

		BHARAT HEAVY ELECTRICAL LIMITED		Enquiry No. :
UNIT'S ADDRESS:				Due Date :
CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)				Supplier Qtn. No.:
				Date :
<p style="text-align: center;">SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC VERTICAL BORER.</p> <p>NOTE:-</p> <p>1. Vendor (OEM) must submit complete information against clause no. 23 (Qualifying condition). The offer meeting this clause would only be processed (OEM : Original Equipment Manufacturer).</p> <p>2. The vendor(OEM) should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be 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.</p> <p>3. The offer and all documents enclosed with offer should be in English language only.</p>				
NAME & ADDRESS OF THE SUPPLIER :				
TELEPHONE NOS.:				
FAX NOS.:				
E-MAIL ADDRESS :				
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC VERTICAL BORER COMPLYING WITH SPECIFICATIONS AS BELOW:				
SNO	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATIONS
				REMARKS

1.0 PURPOSE & WORKPIECE MATERIAL					
1.1 Purpose: This machine is required for facing , OD/ ID turning , Chemfering , boring , profile machining of Heat Exchanger component etc			Vendor to note & accept		
1.2 Work Piece Material: Carbon Steel, Nimonic Steel, Alloy Steel, Stainless Steel, Inconel, Cast Iron, Stellite and Non-Ferrous materials like Aluminium Alloys, Bronze, Copper, Babbitt material etc. having Hardness up to 500 BHN.			Vendor to note & accept		
2 SPECIFICATION: (Minimum requirements)					
2.1 MACHINE CONFIGURATION					
2.1.1 CNC Vertical Borer with Single Ram .			Vendor to note		
2.2 CAPACITY & SIZE					
2.2.1 Maximum Height for Turning & Facing			1600mm or more		
2.2.2 Maximum Turning Diameter			2100mm or more		
2.2.3 Maximum Workpiece Weight			15000 Kg or more		
2.2.4 Maximum Swing Diameter			2500 mm or more		
2.2.5 Minimum Boring Diameter (using standard turning tool holder & tool clamped on the ram)			500mm or less		
2.3 TABLE					
2.3.1 Table Diameter			2000 mm or more		
2.3.2 Load Capacity			15000 Kg or more		
2.3.3 Table Speed (Infinitely Variable)			6-175 RPM		
2.3.4 No. of Speed Ranges			Vendor to specify		
2.3.5 Power of Main Drive (S1 - Continuous Rating) AC			60 kw or more		
2.3.6 The machine should have the capacity to cut Carbon steel with Constant surface speed 120mm /min , Depth of Cut 10mm & Cutting feed 1mm / rev			Vendor to confirm		

2.3.7	Table Motor & Drive Make: FANUC αi or SIEMENS 1PH series spindle motor with matching spindle drive	Vendor to specify			
2.3.8	Table Encoder: FANUC/SIEMENS/HEIDENHAIN rotary encoders for direct reading of actual table rpm	Vendor to specify			
2.3.9	Table encoder for direct reading of table RPM should be mounted at the centre of the table	Vendor to confirm			
2.3.10	No. of Jaws/Vices	4			
2.3.11	Maximum External Clamping Diameter	Vendor to specify			
2.3.12	Minimum External Clamping Diameter (It should be equal or lesser than central bore of table, if possible)	Vendor to specify			
2.3.13	Maximum Internal Clamping Diameter	Vendor to specify			
2.3.14	Minimum Internal Clamping Diameter	Vendor to specify			
2.3.15	Clamping Force of each Jaw.	Vendor to specify			
2.3.16	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	Vendor to specify & submit			
2.3.17	Type of Force Multiplier Mechanism used in Jaws should be explained and Drawings should be submitted.	Vendor to specify & submit			
2.3.18	Maximum permissible Cutting Force	Vendor to specify			
2.3.19	Maximum permissible Torque	Vendor to specify			
2.3.20	RPM at which Max. Torque is available.	Vendor to specify			
2.3.21	Table Torque - Speed diagram should be submitted.	Vendor to submit			
2.3.22	Type of Bearing for the Table : Make & Model no. to be informed by vendor	Vendor to specify			
2.3.23	Bearing of the table should be well-protected from Cutting oil , coolant, hydraulic oil etc.Details to be submitted.	Vendor to confirm & submit			
2.3.24	Size of T - slots, their position and accuracy. Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to submit			
2.3.25	Two perpendicular accurate Slots should be provided at the Center of the table to use for alignment purposes. Sizes (Width & Depth), accuracy etc. of these slots should be furnished along with a Drawing.	Vendor to specify & submit			

