



BHARAT HEAVY ELECTRICAL LIMITED

UNIT'S ADDRESS:

CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)

Enquiry No. :

Due Date :

Supplier Qtn. No.:

Date :

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC HORIZONTAL BORING MACHINE WITH INDEXING DEVICE

NOTE:-

1. Vendor (OEM) must submit complete information against clause no. 24. 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.

NAME & ADDRESS OF THE SUPPLIER :	NAME & ADDRESS OF THE INDIAN AGENT :
TELEPHONE NOS.:	TELEPHONE NOS.:
FAX NOS.:	FAX NOS.:
E-MAIL ADDRESS :	E-MAIL ADDRESS :

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC HORIZONTAL BORING MACHINE WITH INDEXING DEVICE COMPLYING WITH SPECIFICATIONS AS BELOW (MINIMUM REQUIREMENTS)

Sl. NO.	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED/TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0 PURPOSE & WORKPIECE MATERIAL					
1.1	MACHINE CONFIGURATION: The Machine shall be Column type CNC Hor. Boring Machine along with Indexing Device with matching Hydrostatic Steadies for holding/clamping the Rotor Shaft and indexing it at different angles for machining of grooves. Indexing Device shall be placed parallel to X-axis.				
1.2	Work Piece Material: Rotor shaft will be of forging of steel, Grade 26 Ni Cr Mo V 145.				
2.0 SPECIFICATIONS: (Minimum requirements)					
2.1	MACHINE CONFIGURATION: The Machine shall be Column type CNC Hor. Boring Machine along with Indexing Device with matching Hydrostatic Steadies for holding/clamping the Rotor Shaft and indexing it at different angles for machining of grooves. Indexing Device shall be placed parallel to X-axis.				
2.2 HEAD STOCK					
2.2.1	Boring spindle diameter	160mm or more			
2.2.2	Milling spindle diameter	Vendor to specify			
2.2.3	Ram Cross section (LxB)	400 X 440 or more			
2.2.4	Spindle drive power (AC Continuous Rating - S1), Minimum	60 KW			
2.2.5	Spindle speed (Infinitely variable)	6 or less to 3500 or more			

2.2.6	No. of speed ranges				
2.2.7	Max torque on the boring spindle (N-m)		Vendor to specify		
2.2.8	Max torque on the milling spindle (N-m)		2800 Nm		
2.2.9	Spindle taper		2800 Nm		
2.2.10	Spindle Motor & Drive Make: FANUC α i or SIEMENS 1PH series spindle motor with matching spindle drive		ISO50/ BT50		
2.2.11	Spindle Encoder: FANUC/SIEMENS/HEIDENHAIN rotary encoders for direct reading of actual spindle rpm		Vendor to confirm		
2.2.12	Torque-Power-Speed characteristics of the spindle system to be submitted by the vendor.		Vendor to submit		
2.2.13	Oriented Spindle Stop (Any position)		Vendor to confirm		
2.2.14	Spindle Cooling System (Details to be submitted)		Vendor to submit		
2.3 COLUMN:					
2.3.1	Column longitudinal travel (X-Axis)		10000mm		
2.3.2	X-axis feed rate (Infinitely variable)		1 to 20000 mm/min		
2.3.3	X-axis rapid traverse rate		20000 mm/min		
2.3.4	Axis Resolution		0.001mm		
2.4 HEADSTOCK TRAVERSE ON COLUMN:					
2.4.1	Headstock vertical travel (Y-Axis)		3000 mm		
2.4.2	Traverse Range with reference to Rotor Center Line.		-1000 mm to +1000 mm		
2.4.3	Y-axis feed rate (Infinitely variable)		20000 mm/min		
2.4.4	Y-axis rapid traverse rate		20000 mm/min		
2.4.5	Axis Resolution		0.001mm		
2.5 RAM/ SPINDLE TRAVERSE:					
2.5.1	Boring spindle axial travel (W-Axis)		1000 mm		
2.5.2	Ram axial travel (Z-Axis)		1200mm		
2.5.3	Spindle + Ram travel (W+Z)		2200mm		
2.5.4	Lowest Position of Spindle Center from Bed Plate Top.		Vendor to inform		
2.5.5	Boring Spindle axis feed rate (Infinitely variable)		20000 mm/min		
2.5.6	Boring Spindle axis rapid traverse rate		20000 mm/min		
2.5.7	Ram axis feed rate (Infinitely variable)		20000 mm/min		
2.5.8	Ram axis rapid traverse rate		20000mm/m or more		
2.5.9	Axis Resolution		0.001mm		
2.5.10	Spindle & Ram Axes should be independently programmable with Independent Drives and Feed back system.		Vendor to confirm		
2.6 FEED AND DRIVE SYSTEM:					
2.6.1	Feed motors & drives: FANUC α i or SIEMENS 1FT/1FK series AC servo motors with matching AC servo drives		Vendor to submit		
2.6.2	Maximum feed force for all axes		Vendor to specify		
2.6.3	Feed back system for X, Y & Ram (Z) axes: Heidenhain linear scales (Details to be submitted)		Vendor to submit		
2.6.4	Feed back system for Spindle (W) Axis: FANUC/Heidenhain/SIEMENS rotary encoder (Details to be submitted by the vendor)		Vendor to submit		

