

		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 :	
<p align="center">SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC LATHE.</p>					
<p>NOTE:-</p> <p>1. Vendor (OEM) must submit complete information against clause no. 24 (Qualifying condition). The offer meeting this clause would only be processed (OEM : Original Equipment Manufacturer).</p> <p>2. The vendor(OEM) should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.</p> <p>3. The offer and all documents enclosed with offer should be in English language only.</p>					
NAME & ADDRESS OF THE SUPPLIER :					
TELEPHONE NOS.:					
FAX NOS.:					
E-MAIL ADDRESS :					
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC LATHE COMPLYING WITH SPECIFICATIONS AS BELOW:					
SNO	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATIONS	REMARKS
1	PURPOSE & WORKPIECE MATERIAL :				
1.1	Purpose: The machine is required for rough and finish machining of Rotors and Rotor Shafts of Turbogenerators with high level of precision and surface finish. The machine shall be used for all types of turning /grooving operations on diameters & faces, grinding operations on cylindrical & radial surfaces (LH&RH), rolling operations on diameter/faces/fillet radii and advanced electronic measurement operations etc. The machine should also have provision for threading operations.	Vendor to accept			
1.2	Work Piece Material: Material of TG Rotor Shaft will be rough machined forging of high alloy steels like 26NiCrMoV14.5 and similar other materials which are generally used in power producing equipment having Tensile Strength 980 N/mm ² & Hardness 300 BHN.	Vendor to accept			
2	SPECIFICATIONS: (Minimum requirements)				
2.1	CAPACITY & SIZE :				
2.1.1	Max. Turning Diameter	1800 mm or more			
2.1.2	Max. Turning Length	10000 mm or more			

2.2.15	Chuck guard of suitable length to cover the chuck for the length more than jaw's height with motorised movement through push buttons & suitable interlocks to prevent chuck rotation at different guard positions. (Details should be submitted)	Vendor to offer			
2.2.16	Male & Female Gauges/Templates (One Set) for checking the headstock angle should be provided.	Vendor to offer			
2.3	MACHINE BED :				
2.3.1	No. of Guide ways	Vendor to inform			
2.3.2	Bed width across ways	Vendor to inform			
2.3.3	Type of guide ways: Hydro-static Guideways for both X & Z axes (Details should be submitted)	Vendor to offer & confirm			
2.3.4	Hardness of guideways	Vendor to inform			
2.3.5	Metallic Telescopic Covers : Slanting Type Metallic Telescopic Covers of rust resistant material should be provided with wipers for complete X axis (on front & rear sides of tool post) & Z axis (on left and right sides of carriage) guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & hydrostatic oil and entry of chips/swarf/grinding slurry to guideways. The movement of telescopic covers should be smooth, troublefree and requiring minimum maintenance. Part of covers, just adjacent to left and right sides of carriage, should be safe, horizontal and rigid enough for operator's movement as and when required.	Vendor to offer			
2.4	FEEDS :				
2.4.1	Feed range in X & Z axes (Infinitely variable)	1 - 6000mm/min or more			
2.4.2	Rapid traverse in X & Z axes (Infinitely variable)	8000mm / Min. or more			
2.4.3	Feed motors & drives: FANUC ai or SIEMENS 1FT/1FK series AC servo motors with matching AC servo drives	Vendor to offer			
2.4.4	Feed back system for X & Z axes: Heidenhain linear scales (Details to be submitted)	Vendor to offer			
2.4.5	Details of System to ensure zero backlash for X & Z axes.	Vendor to inform			
2.4.6	Mechanism for locking X & Z axis	Vendor to inform			
2.4.7	Maximum feed force in X and Z axes	Vendor to inform			
2.4.8	Maximum Torque in X and Z axes	Vendor to inform			
2.4.9	Detail of X and Z axes feed mechanism	Vendor to inform			
2.5	STEADY RESTS				
2.5.1	Range of supporting dia for Hydrostatic Steady Rests	150 - 1200mm			
2.5.2	No. of Steady Rests to cover the specified range. Price for unit quantity of each steady rest is to be quoted.	Vendor to inform			
2.5.3	Common base for all steady rests for complete supporting range. Price for unit quantity of each unit is to be quoted.	Vendor to offer			