2.3.26	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	Vendor to submit			
2.3.27	Diameter, Depth and Accuracy of Center Bore on Table Top Surface.	Vendor to specify			
2.3.28	Single piece construction of machine table	Vendor to specify			
2.3.29	Position of machine table - with ref. to shop floor in vertical direction.	Vendor to specify			
2.4	CROSS RAIL				
2.4.1	Vertical Travel should accommodate the maximum facing height with standard tools & holders	Vendor to specify & confirm			
2.4.2	Vertical Traverse Rate.	Vendor to specify			
2.4.3	No. of Positions.	Vendor to specify			
2.4.4	Distance between each Position/Step	200 mm or less			
2.4.5	Distance of lowest Step from Table Top	800 mm or more			
2.4.6	Distance of highest Step from Table Top	Vendor to specify			
2.4.7	Maximum Height of Cross Rail bottom from Table Top	3200 mm or more			
2.4.8	Minimum Height of Cross Rail bottom from Table Top	Vendor to specify			
2.4.9	Movement of Cross Rail : Through NC Program as well as manually by Push Buttons	Vendor to confirm			
2.4.10	Machine Reference Point should be at Ram Reference Point and it should be updated automatically with movement of Cross Rail	Vendor to confirm			
2.4.11	Details of crossrail movement/positioning/locking mechanism	Vendor to submit			
2.5	TOOL HEAD and RAM				
2.5.1	No. of Columns	Vendor to specify			
2.5.2	No. of Rams	1			
2.5.3	Cross - Section of Ram (It should be rigid enough for trouble free machining with maximum projection of ram and also suitable for specified minimum bore dia)	250mm X 250 mm			

2.5.4	Thread Cutting Capacity - maximum Pitch (1.5 to 50 mm)	Vendor to confirm			
2.5.5	Clamping details for mounting Turning Tool Holders/Attachments on ram, should be submitted.	Vendor to submit			
2.5.6	Clamping Force Available for clamping of Turning Tool Holders/Attachments.	Vendor to specify			
2.5.7	Mounting of Turning Tool Holders and Attachments should be automatic through Program as well as manually through push buttons.	Vendor to specify			
2.6	MAIN TRAVERSES				
2.6.1	Vertical Travel of Ram (Z-Axis) For maximum turning/facing height of 1600mm. (If offered turning height S.No. 2.2.1 is more than 1600 mm, Ram travel should also be increased by half value of increase in turning & Boring height above 1600 mm)	Vendor to confirm			
2.6.2	Horizontal Travel of Ram (positive X-Axis)	1500 mm			
2.6.3	Horizontal Travel of Ram beyond Center of the Table (negative X-Axis)	Vendor to specify & confirm			
2.6.4	Maximum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to specify & confirm			
2.6.5	Minimum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to specify & confirm			
2.7	MACHINE GUIDEWAYS				
2.7.1	Width of Cross Rail guideways	Vendor to specify			
2.7.2	Width of column guideways	Vendor to specify			
2.7.3	X & Z guide ways should be of hydrostatic type (Details should be submitted)	Vendor to confirm & submit			
2.7.4	Hardness of guideways	Vendor to specify			
2.7.5	Metallic Telescopic Covers: Waterproof Telescopic Covers of rust resistant steel should be provided with pads/wipers on both left and right sides of tool head on the crossrail and also above & below the crossrail on both columns covering the guide ways. Joints of telescopic covers should be sealed to avoid mixing of coolant & hydrostatic oil. The movement of telescopic covers should be troublefree and requiring minimum maintenance.	Vendor to confirm			

2.8	FEEDS AND DRIVE SYSTEM				
2.8.1	Feed traverse in X & Z Axes (Infinitely Variable)	0.5 - 5000mm/min			
2.8.2	Rapid traverse in X & Z Axes	10000mm/min			
2.8.3	Feed motors & drives: FANUC ai or SIEMENS 1FT1/FK series AC servo motors with matching AC servo drives	Vendor to specify			
2.8.4	Maximum cutting force permissible on Ram & at what extension	Vendor to specify			
2.8.5	Maximum permissible Cutting Force at Maximum Ram extension	Vendor to specify			
2.8.6	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to submit			
2.8.7	Feed back system for X & Z axes should be Heidenhain sealed linear scales (Details should be submitted).	Vendor to confirm			
2.8.8	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to submit			
2.8.9	Mechanism for locking X & Z axis	Vendor to submit			
2.8.10	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to submit			
2.9	CONSTRUCTION				
2.9.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various components/ assemblies like Column, Cross Rail, Ram head, Table, Guideways/slides, Feed Transmission system, Ram, Hydraulic and Lubrication system, Feedback system etc .of the machine.	Vendor to submit			
2.9.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer.	Vendor to submit			
2.10	OPERATION AND CONTROL SYSTEM				
2.10.1	OPERATOR'S PANEL : Swivelling and sliding type air conditioned operator's pendant of Rittal / Schneider make with complete CNC operator panel (OP) and machine control panel (MCP) of required configuration shall be provided 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 offer & submit			