2.6.5	Type of power transmission: 1. Pre-loaded backlash free double pinion & rack drive for X-axis. 2. Backlash free re-circulating ball screw with Pre-loaded double nut for all other axes. (Complete description of the aforesaid, including diameter of Ball Screw for each axis, to be submitted with the offer)	Vendor to submit		
2.6.6	Mechanism for locking X, Y & Z axis	Vendor to specify		
2.6.7	Maximum thrust rating of all axes.	Vendor to specify		
2.7	MACHINE GUIDEWAYS:			
2.7.1	Width of bed guideways, X-axis	Vendor to inform		
2.7.2	Width of column guideways, Y-axis	Vendor to inform		
2.7.3	Details of Guide ways for Ram axis and bearing details of Spindle axis are to be submitted with offer.	Vendor to submit		
2.7.4	Guide ways for X-axis, Y-axis & Z-axis: Hydrostatic (Details to be submitted). Details of lubrication system provided on Spindle axis are also to be submitted with the offer.	Vendor to submit		
2.7.5	Hardness of guideways	Vendor to specify		
2.7.6	Metallic Telescopic covers of rust resistant material to be provided with wipers for X & Y axes guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & hydrostatic oil is to be provided. There should be bellow covers of coolant proof material below telescopic covers to eliminate any chance of coolant mixing with hydrostatic oil, as applicable. The movement of telescopic covers should be troublefree and requiring minimum maintenance. Telescopic covers for X-axis should be with a slant towards Chip conveyor.	Vendor to offer and confirm		
2.8	DIMENSIONS OF ROTOR TO BE ACCOMODATED ON MACHINE/INDEXING DEVICE:			
2.8.1	Total length of Rotor	6000 mm to 9000 mm		
2.8.2	Max. Swing Diameter.	2200 mm or more		
2.8.3	Diameter of Disc in which Fir Tree Grooves to be made.	1300 mm to 2000mm		
2.8.4	Max. Length of Disc in which FIR TREE Grooves are to be made.	450 mm		
2.8.5	Max. Depth of Fir Tree Groove.	150 mm		
2.8.6	Max. Weight of rotor.	100 Tonnes		
2.8.7	Rotor Support Diameter	400 mm to 950 mm		
2.8.8	Coupling flange diameter	600 mm to 950 mm		
2.9	ROTOR CLAMPING BED:			
2.9.1	Size of Bed/ Floor Plates.	Vendor to specify		
2.9.2	Details of Tee grooves (Size and Pitch).	Vendor to specify		
2.9.3	Weight carrying capacity of the Floor Plates	Vendor to specify		
2.10	HYDROSTATIC STEADY RESTS (AT BOTH ENDS):			
2.10.1	Steady Rests for Rotor support with Hydraulic clamping of Rotor. Rotary Movement of Rotor should be motorised through Indexing Device mentioned at 2.12 with rapid/ feed motion for alignment of Rotor as well as side machining of grooves in Rotor Disc.	Vendor to specify		
2.10.2	Clamping force of Rotor.	Vendor to specify		
2.10.3	Diameter Range of Support Bearing (To be, preferably, provided through single Steady Support. The number of Steady Rests to cover the specified diameter range shall be finalised after mutual discussion). Its drawing will be supplied by the vendor in case of order.	400 mm to 950 mm		

