

	<b><u>BHARAT HEAVY ELECTRICAL LIMITED</u></b>				Enquiry No. :
	<b><u>UNIT'S ADDRESS:</u></b>				Due Date :
	<b><u>UNIT'S PHONE NOS.</u></b>				Supplier Qtn. No.:
	<b><u>CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)</u></b>				Date :
<b><u>SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR CNC VERTICAL TURRET LATHE MACHINE</u></b>					
<b>NOTE:-</b>					
1. Vendor(OEM) must submit complete information against clause no. 22.0 The offer meeting this clause would only be processed.					
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.					
3. The offer and all documents enclosed with offer should be in English language only.					
<b>ADDRESS OF THE SUPPLIER :</b>					
<b>TELEPHONE NOS.:</b>			<b>ADDRESS OF THE INDIAN AGENTS :</b>		
<b>FAX NOS.:</b>			<b>TELEPHONE NOS.:</b>		
<b>E-MAIL ADDRESS :</b>			<b>FAX NOS.:</b>		
			<b>E-MAIL ADDRESS :</b>		
<b>SCOPE: SUPPLY, ERECTION &amp; COMMISSIONING OF CNC VERTICAL TURRET COMPLYING WITH SPECIFICATION AS BELOW-</b>					

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS		
<b>1.0 PURPOSE &amp; WORKPIECE MATERIAL</b>							
1.1	Purpose: - A CNC vertical Lathe is required for Turning, Boring & Facing operations on soft and also hardened & carburized Traction Gears. Both Ram type Vertical boring machine with 6 stations Tool changer and a Vertical Turret Lathe with 6 post Tool Turret are acceptable.	Vendor to confirm					
1.2	Work Piece Material:-Alloy Steel Hardness RC 22 to 63.	Vendor to confirm					
<b>2.0 SPECIFICATION:</b>							
<b>2.1 MACHINE CONFIGURATION</b>	: - CNC machine with movement for axial , radial , worktable rotation and tool changing.	Vendor to confirm					
<b>2.2 CAPACITY &amp; SIZE</b>		Vendor to confirm					
2.2.1	Maximum Height for Turning.	1000 mm					
2.2.2	Maximum Workpiece Diameter .	1000 mm					
2.2.3	Maximum Workpiece Weight.	1000 kg					
2.2.4	Maximum Swing Diameter.	1200mm					
2.2.5	Maximum Turning Diameter. ( It should be possible to carry out facing operation on a job of OD 1000 mm & height 1000mm , Suitable clearance between job and Tool should be provided.)	1000 mm					
2.2.6	Minimum Boring Diameter.	100mm					
2.2.7	Depth of cut -12 mm, at a feed rate of 1mm/rev at 150 m/min. cutting speed.	Vendor to confirm					
<b>2.3 TABLE</b>							
2.3.1	Table Diameter min.- 1200 mm.	Vendor to confirm					
2.3.2	Load Capacity- 3000 kg.	Vendor to confirm					
2.3.3	Table Speed ( Infinitely Variable ) 0 - 350 rpm.	Vendor to confirm					
2.3.4	No. of Gear Ranges for complete speed Range.	vendor to specify					

