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2.9.2.2	The system should have full alphanumeric keyboard, TFT/LED/ LCD colour display (10" 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 matching with CNC make. Latest hardware & software versions, as available at the time of delivery, should be supplied. (Details to be submitted)	Vendor to Confirm			
2.9.2.3	CNC controller must be with OPCUA/FOCAS , complying Industry 4.0 latest norms. All the necessary formalities/licence needs to be compiled at vendor end.	Vendor to Confirm			
2.9.2.4	Details of the standard features.	Vendor to Specify			
2.9.2.5	Details of optional features recommended by vendor.	Vendor to Specify			
2.9.2.6	Details of other features:				
2.9.2.6.1	Axes Interpolation: Linear, Circular, Cylindrical, Helical.	Vendor to Confirm			
2.9.2.6.2	Part Program Storage: 2 MB or more	Vendor to Confirm			
2.9.2.6.3	Technology Cycles: Standard Drilling, Tapping, Milling.	Vendor to Confirm			
2.9.2.6.4	Pitch Error compensation	Vendor to Confirm			
2.9.2.6.5	Graphics simulation of Part Programs	Vendor to Confirm			
2.9.2.6.6	Max Number of simultaneous interpolation: 3	Vendor to Confirm			
2.9.2.6.7	Backlash error compensation	Vendor to Confirm			
2.9.2.6.8	Co-ordinate Transformation : Datum shift, rotation, mirror image, scaling factor.	Vendor to Confirm			
2.9.2.6.9	Feed override switch 0-120% for all axis	Vendor to Confirm			

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2.9.2.6.10	Spindle speed override switch 50-120%	Vendor to Confirm			
2.9.2.6.11	Zero Offset for all axes	Vendor to Confirm			
2.9.2.6.12	Provision for automatic safe shut down of CNC Control in case of Power Failure (In case of PC based system only)	Vendor to Confirm			
2.9.2.6.13	The Controller should have feature to accept USB Pen-Drives / PCMCIA/Flash Card for Part Program and Machine data transfer both ways.	Vendor to Confirm			
2.10	MANUAL CONTROL:				
2.10.1	Complete manual operation of machine should be possible through Machine control Panel (MCP). The MCP should have spindle & Feed override switches, +/- Jog keys for individual axis, Start/stop keys for cycle, Spindle & Feed and additional keys/switches for auxiliary functions. Diagram of complete operator pendant with full detail of all switches/keys should be submitted.	Vendor to Confirm			
2.11	HAND HELD UNIT:				
2.11.1	Hand Held unit, along with 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. Details to be submitted.	Vendor to Confirm			

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2.12	UPS FOR CNC SYSTEM: (Only in case of PC based CNC system)				
2.12.1	UPS of 10 minutes backup for CNC system is to be supplied only in case of PC based CNC system with HDD. Preferable Make: Hitachi /APC/Emerson (Liebert)/Siemens/Omron or equivalent Internationally reputed make.	Vendor to Confirm			
2.13	MACHINE LIGHTS:				
2.13.1	Machine Lights for sufficient illumination of complete working area on machine should be provided for clear visibility.	Vendor to Confirm			
2.13.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to Confirm			
2.13.3	Any light required in the foundation/pit area (if any) shall also be foreseen and supplied by the vendor.	Vendor to Confirm			
2.13.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to Confirm			
2.13.5	Flashing / rotary type End of Cutting and Program Stop Light should be provided.	Vendor to Confirm			

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2.14	REFRIGERATION UNITS / AIR CONDITIONERS				
2.14.1	Door mounted Air Conditioners 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 and relative Humidity at Bhopal as follows - Ambient temperature : +5 to 45° C and RH 90% Following are to be confirmed & Details to be given by the vendor: a) Panel AC must have Condensation free feature. b) 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.	Vendor to Confirm			
2.14.2	AC unit mounted on the movable pendant must be well-supported by universal-head bolt. 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 MCB to isolate the AC unit from the electrical panel.	Vendor to Confirm			
2.14.3	Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic oil System at a temperature not exceeding 25-27 deg. C irrespective of the ambient conditions. Complete details should be submitted. Make : Advance/Werner Finely/Rittal/Bluestar/Voltas make or other reputed international make having spares & service support in India.	Vendor to Confirm			
2.14.4	Vendor to furnish the cooling capacity (KW or Kcal per Hour) of each Air Conditioners and Refrigerated Unit (s) used in the machine.	Vendor to Specify			
2.14.5	O&M manual of the Panel A.C. / Refrigerated oil system including electrical circuit diagrams, item parts list are to be provided.	Vendor to Confirm			