2.10.4	Mechanism of its linear movement and clamping. The length between two support bearings shall be adjustable. Its details shall be submitted by the vendor.	Vendor to specify		
2.10.5	Support Bearing Pads of D 597, 697 & 847 shall be supplied by the vendor. Schematic drawing, showing relevant details of the same, shall be submitted by the vendor. Detailed manufacturing drawings for the same shall be supplied by the vendor in case of order.	Vendor to confirm.		
2.11	INTERMEDIATE/ CENTER SUPPORT:	Vendor to specify		
2.11.1	Diameter Range of supporting surface of rotor body for Center Support. Minimum width of supporting surface 244mm. Details of mechanism of center support are to be submitted. It will suit Rotor design of BHEL.	1000-1400mm		
2.11.2	Type of Intermediate Support	Vendor to specify		
2.11.3	Range of Intermediate diameter of Center Support.	1000 to 1400 mm		
2.12	INDEXING HEAD :			
2.12.1	Head stock with face plate for job clamping and indexing should be offered. The Face Plate should have provision of axial clamping of Rotor to prevent any shift during cutting. Its details are to be submitted.	Vendor to specify		
2.12.2	Clamping range of face plate	600 to 950 mm		
2.12.3	Maximum load carrying capacity with steadies.	100 Tons		
2.12.4	Indexing Head shall be capable of rotating Rotor, weight of 100 Tons.	Vendor to confirm		
2.12.5	Indexing Head rotation (A-axis), Backlash Free. Vendor to submit details.	360000 indexing positions @ 0.001 deg.		
2.12.6	Accuracy of Indexing Head Rotary axis: +/-3.6 Sec.	Vendor to confirm		
2.12.7	Maximum machining torque on A-axis (N-m)	Vendor to specify		
2.12.8	Max. Clamping Force .	Vendor to specify		
2.12.9	Maximum clamping torque on A-axis (N-m)	Vendor to specify		
2.12.10	Diameter of the face plate.	Vendor to specify		
2.12.11	Feed rate for Indexing Head Rotary Axis.	0.001 to 1.5rpm		
2.12.12	Rapid Traverse Rate for Indexing Head Rotary Axis	1.5rpm		
2.12.13	Maximum distance between Ram/ Spindle Face and Center Axis of Indexing Head/ Rotor.	Vendor to specify.		
2.12.14	Feed back devices: Heidenhain rotary encoder for A-axis	Vendor to specify.		
2.12.15	Feed drives: Fanuc/Siemens digital AC Servo drives. Details of Make, Model, Type etc. to be submitted.	Vendor to submit.		
2.12.16	Mechanism for locking/ clamping of Indexing Head axes.	Vendor to specify		
2.12.17	Location of the Indexing Head: The Indexing Head Should be located on extreme Left side of X-traverse looking from Spindle side.	Vendor to confirm		
2.12.18	The machine shall be capable of carrying out machining of side of Fir Tree Grooves using Milling Cutter by continuous indexing of Rotor Shaft in cutting feed mode. The machine shall, therefore, be capable of carrying out machining with Rotor on steadies in undamped condition also. Its details will be submitted by the vendor.	Vendor to offer and confirm		

2.13 CONSTRUCTION:					
2.13.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various Components/ Assemblies like Column, Bed, Head Stock, Ram, Spindle, Indexing Head etc. of the machine.	Vendor to submit			
2.13.2	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			
2.13.3	Automatic deflection compensation for ram and column effective at any extension of the ram plus spindle is to be provided taking into consideration weight of all possible cutters/ attachments offered. Details of the offered system should be submitted with offer.	Vendor to confirm and submit			
2.13.4	Head Stock and Column Counterbalancing System should be offered. (Details of the offered system to be submitted)	Vendor to submit			
2.14 OPERATOR'S PLATFORM:					
2.14.1	Operator's platform of min 300 kg load carrying capacity attached to Headstock for total Vertical Traverse as well as forward stroke of sufficient length . A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform.	Vendor to confirm			
2.14.2	Horizontal movement of Operator's Platform.	Vendor to specify			
2.14.3	Weight carrying Capacity of the Platform should be Min. 300 Kg..	Vendor to confirm			
2.14.4	Minimum Height of Platform from Shop Floor.	Vendor to specify			
2.14.5	Splash/ Chip guards on operator platform for protection of operator, operator's panel and to avoid spillage of coolant & chips on operator's platform.	Vendor to offer and confirm			
2.15 OPERATION AND CONTROL SYSTEM:					
2.15.1	OPERATOR'S PANEL:				
2.15.2	Swiveling type operator's panel having complete CNC and machine control system with TFT of required configuration shall be provided on the operators platform. All switches on the Operator's panel, including that for table rotation, should be within reach of operator of average height of 5'6" 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 & submit Photographs & Layout.			
2.16 CNC SYSTEM & FEATURES :					
2.16.1	Make : Fanuc / Siemens.	Vendor to confirm			
2.16.2	Type : PC based latest version	Vendor to confirm			
2.16.3	The system should have full alphanumeric keyboard, TFT colour display (10.4" or larger), Machine Control Panel (MCP), RS232C serial interface, USB port for data input/output, network ready, graphic simulation and on-screen PLC Ladder display. All PLC input/output modules should be of FANUC/SIEMENS make. (Latest hardware & software versions, as available at the time of delivery, should be supplied).	Vendor to offer and submit details			
2.16.4	Details of optional features, recommended by vendor. (Including features required for Prove Out Components)	Vendor to offer and submit details			
2.16.5	Details of other optional features:	Vendor to offer and confirm			