2.10.2	CNC SYSTEM & FEATURES				
2.10.2.1	Make: FANUC / SIEMENS			Vendor to specify	
2.10.2.2	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	
2.10.2.3	Details of Standard features			Vendor to specify	
2.10.2.4	Details of optional features, recommended by vendor.			Vendor to specify	
2.10.2.5	Details of other features			Vendor to confirm	
2.10.2.5.1	Axes Interpolation: Linear, Circular			Vendor to confirm	
2.10.2.5.2	Max Number of simultaneous interpolation: 2			Vendor to confirm	
2.10.2.5.3	Part Program Storage: 2 MB or more			Vendor to confirm	
2.10.2.5.4	Technology Cycles: Geometry Calculation, standard turning, boring & threading cycles.			Vendor to confirm	
2.10.2.5.5	Graphics simulation (Static and dynamic) of Part Programs and Machining process.			Vendor to confirm	
2.10.2.5.6	Co-ordinate Transformation: Datum shift, rotation, mirror image, scaling factor.			Vendor to confirm	
2.10.2.5.7	Pitch Error compensation (As applicable)			Vendor to confirm	
2.10.2.5.8	Backlash error compensation (As applicable)			Vendor to confirm	
2.10.2.5.9	Zero Offset for all axes			Vendor to confirm	
2.10.2.5.10	Feed override switch 0-120% for all axis			Vendor to confirm	
2.10.2.5.11	Spindle speed override switch 50-120%			Vendor to confirm	
2.10.2.5.12	Provision for safe shut down of CNC Control in case of Power Failure			Vendor to confirm	

2.10.3	HAND HELD UNIT:				
2.10.3.1	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			
2.10.4	MANUAL CONTROL				
2.10.4.1	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 details of all the switches/keys should be submitted.	Vendor to confirm			
2.11	UPS FOR CNC SYSTEM: (Only in case of PC based CNC systems)	Vendor to confirm			
2.11.1	UPS of 15 minutes for CNC system with inbuilt cooling and charge status display is to be supplied only in case of PC based CNC systems.	Vendor to confirm			
2.12	MACHINE LIGHTS				
2.12.1	Machine Lights for sufficient illumination of complete working area on the table, on the ram to view tool inside long casing type jobs and operator's panel also, should be provided for clear visibility.	Vendor to confirm			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to confirm			
2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to confirm			
2.12.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to confirm			
2.12.5	Flashing/Rotary type light indicating end of cutting, program stop, alarm etc. at a easily visible & suitable place.	Vendor to confirm			

2.13	AIR CONDITIONERS / REFRIGERATION UNITS	Vendor to offer and confirm			
2.13.1	Door mounted Air Conditioners with Dehumidifiers of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal 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 50°C). The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/ modules. ACs must be incorporated with electrical/ refrigeration interlocks.	Vendor to offer and confirm			
2.13.2	ACs unit must be mounted on the movable pendent with 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.	Vendor to confirm			
2.13.3	Oil Chiller units of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal/ Gem in package should have minimum 50% standby with multiple refrigeration circuits having energy-efficient HFC-based Hermetically-sealed Rotary/ Scroll/ Reciprocating 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. The units must have In-line Multistage Gear Pumps (with 100% standby), SS Storage Tank, 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 Compressor at ambient temperature of 50°C.	Vendor to offer and confirm			
2.13.4	For precise air/ oil temperature with energy-efficient operation, latest state-of-the-art technology features like constab pressure control, variable speed control of fan-motor, hot-gas bypass control, etc. needs to be incorporated in the above Unit (s).	Vendor to offer and confirm			
2.13.5	Unit (s) must be designed to work in extremely harsh industrial environment and needs protection from heat, dust, fumes, corrosive or oily vapours, moisture, etc. The condenser coil must resist dust accumulation & must transfer heat efficiently.	Vendor to confirm			

2.13.6	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. - Functional requirement of temperature of cool air/ oil to be maintained between range + 15°C to +40°C. - Type of Microprocessor-based Controller with LCD Display with complete functional details. Detailed specifications of all the components fitted in the Unit (s) are to be submitted with BOM, make, etc. in Technical bid. Vendor have to provide leaflet/ catalogue of all the brought-out items, refrigeration accessories and provide schematic layout of the system.	Vendor to specify			
2.13.7	Compressor, Refrigeration Spares Items, PHE (Plate-type Heat Exchanger), Gear Pump, etc. must be available in India and if possible can be repaired, locally. Vendor have to give training to operate, maintain & repair all the individual items and the Chiller/ AC Unit (s) as a whole. Exhaustive training is to be given for electrically integration of the Unit (s) with the CNC machines.	Vendor to confirm			
2.14	HYDRAULIC SYSTEM (Details should be Submitted by the Vendor)	Vendor to submit.			
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor. Complete Hydraulic system should be designed to avoid any leakage or spillage.	Vendor to confirm & offer			
2.14.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to confirm & offer			
2.14.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hydac.	Vendor to confirm & offer			

2.14.4	Failure indication				
2.14.5	Automatic shut off provision, Details should be submitted.			Vendor to offer	
2.14.6	Refrigerated type cooling and electric heating (Electric heating, only if required) system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. keeping in view the specified ambient conditions to be offered with complete details. The temperature of Hydraulic Oil should not go beyond 40 deg. C.			Vendor to offer & submit	
2.14.7	Hydraulic pump capacity (flow / pressure)			Vendor to specify	
2.14.8	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.			Vendor to confirm & offer	
2.15	FIRST FILLING OF OILS				
2.15.1	First filling of all required Oils & Grease etc. for the machine, voltage stabilizer, isolation transformer & air-compressor etc. 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	
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 as well.			Vendor to confirm	
	a) Recirculating Type Flood Coolant System			Vendor to offer	
	b) Air coolant system			Vendor to offer	
2.16.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.			Vendor to offer	
2.16.3	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 case, any leakage is found, it shall be corrected by vendor. Additionally, suitable equipment should be provided at deepest point of foundation pit to pump out collected oil/coolant up to shop floor.			Vendor to confirm & offer	