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2.15	HYDRAULIC & LUBRICATION SYSTEM : (Details should be Submitted by the Vendor)				
2.15.1	Hydraulic System				
2.15.1.1	The system should be centralised. Hydraulic Oil Tank shall be preferably located at floor level	Vendor to Confirm			
2.15.1.2	Make: Rexroth/Vickers Sperry/Hydac/Yuken/Hawe only (Details to be submitted)	Vendor to Confirm			
2.15.1.3	Failure indication for flow of hydraulic & lubrication oil shall be incorporated in PLC through Flow & pressure switch.	Vendor to Confirm			
2.15.1.4	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging and other maintenance related problems. Filter elements should be of Make: EPE / Hydac/ or any Equivalent international reputed. Details to be given.	Vendor to Confirm			
2.15.1.5	Hydraulic pump capacity (flow / pressure)	Vendor to Specify			
2.15.1.6	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to Confirm			
2.15.1.7	<u>First filling of all required hydraulic oils & grease etc.</u> should be supplied by vendor. Indigenous (Indian) source, or Indian Equivalent, and specifications of oils/ greases also should be provided by the vendor.	Vendor to Confirm			
2.15.1.8	Automatic shut off provision.	Vendor to Confirm			

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2.15.2	Lubrication System				
2.15.2.1	A suitable lubrication system for all the guideways, gearbox, headstock, bearings, ball screw & nuts, and all other parts wherever required.	Vendor to Confirm			
2.15.2.2	Make : Cenlub/ Vogel/ Rexroth/ Dropsa/ Bijur Delimon only. Details to be submitted.	Vendor to Confirm			
2.15.2.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging and other maintenance related problems. Filter elements should be of Make: EPE /Hydac/ or any Equivalent international repute. Details to be given.	Vendor to Confirm			
2.15.2.4	Failure indication	Vendor to Confirm			
2.15.2.5	Automatic shut off provision.	Vendor to Confirm			
2.15.2.6	Details of Pump, Valves, Piping circuit, lay out etc. to be provided in O & M manual at the time of supply of machine.	Vendor to Confirm			
2.15.2.7	<u>First filling of all required lubrication Oils & Grease etc.</u> to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils / greases are also to be provided by the vendor.	Vendor to Confirm			

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2.16	COOLANT SYSTEM :				
2.16.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons provided on the Operator's panel as well. Make : Veeraja Industries / Mak Technosys / Hafi Elektra/ Lex Technoaid / Cleantek / Drasla Technologies / Ferrocure only.	Vendor to Confirm			
2.16.2	Recirculating Type Flood Coolant System through adjustable trajectory multiple nozzles around the spindle (External coolant)	Vendor to Confirm			
2.16.3	Recirculating High Pressure Coolant through Spindle (Internal coolant)	Vendor to Confirm			
2.16.4	All offered attachments, tool holders, boring bars, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to Confirm			
2.16.5	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.	Vendor to Confirm			
2.16.6	Coolant Filtration System: Paper filter based Recirculating type coolant system.	Vendor to Confirm			
2.16.7	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor to Confirm			
2.16.8	Pressure & rate of flow of coolant for different variants should be furnished in the offer. The Pressure should be sufficient for the coolant to reach the tool tip at full pressure.	Vendor to Confirm			

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2.16.9	Coolant Tank Capacity to be specified. Coolant filtration system is to be placed on the Floor Level. Coolant collection tank may be kept at a lower level. The details of the system, including requisite sump, pump etc., should be clearly indicated.	Vendor to Specify			
2.16.10	Provision for control of Pressure and Coolant Flow Rate should be provided. On-Off Push Buttons shall be provided on the Operator's Panel.	Vendor to Confirm			
2.16.11	Coolant pump & motor details for all variants of coolant system are to be submitted with the offer.	Vendor to Specify			
2.16.12	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to Confirm			
2.16.13	Coolant should not get mixed with lubricating oil. Coolant falling on job / table should not get mixed with machine table / bed lubricating oil. Necessary provision to be made.	Vendor to Confirm			
2.16.14	Vendor to ensure that coolant discharge must be contained and routed directly back to the primary tank without any external spillage or volume depletion.	Vendor to Confirm			

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2.17	ELECTRICAL:				
2.17.1	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. Grounding/earthing shall be provided from the adjacent Column structure for the machine.	Vendor to Confirm			
2.17.2	Topicalization: All electrical / electronic equipment shall be tropicalized	Vendor to Confirm			
2.17.3	Electrical cabinets should be of Rittal/Schneider make or any other equivalent from reputed International make, properly air conditioned and sealed from ingress from all liquids & encroachments of rodents. All electrical & electronic control cabinets & panels should be dust and rodent proof. Safety interlock/ door switches on electrical cabinets should be provided.	Vendor to Confirm			
2.17.4	Electrical components should be preferably mounted on DIN Rail	Vendor to Confirm			
2.17.5	All electrical and electronic panels should be provided with fluorescent or LED lamps for sufficient illumination and power receptacles of 230 Volts, 5 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents. Fluorescent or LED lamps provided for illumination should be of 24 Volt DC only.	Vendor to Confirm			
2.17.6	Motors shall conform to IEC or Indian Standards	Vendor to Confirm			