2.16.5.1	Axes Interpolation: Linear, Circular, Cylindrical, Helical, Spline				Vendor to confirm		
2.16.5.2	Max Number of simultaneous interpolation: 3				Vendor to confirm		
2.16.5.3	Part Program Storage: 2 MB or more				Vendor to confirm		
2.16.5.4	Technology Cycles: Geometry Calculation, standard Drilling, Tapping, Milling cycles.				Vendor to confirm		
2.16.5.5	Graphics simulation (Static and dynamic) of Part Programs and Machining process.				Vendor to confirm		
2.16.5.6	Co-ordinate Transformation: Datum shift, rotation, mirror image, scaling factor.				Vendor to confirm		
2.16.5.7	Pitch Error compensation (As applicable)				Vendor to confirm		
2.16.5.8	Backlash error compensation (As applicable)				Vendor to confirm		
2.16.5.9	Zero Offset for all axes				Vendor to confirm		
2.16.5.10	Feed override switch 0-120% for all axis				Vendor to confirm		
2.16.5.11	Spindle speed override switch 70-120%				Vendor to confirm		
2.16.6	Provision for safe shut down of CNC Control in case of Power Failure				Vendor to confirm		
2.17	MANUAL CONTROL:						
2.17.1	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. Layout of panel showing requisite switches to be submitted.		
2.18	HAND HELD UNIT:						
2.18.1	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 offer & details to be submitted.		
2.19	UPS FOR CNC SYSTEM: (Only in case of PC based CNC systems)						
2.19.1	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 offer & details to be submitted.		
2.20	NOTE BOOK PC (I/O DEVICE):						
2.20.1	Note Book PC (Internationally reputed make and latest model) with Windows operating system is to be supplied for bi-directional transfer of program and data between the offered unit and supplied CNC system. The notebook must contain all application softwares for the supplied CNC, PLC and Drives systems along with required interfaces and cables.				Vendor to offer with details.		
2.21	MACHINE LIGHTS:						
2.21.1	Machine Lights for sufficient illumination of complete working area, on both sides of operator's platform, should be provided for clear visibility.				Vendor to offer & specify details.		
2.21.2	A magnetic base portable spot light with sufficiently long cable should also be provided.				Vendor to offer & specify details.		
2.21.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.				Vendor to confirm		
2.21.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents				Vendor to confirm		
2.21.5	Flashing / rotary type End of Cutting and Program Stop Light.				Vendor to confirm		

2.22 REFRIGERATION UNITS / AIR CONDITIONERS				
2.22.1	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	
2.22.2	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.			
2.22.3	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	
2.22.4	For precise air/ oil temperature with energy-efficient operation, latest state-of-the-art technology features like constant 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	
2.22.5	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.			

2.22.6	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. - 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			
2.22.7	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			
2.23	HYDRAULIC SYSTEM : Details should be Submitted by the Vendor				
2.23.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			
2.23.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
2.23.3	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 be of Make: EPE / Hydac.	Vendor to offer and confirm			
2.23.4	Failure indication	Vendor to offer			
2.23.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
2.23.6	Refrigerated type cooling 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			
2.23.7	Hydraulic pump capacity (flow/ pressure) to be intimated.	Vendor to inform			
2.23.8	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			

2.23.9	First filling of all required Oils & Grease 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.					
2.24	COOLANT SYSTEM :					
2.24.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons provided on the Operator's panel as well.	Vendor to confirm				
2.24.2	a) Recirculating Type Flood Coolant System with nozzles around spindle.	Vendor to offer & confirm				
2.24.3	b) Air coolant system	Vendor to offer & confirm				
2.24.4	c) High Pressure Coolant thru Spindle	Vendor to offer & confirm				
2.24.5	All offered 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 confirm				
2.24.6	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				
2.24.7	Coolant Filtration System: Recirculating type coolant system with Vacuum Rotary drum type Filtration System and magnetic separator.	Vendor to confirm and submit details.				
2.24.8	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to submit				
2.24.9	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 & confirm.				
2.24.10	Coolant Tank Capacity. Coolant Tank may preferably be placed on the Floor Level. The details of the system, including requisite sump, pump etc., should be clearly indicated.	Vendor to specify				
2.24.11	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				
2.24.12	Coolant pump & motor details for all variants of coolant system are to be submitted with the offer.	Vendor to submit				
2.24.13	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Required.				

2.25 ELECTRICAL SYSTEM :				
2.25.1	415V with fluctuation +/- 10%, 50HZ with fluctuation +/- 3 %, 3 Phase AC (3 wire system without 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, etc., shall be the responsibility of vendor. Requirement of grounding/ earthing with required material (indian make) details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to confirm & specify		
2.25.2	Tropicalisation: All electrical/ electronic equipment shall be tropicalized.	Vendor to confirm		
2.25.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm		
2.25.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm		
2.25.5	All electrical and electronic panels including operator's panel should have provision of sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/ receptacles should have compatibility with Indian equivalents.	Vendor to confirm		
2.25.6	Motors shall conform to IEC or Indian Standards	Vendor to confirm		
2.25.7	All cables moving with traversing axes should be installed in Caterpillar/ Drag chain mounted vertically. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm		
2.25.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm		
2.25.9	In-cycle hour counter with reset facility is to be included in the offer.	Vendor to offer		
2.26 SAFETY ARRANGEMENTS:		Vendor to confirm & specify		
	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 of the machine or mistakes of the operator. Machine functions should be continuously monitored and alarm/ warning indications through lights/ alarm number with text 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.			
	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 are to be provided.			
	6.In case of power failure/alarm in the system, during machining when Form Cutter is in the Fir Tree Groove, the vendor must provide a suitable solution to retrieve the tool without referencing the machine axes. Its details are to be submitted with the offer.			
	7.Oil & water pipe lines should not run with electrical cable in the same trench.			
	8.Safety Lights on moving column (preferably Flashing during X-travel).			