2.5.4	Swiveling type upper portion of steady rests or equivalent for job loading/unloading (Details should be submitted)	Vendor to offer			
2.5.5	Motorised movement of common base on bedways with positive & quick type clamping (Details like type & no. of clamps, clamping force etc. should be submitted)	Vendor to offer			
2.5.6	Independent, automatic, refrigerated type (with heating, if required) recirculating (with provision to avoid mixing of oil with coolant) lubrication system, fixed on hydrostatic steady, shall be provided for lubrication between hydrostatic pads and supporting dia of job. Tank for lubricating oil fixed with steady shall have provision to display alarm on control panel in case of low oil level (Details should be submitted)	Vendor to offer			
2.5.7	Adjustable Chip Protection Guards on steady rests, for complete supporting dia range, to avoid falling of small chips on hydrostatic steady pads etc.	Vendor to offer			
2.5.8	Clamping of steady rests on common base should be with quick clamping fasteners. (Details should be submitted)	Vendor to offer			
2.5.9	Clamping force of base on bedways	Vendor to inform			
2.5.10	Drawings of steady rests and supporting pads for each type of steady rests for complete range are to be submitted.	Vendor to submit			
2.5.11	Minimum distance from face plate (up to position of steady pad), at which the steady rest can be placed on bedways for supporting the rotor.	Vendor to inform			
2.5.12	The body of steady should not obstruct in any way while machining near steady support dia, when the component is supported on steady with other end in chuck considering attached component drawings. Any limitation in this regard should be informed by vendor.	Vendor to inform			
2.6	TAIL STOCK :				
2.6.1	Motorised movement on bed through push buttons on tailstock body.	Vendor to offer			
2.6.2	Quill stroke	Vendor to inform			
2.6.3	Quill movement should be equipped with following : (Details should be submitted)				
2.6.3.1	Presetting, display & automatic control of thrust applied	Vendor to offer			
2.6.3.2	Compensation for thermal expansion of work piece	Vendor to offer			
2.6.3.3	Motorised Drive	Vendor to offer			
2.6.4	Quill diameter	Vendor to inform			
2.6.5	Rapid Traverse rate of tail stock body on bed	Vendor to inform			
2.6.6	Traverse of quill with traverse rate	Vendor to inform			
2.6.7	Hardened Tail stock centre - For both 60 & 90degree (Drawing to be submitted) as per standard.	Vendor to offer			
2.6.8	Detail of Positive Clamping & Unclamping of tail stock on bed like type & no. of clamps, clamping force etc.	Vendor to inform			
2.6.9	Max thrust on the Quill	Vendor to inform			

2.6.10	Details of provision for re-alignment of tailstock with headstock/machine axis, if required in future, to be submitted.	Vendor to submit			
2.7	CARRIAGE/CROSS-SLIDE :				
2.7.1	Z-axis travel	Vendor to inform			
2.7.2	X-axis travel (specify movement beyond center i.e. X negative side)	Vendor to inform			
2.7.3	Cutting force available at the carriage	Vendor to inform			
2.7.4	Layout showing extreme positions of the all axes movements	Vendor to submit			
2.7.5	Carriage to clear chuck, tailstock and all steady rests mounted on common base.	Vendor to confirm			
2.8	TOOL POST :				
2.8.1	Type of Tool Post: Rigid tool post having Plate type Tool Carriers and with provision of mounting Boring Bar Holder, Grinding Unit, Rolling Device, & other machine's accessories etc. The plate type tool carriers should be suitably placed (fixed type) on the tool post to enable all types of machining operations without any difficulty on the rotor. Alternatively, vendor may suggest superior configuration of tool post, if possible, for efficient & effective use of the machine for the required applications.	Vendor to offer			
2.8.2	Tool Carrier No.1 : This tool carrier will be used for turning, facing, grooving and rolling operations etc. using square shank tools clamped in cassettes as per VDI 3425, size 40 (DIN 69881, size 140) on left and right hand face of carrier. So, provision of clamping these cassettes should be there on both left & right side of the tool carrier and also on front face, if possible. Maximum Projection of tool carrier should be 800mm or more. Projection should be in steps of 100mm. Width of tool carrier for total length should suit to required rigidity at maximum overhang and should be around 120mm. This carrier should be located on left side (towards chuck) of tool post. Provision should be there to mount tools clamped in cassettes with their inserts facing upwards and downwards as well. Cross section of tools in cassettes shall be 40x40mm & 32x32mm. Minimum possible distance of tool carrier from face plate is to be informed.	Vendor to offer			