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2.17.7	All cables outside the electrical cabinets and operator pendant must be routed through flexible conduits made of polymer, capable of withstanding stress, chip hazard and ingress of oil /coolant. All cable through trenches to run on cable trays. Additionally, all cables moving with transverse axis should be of trailing type and installed in caterpillar / cable drag chain made of polymer.	Vendor to Confirm			
2.17.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to Confirm			
2.18	SAFETY ARRANGEMENTS:				
2.18.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to Confirm			
2.18.2	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 number with messages (on CNC display and panels) should be available.	Vendor to Confirm			
2.18.3	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to Confirm			
2.18.4	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm			
2.18.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.18.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm			
2.18.7	Oil & water pipe lines should not run with electrical cable in the same tray / trench wherever possible.	Vendor to Confirm			
2.19	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :				
2.19.1	The Machine shall conform to following factors related to environment:	Vendor to Confirm			
2.19.2	Maximum noise level shall be 85 dB(A) at normal load condition, 1 M 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			
2.19.3	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to Confirm			
2.19.4	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			
2.19.5	No hazardous chemicals shall be required to be used in the machine.	Vendor to Confirm			
2.19.6	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to Specify			
2.19.7	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.19.8	The machine and its accessories should be tropicalised for efficient operation in the ambient temperature range of +5° C to +45° C as mentioned in clause 17 .	Vendor to Confirm			
3.0	CHIP CONVEYOR:				
3.1	A chip extraction system to carry both short and curly chips efficiently and effectively to the chip bin to be provided on one end of the machine. Make : Miven Mayfran/ Jorgensen Conveyors/ Hennig Inc/ Drasla only	Vendor to Confirm			
3.2	Two Chips bins of appropriate size with wheels & handle for movement, should be supplied.	Vendor to Confirm			
3.3	Type of chip conveyor	Vendor to Specify			
3.4	Width of conveyor	Vendor to Specify			
3.5	Material of chip conveyor to be rust resistant .	Vendor to Confirm			
3.6	Provision for smooth flow of chips to the conveyor.	Vendor to Confirm			
3.7	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel.	Vendor to Confirm			
3.8	Layout showing location of chip conveyor to be submitted.	Vendor to Confirm			
4.0	ULTRA ISOLATION TRANSFORMER				
4.1	Indian make Ultra Isolation Transformer (TTN configuration) suitable for complete machine shall be provided.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
4.2	Make: NEEL / AEI or any other equivalent Indian make of International repute.	Vendor to Specify			
4.3	Model & Rating	Vendor to Specify			
4.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to Confirm			
5.0	PNEUMATIC SYSTEM:				
5.1	AIR COMPRESSOR:				
5.1.1	Independent Air Compressor (Make: ELGI / ATLAS COPCO / INGERSOLL RAND only), screw type with refrigerated type Dryer & Filter of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The compressor unit should be suitable for continuous duty operation at 10 bar minimum. Full details to be given	Vendor to Confirm			
5.1.2	Make & Model of Air Compressor and Refrigerator type Dryer.	Vendor to Specify			
5.1.3	Capacity (Flow, Pressure & KW)	Vendor to Specify			
5.2	COMPRESSED AIR POINTS:				
5.2.1	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of min. 4 meter, for work piece cleaning along with air gun.	Vendor to Confirm			
6.0	ATTACHMENTS & TOOLINGS:				
6.1	ATTACHMENTS:				