5 PNEUMATIC SYSTEM:				
5.1 AIR COMPRESSOR:				
5.1.1 Independent Air Compressor (of reputed Indian make Elgi or Ingersol Rand) 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 5 Kg/sq.cm with high moisture could be used as and when required. The compressor unit should be suitable for continuous duty operation. (24 Hrs. a day, 7 days a week)	Vendor to offer with details.			
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 Spares for Air Compressor. 1.) Air Filter - 06 Nos. 2.) Oil Filter - 15 Nos. 3.) Oil - 50 Ltrs. 4.) Air - Oil Separator Element - 06 Nos. 5.) Belt - 04 Nos. 6.) Flexible Hose Kit - 01 Set	Vendor to offer .			
5.2 COMPRESSED AIR POINTS:				
5.2.1 Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	Vendor to confirm			
6 TOOLINGS:				
6.1 Complete Description of Tooling Ssystem	Vendor to specify			
6.2 Complete set of Tools including High Performance cutting tools, tool holders, clamping elements etc. recommended for machining of proveout component to carryout the machining of Fir Tree Grooves in LP Rotor, Drg. No. 01030146000, Groove Plan Drg. No. 9103429000, Groove Drawing Nos. 21030746035 (Form 14), 21030741031 (Form 17) shall be offered by Vendor. Consumables for offered Tools, like inserts, screws etc., should be quoted for machining of 2 more similar components of each type in addition to the prove-out components.	Vendor to specify and offer.			
7 AUTOMATIC TOOL OFFSET MEASURING SYSTEM :				
7.1 Automatic Tool Offset measuring system with measuring cycles, calibration system etc suitable for all types of tools recommended for prove-out components. The system shall be capable of measuring tool length ,tool radius and loading these values into tool offset memory of the machine. In addition, the system shall be capable of monitoring of runout of tools. Vendor to furnish detailed description of the system along with offer.	Vendor to offer with details.			
7.2 Automatic tool offset measuring system spares: Complete BLUM/EQUIVALENT UNIT including pneumatic system.	Vendor to confirm			

8 DIAGNOSTIC SYSTEM:				
8.1	TELE-DIAGNOSTIC SERVICE :			
8.1.1	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 Graphic User Interface of CNC 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 offer and submit details.		
8.2	FAULT DIAGNOSTIC SYSTEM:			
8.2.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book along with Simatic S7 software (licensed copy), necessary cables, PCMCIA card / Adaptor (for Communication with MPI port) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer and submit details.		
8.2.2	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer		
8.2.3	Help guide should be provided to use both diagnostic systems shall be provided.	Vendor to confirm		
9	LEVELING & ANCHORING SYSTEM	Required.		
9.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc shall be supplied for the Machine, Indexing Head, Floor Plates etc.	Vendor to offer and submit details.		
10	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :	Vendor to confirm		
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 confirm		
10.2	Test mandrel for checking spindle run-out & alignment should be supplied			

