

	<u><b>BHARAT HEAVY ELECTRICAL LIMITED</b></u> <u>UNIT'S ADDRESS:</u>  <u>UNIT'S PHONE NOS.</u>  <u>CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL</u> <u>(FROM PURCHASE DEPTT.)</u>			Enquiry No. :  Due Date :  Supplier Qtn. No.:  Date :		
<u><b>SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR CNC VERTICAL BORING MACHINE</b></u>						
<b>NOTE:-</b>						
<b>1. Vendor must submit complete information against clause no. 24.0 The offer meeting this clause would only be processed.</b>						
<b>2. The "Offered" Column and where applicable, the "Deviations" &amp; "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.</b>						
<b>3. The offer and all documents enclosed with offer should be in English language only.</b>						
<b>ADDRESS OF THE SUPPLIER :</b>						
<b>TELEPHONE NOS.:</b>						
<b>FAX NOS.:</b>						
<b>E-MAIL ADDRESS :</b>						
<b>SCOPE: SUPPLY, ERECTION &amp; COMMISSIONING OF CNC VERTICAL BORER COMPLYING WITH SPECIFICATION AS BELOW</b>						
SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS	
						1.0 PURPOSE & WORKPIECE MATERIAL

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.1	Purpose: (Operations/Jobs involved): For machining of Stator frames of the AC motors. Drgs of some of the represattative components are attached.	Vendor to confirm			
1.2	Work Piece Material: (Material detail, Hardness etc.) : Fabricated Structure of structural steel with plates of 8 to 30 mm thick to have shape of stator frame of electric motor. Hardness may be upto 35 HRC.				
<b>2.0</b>	<b>SPECIFICATION:</b>				
<b>2.1</b>	<b>MACHINE CONFIGURATION</b>	Indentor			
	Machine should be single ram type with hydrostatic lubrication of ram as well as crossslide.				
<b>2.2</b>	<b>CAPACITY &amp; SIZE</b>				
2.2.1	Maximum Workpiece Height 3.2 m.	Vendor to confirm			
2.2.2	Maximum Workpiece Diameter 3.5 m	Vendor to confirm			
2.2.3	Maximum Workpiece Weight 15 tons	Vendor to confirm			
2.2.4	Maximum Swing Diameter 3.5 m	Vendor to confirm			
2.2.5	Maximum Turning Diameter 3.5 m	Vendor to confirm			
2.2.6	Minimum Boring Diameter 500 mm	Vendor to confirm			
2.2.7	Maximum Height for Turning & facing 3.2 m	Vendor to confirm			
<b>2.3</b>	<b>TABLE</b>				
2.3.1	Table Diameter, 3.5 m	Vendor to confirm			
2.3.2	Load Capacity, 15 ton	Vendor to confirm			
2.3.3	Table Speed ( Infinitely Variable ) 0 - 100 rpm	Vendor to confirm			
2.3.4	Power of Main Drive ( SI - Continuous Rating ) AC / DC, 60 KW	Vendor to confirm			
2.3.5	Details of Main Drive viz.Type, Make, Model etc.Siemens / FANUC	Vendor to confirm			
2.3.6	No. of Jaws 4 Standard & 4 Optional	Vendor to confirm			
2.3.7	Maximum External Clamping Diameter	Vendor to specify			

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2.3.8	Minimum External Clamping Diameter	Vendor to specify			
2.3.9	Maximum Internal Clamping Diameter	Vendor to specify			
2.3.10	Minimum Internal Clamping Diameter	Vendor to specify			
2.3.11	Clamping Force of each Jaw suitable to meet cutting forces	Vendor to specify			
2.3.12	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	Vendor to specify			
2.3.13	Type of Force Multiplier Mechanism used in Jaws, if any , should be explained and Drawings should be submitted.	Vendor to specify			
2.3.14	Maximum permissible Cutting Force	Vendor to specify			
2.3.15	Maximum permissible Torque	Vendor to specify			
2.3.16	RPM at which Max. Torque is available.	Vendor to specify			
2.3.17	Table Torque - Speed diagram should be submitted.	Vendor to specify			
2.3.18	Type of Bearing for the Table : Complete details like bearing diameters, etc. should be furnished.	Vendor to specify			
2.3.19	Size of T - slots, their position and accuracy. Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to specify			
2.3.20	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			
2.3.21	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	Vendor to specify			
2.3.22	Diameter, Depth and Accuracy of Center Bore on Table Top Surface.	Vendor to specify			