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.1.1	Universal Milling head (Minimum Parameter)	Vendor to Confirm			
6.1.1.1	Power	Vendor to specify			
6.1.1.2	Max torque	Vendor to specify			
6.1.1.3	Speed Range (Infinitely Variable)	Vendor to Confirm			
6.1.1.4	Speed ratio(1:1 between spindle of Machine and Head)	Vendor to confirm			
6.1.1.5	Spindle Taper : ISO 50 / BT 50	Vendor to confirm			
6.1.1.6	Tool clamping : Hydraulic	Vendor to confirm			
6.1.1.7	Rotation of A-axis : (+/-)180deg.	Vendor to confirm			
6.1.1.8	Resolution of A-axis: 0.001deg.	Vendor to confirm			
6.1.1.9	Rotation of C-axis : 360 deg.	Vendor to confirm			
6.1.1.10	Resolution of C-axis : 0.001 deg.	Vendor to confirm			
6.1.1.11	Weight of the head	Vendor to specify			
6.1.1.12	Coolant system: Internal (through spindle) & External coolant with requisite flexible pipes on its snout is to be provided.	Vendor to confirm			
6.1.1.13	Pull stud (4 sets) for mounting the Head shall be supplied by vendor	Vendor to confirm			
6.1.1.14	Pull stud for mounting the tools in the taper of the head shall be supplied by vendor	Vendor to confirm			
6.1.1.15	Make & Model of head including drawing /sketch/catalogue pages showing major dimensions of the head to be submitted with the offer.	Vendor to submit			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.1.1.16	The offered universal milling head should be fully programmable in all aspects and should be fully customized to carryout machining (Drilling, Boring, Circular interpolation with cutter compensation, Tapping, Thread millings etc) at different angular positions with reference to existing work offset.	Vendor to confirm			
6.2	TOOLINGS:				
6.2.1	All supplied tool holders, Cutting Tools, adapters etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations.	Vendor to Confirm			
6.2.2	Tooling from SANDVIK, SECO, ISCAR, KENNAMETAL & WIDIA or any reputed international make operating in India. Following Tools are to be supplied along with the machine:	Vendor to Confirm			
6.2.3	Dia. 100 mm, 45 degree face milling cutter for S.S. application - Qty 02 nos.	Vendor to Confirm			
6.2.4	Dia. 160 mm, 45 degree face milling cutter for S.S. application - Qty 02 nos.	Vendor to Confirm			
6.2.5	Dia. 200 mm, 45 degree face milling cutter for S.S. application - Qty 02 nos.	Vendor to Confirm			
6.2.6	Dia. 250 mm, 45 degree face milling cutter for S.S. application - Qty 02 nos.	Vendor to Confirm			
6.2.7	1 no. adaptor/holder having back hand ISO50 DIN69871 / BT 50 for each size cutter - Qty total 4 nos.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.2.8	Coated carbide Inserts (suitable for above cutters & machining of S.S. material) : Qty. 400 nos.	Vendor to Confirm			
6.2.9	Screws for insert (of cutter) : Qty 200 nos.	Vendor to Confirm			
6.2.10	Capto type Micro boring bar : Range dia. 50 -250 mm - Qty 2 sets	Vendor to Confirm			
6.2.11	1 no. adaptor/holder having back hand ISO50 DIN69871 / BT 50 for micro boring bar - Qty 1 no.	Vendor to Confirm			
6.2.12	Coated carbide Inserts (suitable for above micro boring bar & machining of S.S. material) : Qty. 100 nos.	Vendor to Confirm			
6.2.13	Screws for insert (of micro boring bar) : 50 nos.	Vendor to Confirm			
6.2.14	In addition to above mentioned items, other items like mounting bolts, key, cartridges or any other spares (if applicable) which is necessary for successful assembly of tools for cutting shall be supplied in sufficient quantity/proportionate to main items for smooth functioning of tools.	Vendor to Confirm			
6.2.15	All cutting tools, adaptors, sleeves & tool holders recommended for machining of prove out components shall be supplied by vendor (which are not included in the above list - Qty 1 set	Vendor to Confirm			
6.2.16	Job Fasteners - 1 Set	Vendor to Confirm			
7.0	FAULT DIAGNOSTIC SYSTEM:				
7.1	Individual faults & Messages should appear on the operator screen.	Vendor to Confirm			
7.2	Help guide should be provided for fault diagnosis.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
8.0	LEVELING & ANCHORING SYSTEM				
8.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes, shim pack etc for the machine shall be supplied by the vendor. Details to be submitted.	Vendor to Confirm			
9.0	TOOLS FOR OPERATION & MAINTENANCE :				
9.1	Special tools and equipment required for operation and maintenance of the machine like Torque Wrench, Spanners, Keys, grease guns, collets etc. Should be supplied by the vendor.	Vendor to Confirm			
9.2	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor to Confirm			
10.0	ACCESSORIES:				
10.1	Tool Cabinet to be provided (Details to be submitted)	Vendor to Confirm			
11.0	SPARES:				
11.1	Itemised list of mechanical, hydraulic, electrical and electronic spares used on the machine (as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis) should be offered by vendor. The spares will be ordered separately as per requirement. The list to include following, in addition to other recommended spares:	Vendor to Specify			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
11.2	Mechanical & Hydraulic Spares: All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to Specify			
11.3	Electrical /Electronic / CNC Spares: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Scanning Heads for Linear Scales, CNC controller, Operator's panel with Display Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to Specify			
11.4	All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine, software or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure them in advance, if required	Vendor to Confirm			
11.5	Complete list of spares for machine and accessories, along with specification / type / model/ and make shall be furnished along with documentation to be supplied with the machine	Vendor to Confirm			
12.0	DOCUMENTATION : Three sets of following documents (Hard copies with Soft Copies wherever specified) in English language should be supplied along with the machine. All the below mentioned are to be offered.	Vendor to Confirm			
12.1	Operating manuals of Machine & CNC system	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.2	Programming Manuals of Machine & CNC system	Vendor to Confirm			
12.3	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 the part list also.	Vendor to Confirm			
12.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives and position feed back system.	Vendor to Confirm			
12.5	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to Confirm			
12.6	Detailed specification of all rubber items and hydraulic/lube fittings.	Vendor to Confirm			
12.7	Operating Manuals, Maintenance Manuals & Catalogues for supplied Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.	Vendor to Confirm			
12.8	Hard copy (Print-out) with comments in English of PLC program of main machine and auxiliary systems (if used) along with cross reference.	Vendor to Confirm			
12.9	Soft copy of PLC program and complete machine data.	Vendor to Confirm			
12.10	Complete back-up of hard disk on GHOST CD (only in case of PC based CNC system).	Vendor to Confirm			