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2.3.5	Power of Main Drive ( S1 - Continuous Rating ) AC / DC	vendor to specify			
2.3.6	Details of Main Drive viz. Type, Make, Model etc.	vendor to specify			
2.3.7	No. of Jaws - Four.	Vendor to confirm			
2.3.8	Maximum External Clamping Diameter-1000 mm.	Vendor to confirm			
2.3.9	Minimum External Clamping Diameter - 250 mm.	Vendor to confirm			
2.3.10	Maximum Internal Clamping Diameter- 1000 mm.	Vendor to confirm			
2.3.11	Minimum Internal Clamping Diameter - 350 mm.	Vendor to confirm			
2.3.12	Clamping Force of each Jaw.	vendor to specify			
2.3.13	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	vendor to specify			
2.3.14	Type of Force Multiplier Mechanism used in Jaws should be explained and Drawings should be submitted.	vendor to specify			
2.3.15	Maximum permissible Cutting Force.	vendor to specify			
2.3.16	Maximum permissible Torque.	vendor to specify			
2.3.17	RPM at which Max. Torque is available.	vendor to specify			
2.3.18	Type of Bearing for the Table : - Complete details like bearing type, diameters, sizes of pockets etc. should be furnished.	vendor to specify			
2.3.19	Four perpendicular accurate Slots of 28 mm should be provided on table for alignment purposes . 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	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	vendor to specify			
2.3.21	Table Bore Diameter, Depth and Accuracy - on Center of Table Top Surface.	vendor to specify			
2.3.22	Table Clamping Mechanism - (Drawing should be submitted.)	vendor to specify			
2.3.23	Feed back system - Heidenhain Encoder (Details should be submitted)	Vendor to confirm			

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2.4	Surface finish - of Ra 1.6 micron, min.,required on turned component.	Vendor to confirm			
2.5	RAM / TURRET				
2.5.1	Vertical Traverse - 1000 mm.	Vendor to confirm			
2.5.2	Vertical Traverse Rate -5000 mm/min.	Vendor to confirm			
2.5.3	Horizontal Traverse of Ram center beyond the table center, on both directions .	vendor to specify			
2.5.4	Horizontal traverse rate -5000 mm/min.	Vendor to confirm			
2.5.5	No. of tool post- 6, out of which 2 should be for boring bar adapter of dia. 80 mm and 4 tool of shank size 32x32 mm .	Vendor to confirm			
2.5.6	Details of the tool changing/indexing system should be submitted separately for ATC / Turret .	vendor to specify			
2.6	MACHINE GUIDEWAYS:				
2.6.1	X & Z guideways - All details as construction, hardness, type, lubrication etc.should be submitted.	vendor to specify			
2.6.2	<u>Metallic Telescopic Covers</u> of rust resistant material should be provided with wipers for all axes guide ways. Provision to avoid mixing of coolant & hydrostatic/hydraulic oil should be provided.	Vendor to confirm			
2.7	FEEDS AND DRIVE SYSTEM:				
2.7.1	Cutting feed in X - Axis ( Infinitely Variable )-1000 mm/min.	Vendor to confirm			
2.7.2	Cutting feed in Z - Axis ( Infinitely Variable )- 1000 mm/min.	Vendor to confirm			
2.7.3	Rapid feed in X - Axis- 5000 mm/min.	Vendor to confirm			
2.7.4	Rapid feed in Z - Axis- 5000 mm/min.	Vendor to confirm			
2.7.5	X-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 confirm			

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2.7.6	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 confirm			
2.7.7	Maximum cutting force permissible on Ram and at what extension.	Vendor to confirm			
2.7.8	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to confirm			
2.7.9	Feed back system for X & Z axes. Heidenhain linear scales with pressurised compressed air cleaning (Details should be submitted).	Vendor to confirm			
2.7.10	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to confirm			
2.7.11	Mechanism for locking X & Z axis.	Vendor to confirm			
<b>2.8</b>	<b>CONSTRUCTION:</b>				
2.8.1	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 confirm			
2.8.2	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 confirm			
<b>2.9</b>	<b>OPERATOR'S PENDANT:</b>				
2.9.1	Operator's Pendant should be provided. A power receptacle (220VAC, 1F) with ON/ OFF switch is also to be provided on the pendant. It should be ergonomic for operator to operate the machine, including job loading, unloading, clamping & unclamping the jobs.	vendor to confirm			
2.9.2	Splash / Safety guards for protection of operator, operator's panel and to avoid spillage of coolant & chips .	vendor to confirm			