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<b>2.4</b>	<b>CROSS RAIL</b>				
2.4.1	Vertical Travel. 2250 mm	Vendor to 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	Vendor to specify			
2.4.5	Distance of lowest Step from Table Top	Vendor to specify			
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	Vendor to specify			
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 - should be confirmed.	Vendor to specify			
2.4.10	Machine Reference Point should be at Ram Reference Point and it should be updated automatically with movement of Cross Rail - should be confirmed.	Vendor to specify			
2.4.11	Details of crossrail movement	Vendor to specify			
<b>2.5</b>	<b>CROSS RAIL TOOL HEAD and RAM</b>				
2.5.1	No. of Columns, 2	Vendor to confirm			
2.5.2	No. of Rams, 1	Vendor to confirm			
2.5.3	Cross - Section of Ram, 250 x 250 approx	Vendor to confirm			
2.5.4	Tread Cutting Capacity - min/ maximum Pitch, 1.5 mm/500 mm	Vendor to confirm			
2.5.5	Minimum dia of bore using ram, Vendor to specify	Vendor to confirm			
2.5.6	Clamping details for mounting Turning Tool Holders/Attachments on ram, should be submitted.	Vendor to specify			
2.5.7	Clamping Force Available for clamping of Turning Tool	Vendor to specify			
<b>2.6</b>	<b>MAIN TRAVERSES</b>				
2.6.1	Vertical Travel of Ram (Z-Axis) , 1500	Vendor to confirm			
2.6.2	Horizontal Travel of Ram ( +ve X - Axis )	Vendor to specify			
2.6.3	Horizontal Travel of Ram beyond Center of the Table ( -ve X - Axis )	Vendor to specify			

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2.6.4	Maximum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to specify			
2.6.5	Minimum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to specify			
<b>2.7</b>	<b>MACHINE GUIDEWAYS:</b>				
2.7.1	Width of Cross Rail guideways	Vendor to specify			
2.7.2	Width of column guideways	Vendor to specify			
2.7.4	Hardness of guideways	Vendor to specify			
2.7.5	<b>Metallic Telescopic Covers</b> of rust resistant material should be provided with wipers for all axes guide ways. Provision to avoid mixing of coolant & hydrostatic oil should be provided.	Vendor to specify			
<b>2.8</b>	<b>FEEDS AND DRIVE SYSTEM:</b>				
2.8.1	Cutting feed in X - Axis ( Infinitely Variable ) 0.01 mm/rev to 2 mm/rev	Vendor to confirm			
2.8.2	Cutting feed in Z - Axis ( Infinitely Variable ) 0.01 mm/rev to 2 mm/rev	Vendor to confirm			
2.8.3	Rapid feed in X - Axis 3 m/min	Vendor to confirm			
2.8.4	Rapid feed in Z - Axis 3 m/min	Vendor to confirm			
2.8.5	X - Axis Feed Drives / Motors [AC servo motors] Make- Siemens / Fanuc digital servo type (detail like model, make, type, rating etc. should be submitted)	Vendor to specify			
2.8.6	Z-Axis Feed Drives / Motors [AC servo motors] Either Siemens or Fanuc digital type (detail like model, make, type, rating etc. should be submitted)	Vendor to specify			
2.8.7	Maximum cutting force permissible on Ram and at what extension	Vendor to specify			
2.8.8	Maximum permissible Cutting Force at Maximum Ram extension	Vendor to specify			
2.8.9	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to specify			

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2.8.10	Feed back system for X & Z axes. Heidenhain linear scales with pressurised compressed air cleaning (Details should be submitted)	Vendor to specify			
2.8.11	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to specify			
2.8.12	Mechanism for locking X & Z axis	Vendor to specify			
	<b>2.9 CONSTRUCTION:</b>				
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 specify			
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 specify			
	<b>2.10 OPERATOR'S PLATFORM:</b>				
2.10.1	It may be independent motorised type, movable / adjustable in vertical and horizontal directions or it may be attached to the machine cross rail .  Positions of the gates provided in the platform for Operator's convenience should be informed by the Vendor . Drawing / Details of the Operator's Platform should be submitted.A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform	Vendor to specify			
2.10.2	Horizontal movement of complete Platform for independent platform, in case independent	Vendor to specify			
2.10.3	Vertical movement of complete Platform to cover total turning height for independent platform, in case independent	Vendor to specify			
2.10.4	Height of Railing.	Vendor to specify			
2.10.5	Weight Capacity of the Platform.	Vendor to specify			
2.10.6	Minimum Position of Platform from Shop Floor in case of independent platform.	Vendor to specify			