12.11	Complete Master List of parts used in the machine shall be submitted by the vendor.	Vendor to Confirm			
12.12	Hardcopy (Print out) as well as soft copy (in PDF Format) of Electrical Schematics of the machine with comments in English.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.13	One additional set of all the above documentation on CD ROM / Pen drive wherever possible.	Vendor to Confirm			
13.0	TRAINING				
13.1	<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 - 1 person for 3 working days</p> <p>(b) Electrical, Electronic & CNC maintenance for machine & other supplied equipment's - 1 person for 3 working days</p> <p>(c) Mechanical & Hydraulic maintenance of the machine & other supplied equipment's - 1 person for 3 working days</p> <p>(d) Operation of the machine & other supplied accessories / equipment's - 1 person for 3 working days</p>	Vendor to Confirm			
13.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to note			
13.3	Competent, English speaking experts shall be arranged by the vendor for satisfactory & effective training of BHEL personnel.	Vendor to Confirm			
13.4	Vendor to quote for training on per man per day basis	Vendor to Confirm			
13.5	Vendor should organize for training of Electronics Engineer and Programmer at the CNC System Manufacturer's (Fanuc/Siemens) Training Centre in INDIA for 5 working days for advanced features and specialised training.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
14.0	FOUNDATION :				
14.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI)/ Purchase Order. Tentative Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details such as (a) Excavation details (b) Reinforcement details (c) Concrete details (d) pocket size for foundation bolt (e) cable trench, Ramp, drain & collection pit (f) any other information if required shall be in vendor's scope. Vender shall provide "Good for Construction" drawings having all details as per above design within one months after getting BHEL's approval without any extra to BHEL. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts. BHEL shall construct complete foundation as per details provided above and under supervision of supplier's representative (if deputed by vendor).	Vendor to Confirm			
14.2	If verification of soil condition data or any other data required for foundation design, vendor may carry out required soil investigation within one month of placement of PO or as mutually agreed without any financial implication to BHEL. All required equipment's for the same shall be arranged by vendor at site on returnable basis.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
14.3	<p>The submission of civil foundation drawings for the equipment specified in this tender is desirable. Vendors are encouraged to provide detailed foundation drawings after placement of PO.</p> <p>In case the vendor is unable to submit the foundation drawings, they shall be required to provide detailed load data, including but not limited to equipment weight, dynamic loads, and any other relevant load details that are necessary for the foundation design.</p> <p>If the vendor fails to submit the required foundation drawings and only submits load details, BHEL reserves the right to prepare the foundation design and drawings based on the load data provided by the vendor. It is the vendor's responsibility to ensure that the load details provided are accurate and complete to avoid any discrepancies in the foundation design process.</p> <p>The cost incurred by BHEL for the design and preparation of foundation drawings will be deducted from the vendor's payment/bill.</p>	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
15.0	ERECTION & COMMISSIONING				
15.1	<p>Supplier to take full responsibility for carrying out erection, start up, testing of the machine and all types of supplied equipment's, machining of test pieces etc. The machine is to be erected at the site by the supplier with their own manpower, Hardware's, anchor, fasteners, tools & tackles etc. Other erection equipment's like mobile crane, Hydra , measuring instruments & devices etc for testing & commissioning of machines should be brought by the supplier on returnable basis.</p> <p>Service requirement like air, water, electricity will be provided by BHEL at one point to be indicated by the supplier with complete information in advance.</p> <p>Police verification & Company undertaking will be required for each & every member of Erection & Commissioning team.</p> <p>However, EOT Crane will be provided by BHEL depends on the availability. EOT crane of capacity 25 T is available in the bay where machine is to be erected . Hence it may be noted that the heaviest part of the machine should not be more then 25 T.</p> <p>Completed commissioning & demonstration of all the features of machine/equipment's to the entire satisfaction of BHEL is the sole responsibility of vendors at BHEL Bhopal work.</p> <p>Complete commissioning, testing including all the test is in the scope of supplier.</p>	Vendor to Confirm			
15.2	Erection & Commissioning of Isolation Transformer, chip conveyor, coolant system, Air Compressor & its dryer and any other accessories supplied with machine shall also be responsibility of the vendor	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
15.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause 19 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to Confirm			
15.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier. Special tools and equipment required for erection of the machine shall be brought by the vendor. (On returnable basis).	Vendor to Confirm			
15.5	All fixators, foundation bolts, shims, wedges etc. required for erection, anchoring and levelling of the machine and allied equipment shall be supplied by the vendor.	Vendor to Confirm			
15.6	Commissioning spares and first fill coolants, oils etc required for commissioning of the machine within stipulated time, shall be brought by the supplier.	Vendor to Confirm			
15.7	All Cover Plates required for the machine and its peripherals shall be supplied by the vendor.	Vendor to Confirm			
15.8	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. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to Confirm			
15.9	All the activities from clauses 15.1 to 15.8 shall be logged and after completion of all activities commissioning shall be declared completed.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
16.0	ACCURACY TESTS:				
16.1	GEOMETRICAL ACCURACIES :				
16.1.1	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			
16.1.2	All the accuracies are to be demonstrated to BHEL engineers during pre-acceptance tests at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to Confirm			
16.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441/ ISO 230-2 (Latest Revision) using LASER INTERFEROMETER.	Vendor to Confirm			
16.2.1	Positional uncertainty (P) in X, Y, Z axes: 0.015 mm per 1000 mm	Vendor to Confirm			
16.2.2	Positional uncertainty (P) in W axis: 0.030 mm per 1000 mm	Vendor to Confirm			
16.2.3	Positional uncertainty (P) in B axis: 10 arc secs	Vendor to Confirm			