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<b>2.10</b>	<b>OPERATION AND CONTROL SYSTEM:</b>				
<b>2.10.1</b>	<b>OPERATOR'S PANEL:</b>				
2.10.1.1	CNC operator panel with colour LCD/TFT screen and machine operator panel of required configuration shall be provided on the operators platform. All switches on the Operator's panel should be within reach of operator of average height (160 cms) for convenient, efficient & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details of the panel should be submitted.	vendor to confirm			
<b>2.10.2</b>	<b>CNC SYSTEM &amp; FEATURES :</b>				
2.10.2.1	Make: Fanuc/Siemens	Vendor to confirm			
2.10.2.2	Details of Standard operating/programming features. List to be submitted.	Vendor to specify			
2.10.2.3	Details of optional features, recommended by vendor, to be submitted.	Vendor to specify			
2.10.2.4	The system should have full alphanumeric keyboard with TFT colour display (10.4" or more), RS232C serial interfaces, network ready with LAN, graphic simulation, <b>onscreen PLC online LADDER display</b> with editing facilities. (Details should be submitted by Vendor)	Vendor to confirm			
<b>2.10.3</b>	<b>MANUAL CONTROL :</b>				
2.10.3.1	Complete manual operation of machine must be possible through the machine control/operator panel. The machine operator panel must have +/- jog keys and selector switches for required axis, spindle inch key, spindle ON/OFF keys, Spindle override switch, Feed On/OFF keys, Feed override switch, Cycle START/STOP keys and keys for auxiliary functions as per requirement. Diagram/ Sketches for switches/ keys provided on operators pendant to be submitted.	vendor to confirm			

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<b>2.10.4</b>	<b>HAND HELD UNIT:</b>				
2.10.4.1	An auxiliary handheld operator's panel with display, handwheel (MPG) and jog keys for movement of axes and spindle for job setting and similar other purposes, should be provided.	vendor to confirm			
<b>2.10.5</b>	<b>UPS FOR CNC SYSTEM:</b>				
2.10.5.1	UPS of 30 minutes for CNC system with charge status display for automatic shutdown of machine should be provided only if a PC based CNC system is offered. (Battery charging /discharging time should be specified by vendor) Max. capacity required 1KVA.	vendor to confirm			
<b>2.11</b>	<b>MACHINE LIGHTS:</b>				
2.11.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	vendor to confirm			
2.11.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	vendor to confirm			
2.11.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	vendor to confirm			
2.11.4	Flashing / rotary type PILOT Lamps indicating Program Running, Program Stop and Alarm status should be provided.	vendor to confirm			
2.11.5	Indicators should be of clustered LED type.	Vendor to confirm			
<b>2.12</b>	<b>PANEL AIR CONDITIONERS:</b>				
2.12.1	Closed-Loop, Ductable Stand-alone Panel/Pendent ACs with Dehumidifiers of sufficient capacity to be provided for all Electrical /Electronics Enclosures /Cabinets including Operator's Panel/Pendant. These ACs must operate on ecofriendly refrigerant gas & at an ambient of 50° C max.All necessary safety Interlock in DDC Microprocessor as per AC&R norms must be incorporated.Complete detail specifications with software and circuit diagrams are to be submitted for AC section approval . <b>Indigeneous supply will be preferred</b> .	vendor to confirm			
2.12.2	make and capacity .	vendor to specify			