2.8.3	<p>Tool Carrier No. 2 : This tool carrier will be used for deep grooving, contouring, turning etc. on diameters using suitable rigid tool holders for deep grooving like Sitzmann and Heinlein LH/RH plunging/ copying/ turning tool holders (WK 160 type) or other equivalent/superior system. Max. Projection of tool carrier should be 700mm or more, if possible. Projection should be in equal steps. Width of tool carrier for total length should suit to required rigidity at maximum overhang and should be around 35mm. This carrier should be located on right side (towards tailstock) of tool post. The tool holders shall be clamped with their inserts facing downwards. Minimum possible distance of tool carrier from face plate is to be informed.</p>	Vendor to offer			
2.8.4	<p>Tool Carrier No. 3 : This tool carrier will be used for grooving & turning operations. Suitable provision should also be there to mount square shank tools for machining of sealing strips between the two bladed stages of rotor. Max. Projection of tool carrier should be 700mm or more, if possible. Projection should be in equal steps. Width of tool carrier for total length should suit to required rigidity at maximum overhang and should be around 35mm. This carrier should be located on right side (towards tailstock) of tool carrier no. 2. The tools shall be clamped with their inserts facing upwards. Minimum possible distance of tool carrier from face plate is to be informed.</p>	Vendor to offer			
2.8.5	All tool carriers at their maximum projection of all carriers, with standard tools clamped on them, should clear all offered steady rests.	Vendor to offer			
2.8.6	Mode of selection of all tool carriers and their positions (steps) should be automatic through CNC program, Manual Data Input and manually also through push buttons.	Vendor to offer			
2.8.7	Clamping / unclamping and positioning of each tool carrier to be power operated.	Vendor to offer			
2.8.8	Max. permissible cutting force on each tool carrier and tool post.	Vendor to inform			
2.8.9	Total no. of positions (100mm steps) for each tool carrier.	Vendor to inform			
2.8.10	<p>Following safety features to be provided for all the tool carriers.</p> <p>* The tool carrier should not go to its reference position unless cassette/tool, mounted on it, is removed.</p> <p>* Movement of a tool carrier should be possible only when other two carriers are at reference position.</p> <p>* Movement of tool carriers should be interlocked with chuck rotation and feed motion in X & Z-axes.</p>	Vendor to offer			
2.8.11	Additionally, vendor can also quote any other type of latest tool mounting system available for similar applications with complete details.	Vendor to offer			

2.8.12	Provision for coolant to reach up to tool tip in all types of tool holders/tool carriers.	Vendor to offer			
2.8.13	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for troublefree operation.	Vendor to inform			
2.8.14	Drawings showing details/configuration of the tool post and all tool carriers.	Vendor to submit			
2.8.15	Drawing showing extreme movements of tool post with different projections of tool carriers in both X and Z axes etc. to be submitted.	Vendor to submit			
2.8.16	Tool post should be so designed to ensure clear visibility of the tool to the operator, standing on operator's platform, while operating operator's panel for machining very near to chuck.	Vendor to confirm			
2.9	CONSTRUCTION :				
2.9.1	Vendor to furnish details of material, hardness & constructional details including explanatory drawings of various components/assemblies like Headstock, Steady Rest, Chuck, Tailstock, Carriage, Tool post, Machine bed, Feed Transmission system, Feedback system etc.of the machine.	Vendor to explain & submit, as applicable.			
2.9.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer.	Vendor to explain & submit, as applicable.			
2.10	OPERATOR'S PLATFORM :				
2.10.1	Independent operator's platform should be provided on both sides , i.e. left & right , of the tool post with staircases and having sufficient space for safe swiveling of tool post and for left to right or vice versa movement of operator without any obstruction & without stepping down . The platform should provide sufficient space for convenient and safe operation of the machine and its control from both sides of tool post for external & internal turning operations using different tool carriers and grinding operations. It should be easy, safe & free from any obstruction for machine operator to reach upto tool clamped on different tool carriers. There should not be obstructing doors. It should be provided with two different staircases (parallel to z-axis) for left and right portions of platform.	Vendor to offer			
2.10.2	The platform should clear all steady rests, tailstock and also headstock while working near chuck.	Vendor to confirm			

2.10.3	Operator's platform should have suitably located sufficient illumination (for clear view of tool, job, operator's panel, drg. display area etc.), 2 nos. power plug point (Indian type) of 220Volts, 15 Amp AC with on/off switch for connecting 2000W electric heater (BHEL's supply), fans (pedestal type or wall-hanging type) and a board for display of component drawing (A0 size) for ease of operator while working on both left and right side of the platform.	Vendor to offer			
2.10.4	Sliding door type Splash / Chip guards of sufficient height should be provided on both sides of operator platform with glass windows on the guards (including fixed guards to support sliding door) for protection of operator, operator's panel and to avoid spillage of coolant & chips on shop floor and operator's platform.	Vendor to offer			
2.10.5	Additionally, manually operated Movable Splash / Chip guard (L or C shaped) of sufficient length (minimum 3.0 m) & height (to suit tangential spillage of coolant at max. turning dia of 2000mm) should also be provided on rear side of machine to avoid spillage of coolant & chips on shop floor and control cabinets etc.. These guards should be traversing with wheels on rails provided parallel to bed ways for full turning length. These guards should have provision like tapered bottom part for smooth flow of coolant , spilled over them, towards chip conveyor to avoid spillage of coolant on shop floor.	Vendor to offer			
2.11	OPERATION & CONTROL SYSTEM :				
2.11.1	OPERATOR'S PANEL : Swiveling and Sliding type operator's panel having complete CNC and machine control system with display of specified configuration should be provided on the operators platform for safe, convenient and efficient operation from both left and right sides of tool post. All switches should be within reach of operator of average height (5' 5") for easy operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details should be submitted.	Vendor to offer			
2.11.2	CNC SYSTEM & FEATURES Details/Requirements mentioned below are as per Siemens make system. In case of Fanuc make system, equivalent features/requirements are to be offered.				
2.11.2.1	Make : Fanuc / Siemens.	Vendor to confirm			
2.11.2.2	Type : PC based latest version	Vendor to confirm			