2.16.4	Coolant Filtration System: Recirculating type coolant system with Vacuum Rotary drum type Coolant Filtration System and magnetic separator. The filtration system should be mounted at shop floor level, if possible with provision to avoid leakage/spillage of coolant.	Vendor to confirm and submit details.			
2.16.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.	Vendor to submit			
2.16.6	Coolant pumps & motor details etc. for all types of coolant variants	Vendor to specify			
2.16.7	Coolant Tank Capacity	Vendor to specify			
2.16.8	Pressure & rate of flow of coolant for different coolant variants for turning operations should be furnished in the offer. The coolant should be able to reach tool tip at full pressure.	Vendor to specify			
2.16.9	All types of coolant variants should be switchable through program as well as manually by push buttons provided on the Operator's control panel.	Vendor to confirm			
2.16.10	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to confirm			
2.16.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			
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. 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 note			
2.17.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm			
2.17.3	Electrical cabinets should be of Rittal/Schneider make properly air conditioned and sealed from ingress of liquids and encroachment of rodents	Vendor to confirm			

2.17.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm			
2.17.5	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. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
2.17.6	Motors shall conform to IEC or Indian Standards	Vendor to confirm			
2.17.7	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			
2.17.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm			
2.18	SAFETY ARRANGEMENTS	Vendor to confirm			
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 and messages (with device identification) on CNC display and panels should be available.	Vendor to confirm			
2.18.3	A detailed list of all alarms / indications provided on machine along with cause and remedy 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			
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.	Vendor to confirm			
2.19	ENVIRONMENTAL PERFORMANCE OF THE MACHINE : The Machine should conform to following factors related to environment :	Vendor to offer			
2.19.1	Maximum noise level shall be 85 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, if required. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm			
2.19.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.19.3	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			
2.19.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.19.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.19.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			

3.0	CHIP CONVEYOR				
3.1	An elevating type chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on shop floor (on either side of the machine) should be provided at appropriate location. Metallic chutes should be provided all around the table for smooth collection of chips upto opening of chip conveyor.	Vendor to offer			
3.2	Type of chip conveyor	Hinged type or superior			
3.3	Width of conveyor	Vendor to specify			
3.4	Elevation of chip conveyor for chip bin	Vendor to specify			
3.5	Material of chip conveyor (should be rust resistant)	Vendor to specify			
3.6	Provision for smooth collection of chips from all-around table to the conveyor and for avoiding clogging of chips should be provided. Removable Grill/Mesh type rigid covers should be provided above some portion of the chip conveyor, to enable machine operator's access to chip conveyor from shop floor for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor.	Vendor to confirm			
3.7	Operation of chip conveyor (forward & reverse) should be possible through push buttons on operator's panel and also near chips disposal point/chip bin.	Vendor to confirm			
3.8	Layout showing location of chip conveyor should be submitted.	Vendor to submit			
3.9	CHIP BIN of appropriate size of Indian make, with wheels, lifting hooks & handle for movement.	Vendor to confirm			
4	ULTRA ISOLATION TRANSFORMER :				
4.1	Ultra Isolation Transformer (of reputed Indian make) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
4.2	Make: NEEL or Aplab or Auto Electric or Servomax	Vendor to specify			
4.3	Model, Rating & Input/Output Voltage etc.	Vendor to specify			

4.4	Catalogue of the Ultra Isolation Transformer (copy of relevant pages) shall be submitted with the offer.	Vendor to submit			
5	PNEUMATIC SYSTEM :				
5.1	AIR COMPRESSOR :				
5.1.1	Independent Air/Oil cooled, Screw Type Air Compressor (of reputed Indian make Elgi or Ingersol Rand) with refrigerated type Dryer & Filter of suitable/sufficient capacity with all required accessories for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply (having pressure 5-6 bar with little moisture/dirt content) could be used as and when required. The compressor unit should be suitable for continuous duty considering specified power supply & ambient conditions...	Vendor to offer			
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			
5.1.4	Refrigerant used	Vendor to specify			
5.1.5	Output Air Quality (Pressure Dew Point in degree Celsius, Residual mist/oil content in ppm etc.). It should be odor-free.	Vendor to specify			
5.1.6	Noise level (Maximum 80 db)	Vendor to specify			
5.1.7	Spares Package for the Air Compressor and Refrigerator type Dryer etc. for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit			
5.2	COMPRESSED AIR POINTS :				
5.2.1	Compressed Air Point with connections for Air Coolant System mentioned at Sl. No. 2.16.1	Vendor to offer			
5.2.2	Suitably located Compressed Air Point near machine table with manually operated ON/ OFF Valve and flexible pipe of suitable length for cleaning of workpiece, tools and work area etc.	Vendor to offer			