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2.13	<b>HYDRAULIC &amp; LUBRICATION SYSTEM : Details should be Submitted by the Vendor</b>	vendor to confirm			
2.13.1	The System should be centralised. Hydraulic Tank shall preferably be located at floor level	vendor to confirm			
2.13.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	vendor to confirm			
2.13.3	Filtration System	vendor to confirm			
2.13.4	Failure indication	vendor to confirm			
2.13.5	Automatic shut off provision. Details should be submitted.	vendor to confirm			
2.13.6	Refrigerated type cooling system of sufficient capacity to maintain a temperature not exceeding 30 ° C even when the ambient temperature reaches 50 °C of complete Hydraulic System, including hydraulic oil, lubrication oil , cutting oil etc. Detail specifications with schematic layout ,software & circuit diagrams are to be submitted for AC section approval.Make and capacity .Two compressor should be provided for cooling of all oil ,both compressor shall work alternatively (one at a time ) to enable longer life of compressor . The compressor should switch over automatically during operation of cooling unit with adjustable time period of 1 hr. to 5 hrs.The cooling unit circuit shall have PLC/ DDC Microprocessor control and should have electrical protecting device like overload relays.single phase preventor etc.	vendor to confirm			
2.13.7	Hydraulic pump capacity (flow / pressure)	vendor to confirm			
2.13.8	Each pump should have an independent motor. Tandem pumps should not be used	vendor to confirm			
2.13.9	<b>First filing 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 confirm			
2.14	<b>COOLANT SYSTEM :</b>				
2.14.1	Coolant System-Recirculating Type Flood Coolant System with all accessories shall be provided. It shall be controlled through program and push buttons as well.	vendor to confirm			



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2.14.2	All attachments, tool holders, boring bars, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	vendor to confirm			
2.14.3	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 confirm			
2.14.4	<b>Coolant Filtration System:</b> Recirculating type coolant system with chips separator and removal. Details to be submitted.	vendor to confirm			
2.14.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	vendor to confirm			
2.14.6	Pressure & rate of flow of coolant should be furnished in the offer. The Pressure should be sufficient for the coolant to reach the tool tip at full pressure.	vendor to confirm			
2.14.7	Coolant Tank Capacity min. 500 litres.	vendor to confirm			
2.14.8	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			
2.14.9	Coolant pump & motor details for all variants.	vendor to confirm			
2.14.10	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	vendor to confirm			
2.14.11	Rinsing pistol for cleaning of remaining chips by coolant oil should be provided.	vendor to confirm			
	<b>2.15 ELECTRICAL :</b>				
2.15.1	415 ±10% V, 50±3% HZ. 3 Phase AC (3 wire system with out neutral) Power Supply Source 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			

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2.15.2	<b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized.	vendor to confirm			
2.15.3	All electrical & electronic control cabinets & panels should be dust and vermin proof. Class IP 55.	vendor to confirm			
2.15.4	All electrical components in the cabinets should be mounted on DIN Rail	vendor to confirm			
2.15.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	vendor to confirm			
2.15.6	Motors shall conform to IEC Standards.	vendor to confirm			
2.15.7	All cables outside the electrical cabinet should be oil and coolant resistant and routed in metal armoured flexible conduits. Further, all cables moving with traversing axes should be of trailing type and installed in Caterpillars/Cable Drag chains.	vendor to confirm			
2.15.8	Vendor should ensure the proper earthing for the machine and its peripherals.	vendor to confirm			
2.15.9	In-cycle hour counter with reset facility.	vendor to confirm			
<b>2.16</b>	<b>SAFETY ARRANGEMENTS:</b>	vendor to confirm			
	Following safety features in addition to other standard safety features should be provided on the machine:				
	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.				

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	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.				
	<b>2.17 ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b>	vendor to confirm			
	The Machine shall conform to following factors related to environment :				
	(a) Maximum noise level shall be 80 dB at normal load condition, 1 M away from the machine with correction factor for back ground noise, if necessary.				
	(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.				
	(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.				