2.11.2.3	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			
2.11.2.4	Details of optional features, recommended by vendor. (Including features required for Prove-Out Components)	Vendor to offer and submit details			
2.11.2.5	Details of other optional features:	Vendor to offer and confirm			
2.12.2.5.1	Axes Interpolation: Linear, Circular, Cylindrical, Helical, Spline	Vendor to confirm			
2.12.2.5.2	Max Number of simultaneous interpolation: 3	Vendor to confirm			
2.12.2.5.3	Part Program Storage: 2 MB or more	Vendor to confirm			
2.12.2.5.4	Technology Cycles: Geometry Calculation, standard Drilling, Tapping, Milling cycles.	Vendor to confirm			
2.12.2.5.5	Graphics simulation (Static and dynamic) of Part Programs and Machining process.	Vendor to confirm			
2.12.2.5.6	Co-ordinate Transformation: Datum shift, rotation, mirror image, scaling factor.	Vendor to confirm			
2.12.2.5.7	Pitch Error compensation (As applicable)	Vendor to confirm			
2.12.2.5.8	Backlash error compensation (As applicable)	Vendor to confirm			
2.12.2.5.9	Zero Offset for all axes	Vendor to confirm			
2.12.2.5.10	Feed override switch 0-120% for all axis	Vendor to confirm			
2.12.2.5.11	Spindle speed override switch 70-120%	Vendor to confirm			
2.12.2.6	Provision for safe shut down of CNC Control in case of Power Failure	Vendor to confirm			
2.11.3	MANUAL CONTROL:				
2.11.3.1	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.			
2.11.4	HAND HELD UNIT:				
2.11.4.1	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.			
2.11.5	UPS FOR CNC SYSTEM: (Only in case of PC based CNC systems)				
2.11.5.1	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.			

2.11.6	NOTE BOOK PC (I/O DEVICE):				
2.11.6.1	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.			
2.12	MACHINE LIGHTS :				
2.12.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform for clear visibility.	Vendor to offer			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer			
2.12.3	Lights required in the foundation / pit area.	Vendor to offer			
2.12.4	All light fittings, consumables, adapters / receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
2.12.5	Flashing / Rotary type light (indicating end of cutting, program stop, alarm etc.)	Vendor to offer			
2.13	REFRIGERATION UNITS / AIR CONDITIONERS				
2.13.1	Door mounted Air Conditioners with Dehumidifiers of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal for all Electrical/ Electronic Panels/ Cabinets including Operator's Panel (One no. of sufficient capacity for each cabinet/ panel considering continuous operation at ambient temperature of 50°C). The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/ modules. ACs must be incorporated with electrical/ refrigeration interlocks.	Vendor to offer and confirm			
2.13.2	ACs unit must be mounted on the movable pendant 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.				