16.2.4	Positional scatter (Ps) in X, Y & Z axes: 0.008 mm	Vendor to Confirm			
16.2.5	Positional scatter (Ps) in W axis: 0.010 mm	Vendor to Confirm			
16.2.6	Positional scatter (Ps) in B axis: 8 arc secs	Vendor to Confirm			
16.2.7	Positional deviation (Pa) per 1000 mm for X, Y & Z axes: 0.015 mm	Vendor to Confirm			
16.2.8	Positional deviation (Pa) per 1000 mm for W axis: 0.020 mm	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
16.2.9	Positional deviation (Pa) for entire travel for B axis: 8 arc secs	Vendor to Confirm			
16.2.10	Reversal error (U) in X, Y, Z & W axes: 0.006 mm	Vendor to Confirm			
16.2.11	Reversal error (U) in B axis: 6 arc secs	Vendor to Confirm			
16.2.12	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			
17.0	OPERATING CONDITIONS & THERMAL STABILITY:				
17.1	<p>Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies.</p> <p>Power Supply:</p> <p>Voltage: 415 V, $\pm 10\%$</p> <p>Frequency: 50 Hz $\pm 3\%$</p> <p>No. of phases = 3</p> <p>Ambient Conditions: Temperature = 5 to 45 degree Celsius</p> <p>Relative Humidity = 95% max.</p> <p>(Vendor to confirm that machine is suitable for above)</p>	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
17.2	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. temperature variation is up to 25 deg. Centigrade in 24 hours. Vendor to ensure that machine is suitable for above mentioned temperature variation, specified Ambient Conditions, accuracy requirements of BHEL components and trouble free operation of the machine.	Vendor to Confirm			
17.3	The machine including attachments and accessories should be suitable for 24 hours continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure & confirm the same.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
18.0	PROVEOUT OF BHEL COMPONENTS :				
18.1	<p>Vendor to carry out complete machining of ONE prove out component as per enclosed drawing (Drawing no. HBM/DRG/001 Rev.00). Vendor to submit preliminary process & tool list recommended by them. Change in process/tools may be mutually discussed and agreed. Complete machining of prove out component shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools, fixture and CNC programs provided by the vendor to prove the machine after complete erection, testing & test piece machining etc. Material for the prove out components shall be provided by BHEL. Vendor should submit the CNC programs, setting schemes, process sheets, tooling layouts, time studies etc. for the prove out components. Vendor to provide cutting tools (along with adaptor, holders, sleeves etc) and fixture (if required) to hold the prove out components for successful machining.</p> <p>Vendor shall be fully responsible for machining of prove out component 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 prove out components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.</p> <p>Note 1: In case of unavailability of the same component (Drawing no. HBM/DRG/001 Rev.00), similar type of other component along with corresponding drawings shall be provided for job proving. Similar job offered for job prove out shall have accuracies at par with this drawing.</p>	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
18.2	Vendor shall be responsible for any deviation/rejection in prove out component due to wrong machining or malfunctioning of the machine during prove out machining and also for the delay in machining due to improper recommended tooling etc.	Vendor to Confirm			
18.3	Accuracies for prove out component				
18.3.1	Tolerance on dimension: 0.03 mm	Vendor to Confirm			
18.3.2	Runout: 0.02 mm	Vendor to Confirm			
18.3.3	Concentricity: 0.02 mm	Vendor to Confirm			
18.3.4	Flatness: 0.02 mm	Vendor to Confirm			
18.3.5	Perpendicularity : 0.02 mm	Vendor to Confirm			
18.3.6	Surface Finish (Ra): 1.6 micron	Vendor to Confirm			
19.0	MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)	Vendor to Confirm			
19.1	Tests/Activities to be Performed by Vendor at Vendor's work on the machine before dispatch (during PDI)	Vendor to Confirm			
19.1.1	Geometrical Accuracy Tests as per Clause 16.1	Vendor to Confirm			
19.1.2	Positioning Accuracy & Repeatability Tests as per VDI/DGQ 3441 / ISO 230-2 (Latest Revision) using Laser interferometer in line with Clause 16.2	Vendor to Confirm			
19.1.3	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			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.1.4	Material Removal capacity: While roughing the machine should be able to take a depth of cut of 4 mm at a feed rate of 0.15 mm/tooth with a 45 degree Face milling cutter of diameter 250 mm at 100 % engagement of cutter having latest generation of coated carbide insert at a cutting speed of 90 m/min on stainless steel AISI 304. Trial for Material removal capacity will be done with above parameters on S.S. AISI 304 block. Material & Tooling's for trial shall be arranged by supplier.	Vendor to Confirm			
19.1.5	Surface finish : As per clause 1.4 , material & tooling's for trial shall be arranged by supplier.	Vendor to Confirm			
19.1.6	Demonstration of all features of the machine, control system & accessories.	Vendor to Confirm			
19.1.7	Machining of test piece as per NAS/ISO . Vendor to supply test piece and tooling for it's machining. Vendor to arrange the instruments required for measurement of the machined test piece.	Vendor to Confirm			
19.2	Tests/Activities to be Performed by Vendor at BHEL works on the machine while commissioning:	Vendor to Confirm			
19.2.1	Geometrical Accuracy Tests as per Clause 16.1	Vendor to Confirm			
19.2.2	Positioning Accuracy & Repeatability Tests as per VDI/DGQ 3441 / ISO 230-2 (Latest Revision) using Laser interferometer in line with Clause 16.2	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.2.3	Full load test : To demonstrate the maximum power & cutting capacity of the machine trial will be done as per clause 1.3 . Material for trial shall be arranged by BHEL. Tooling's shall be arranged by vendor.	Vendor to Confirm			
19.2.4	Surface finish : As per clause 1.4 . Material for trial shall be arranged by BHEL. Tooling's shall be arranged by vendor.	Vendor to Confirm			
19.2.5	Machining test piece as per NAS/ISO. Vendor to arrange test piece and tooling for it's machining. BHEL shall arrange the instruments required for measurement of the machined test piece.	Vendor to Confirm			
19.2.6	Prove out of BHEL component as per Clause 18	Vendor to Confirm			
19.2.7	The machine should be tested for continuous running of 24 hrs. If any break down occurs during this test, the test should be repeated for 24 hrs from that time.	Vendor to Confirm			
19.2.8	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			
19.2.9	Two weeks of independent operation of machine by BHEL (after job prove out) under the supervision of the supplier.	Vendor to Confirm			
19.2.10	5 working days training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works. Cost of training shall be borne by the vendor.	Vendor to Confirm			
19.2.11	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to Confirm			

S. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.2.12	Load Test of table at BHEL Bhopal	Vendor to Confirm			
20.0	PACKING:				
20.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes. If any damage in transit is witnessed, vendor shall be rectifying the same.	Vendor to Confirm			
21.0	WARRANTY :				
21.1	Machine along with all its accessories must be warranted for 24 months from date of acceptance of machine at BHEL Bhopal which is same as date of commissioning. Date of acceptance shall be considered as date of proving and final commissioning of item.	Vendor to Confirm			
22.0	GENERAL : The vendor should submit the following information:				
22.1	Machine Model	Vendor to Specify			
22.2	Total connected load (KVA):	Vendor to Specify			
22.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to Specify			
22.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to Confirm			

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22.5	Total weight of the machine	Vendor to Specify			
22.6	Weight of heaviest part of machine	Vendor to Specify			
22.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to Specify			
22.8	We are having EOT crane of maximum 25 T capacity, beyond which supplier has to make arrangements for lifting at his risk and cost.	Vendor to Confirm			
22.9	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to Specify			
22.10	Vendor to submit, along with offer, the reference list of customers where similar machines have been supplied mentioning the customer, Machine Model, major specifications of the supplied machine, CNC System, Year of Supply etc.	Vendor to Confirm			
22.11	Detailed catalogues, sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to Confirm			
22.12	Hydraulic, Pneumatic & oil piping's should be preferably metallic except places where flexible piping's are essential. All the pipes required for the same shall be included in the standard scope of the machine including first filling of oil.	Vendor to Confirm			