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<b>3.0</b>	<b>CHIP CONVEYOR :</b>				
3.1	Elevating type 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. Two Chip bins of appropriate size of Indian make, with wheels & handle for movement, should also be supplied.	vendor to confirm			
3.2	Material of chip conveyor (should be rust resistant)	vendor to confirm			
3.3	Provision for smooth flow of chips to the conveyor.	vendor to confirm			
3.4	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor.	vendor to confirm			
3.5	Layout showing location of chip conveyor should be submitted.	vendor to confirm			
<b>4.0</b>	<b>ULTRA ISOLATION TRANSFORMER</b>				
4.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be supplied	vendor to confirm			
4.2	Make (To be specified by indentor as per the practice of units.)	vendor to confirm			
4.3	Model and Rating	vendor to confirm			
4.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered, if recommended.	vendor to confirm			
4.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	vendor to confirm			
<b>5.0</b>	<b>PNEUMATIC SYSTEM:(If required for running of the machine)</b>				
<b>5.1</b>	<b>AIR COMPRESSOR:</b>				
5.1.1	Independent Rotary/Screw type Air Compressor (preferably Atlas Copco,Ingersol Rand or Elgi 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 before Refrigerated type Air Dryer so that BHEL compressed air supply having pressure <b>(60psi)</b> could be used as and when required. The compressor unit should be suitable for continuous duty operation.	vendor to confirm			
5.1.2	Make & Model of Air Compressor	vendor to confirm			
5.1.3	Make & Model of Refrigerated Air Dryer	vendor to confirm			

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5.1.4	Capacity (Flow, Pressure & KW)	vendor to confirm			
	<b>5.2 COMPRESSED AIR POINTS:</b>				
5.2.1	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	vendor to confirm			
	<b>6.0 Tooling System:</b>	vendor to confirm			
6.1.2	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 deep grooving, turning etc. Provision for external coolant shall also be provided.	vendor to confirm			
6.1.2	All types of tool holders, adapters, sleeves, arbors, boring bars, etc. required for the machine.	vendor to confirm			
6.1.3	All cutting tools, tool holders, arbors, boring bars, clamping elements etc recommended for machining of proveout components as mentioned in clause 17.2.	vendor to confirm			
	<b>7.0 DIAGNOSTIC SYSTEM</b>				
	<b>7.1 FAULT DIAGNOSTIC SYSTEM:</b>				
7.1.1	Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include customised auto-diagnostic system with supporting hardware and software which shows detailed cause and remedy for the fault on the display ,online ladder display for PLC should be provided.	vendor to confirm			
	<b>8.0 LEVELING &amp; ANCHORING SYSTEM</b>				
8.1	Complete levelling & anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc shall be supplied for the Machine, Rotary Table, Floor Plates etc.	vendor to confirm			
9.0	<b>TOOLS FOR ERECTION, COMMISSIONING, OPERATION &amp; MAINTENANCE :</b>				

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9.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	vendor to confirm			
9.2	Test mandrel for checking run-out/taper & alignment should be supplied	vendor to confirm			
<b>10.0 SPARES:</b>					
10.1	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.	vendor to confirm			
	<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 confirm			
	<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, Main motor, Feed Motors, Power Modules & Control Cards for Main Drive and Feed Drives, all spares for CNC controller, Display unit, PLC system and auxiliary controllers.	vendor to confirm			
10.2	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 confirm			
10.3	Recommended set of spares for all attachments are to be offered with details.	vendor to confirm			

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10.4	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 confirm			
11.0	<b>DOCUMENTATION :</b> Five sets of following documents (Hard copies) in English language should be supplied along with the machine	vendor to confirm			
11.1	Operating manuals of Machine & CNC system, Drives, PLC and feedback system				
11.2	Programming Manuals of Machine & CNC system				
11.3	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				
11.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives PLC, feedback system and any other controller used in the machine.				
11.5	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.				
11.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.				
11.7	Detailed specification of all rubber items and hydraulic/lube fittings				
11.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.				
11.9	PLC program print-outs <b>with comments in English</b> .	Vendor to confirm			