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2.10.7	Movable Chip / Splash Guard should be provided all around the Machine/ Table with sufficient height to avoid spilling of Coolant and scattering of Chips on Operator's Platform and Shop Floor. Details of the same should be submitted.	Vendor to specify			
	<b>2.11 OPERATION AND CONTROL SYSTEM:</b>				
	<b>2.11.1 OPERATOR'S PANEL:</b>				
2.11.1.1	Swiveling type operator's panel having complete CNC and machine control system with CRT of required configuration shall be provided on the operators platform in case of independent platform or at a suitable location near the machine on floor. All switches with suitable interlock with table rotation should be within reach of operator of average height (Indian) for easy & safe operation. All displays / indications should also be conveniently placed accordingly. Layout showing complete details should be submitted.	Vendor to specify			
2.11.1.2	An auxiliary pendant, which can be taken to the table for job setting and similar other purposes, should be provided.	Vendor to specify			
	<b>2.11.2 CNC SYSTEM &amp; FEATURES :</b>				
2.11.2.1	Make : Siemens / FANUC	Vendor to confirm			
2.11.2.2	Model latest at the time of Delivery (Latest version, as available at the time of ordering, should be supplied).	Vendor to confirm			
2.11.2.3	Details of Standard features	Vendor to specify			
2.11.2.4	Details of optional features, recommended by vendor.	Vendor to specify			
2.11.2.5	Details of other optional features	Vendor to specify			

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2.11.2.6	The system should have full alphanumeric keyboard, TFT colour display(10.4" or more), additional draw-out type Query Key Board and mouse in suitable enclosure, RS232C serial interfaces, USB port parallel interface for printer, COM port for telediagnostics, network ready with LAN, electronic hand wheels for all axes, hard disk of sufficient capacity <b>(Largest size available at the time of order shall be supplied)</b> , graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor)	Vendor to specify			
	<b>2.11.3 MANUAL CONTROL :</b>				
2.11.3.1	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, table / spindle rpm, cutting feed on / off, display of axis position values etc, for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor to specify			
	<b>2.11.4 HAND HELD UNIT:</b>				
2.11.4.1	Hand Held unit, with axis selection switch, feed, overside switches, feed forward reverse Jog emergency, etc. alongwith sufficient length of interfacing cable is to be offered with complete details.	Vendor to confirm			
	<b>2.11.5 UPS FOR CNC SYSTEM:</b>				
2.11.5.1	UPS of 30 minutes for CNC system with inbuilt cooling and charge status display	Vendor to specify			
	<b>2.12 MACHINE LIGHTS:</b>				
2.12.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to specify			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to specify			



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2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to specify			
2.12.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to specify			
2.12.5	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm			
	<b>2.13 AIR CONDITIONERS:</b>				
2.13.1	Air Conditioners with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Detailed specifications of the same are to be submitted. Peak ambient Summer temp- 48 deg.C.	Vendor to specify			
	<b>2.14 HYDRAULIC SYSTEM : Details should be Submitted by the Vendor</b>				
2.14.1	The System should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to specify			
2.14.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to specify			
2.14.3	Filtration System Required	Vendor to confirm			
2.14.4	Failure indication Required	Vendor to confirm			
2.14.5	Automatic shut off provision. Details should be submitted.	Vendor to specify			
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, and gearbox oil, etc. at a temperature not exceeding 40 deg C irrespective of the ambient conditions. Complete details should be submitted	Vendor to specify			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to specify			
2.14.8	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to confirm			
2.14.9	<b>First filling of all required Oils &amp; Grease etc.</b> 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 specify			