6	TOOLINGS :					
6.1.1	Standard (Conventional) tool holder for 40*40mm tool shank with direct clamping of tools for internal / external turning, Axial / Radial & LH/RH facing operations with provision for clamping 32*32mm shank tools with packing pieces.	Vendor to offer				
6.1.2	General adapter for turning with flange type clamping or equivalent so that special tool holders manufactured by BHEL could be clamped for use in future.	Vendor to offer				
6.1.3	LH cassette for 40*40mm tool shank, Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer				
6.1.4	RH cassette for 40*40mm tool shank, Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer				
6.1.5	LH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer				
6.1.6	RH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer				
6.2	TOOLING FOR MACHINING OF PROVE-OUT COMPONENTS					
6.2.1	All types of required tools, inserts, holders, adapters, fixtures & clamping elements, in sufficient quantity for all types of operations like turning, boring, grooving, threading, profiling etc., as recommended by the vendor, should be offered for complete proveout machining to meet required drawing accuracy & surface finish . These tooling items shall be in addition to the tools mentioned above at clause 6.0 . List with item's nomenclature, quantity & copies of relevant pages of catalogue to be submitted by vendor	Vendor to offer				

6.2.2	Consumables (e.g. inserts, screws, shims etc.) for the tools offered for the proveout components should be quoted for machining of two more same components by BHEL after proveout and commissioning of the machine.	Vendor to offer			
6.3	ADDITIONAL TOOLING REQUIREMENTS				
6.3.1	Mounting details of each type of toolings to be explained & submitted with the help of drawings / sketches.	Vendor to submit			
6.3.2	Offered tooling system to be rigid to carryout machining without undue vibration, which can effect job accuracy and surface finish in extreme machining conditions like max. overhang of ram etc.	Vendor to confirm			
6.3.3	In case of order, manufacturing drgs., catalogues & source of all tooling items should be submitted by vendor.	Vendor to confirm			
6.3.4	Supplier should offer all tools & inserts with latest cutting geometries & grades to achieve high productivity and cutting parameters.	Vendor to confirm			
6.3.5	All supplied tool holders, boring bars, cassettes, adapters etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations like grooving, turning etc. Provision for external coolant should also be provided.	Vendor to offer			
6.3.6	Offered tooling system to be rigid to carryout machining in extreme conditions like max. overhang of tool carriers etc. without undue vibration, which can effect job accuracy and surface finish.	Vendor to confirm			
6.3.7	Additional 2 nos. of offered Vices (Complete with jaw, force multiplier,screw, fasteners etc.)	Vendor to offer			

7	DIAGNOSTIC SYSTEMS					
7.1	TELE-DIAGNOSTIC SERVICE :			Vendor to confirm		
7.1.1	Tele diagnostic service package consisting of Modem and other hardware with all necessary software package for remote diagnosis and resolution of faults of CNC System and PLC of the machine should be offered. With this facility, complete CNC-PLC system can be looked at and operated from remote controlled PC of supplier so that errors can be recognized and changes or correction can be made from supplier's end. Tele-diagnostic service should be provided through International telephone lines. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future.			Vendor to confirm		
7.2	FAULT DIAGNOSTIC SYSTEM :			Vendor to confirm		
7.2.1	All alarms and messages should be displayed on the CNC monitor with device ID numbers. Additionally, softcopy and hardcopy of all alarms and messages with cause and remedial measures must be supplied.			Vendor to confirm		
8	LEVELING & ANCHORING SYSTEM:			Vendor to offer		
8.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment of table/ram and to fix the machine to the foundation should be supplied. Details to be submitted.					
9	TOOLS FOR ERECTION, OPERATION & MAINTENANCE					
9.1	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 by the vendor. List of such tools should be submitted with offer.			Vendor to offer		
9.2	Set of Test Mandrels/Cylindrical Bars for checking table run-out & alignment of ram etc. should be supplied with protection boxes.			Vendor to offer		

10	CHIP & SPLASH GUARD				
10.1	Movable Chip / Splash Guards of sufficient height and made of rust resistant material (painted), shall be provided all around the Table (on front side of columns) to avoid spilling of Coolant and scattering of Chips on Operator's Panel and Shop Floor. Front part of splash guards shall be movable provided with safety glass for clear visibility of job to the operator.	Vendor to offer			
10.2	Additionally a fixed type of splash/ chip guard of atleast full turning height should be provided on rear side of machine i.e. around rear portion of table between columns .	Vendor to offer			
10.3	Movable splash guard should have interlock for table rotation. Opening of guards on front side of table should suit maximum possible size of the job which can be loaded on the table. The guards should not provide any hindrance with complete vertical movement of crossrail/ATC on both sides of the table.	Vendor to confirm			
10.4	Drawing of Chip/Splash Guards (pre-liminary) showing total height, layout and other details of the same should be submitted.	Vendor to submit			
11	SPARES : (Optional : to be quoted seperately)				
11.1	Itemised breakup of mechanical ,hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to offer			
11.1.1	Mechanical & Hydraulic Spares : Following Spares are to be offered.	Vendor to offer			
11.1.1.1	Pumps used on machine i.e. Hydraulic, Hydrostatic, Lubrication, Coolant and Oil Cooling etc. recirculating system (1 no. each type).	Vendor to offer			
11.1.1.2	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 no. of each type)	Vendor to offer			