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23.0	QUALIFYING CONDITIONS :				
23.1	The vendor must be an Original Equipment Manufacturer (OEM)	Vendor to Confirm			
23.2	<p>a) Only those Indian vendors (OEMs) should quote who have supplied and commissioned at least One "T" TYPE SINGLE COLUMN CNC HORIZONTAL BORING MACHINE of same {Spindle Power: 37 KW, Table load capacity: 12 Tons, Table longitudinal traverse (X-Axis): 2500 mm, Headstock vertical travel (Y-Axis): 2000 mm, Column cross traverse (Z -Axis): 1500 mm, Spindle axial traverse (W -Axis): 800 mm} or higher sizes, in the past 10 years (on the date of opening of Tender)</p> <p>(i) In at least one country other than the country of Origin or (ii) in India</p> <p>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.</p> <p>b) However, such Indian machine tool vendors (OEMs), who do not meet specified qualifying conditions [clause 23.2(a)], can quote if they meet all of the following conditions:</p> <p>i) They have running Collaboration / Joint Venture / Joint Working Arrangement with a foreign partner (OEM) who meets all of the qualifying criteria as mentioned in clause 23.1 and sub clauses 23.2(a). Vendor should submit proof of the same.</p>	Vendor to Confirm			

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	<p>ii) The Collaboration / Joint Venture / Joint Working Arrangement of the Indian Machine Tool manufacturer with its foreign partner (OEM) should be of at least 2 years old (on the date of opening of tender). Vendor should submit proof of the same.</p> <p>iii) The Indian Machine Tool manufacturer should have supplied and commissioned at least one such machine (Refer clause 23.2(a)) after Collaboration / Joint Venture / Joint Working Arrangement with a foreign partner (OEM) 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.</p> <p>iv) Such Indian machine tool vendors (OEMs) shall have to submit from their foreign partner a back to back guarantee for satisfactory performance of the offered machine in compliance to all specified tender requirements.</p> <p>NOTE :</p> <p>1. BHEL reserves the right to accept or reject the OEMs based on the assessment of their technical and financial capability.</p> <p>2. In respect of Indian vendors (OEMs) against (b) above, BHEL reserves the right to accept or reject both the Indian vendors (OEMs) & their Foreign Partners based on the assessment of their technical and financial capability.</p>				

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23.3	<p>Vendor to submit PO copy as per below mentioned details:</p> <p>a) Copy of Purchase Order (PO) in the name of Indian OEM for the machine as per clause 23.1 & clause 23.2 is to be submitted along with the offer. The type, make and model number of the machine should be clearly mentioned in the PO copy.</p> <p>b) In case offer submitted by Indian (OEM) is as per clause 23.2 (b), Purchase order (PO) copy in the name of foreign partner (OEM) meeting qualifying criteria as per clause 23.1 & clause 23.2 is also to be submitted in addition to PO copy mentioned in clause 23.3 (a). The type, make and model number of the machine should be clearly mentioned in the PO copy.</p>	Vendor to Submit			
23.4	Vendor to submit erection & commissioning certificate of machine supplied against submitted PO as per clause 23.3 (a) . Certificate to clearly mention date of commissioning.	Vendor to Submit			
23.5	<p>Performance certificate (in the name of Indian OEM) from the customers regarding satisfactory performance of machine supplied to them vide Purchase Order as per clause 23.3 (a) (Original Certificate or through Email directly from the customer).</p> <p>The original performance certificate may be returned after verification by BHEL, if required.</p> <p>The Performance Certificate submitted should be recently issued (i.e. its date of issue should not be more than 2 year old from the tender opening date) from the customers.</p> <p>Note: Vendor to indicate clearly the PO Number, PO Date and Date of Commissioning/final handover of the machine on the performance certificate.</p>	Vendor to Submit			

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23.6	The following Information should be submitted by the vendor about the companies where referred machine(s) (clause 23.2) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to Confirm			
23.6.1	Name of the customer(s)/company(s)where referred machine is installed	Vendor to Specify			
23.6.2	Complete postal address of the customer(s).	Vendor to Specify			
23.6.3	Month & Year of commissioning	Vendor to Specify			
23.6.4	Model of the machine(s)	Vendor to Specify			
23.6.5	Parameters of machine(s) (Spindle Power, Table load capacity, Axes travel : X Axis, Y Axis, Z Axis & W Axis) and application for which the machine(s) is supplied	Vendor to Specify			
23.6.6	Name and designation of the contact person of the customer(s).	Vendor to Specify			
23.6.7	Phone & E-mail address of the contact person of the customer(s).	Vendor to Specify			

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23.7	<p><u>FINANCIAL PQC:</u> Vendor should have minimum average annual turnover of Rs. 350 lakhs for the last three consecutive financial years. Vendor to submit audited Profit & Loss Account Statement and balance sheet of last three consecutive years as documentary evidence for the same. For Micro & Small Enterprises (MSE) & Start-Up Vendors, in line with GOI circular 1(2)(1)/2016-MA dated 10/03/2016 & 09/02/2017 and Ministry of Finance circular No.F.20/2/2014-PPD(Pt.) dated 20/09/2016, relaxation permitted for prior turnover criteria only. However, prior experience is mandatorily required and no relaxation in this regard shall be given.</p>	Vendor to Confirm & Submit			
23.8	<p>BHEL reserves the right to verify the information provided by the Vendor for the referred machine 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 works .The Travel and Boarding expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false/incorrect the offer shall be rejected.</p>	Vendor to accept & confirm			

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24.0	NETWORKING:				
24.1	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. The networking should have following capabilities.	Vendor to Confirm			
24.1.1	The machine shall appear as a node in the Entire Network. (Network Neighbourhood)	Vendor to Confirm			
24.1.2	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			