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2.15	<b>COOLANT SYSTEM :</b>				
2.15.1	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 specify			
	a) Recirculating Type Flood Coolant System	Vendor to specify			
2.15.2	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 specify			
2.15.3	Coolant collection and recirculation system should be leakproof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to specify			
2.15.4	<b>Coolant Filtration System:</b> Recirculating type coolant system with centrifugal Hydrocyclone System/ Vacuum Rotary drum type System/ Cartridge Type Filtration System and magnetic separator. <b>(Type of system to be specified by Indentor).</b>	Vendor to specify			
2.15.6	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to specify			
2.15.7	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 specify			
2.15.8	Coolant Tank Capacity	Vendor to specify			
2.15.9	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 specify			
2.15.10	Coolant pump & motor details for all variants	Vendor to specify			
2.15.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			

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<b>2.16</b>	<b>ELECTRICAL :</b>				
2.16.1	415V + 10% / -10%, 50HZ +/-3 HZ, 3 Phase AC (3 wire system with out neutral) Power Supply Voltage 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 is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm			
2.16.2	<b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized	Vendor to specify			
2.16.3	All electrical & electronic control cabinets & panels should be dust and vermin proof				
2.16.4	All electrical components in the cabinets should be mounted on DIN Rail/ equivalent	Vendor to specify			
2.16.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220 Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to specify			
2.16.6	Motors shall conform to IEC or Indian Standards	Vendor to specify			
2.16.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm			
2.16.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm			
2.16.9	In-cycle hour counter with reset facility. Required	Vendor to confirm			
<b>2.17</b>	<b>SAFETY ARRANGEMENTS:</b>	Vendor to specify			
	Following safety features in addition to other standard safety features should be provided on the machine:				

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	1. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.				
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.				
	3. 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.				
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.				
	5. Emergency Switches at suitable locations as per International Norms should be provided.				
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.				
2.18	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b>	Vendor to specify			
	The Machine shall conform to following factors related to environment :				
	(a) 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. Supplier to demonstrate compliance to noise level, if so required.				
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.				
	(c) 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.				
	(d) No hazardous chemicals shall be required to be used in the machine.				

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	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.				
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.				
	<b>3.0 CHIP CONVEYOR :</b>				
3.1	Elevating chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on floor, should be provided at the side of the machine. One Chip bins of appropriate size of Indian make, with wheels & handle for movement, should also be supplied.	Vendor to specify			
3.2	Type of chip conveyor belt type/suitable	Vendor to confirm			
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 flow of chips to the conveyor.	Vendor to specify			
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to specify			
3.9	Layout showing location of chip conveyor should be submitted.	Vendor to specify			
	<b>4.0 SERVO VOLTAGE STABILIZER:</b>				
4.1	Indian make Oil / Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabiliser output.	Vendor to confirm			
4.2	Make Neel or equivalent	Vendor to confirm			
4.3	Model & Rating	Vendor to specify			
4.4	Spares Package for the Voltage Stabiliser for 2 years working should also be offered.	Vendor to specify			
4.5	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to specify			

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<b>5.0</b>	<b>ULTRA ISOLATION TRANSFORMER</b>				
5.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be supplied	Vendor to confirm			
5.2	Make Neel or equivalent	Vendor to confirm			
5.3	Model and Rating	Vendor to specify			
5.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to specify			
5.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to specify			
<b>6.0</b>	<b>PNEUMATIC SYSTEM:</b>				
<b>6.1</b>	<b>AIR COMPRESSOR:</b>				
6.1.1	Independent Air Compressor (of reputed Indian make) 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 system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to specify			
6.1.2	Make & Model of Air Compressor				
6.1.3	Make & Model of Refrigerated Air Dryer	Vendor to specify			
6.1.4	Capacity (Flow, Pressure & KW)	Vendor to specify			
<b>6.2</b>	<b>COMPRESSED AIR POINTS:</b>				
6.2.1	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning required.	Vendor to confirm			



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9.0	<b>LEVELING &amp; ANCHORING SYSTEM</b>				
9.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to specify			
10.0	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE :</b>				
10.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to specify			
10.2	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor to specify			
11.0	<b>ACCESSORIES:</b> (Details of Accessories / other attachment may be mentioned by Vendors .	Vendor to specify			
12.0	<b>SPARES:</b>				
12.1	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: <b>(Unit Price of each item of spare should be offered)</b>	Vendor to specify			
	<b>a) Mechanical &amp; Hydraulic Spares:</b> All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to specify			



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	<b>b) Electrical/Electronic / CNC Spares:</b> 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, Floppy Disk 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			
12.2	All types of spares for total machine and accessories should be available for atleast 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 specify			
12.3	Recommended set of spares for all attachments are to be offered with details.	Vendor to specify			
12.4	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 specify			
<b>13.0</b>	<b>DOCUMENTATION :</b> Five sets of following documents (Hard copies) in English language should be supplied along with the machine	Vendor to specify			
13.1	Operating manuals of Machine & CNC system				
13.2	Programming Manuals of Machine & CNC system				
13.3	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				
13.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.				
13.5	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.				