2.13.3	Oil Chiller units of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal/ Gem in package should have minimum 50% standby with multiple refrigeration circuits having energy-efficient HFC-based Hermetically-sealed Rotary/ Scroll/ Reciprocating Compressors with independent refrigeration circuits having SS-brazed Plate-type Heat Exchanger, Air-cooled Condenser, Thermostatic Expansion Valve, HP/ LP Switch, Oil Flow/ Anti Freeze Cut-out, etc. The units must have In-line Multistage Gear Pumps (with 100% standby), SS Storage Tank, Valves, NRVs, Filters, Automatic Microprocessor-based Controller with LCD Display, Safety Interlocks, etc. in one complete package. The unit must operate continuously with equal-run-time of Compressor at ambient temperature of 50°C.	Vendor to offer and confirm			
2.13.4	For precise air/ oil temperature with energy-efficient operation, latest state-of-the-art technology features like 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			
2.13.5	Unit (s) must be designed to work in extremely harsh industrial environment and needs protection from heat, dust, fumes, corrosive or oily vapours, moisture, etc. The condenser coil must resist dust accumulation & must transfer heat efficiently.				
2.13.6	Vendor to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Air Conditioning/ Chiller Unit. - Capacity of the Unit. - Type of Compressor with complete specifications. - Type of Thermostatic Expansion Valve with complete specifications. - Fan size and flow in CFM (cubic feet meter) of the Condenser unit. - Specifications of the Evaporator Unit. - Functional requirement of temperature of cool air/ oil to be maintained between range +15°C to +40°C. - Type of Microprocessor-based Controller with LCD Display with complete functional details. Detailed specifications of all the components fitted in the Unit (s) are to be submitted with BOM, make, etc. in Technical bid. Vendor have to provide leaflet/ catalogue of all the brought-out items, refrigeration accessories and provide schematic layout of the system.	Vendor to specify			

2.13.7	Compressor, Refrigeration Spares Items, PHE (Plate-type Heat Exchanger), Gear Pump, etc. must be available in India and if possible can be repaired, locally. Vendor have to give training to operate, maintain & repair all the individual items and the Chiller/ AC Unit (s) as a whole. Exhaustive training is to be given for electrically integration of the Unit (s) with the CNC machines.	Vendor to confirm			
2.14	HYDRAULIC SYSTEM :				
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			
2.14.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
2.14.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should be of Make : EPE / Hydac.	Vendor to offer and confirm			
2.14.4	Failure indication	Vendor to offer			
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
2.14.6	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			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform			
2.14.8	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.	Vendor to confirm & offer			
2.14.9	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.	Vendor to offer & submit			
2.15	COOLANT SYSTEM :				
2.15.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons as well.	Vendor to offer			
2.15.1.1	Recirculating Type Flood Coolant System	Vendor to offer			
2.15.1.2	Air coolant system	Vendor to offer			
2.15.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip or grinding wheel.	Vendor to offer			

2.15.3	Coolant collection and recirculation system should be leak proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc. In case, any leakage is found, it shall be corrected by vendor. Additionally, suitable equipment should be provided at deepest point of foundation pit to pump out collected oil/coolant up to shop floor.	Vendor to offer & confirm			
2.15.4	Vacuum Rotary drum type Coolant Filtration System with Magnetic Separator for all machining operations. Additional Paper Filter (Indian make consumable paper) should be used only for grinding. For turning and grinding operations, the coolant should be collected through the chip conveyor and re-circulated through a vacuum filter & magnetic separator. In case of grinding operation, after the vacuum filter & magnetic separator, the coolant should also pass through a paper filter. The selection should be automatic or through program. Details to be submitted.	Vendor to offer			
2.15.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.	Vendor to submit			
2.15.6	Coolant pumps & motor details etc.	Vendor to inform			
2.15.7	Coolant Tank Capacity	Vendor to inform			
2.15.8	Pressure & rate of flow of coolant for different variants & operations like turning & grinding etc. should be furnished in the offer. The coolant should be able to reach tool tip at full pressure.	Vendor to inform			
2.15.9	All types of coolant variants should be switchable through program as well as manually by push buttons provided on the Operator's control panel.	Vendor to offer			
2.15.10	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to offer			
2.15.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer			
2.16	ELECTRICAL :				
2.16.1	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 accept.			

2.16.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized to suit specified ambient & operating conditions.	Vendor to confirm			
2.16.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm			
2.16.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm			
2.16.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
2.16.6	Motors shall conform to IEC or Indian Standards.	Vendor to confirm			
2.16.7	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			
2.16.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm			
2.17	In-cycle hour counter with reset facility for counting spindle & carriage running time, machine idle time, machine under maintenance time etc. and display the counted data on CNC display on video pages created by vendor.	Vendor to offer			
2.18	Tool Storage Cabinets (4 nos.) of reputed (Indian) make having covered heavy duty drawers of suitable sizes with lock facility to store offered tooling items etc.	Vendor to offer			
2.19	Portable Data Input Output Device : Portable unit or its equivalent (Note Book PC with 1 GB pen drive) for bi-directional program & data transfer between the offered unit & supplied system and as well as standard PC available at BHEL works, using floppy drive or its equivalent, should be offered with all required hardware, software, interfaces, cables, protection cover etc.	Vendor to offer			
2.20	SAFETY ARRANGEMENTS : Following safety features in addition to other standard safety features should be provided on the machine:				
2.20.1	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.	Vendor to offer			
2.20.2	A detailed list of all alarms / indications provided on machine along with cause and remedy should be submitted by the supplier.	Vendor to submit			