11	AUTOMATIC TOOL CHANGER & TOOL MAGAZINE							
11.1.1	Type			Vendor to specify				
11.1.2	No. of storage locations			30				
11.1.3	Tool Shank			ISO50/BI50				
11.1.4	Max tool diameter (all pockets filled)			125mm or more				
11.1.5	Max tool diameter (adjacent pockets empty)			Vendor to specify				
11.1.6	Tool length			300mm or more				
11.1.7	Tool change time (tool-to-tool)			Vendor to specify				
11.1.8	Tool change time (chip-to-chip)			Vendor to specify				
11.1.9	Tool selection method: Random with shortest path			Vendor to confirm				
11.1.10	The machine shall have manual Tool loading/ unloading through push button provided on machine head stock/ Auxiliary Hand pendant.			Vendor to confirm				
11.1.11	The spindle taper and tool pocket at changer station will have the provision of cleaning by compressed air blow during ATC cycle. The spindle taper will also have the provision of compressed air blow through push button provided on machine head stock/ Auxiliary Hand pendant during manual tool change.			Vendor to confirm				
11.1.12	Auxiliary Control, with suitable interlocks, for manual insertion / withdrawal of tool from the tool magazine.			Vendor to confirm				
11.1.13	Suitable arrangement, Software based and manual key based, should be provided to extract a tool trapped in the ATC cycle. Details of both the system to be provided along with the offer.			Vendor to submit				
11.1.14	Maximum Permissible Weight on each Pocket. (It should not be less than 35 Kg.)			Vendor to specify				
11.1.15	Maximum Permissible Weight on Complete ATC.			Vendor to specify				
11.1.16	The Machine operation should be possible with or without referencing ATC.			Vendor to confirm				
11.1.17	One set of tool holder retention stud equal to Tool Magazine capacity shall be provided as standard item with the machine. Drawing of Pull Stud should also be supplied.			Vendor to confirm & submit				
11.1.18	Screen displaying the status of all inputs and outputs status of ATC operation along with controlling individual steps of steps of ATC manually for service personnel only. This may be provided through a separate hand pendant.			Vendor to confirm				
11.1.19	Tool Changer arm working should be explained in details. Full ATC catalogue should be submitted with the offer.			Vendor to confirm & submit				
11.1.20	During a tool change if Power goes off or the fault occurs : a provision shall be provided by the vendor for auto tool change recovery cycle. So that when the power resumes or fault is removed, the operator can complete the tool change. Provision has to be provided for tool change in manual mode in single individual steps. Also, any tool change performed in manual mode should be recorded by the CNC in the 'Tool Table', as in case of Automatic Tool Change. A by-pass switch has to be provided so that one can change the tool in manual mode instead of Automatic mode.			Vendor to confirm & submit				

12 SPARES:				
12.1.0	Itemwise 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
12.1.1	Mechanical & Hydraulic Spares: The following spares are to be included.			
12.1.1.1	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hyd / Lub / Pneumatic/ coolant circuit. (1 no. of each type)			Vendor to offer
12.1.1.2	Pressure switches, flow switches used in Hyd / Lub / Pneumatic/ coolant circuit. (1 No. of each type)			Vendor to offer
12.1.1.3	All types of regenerative type filter inserts (6 No. of each type in hydraulic, pneumatic & coolant circuit)			Vendor to offer
12.1.1.4	All types of Disposable type filter inserts (30 nos. of each type)			Vendor to offer
12.1.1.5	All types of Accumulator bladders (1 no. of each type) with charging kit			Vendor to offer
12.1.1.6	One set of timing belts used in the machine.			Vendor to offer
12.1.1.7	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.			Vendor to offer
12.1.1.8	One set of hose pipe with end connection used in the machine.			Vendor to offer
12.1.1.9	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.			Vendor to offer
12.1.1.10	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
12.1.1.11	One set of pneumatic filtration / condensate drain system.			Vendor to offer
12.1.2	Electrical /Electronic / CNC Spares : Following Spares are to be offered.			Vendor to offer
12.1.2.1	Relays (2 Nos each type)			Vendor to offer
12.1.2.2	Contactors (2 Nos each type)			Vendor to offer
12.1.2.3	RTD temperature transmitter (1 No each type)			Vendor to offer
12.1.2.4	Proximity Switches (5 Nos each type)			Vendor to offer
12.1.2.5	Push Buttons (5 Nos each type)			Vendor to offer
12.1.2.6	Indicating Lamps (10 Nos each type)			Vendor to offer
12.1.2.7	Semiconductor Fuses (5 Nos each type)			Vendor to offer
12.1.2.10	Special Fuses (5 Nos each type)			Vendor to offer
12.1.2.11	Circuit Breakers (1 No each type)			Vendor to offer
12.1.2.12	Main Power Switch (1 No each type)			Vendor to offer
12.1.2.13	Encoders (1 No each type)			Vendor to offer
12.1.2.15	Scanning Heads for Linear Scales (1 No each type)			Vendor to offer
12.1.2.17	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)			Vendor to offer
12.1.2.18	NCU module			Vendor to offer
12.1.2.21	I/O Cards for PLC (1 No each type)			Vendor to offer
12.1.2.23	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type)			Vendor to offer
12.1.2.24	Limit Switches/ Micro Switches (2 Nos each type)			Vendor to offer

12.2	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			
12.3	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			
12.4	Repair service contract with supplier of offered CNC system for service & spares for motor drives & CNC Unit etc.	Vendor to offer			
13	DOCUMENTATION : Three sets of following documents (Hard copies with Soft Copies wherever specified) in English language should be supplied along with the machine	Vendor to offer			
13.1	Operating manuals of Machine & CNC system	Vendor to offer			
13.2	Programming Manuals of Machine & CNC system	Vendor to offer			
13.3	Detailed Maintenance manual of machine and supplied systems.	Vendor to offer			
13.4	Maintenance Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for spindle ,feed drives and auxiliary drive.	Vendor to offer			
13.5	Manufacturing drawings for all supplied clamping jaws and its lead screws, tool holders, coolant connections, fixtures etc. wherever available.	Vendor to offer			
13.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer			
13.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer			
13.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor, etc.	Vendor to offer			
13.9	User Program print-outs (hard copy) with comments in English for PLC of main machine and auxiliary systems (if used) alongwith cross reference list and Input/Output list.	Vendor to offer			
13.10	PLC program, NC data & PLC data on CD.	Vendor to offer			
13.11	Complete back-up of PCU-50 or equivalent (in case of Fanuc) hard disk on GHOST CD and clear written Instructions to take back-up and reloading of a new hard disk.	Vendor to offer			
13.12	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer			
13.13	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer			
13.14	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			
13.15	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer			