11.1.1.3	Pressure switches, flow switches used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 No. of each type)	Vendor to offer			
11.1.1.4	All types of regenerative type filter inserts (10 No. of each type)	Vendor to offer			
11.1.1.5	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer			
11.1.1.6	All types of Accumulators with charging kit (1 no. of each type)	Vendor to offer			
11.1.1.7	One set of belts (including timing belt) used in the machine.	Vendor to offer			
11.1.1.8	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer			
11.1.1.9	One set of hose pipe with end connection used in the machine.	Vendor to offer			
11.1.1.10	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.	Vendor to offer			
11.1.1.11	All types of shaft seals (2 no. of each type), O-rings & Piston Rings (5 nos. of each type) used in the machine.	Vendor to offer			
11.1.1.12	One set of pneumatic filtration / condensate drain system.	Vendor to offer			
11.1.2	Electrical / Electronic / CNC Spares : Following Spares are to be offered.	Vendor to offer			
11.1.2.1	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
11.1.2.2	Relays (2 Nos each type)	Vendor to offer			
11.1.2.3	Contactors (2 Nos each type)	Vendor to offer			
11.1.2.4	RTD temperature transmitter (1 No each type)	Vendor to offer			
11.1.2.5	Proximity Switches (2 Nos each type)	Vendor to offer			
11.1.2.6	Push Buttons (5 Nos each type)	Vendor to offer			
11.1.2.7	Indicating Lamps (10 Nos each type)	Vendor to offer			
11.1.2.8	Semiconductor Fuses (5 Nos each type)	Vendor to offer			
11.1.2.9	Special Fuses (5 Nos each type)	Vendor to offer			
11.1.2.10	Circuit Breakers (1 No each type)	Vendor to offer			

11.1.2.11	Main Power Switch (1 No each type)	Vendor to offer			
11.1.2.12	Encoders (1 No each type)	Vendor to offer			
11.1.2.13	Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
11.1.2.14	Wave shape unit/ EXE unit (1 No each type)				
11.1.2.15	PCBs of the CNC controller (1 No each type)	Vendor to offer			
11.1.2.16	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type)	Vendor to offer			
11.1.2.17	I/O Cards for PLC (1 No each type)	Vendor to offer			
11.1.2.18	Servo Motors for Feed Drives (1 No each type)	Vendor to offer			
11.1.2.19	Operator Panel, Machine Control Panel, Hand Held Unit (1 No each)	Vendor to offer			
11.1.2.20	One each of the following items : Any other auxiliary drive , if used, Complete Proportional Valve Controller, if used.	Vendor to offer			
11.2	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 sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor to confirm			
11.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor to confirm			
12	DOCUMENTATION : Four sets of Hard Copies (Print form) and four sets of soft copies (on CD/DVD) of the following documents in English language should be supplied along with the machine	Vendor to offer			

12.1	Operating manuals of Machine & CNC system	Vendor to offer			
12.2	Programming Manuals of Machine & CNC system	Vendor to offer			
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 offer			
12.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives and position feedback system.	Vendor to offer			
12.5	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.	Vendor to offer			
12.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer			
12.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer			
12.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Isolation Transformer, Air-Compressor and all supplied Accessories.	Vendor to offer			
12.9	Electrical Schematics of the machine with comments in English.	Vendor to offer			
12.10	PLC program with symbols & comments in English.	Vendor to offer			
12.11	Soft copy of complete machine data and PLC project with symbols and comments in English	Vendor to offer			
12.12	Complete software back-up (Ghost) of hard disk (only in case of PC based CNC system) on DVD	Vendor to offer			
12.13	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer			
12.14	Drawings of machine assemblies/sub-assemblies/parts including Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list marked on it in English.	Vendor to offer			
12.15	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer			

13	PROVEOUT MACHINING OF BHEL COMPONENTS							
13.1	Drawings No. 21750540372 of proveout components are enclosed. Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor (Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing). Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.				Vendor to accept & offer			
13.2	Vendor shall be fully responsible for machining 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.							
13.3	Separate package price for proveout machining of each component shall be quoted.				Vendor to confirm			
14	TRAINING							
14.1	Four BHEL Persons should be trained at vendor's works (2 weeks in each area) (a) CNC Part Programming for the machine, application of all CNC Features & other supplied accessories etc. (b) Electronic & CNC maintenance for machine & other supplied equipments (c) Electrical, Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipments Pre-dispatch inspection (ref. SI.No. 19.1) of the machine shall also be carried out by the team during their stay at vendor's works for the training. Vendor may specify days required for pre-dispatch inspection. BHEL reserves the right to choose no. of persons, field & period of training, out of above, while deputing their engineers for training.				Vendor to accept & confirm			
14.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.				Vendor to note			