2.20.3	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.	Vendor to offer			
2.20.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm			
2.20.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to offer			
2.20.6	Oil & water pipe lines should not run with electrical cable in the same trench.	Vendor to offer			
2.21	ENVIRONMENTAL PERFORMANCE OF THE MACHINE : The Machine should conform to following factors related to environment :				
2.21.1	Maximum noise level shall be 85 dB (A) at 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to confirm			
2.21.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.21.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm			
2.21.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.21.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.21.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			
3	CHIP CONVEYOR :				
3.1	One chip conveyor (elevated on tailstock side) to carry both short and curly chips efficiently and effectively should be provided on rear side of machine along bed ways with trouble free chip flow through chutes under the bed ways up to chip bin at shop floor.	Vendor to offer			
3.2	Type of chip conveyor (Hinged Type or superior)	Vendor to inform			
3.3	Width of conveyor	Vendor to inform			
3.4	Elevation of chip conveyor for chip bin	Vendor to inform			
3.5	Material of chip conveyor (should be rust resistant)	Vendor to inform			

3.6	Provision for smooth flow of chips through chutes under bed ways to the conveyor and for avoiding clogging of chips should be provided. Grill/Mesh type rigid covers should be provided above the chip conveyor, to enable machine operator to use the access to chip conveyor from shop floor as and when required for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor. There should not be any gap (left uncovered of metallic sheet chutes) on both sides of chip conveyor along its length to avoid scattering & collection of chips & coolant in foundation pit.				
3.7	In case of grinding, provision for flushing out grinding dust/slurry to avoid clogging of conveyor's holes should be provided.		Vendor to confirm		
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and also at Chip Conveyor's disposal end.		Vendor to offer		
3.9	Layout showing location of chip conveyor should be submitted.		Vendor to submit		
3.10	One no. Chip Bin of appropriate size of Indian make, with wheels, lifting hooks & handle for movement, should also be supplied.		Vendor to offer		
4	ULTRA ISOLATION TRANSFORMER :				
4.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied for unbalanced load & supply conditions considering specified power supply & ambient conditions.		Vendor to offer		
4.2	Make		NEEL or Aplab or Auto Electric or Servomax or of international repute.		
4.3	Model and Rating		Vendor to inform		
4.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.		Vendor to specify		
4.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.		Vendor to submit		
5	PNEUMATIC SYSTEM :				
5.1	AIR COMPRESSOR :				

5.1.1	Independent Air Compressor (of reputed Indian make - Elgi, Chicago Pneumatic or Ingersol Rand) with refrigerated type Dryers & Filters of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be offered. The system should be so designed to have additional provision and required accessories so that BHEL's centralized compressed air supply having pressure (around 4-5 bar) & moisture/oil contents could be used as and when required. The compressor unit should be suitable for continuous duty. All pipe lines (metallic) and Valves required for joining the compressor to inlet points of the machine will be supplied by vendor.	Vendor to offer			
5.1.2	Make & Model of Air Compressor and Refrigerator type Dryer.	Vendor to inform			
5.1.3	Capacity (Flow, Pressure & KW)	Vendor to inform			
5.1.4	Output Air Quality : Pressure dew point, Residual Mist and oil content in ppm.	Vendor to inform			
5.1.5	Noise level (Maximum 80 db)	Vendor to inform			
5.1.6	Spares Package for the Air Compressor and Refrigerator type Dryer etc. for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit			
5.1.7	Availability of suitable compressed air supply, if required, for offered grinding spindle unit. Leakage through any part of grinding spindle unit is to be taken into consideration.	Vendor to confirm			
5.2	COMPRESSED AIR POINTS :				
5.2.1	Compressed Air Point with manually ON/ OFF Valve and flexible pipe of required length for work piece cleaning should be suitably provided on carriage near tool post.	Vendor to offer			
5.2.2	Compressed Air Point with connections for Air Coolant System mentioned at Sl. No. 2.15.1.2	Vendor to offer			
6	TOOLINGS : * Price of unit quantity of each offered item should be quoted. * For inserts, price for ten inserts should be quoted. * Vendor may recommend and offer any other type of tool holders/adapters/cassettes in addition to tooling items mentioned below considering specified requirements/applications and submit their details. * Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering.				
6.1	Cassettes as per VDI 3425 size 40/ DIN 69881 size 140 for Tool Carrier no. 1 : (LH - Left Hand / RH - Right Hand) If required, special cassette, with dimensions different from the standard, is to be provided keeping in view rigidity required for heavy machining load.				