14 TRAINING:					
14.1	Four BHEL Persons should be trained at vendor's works for each machine for the area & period given below: (a) CNC Part Programming for the machine, application of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (Period 3 Weeks) (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (Period 2 weeks) (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (Period 2 weeks) (d) Operation of the machine & other supplied equipments (Period 2 weeks) Pre-dispatch inspection (ref. SI.No. 20.1) 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 offer			
14.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm			
14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
14.4	Vendor to quote for training on per man week basis	Vendor to quote			
14.5	Vendor should commit to organize and quote for training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL.	Vendor to confirm			
15 FOUNDATION:					
15.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within two month from the date of Letter of Intent (LOI)/ P.O., whichever is earlier. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details, like Static/ Dynamic load details etc. and final Layout Drawings shall be submitted by the supplier within three months after getting BHEL's approval. The Layout should consist of all requirements pertaining to complete machine and all accessories, including space requirement for Voltage Stabiliser, Isolation Transformer, Air Compressor, Chip Bin & any other accessory. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for grouting of foundation bolts of the machine.	Vendor to confirm			

16	ERECTION & COMMISSIONING				
16.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control system & 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. The available crane capacity at the proposed location of the machine will be 150 Ton. The vendor will ensure to make requisite arrangement for lifting of heavier consignment/ items/ assembly of the machine not getting covered by this capacity.	Vendor to confirm			
16.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor with Air Dryer shall also be responsibility of the vendor.	Vendor to confirm			
16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Clause 21 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to confirm			
16.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm			
16.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
16.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
16.7	All Cover Plates required for the machine and its peripherals shall be supplied by the vendor.	Vendor to confirm			
16.8	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 and submit details.			
16.9	Test mandrel for checking spindle run-out & alignment should be supplied by the vendor.	Vendor to confirm			
16.10	The vendor shall supply sufficient quantity of paint of the machine and carry out touching wherever the paint is damaged during transit or erection of the machine.	Vendor to confirm			
16.11	Charges, duration, terms & conditions for E&C should be furnished in details separately by vendor along with offer.	Vendor to offer			

17	ACCURACY TESTS:					
17.1	GEOMETRICAL ACCURACIES :					
17.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 3070 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be submitted with the offer.	Vendor to confirm				
17.1.2	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance tests at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm				
17.2	POSITIONING & REPEATABILITY ACCURACIES : TO BE MEASURED AS PER VDI/DGQ 3441 (LATEST REVISION) INCLUDING LASER MEASUREMENTS BY USING INTERFEROMETER.					
17.2.1	Positioning uncertainty (Pa per 1000mm) for X,Y,Z & W axes	0.010 mm				
17.2.2	Positioning uncertainty Pa for A-axis	3.6 secs				
17.2.3	Positional scatter (Ps per 1000mm) for X,Y,Z& W axes	0.008 mm				
17.2.4	Positional scatter Ps for A-axis	1.8 secs				
17.2.5	Total positioning error P for entire travel for X,Y,Z &W axes	Vendor to specify				
17.2.6	Total positioning error P for A-axis	Vendor to specify				
17.2.7	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm				
	Note1: LC of scale should be taken to achieve above	Vendor to note				
	Note 2: Accuracy should remain within specified tolerance over a time period of 24 hours (Maximum temperature variation is 25 degree centigrade during peak summer)	Vendor to note				
18	AMBIENT CONDITIONS & THERMAL STABILITY :					
18.1	Power Supply (AC): Voltage = 415V +/-10% of fluctuations , Frequency= 50Hz +/- 3% , No. of phases = 3 phase without neutral. Ambient Operating Conditions: Temperature = 5 to 48 degree Celsius , Relative Humidity = 95% max.	Vendor to take note				
18.2	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 confirm				
18.3	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. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished by Vendor)	Vendor to confirm				