14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm & offer			
14.4	Vendor should commit & offer to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works/training school for advanced features and specialized training, if so required by BHEL.	Vendor to confirm & offer			
14.5	Training charges, if any, for training requirement at Sl.No. 14.1 & 14.4 should also be quoted on per Man-day basis so that training charges can be derived for the agreed period & persons, in case of any change.	Vendor to confirm & offer			
15	FOUNDATION				
15.1	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. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details viz. 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 including space requirement for Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of vendor and at vendor's responsibility. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Vendor should arrange equipments required for the testing of foundation, if required.	Vendor to confirm & offer			
16	ERECTION & COMMISSIONING				
16.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. 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 and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to offer			

16.2	Erection & Commissioning of indigenously supplied items like Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to offer			
16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause no. 19 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to offer			
16.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be arranged and brought by the supplier. Out of the complete supply, all tools, tackles, mandrels etc. which may be required by BHEL to maintain the machine, after commissioning, shall not be taken back by vendor. Other equipment including Laser equipment shall be arranged by vendor on returnable basis. Vendor to offer accordingly.	Vendor to accept			
16.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to accept			
16.6	All Cover Plates, sheets/plates for chutes for chips flow etc. required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor to accept			
16.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
16.8	Duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to submit			
16.9	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. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer			
17	ACCURACIES				
17.1	GEOMETRICAL ACCURACIES				
17.1.1	Geometrical Accuracy Tests shall be in accordance with DIN 8609 / ISO 3655 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			

17.1.2	Table Flatness	Vendor to specify			
17.1.3	Table Radial Runout (at 2.0 M dia)	Vendor to specify			
17.1.4	Table Axial Runout	Vendor to specify			
17.1.5	Cylindricity of turning	Vendor to specify			
17.1.6	True roundness of turning	Vendor to specify			
17.1.7	Facial run-outs	Vendor to specify			
17.1.8	All other accuracies to conform to specified standard (Latest Revision) or Suppliers Test chart whichever is finer and more accurate.	Vendor to confirm			
17.1.9	All the Geometrical accuracies including test pieces machining for turning & grinding operations etc. should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works. Test pieces are to be supplied by vendor for test pieces machining both at vendor's works & at BHEL's works. Drawings of test pieces to be submitted with the offer.	Vendor to confirm			
17.1.10	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
17.2	POSITIONING & REPEATABILITY ACCURACIES				
	(Should be measured as per VDI/DGQ 3441 - Latest Revision) CHECKING BY USING LASER INTERFEROMETER.	Vendor to confirm			
17.2.1	Positioning accuracy in X axis (Pa) per 1000 mm ($\pm 0.005\text{mm}$ or 0.01mm)	Vendor to confirm			

17.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm ($\pm 0.005\text{mm}$ or 0.01mm)	Vendor to confirm			
17.2.3	Repeatability in X axis (Ps) per 1000 mm 0.007mm	Vendor to confirm			
17.2.4	Repeatability in Z axis (Ps) per 1000 mm 0.007mm	Vendor to confirm			
17.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to specify & Confirm			
17.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to specify & Confirm			
17.2.7	Backlash on reversal in X axis (U) = 0.01 mm	Vendor to confirm			
17.2.8	Backlash on reversal in Z axis (U) = 0.015 mm	Vendor to confirm			
17.2.9	Total positioning error along X & Z axes (P) = 0.02 mm	Vendor to confirm			
17.2.10	Total positioning error along X & Z axes over entire traverse (P)	Vendor to specify & Confirm			
17.2.11	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
17.2.12	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works.	Vendor to confirm			
18	OPERATING CONDITIONS & THERMAL STABILITY :				
18.1	Total machine including all supplied items should work trouble free and should give specified accuracies under existing power supply and ambient operating conditions, as mentioned below at SI. Nos. 18.2 & 18.3	Vendor to confirm			
18.2	Power Supply (AC): Voltage = 415V +10% / -10% of fluctuations , Frequency= 50Hz +3% / -3% , No. of phases = 3 phase 3 wire without neutral.	Vendor to confirm			

18.3	<p>Ambient Operating Conditions: Temperature = 5 to 48 degree Celsius Relative Humidity = 95% max. 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 without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor.</p>	Vendor to confirm			
18.4	<p>Thermal Stability: Thermal Stability of the complete machine and all supplied items keeping in view the specified Ambient Conditions at Sl.No. 18.3, specified accuracies, machining requirements of BHEL component and trouble free operation of the machine to be ensured by vendor. Since the machine shall be installed in shop with operating conditions as per Sl.No.18.3, the vendor shall ensure to have provisions in the machine for achieving the drawing accuracies on the job under these conditions. Accordingly, Vendor to ensure that machine is suitable for above and provisions on the machine for the suitability should be included by Vendor.</p>	Vendor to confirm			
18.5	<p>The machine, including attachments and accessories, should be suitable for continuous operation to its full capacity for 24 hours a day and 7 days a week throughout year. Vendor to ensure and confirm the same.</p>	Vendor to confirm			
19	MACHINE ACCEPTANCE (Tests/Activities to be performed & demonstrated by Vendor)				
19.1	<p>Tests/Activities to be carried out at vendor's works on the machine before dispatch : All these activities (As per Sl.Nos. 19.1.1 to 19.1.5) shall be part of pre-dispatch inspection of the machine which shall be carried out by BHEL's team during their stay at vendor's works for PDI & training. Report of the same shall be submitted to BHEL by vendor.</p>	Vendor to confirm			