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13.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.				
13.7	Detailed specification of all rubber items and hydraulic/lube fittings				
13.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.				
13.9	PLC program print-outs with comments in English.				
13.10	PLC program NC Data on CD.				
13.11	Complete back-up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new hard disk.				
13.12	Complete Master List of parts used in the machine shall be submitted by the vendor.				
13.13	One additional set of all the above documentation on CD ROM, wherever possible.				
<b>14.0</b>	<b>TRAINING</b>				
14.1	BHEL Persons should be trained at supplier's Works for mutually agreed period in the area of (a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipments.	Vendor to specify			
14.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.				
14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to specify			
14.4	Vendor to quote for training on man / week basis	Vendor to specify			

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14.5	Vendor should commit to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL	Vendor to specify			
	<b>15.0 FOUNDATION :</b>				
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. whichever is earlier. Soil condition data will be furnished by BHEL along with 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 Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor to specify			
	<b>16.0 ERECTION &amp; COMMISSIONING</b>				
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 specify			
16.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to specify			

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16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at <b>clause 20</b> (Machine Acceptance) shall form part of the commissioning activity.	Vendor to specify			
16.4	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor to specify			
16.5	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier. .	Vendor to specify			
16.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to specify			
16.7	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates should be sourced from India	Vendor to specify			
16.8	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.	Required			
16.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to specify			
16.10	Charges, duration, terms & conditions for E&C should be furnished in detail	Vendor to specify			
	<b>17.0 ACCURACY TESTS:</b>				
	<b>17.1 GEOMETRICAL ACCURACIES :</b>				
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 specify			

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17.1.2	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm			
17.2	<b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY:</b>  <b>Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.</b>				
17.2.1	Positioning uncertainty in X axis (P) per 1000 mm as per standard 0.015	Vendor to confirm			
17.2.2	Positioning deviation in X axis (Pa) per 1000 mm as per standard 0.015	Vendor to confirm			
17.2.3	Positioning scatter in X axis (Ps) per 1000 mm as per standard 0.015 mm	Vendor to confirm			
17.2.4	Backlash on reversal in X axis (U) as per standard 0.01 mm	Vendor to confirm			
17.2.5	Positioning uncertainty in Z axis (P) per 1000 mm as per standard 0.02	Vendor to confirm			
17.2.6	Positioning deviation in Z axis (Pa) per 1000 mm as per standard 0.02	Vendor to confirm			
17.2.7	Positioning scatter in Z axis (Ps) per 1000 mm as per standard 0.015 mm	Vendor to confirm			
17.2.8	Backlash on reversal in Z axis (U) as per standard 0.015 mm	Vendor to confirm			
17.2.9	Positioning accuracy over entire traverse in X axis 0.03 mm	Vendor to confirm			
17.2.10	Positioning accuracy over entire traverse in Z axis 0.03 mm	Vendor to confirm			

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17.2.11	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor to specify			
	<b>18.0 AMBIENT CONDITIONS &amp; THERMAL STABILITY :</b>				
18.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V - 10%, +10% Frequency: 50 Hz +3%, - 3% No. of phases = 3 Ambient Conditions: Temperature = 5 to 48 degree celsius Relative Humidity = 95% max. (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)	Vendor to specify			
19.2	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 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)	Vendor to specify			
18.2	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. (Confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished)	Vendor to specify			
18.3	The machine, including attachments and accessories, should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure and confirm the same.	Vendor to specify	18	Surface quality required in grinding	Ra 0.4 to 0.8 microns