6.1.1	LH cassette, approx. length 200mm, for turning tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32mm & 25x25 mm also.	Vendor to offer			
6.1.2	RH cassette, approx. length 200mm for turning tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.3	LH long cassette, approx. length 400mm for turning tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.4	RH long cassette, approx. length 400mm for turning tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.5	LH cross cassette, approx. length 200mm for facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.6	RH cross cassette, approx. length 200mm for facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.7	LH long cross cassette, approx. length 400mm for facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.8	RH long cross cassette, approx. length 400mm for facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.9	LH conventional type cassette, approx. length 200mm for both turning & facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.1.10	RH conventional type cassette, approx. length 200mm for both turning & facing tool shank 40 x 40 mm with packing plate to clamp tool shank 32 x 32 mm & 25x25 mm also.	Vendor to offer			
6.2	Boring Bar Holders for Tool Carrier no. 1 :				
6.2.1	Boring Bar Holder with through hole for boring bar dia 80. Holding length for boring bar in the holder should be sufficient (approx. 4x dia i.e. 320mm) for vibration/chattering free boring operation.	Vendor to offer			
6.2.2	Boring Bar Holder with through hole for boring bar dia 60. Holding length for boring bar in the holder should be sufficient (approx. 4x dia i.e. 240mm) for vibration/chattering free boring operation.	Vendor to offer			
6.2.3	Reduction Sleeve, dia 60 - dia 50, for Boring Bar Holder	Vendor to offer			
6.2.4	Reduction Sleeve, dia 60 - dia 40, for Boring Bar Holder	Vendor to offer			
6.2.5	Reduction Sleeve, dia 60 - dia 32, for Boring Bar Holder	Vendor to offer			

6.3	Tool Holders for Tool Carrier no. 2 : Suitable rigid tool holders for deep grooving like Sitzmann & Heinlein (WK 160 type) or equivalent/ superior tool holders for sizes given below should be offered. Standard grooving inserts of widths same or near to specified sizes may be selected with consent from BHEL.	Vendor to offer			
6.3.1	LH Grooving Tool Holder, Grooving Width= 10.0 mm / Depth= 60 mm.	Vendor to offer			
6.3.2	RH Grooving Tool Holder, Grooving Width= 10.0 mm / Depth= 60 mm.	Vendor to offer			
6.3.3	LH Grooving Tool Holder, Grooving Width= 12.0 mm / Depth= 70 mm.	Vendor to offer			
6.3.4	RH Grooving Tool Holder, Grooving Width= 12.0 mm / Depth= 70 mm.	Vendor to offer			
6.3.5	LH Grooving Tool Holder, Grooving Width= 15.0 mm / Depth= 80 mm.	Vendor to offer			
6.3.6	RH Grooving Tool Holder, Grooving Width= 15.0 mm / Depth= 80 mm.	Vendor to offer			
6.3.7	LH Grooving Tool Holder, Grooving Width= 18.0 mm / Depth= 90 mm.	Vendor to offer			
6.3.8	RH Grooving Tool Holder, Grooving Width= 18.0 mm / Depth= 90 mm.	Vendor to offer			
6.3.9	LH Grooving Tool Holder, Grooving Width= 23.0 mm / Depth= 100 mm.	Vendor to offer			
6.3.10	RH Grooving Tool Holder, Grooving Width= 23.0 mm / Depth= 100 mm.	Vendor to offer			
6.3.11	LH Grooving Tool Holder, Grooving Width= 25.0 mm / Depth= 130 mm.	Vendor to offer			
6.3.12	RH Grooving Tool Holder, Grooving Width= 25.0 mm / Depth= 130 mm.	Vendor to offer			
6.3.13	LH Grooving Tool Holder, Grooving Width= 30.0 mm / Depth= 140 mm.	Vendor to offer			
6.3.14	RH Grooving Tool Holder, Grooving Width= 30.0 mm / Depth= 140 mm.	Vendor to offer			
6.3.15	LH Turning Tool Holder with Round Insert Dia 25.0 mm for Depth= 140 mm.	Vendor to offer			
6.3.16	RH Turning Tool Holder with Round Insert Dia 25.0 mm for Depth= 140 mm.	Vendor to offer			
6.3.17	LH Turning Tool Holder with Round Insert Dia 12.0 mm for Depth= 60 mm.	Vendor to offer			
6.3.18	RH Turning Tool Holder with Round Insert Dia 12.0 mm for Depth= 60 mm.	Vendor to offer			
6.3.19	Neutral Tool Holder for square SNMM type or equivalent Insert for turning operations.	Vendor to offer			
6.3.20	LH Tool Holder for CNMM type or equivalent Insert for turning operations.	Vendor to offer			
6.3.21	RH Tool Holder for CNMM type or equivalent Insert for turning operations.	Vendor to offer			