19.1.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values (SI.No. 17.1)	Vendor to confirm			
19.1.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values (SI.no. 17.2)	Vendor to confirm			
19.1.3	The machine should be tested for continuous running of 48 hrs. If any breakdown occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to confirm			
19.1.4	Demonstration of all features of the machine, control system & accessories/attachments	Vendor to confirm			
19.1.5	Machining of test piece as per AFNOR/ISO/NAS for turning operations etc. Vendor to supply test pieces.	Vendor to confirm			
19.2	Tests/Activities to be carried out at BHEL works while commissioning the machine : as per SI. Nos. 19.2.1 to 19.2.10	Vendor to confirm			
19.2.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values (SI.No. 17.1)	Vendor to confirm			
19.2.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values (SI.no. 17.2)	Vendor to confirm			
19.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm			
19.2.4	The machine should be tested for continuous running of 48 hrs. If any breakdown occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to confirm			
19.2.5	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			
19.2.6	Demonstration by actual use of all supplied accessories to their full capacity for required applications.	Vendor to confirm			

19.2.7	Machining of test piece as per AFNOR/ISO/NAS for turning & grinding operations etc. Vendor to supply test pieces and required tools for their machining. Drawing of test pieces & list of offered tools to be submitted.	Vendor to confirm			
19.2.8	Successful machining of proveout components to required drawing accuracies as per SI. No. 13	Vendor to confirm			
19.2.9	Two weeks of supervision by Vendor of independent operation of machine by BHEL after job proveout.	Vendor to confirm			
19.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works. This training is in addition of the training specified at SI. No. 14	Vendor to confirm			
20	PACKING				
	PACKING : 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 dispatched in containers, all small loose items shall be suitably packed in boxes. Indigenous supply items like Voltage Stabiliser, Isolation Transformer, Air Compressor etc. should be fully packed in proper rigid boxes for safe transportation and avoiding pilferages.	Vendor to confirm			
21	GUARANTEE				
	Guarantee for complete machine and all supplied accessories/equipments for 24 months from the date of acceptance of the machine.	Vendor to confirm			
22	GENERAL				
22.1	Machine Model No.	Vendor to specify			
22.2	Total connected load (KVA)	Vendor to specify			

22.3	Total Space required (Length, Width, Height) for complete machine, accessories/attachments and other supplied items like Voltage Stabilizer, Isolation Transformer & Air compressor etc.	Vendor to specify			
22.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to specify			
22.5	Total weight of the machine	Vendor to specify			
22.6	Vendor to submit reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, CNC System, Table Dia, Max. Turning Dia, Max. Turning Height, RPM, Load Carrying Capacity, Main Drive Rating and detail of accessories/attachments, if any, etc.	Vendor to submit			
22.7	Detailed catalogues, sketches / drawings / photographs pertaining to the offered machines and accessories / attachments/items should be submitted with the offer.	Vendor to submit			
22.8	Hydraulic, Pneumatic & Oil piping should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be supplied by the vendor.	Vendor to confirm			
22.9	All Cables and Hoses etc. should be well supported & protected in trays/brackets/drag chains etc.	Vendor to confirm			
23	QUALIFYING CONDITIONS				
23.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC VERTICAL BORING MACHINE of same (Table diameter 2.0M, Load Capacity 15 Tons & Max Turning Height 1.6M) or higher sizes in the past ten years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year (on the date of opening of Tender) after commissioning, should quote. The following information should be submitted by the vendor about the companies where referred machine (s) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to confirm			

23.2	Name of the customer / company where referred machine is installed.	Vendor to specify			
23.3	Complete postal address of the customer.	Vendor to specify			
23.4	Month & Year of commissioning.	Vendor to specify			
23.5	Parameters of machine(s) supplied (Table diameter, Max. Turning Height, Table Load Carrying Capacity) and application for which the machine is supplied.	Vendor to specify			
23.6	Name and designation of the contact person of the customer.	Vendor to specify			
23.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to specify			
23.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them issued within one year of tender opening.	Vendor to submit			
23.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to confirm			
24	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. This network to be connected to wide area network/Internet. The networking should have following capabilities.	Vendor to confirm			
24.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm			
24.3	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			
24.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm			

25	MACHINE MONITORING SYSTEM (MMS) SIGNALS					
25.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals should be sourced from a PLC output card separately.			Vendor to confirm		
25.2	a) Control ON			Vendor to confirm		
25.3	b) Cycle ON			Vendor to confirm		
25.4	c) Spindle Running			Vendor to confirm		
25.5	d) Feed Active (Any of the axes moving)			Vendor to confirm		
25.6	e) M30 (Program Stop)			Vendor to confirm		
25.7	f) Alarm Active			Vendor to confirm		