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11.10	PLC program and complete Machine data on CD.	Vendor to confirm			
11.11	Complete back-up of hard disk (in case of PC based systems) on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new hard disk. Spare hard disk with complete software to be provided.	Vendor to confirm			
11.12	Complete Master List of parts used in the machine shall be submitted by the vendor.	Vendor to confirm			
11.13	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm			
	<b>12.0 Pre Dispatch Inspection and Training:-</b>				
12.1.1	All the Pre dispatch Inspection (clause 15) at Supplier's works will be done in presence of BHEL persons. Complete Geometric tests and Positioning ,Repeatability test as per VDI/DGQ3441, using Laser Interferometer, will be shown to BHEL persons .	vendor to confirm			
12.1.2	Machining of Test Gear wheel. The test gears should be of size approximately equal to the jobs mentioned in clause17.2.	vendor to confirm			
12.2	BHEL Persons should be trained at supplier's Works for 10 working days per person in the area of (Total 40 man days)- (a) Operation of the complete machine & other supplied equipments. (b) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc (c) Electrical, Electronic & CNC maintenance for machine & other supplied equipments. (d) Mechanical & Hydraulic maintenance of the machine & other supplied equipments.	vendor to confirm			
12.3	Air-fare, boarding & lodging for the BHEL personnel shall be borne by BHEL.	vendor to confirm			
12.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	vendor to confirm			
12.5	Vendor to quote for training on man / day basis	vendor to confirm			
12.6	Vendor should commit to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training .	vendor to confirm			



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<b>13.0</b>	<b>FOUNDATION :</b>				
13.1	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 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 confirm			
<b>14.0</b>	<b>ERECTION &amp; COMMISSIONING</b>				
14.1	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 confirm			
14.2	Erection & Commissioning of Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	vendor to confirm			
14.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at <b>clause 18</b> (Machine Acceptance) shall form part of the commissioning activity.	vendor to confirm			
14.4	Test mandrel for checking run-out/taper & alignment should be supplied	vendor to confirm			

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14.5	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 confirm			
14.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	vendor to confirm			
14.7	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	vendor to confirm			
14.8	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	vendor to confirm			
14.9	Schedule of Erection and Commissioning shall be submitted with the offer.	vendor to confirm			
14.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	vendor to confirm			
<b>15.0</b>	<b>ACCURACY TESTS:</b>				
<b>15.1</b>	<b>GEOMETRICAL ACCURACIES :</b>				
15.1.1	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			
15.1.2	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			
<b>15.2</b>	<b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY: Should be measured as per VDI/DGQ 3441/ ISO 230-2 (Latest Revision) using LASER INTERFEROMETER.</b>				
15.2.1	Positioning accuracy in X axis per 1000 mm- 0.010 mm.	vendor to confirm			
15.2.2	Positioning accuracy in Z axis per 1000 mm - 0.010 mm.	vendor to confirm			

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15.2.3	Repeatability in X axis - per 1000mm - 0.005 mm.	vendor to confirm			
15.2.4	Repeatability in Z axis - per 1000 mm- 0.008 mm.	vendor to confirm			
15.2.5	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			
<b>16.0</b>	<b>OPERATING CONDITIONS &amp; THERMAL STABILITY :</b>				
16.1	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 ±10% V, Frequency: 50±3% HZ, No. of phases = 3, (3 wire , no neutral.) Ambient Conditions: Temperature = 5 to 50 degree celsius Relative Humidity = 95% max.	vendor to confirm			
16.2	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).With the prevailing ambient condition , there should not be any deviation in Positional accuracy and Repeatability.	vendor to confirm			
16.3	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 confirm			
16.4	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 confirm			

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<b>17.0</b>	<b>PROVEOUT OF BHEL COMPONENTS :</b>				
17.1	<p>Drawings of proveout components are enclosed. Vendor to submit <b>preliminary process, time study</b> &amp; 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 &amp; test piece machining etc. Material for the proveout components shall be provided by BHEL.</p> <p>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. .</p>	vendor to confirm			
17.2	Drgs. 14461699007 (GM 90T), 14391685001 (K 62T), and 24391613005 (AC 65T), 04451664001 (ABB77 T), 14351616002 ( 102T ) will be supplied. Vendor to prove the machine with 2 pieces each of above items.	vendor to confirm			
17.3	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.	vendor to confirm			
<b>18.0</b>	<b>MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)</b>	Should be accepted & confirmed by Vendor			
<b>18.1</b>	<b>Tests/Activities should be carried out at supplier's works on the machine before dispatch :</b>	vendor to confirm			
18.1.1	Geometrical accuracies as per test chart.	vendor to confirm			
18.1.2	Positioning accuracies as per VDI-DGQ/3441	vendor to confirm			