18.4	Vendor to confirm that machine is suitable for successful running with guaranteed accuracies and production of jobs with accuracies as specified in proveout components in the conditions specified above. Details of provisions made on the machine for the same are to be furnished to BHEL.	Vendor to confirm			
18.5	The machine, including Attachments and Accessories etc., should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure and confirm the same.	Vendor to confirm			
19	PROVEOUT OF BHEL COMPONENTS :				
19.1	LP Rotor, Drg. No. 01030146000, Groove Plan, Drg. No. 91030429000 with Groove Drawing Nos. 21030746035 (Form 14), 21030741031 (Form 17) or equivalent shall be proveout component. The machining of Fir Tree Grooves shall be carried out by the vendor. The drgs. of proveout component are enclosed. Vendor to submit preliminary process, Time Study & Tool List recommended by them along with the offer. 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 component, as above, 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 CNC job setting plan to start of roughing process at BHEL and with complete details of the plan to start of finishing process at BHEL.	Vendor to offer.			
19.2	Vendor shall be responsible, financially or otherwise, for any deviation/ rejection in proveout component to the extent of cost of Casting/Forging, due to wrong 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.				
20	MACHINE ACCEPTANCE: (Tests/Activities TO be Performed by Vendor)	Should be accepted & confirmed by Vendor			
20.1	Tests/Activities to be carried out at supplier's works on the machine before dispatch :				
20.1.1	Geometrical Accuracy Tests as per test chart.	vendor to accept and confirm			
20.1.2	Positioning Accuracy Tests as per VDI-DGQ/3441	vendor to accept and confirm			
20.1.3	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 accept and confirm			
20.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	vendor to accept and confirm			
20.1.5	Machining of NAS Test Piece. Vendor to supply test piece and tooling for it's machining.	vendor to accept and confirm			

20.2	Test to be carried out at BHEL works while commissioning the machine :				
20.2.1	Geometrical Accuracy Tests as per test chart.			vendor to accept and confirm	
20.2.2	Positioning Accuracy Tests as per VDI-DGQ/3441			vendor to accept and confirm	
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.			vendor to accept and confirm	
20.2.4	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 accept and confirm	
20.2.5	Demonstration of all features of the machine, CNC system & all accessories to the satisfaction of BHEL for their efficient and effective use.			vendor to accept and confirm	
20.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.			vendor to accept and confirm	
20.2.7	Machining of NAS Test Piece. Vendor to supply test piece and tooling for it's machining.			vendor to accept and confirm	
20.2.8	Job prove out.			vendor to accept and confirm	
20.2.9	Two weeks supervision of independent operation of machine by BHEL after job proveout.			vendor to accept and confirm	
20.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works			vendor to accept and confirm	
21	PACKING:				
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 confirm	
22	GUARANTEE :				
22.1	24 months from the date of acceptance of the machine.			Vendor to confirm	
23	GENERAL : The vendor should submit the following information:				
23.1	Machine Model			Vendor to specify	
23.2	Total connected load (KVA):			Vendor to specify	
23.3	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)			Vendor to confirm	
23.4	Total weight of the machine			Vendor to specify	
23.5	Weight of heaviest part of machine			Vendor to specify	
23.6	Weight of the heaviest assembly/ subassembly of the Machine			Vendor to specify	
23.7	Dimensions of largest part/ subassembly/ assembly of the machine			Vendor to specify	
23.8	Vendor to submit, along with offer, the reference list of customers where similar machines have been supplied mentioning the customer, Machine Model, major specifications of the supplied machine, CNC System, Year of Supply etc.			Vendor to specify	

23.9	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to specify			
23.10	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			
23.11	Ladder is to be provided to access the machine elements located at the top of the column as well as movement of operator in case of power failure or any other emergency.	Vendor to offer & confirm			
24	QUALIFYING CONDITIONS :				
24.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC Horizontal Boring M/C of same (Spindle Diameter 160 mm, Ram + Spindle Travel= 2200 mm for higher sizes with Indexing Device for machining of Fir Tree Grooves in Turbine Rotors in the past ten years (on the date of opening of Tender) 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 accept & confirm			
	1. Name of the customer / company where similar machine is installed.	Vendor to inform			
	2. Complete postal address of the customer.	Vendor to inform			
	3.Month & Year of commissioning.	Vendor to inform			
	4.Parameters of machine(s) supplied (Spindle Diameter, Ram+Spindle Travel, X, Y) & application for which the machine is supplied.	Vendor to inform			
	5. Name and designation of the contact person of the customer.	Vendor to inform			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
	7. Performance certificate from at least one customer regarding satisfactory performance of machine supplied to them. The referred machine should presently be working satisfactorily for more than one year (on the date of opening of Tender) after its commissioning.	Vendor to submit			
	8.BHEL reserves the right to verify the information provided by vendor. In case the information is found to be false /incorrect, the offer shall be rejected.	Vendor to accept & confirm			
25	OTHER FEATURES:	Vendor to confirm			
25.1	NETWORKING:				
	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)	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			

25.2	MACHINE MONITORING SYSTEM (MMS) SIGNALS					
	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 offer	
	a) Control ON					
	b) Cycle ON					
	c) Spindle Running					
	d) Feed Active (Any of the axes moving)					
	e) M30 (Program Stop)					
	f) Alarm Active				Vendor to offer	