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<b>19.0</b>	<b>PROVEOUT OF BHEL COMPONENTS :</b>				
19.1	Drawings of proveout components are enclosed. Vendor to submit preliminary process, time study & tool list recommended by them along with the offer. Change in process/tools may be mutually discussed and agreed. 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 should submit the CNC programs, setting schemes, process sheets, tooling layouts, time studies etc. in advance for the prove out components. 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.	Vendor to confirm.			
19.2	Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.				
<b>20.0</b>	<b>MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)</b>	Should be accepted & confirmed by Vendor			
<b>20.1</b>	<b>Tests/Activities should be carried out at supplier's works on the machine before dispatch :</b>				
20.1.1	Geometrical accuracies as per test chart.	Vendor to confirm			
20.1.2	Positioning accuracies as per VDI-DGQ/3441	Vendor to confirm			
20.1.3	The machine should be tested for continuous running of 10 hrs. If any break down occurs during this test, the test should be repeated for another 10 hrs from that time.	Vendor to confirm			

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20.1.4	Demonstration of all features of the machine, control system & accessories	Vendor to confirm			
20.1.5	Machining of test piece as per NAS / AFNOR / ISO. Vendor to supply test piece and tooling for it's machining.	Vendor to confirm			
20.2	<b>Tests/Activities should be carried out at BHEL works while commissioning the machine :</b>	Vendor to confirm			
20.2.1	Geometrical accuracies as per test chart.	Vendor to confirm			
20.2.2	Positioning accuracies as per VDI-DGQ/3441	Vendor to confirm			
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm			
20.2.4	The machine should be tested for continuous running of 10 hrs. If any break down occurs during this test, the test should be repeated for 10 hrs from that time.	Vendor to confirm			
20.2.5	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			
20.2.6	Machining test piece as per NAS/AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.	Vendor to confirm			
20.2.7	Proveout machining.	Vendor to confirm			
20.2.8	Two weeks supervision by supplier of independent operation of machine by BHEL after handing over the m/c.	Vendor to confirm			
20.2.9	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm			
20.2.10	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm			



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<b>21.0</b>	<b>PACKING:</b>				
21.1	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	Vendor to specify			
<b>22.0</b>	<b>GUARANTEE :</b>				
22.1	24 months from the date of acceptance of the machine.	Vendor to specify			
		Vendor to specify			
<b>23.0</b>	<b>GENERAL :</b>				
23.1	Machine Model	Vendor to specify			
23.2	Total connected load (KVA):	Vendor to specify			
23.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify			
23.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm			
23.5	Total weight of the machine	Vendor to specify			
23.6	Weight of heaviest part of machine	Vendor to specify			
23.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify			
23.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify			
23.9	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Table diameter, Load Capacity, Maximum Turning Diameter, Max Turning Height, Main Drive Rating, CNC System etc	Vendor to specify			
23.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer required.	Vendor to confirm			
23.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to specify			

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<b>24.0</b>	<b>REFERENCE LIST / QUALIFYING CONDITIONS :</b>				
24.1	Only those vendors, who have supplied and commissioned at least one CNC VERTICAL BORING MACHINE of same or higher sizes ( Table diameter, Load Capacity & Max Turning Height) for similar applications in the past ten years (on the date of opening of tender) and such machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of tender ) , should quote. However if such machine(s) has/had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of tender ) in BHEL should quote. The following information should be submitted by the vendor about the companies where similar machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to specify			
	1. Name of the customer / company where similar machine is installed.	Vendor to confirm			
	2. Complete postal address of the customer.	Vendor to confirm			
	3.Month & Year of commissioning.	Vendor to confirm			
	4. Application for which the machine is supplied .	Vendor to confirm			
	5. Name and designation of the contact person of the customer.	Vendor to confirm			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to confirm			
	7. Performance certificate from the customers regarding satisfactory performance of machine supplied to them in original.	Vendor to confirm			
	8.BHEL reserves the right to verify information provided by vendor.In case the information provided by vendor is found to be false/incorrect,the offer shall be rejected.	Vendor to confirm			
<b>25.0</b>	<b>OTHER FEATURES:</b>				
<b>25.1</b>	<b>NETWORKING:</b>				
25.1.1	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			

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	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm			
	b) 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			
	c) The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm			
<b>25.2</b>	<b>MACHINE MONITORING SYSTEM (MMS) SIGNALS</b>				
25.2.1	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			
	a) Control ON				
	b) Cycle ON				
	c) Spindle Running				
	d) Feed Active (Any of the axes moving)				
	e) M30 (Program Stop)				