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18.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	vendor to confirm			
18.1.4	Demonstration of all features of the machine, control system & accessories	vendor to confirm			
18.1.5	Machining of test piece as per NAS/AFNOR/ISO. Vendor to supply test piece material and tooling for it's machining.	vendor to confirm			
18.2	<b>Tests/Activities should be carried out at BHEL works while commissioning the machine :</b>	vendor to confirm			
18.2.1	Geometrical accuracies as per test chart.	vendor to confirm			
18.2.2	Positioning accuracies as per VDI-DGQ/3441	vendor to confirm			
18.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	vendor to confirm			
18.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	vendor to confirm			
18.2.5	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			
18.2.6	Machining test piece as per NAS/AFNOR/ISO. Vendor to arrange Test pieces material and tooling for it's machining.	vendor to confirm			
18.2.7	Proveout machining of jobs as per clause 17.2.	vendor to confirm			
18.2.8	Two weeks supervision by Supplier of independent operation of machine by BHEL operators after job proveout	vendor to confirm			
18.2.9	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			
18.2.10	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	vendor to confirm			
19.0	<b>PACKING:</b>				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.1	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 confirm			
<b>20.0</b>	<b>GUARANTEE :</b>				
20.1	12 months from the date of acceptance of the machine.	vendor to confirm			
<b>21.0</b>	<b>GENERAL :</b>				
21.1	Machine Model	vendor to specify			
21.2	Total connected load (KVA):	vendor to specify			
21.3	Floor area required (Length, Width, Height) for complete machine & accessories	vendor to specify			
21.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	vendor to specify			
21.5	Total weight of the machine	vendor to specify			
21.6	Weight of heaviest part of machine	vendor to specify			
21.7	Weight of the heaviest assembly / sub-assembly of the Machine	vendor to specify			
21.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	vendor to specify			
21.9	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 confirm			
21.10	Detailed catalogues, sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	vendor to confirm			
21.11	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 confirm			
<b>22.0</b>	<b>REFERENCE LIST / QUALIFYING CONDITIONS :</b>				

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22.1	Only those vendors(OEM), who have supplied and commissioned at least one CNC VERTICAL TURNING 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 ).The machine should be a standard machine and it should not be a Prototype machine.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 confirm			
	1. Name of the customer / company where similar machine is installed.				
	2. Complete postal address of the customer.				
	3.Month & Year of commissioning.				
	4.Parameters of machine(s) supplied (Table diameter,Load Capacity & Maximum Turning Height) & application for which the machine is supplied .				
	5. Name and designation of the contact person of the customer.				
	6. Phone, FAX no. and email address of the contact person of the customer.				
	7. Performance certificate from the customers regarding satisfactory performance of machine supplied to them ( original certificate or through E-mail directly from customer)The original may be returned after verification by BHEL,if required.				
	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.				
23.0	<b>OTHER FEATURES: (To be Included only if required)</b>				
23.1	<b>NETWORKING:</b>				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
23.1.1	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			
	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood)				
	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.				
	c) The program transfer between CNC system and network should also be possible in CNC Mode.				
	<b>23.2 MACHINE MONITORING SYSTEM (MMS) SIGNALS</b>				
23.2.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.				
	a) Control ON	Vendor to confirm			
	b) Program Running	Vendor to confirm			
	c) Spindle Running	Vendor to confirm			
	d) Axes moving (Any of the axes)	Vendor to confirm			
	e) Program Stop	Vendor to confirm			
	f) Alarm active	Vendor to confirm			