6.4	TOOLS FOR MACHINING OF PROVE-OUT COMPONENT : All types of required tools, inserts, holders, adapters, grinding wheels, measuring probes/styli, steady pads, special measuring instruments etc. in sufficient quantity for all types of operations like turning, grooving, grinding, rolling, measurement operations etc., as recommended by the vendor for complete proveout machining as mentioned at SI. No.. 20 to meet required drawing accuracy & surface finish . These tooling items shall be in addition to the tools mentioned above.	Vendor to offer			
6.4.1	Vendor to quote separately for the package of tools required for machining of each of the two components specified at SI.Nos. 20.2. Component wise list of offered items with quantity is to be submitted.	Vendor to accept & offer			
6.5	Other Tooling Requirements :				
6.5.1	Additional set of 4 Jaws	Vendor to offer			
6.5.2	Steady pads for diameters 250, 315, 360, 380, 400, 450, 451, 457, 500, 597, 599, 605, 620, 697, 699, 705, 746, 747, 749, 847, 849 & 855 mm. Price of each pad is to be quoted separately. In case of minor changes in diameters of required pads, vendor shall be informed prior to ordering. Manufacturing drg of each pad shall be submitted by vendor in case of order.	Vendor to offer & confirm			
6.5.3	Mounting details of each type of toolings to be explained with the help of drawings / sketches.	Vendor to explain			
6.5.4	Offered tooling system to be rigid to carryout machining in extreme conditions like max. overhang of tool carriers etc. without undue vibration, which can effect job accuracy and surface finish.	Vendor to confirm			
6.5.5	In case of order, manufacturing drgs., catalogues & source of all tooling items should be submitted by vendor.	Vendor to confirm			
6.5.6	Supplier should offer all tools & inserts with latest cutting geometries and grades to achieve better productivity and higher cutting parameters.	Vendor to confirm			
6.5.7	The center line of the boring bar holders should reach atleast up to machine center line. Drg. is to be submitted.	Vendor to confirm & offer			
6.5.8	Consumables (e.g. inserts, screws, shims etc.) for the tools offered for the proveout component at s.no. 7.4 should be quoted for machining of two more same component by BHEL after proveout and commissioning of the machine. Vendor to quote component wise list of offered items & quantity.	Vendor to offer			
7	MEASURING SYSTEMS :				
7.1	AUTOMATIC JOB MEASURING SYSTEM :				

7.1.1	Automatic Wireless Job Measuring System using electronic probes with measuring cycles, automatic programmable calibration system. The probe adapters should be clamped in tool holders mounted on tool carriers. Calibration block should be fixed on headstock for automatic programmable calibration. Complete tool post should clear headstock for this purpose. Details to be submitted.	Vendor to offer & submit			
7.1.2	All types of standard & special probes/stylus & their adapters required to measure all machined surfaces & dimensions (external & internal) of the prove-out components. Adapters should include special adapters for checking the different dimensions of T-type blade grooves & other grooves shown in drawings of the proveout component. Details to be submitted.	Vendor to offer			
7.1.2.1	Vendor to quote separately for the package of probes/stylus & their adapters required for measurements, as above, of each of the two components specified at SI Nos. 20.2 Vendor to quote accordingly. Component wise list of offered items with quantity is to be submitted.	Vendor to offer & submit			
7.1.3	The measurement system shall be customised so that the measured result file shall be generated in the CNC System only and shall contain all relevant information such as nominal values, measured values, tolerances along with project details of measured component as per sample format at Annexure-I. Further , all the measurements done on the component shall appear in a single file in the above sample format. The selected probing results output file shall be printable from the CNC screen of the machine on a printer through a single key command/soft Key. All necessary hardware & software including Printer, all types of cables, communication software, CNC features required for above mentioned setup shall be provided by the vendor.	Vendor to offer with details.			
7.1.4	Spares Package for the Measuring system for 2 years trouble free working should also be offered. The spares should include Tool Probes, Interface Unit & Special Probes if any. List to be submitted.	Vendor to offer & submit			
7.1.5	Details of Automatic calibration of the probes.	Vendor to submit			
7.1.6	Repeatability and accuracy of the probe	Vendor to inform			
7.1.9	Operating Manuals, Maintenance Manuals & Catalogues for offered Automatic Job Measuring System.	Vendor to offer			
7.1.10	During proveout machining, final inspection of the components shall be done by supplied Job Measuring System using required program supplied by vendor.	Vendor to accept & offer			
7.2	AUTOMATIC TOOL OFFSET MEASURING SYSTEM :				

7.2.1	Automatic Tool Offset Measuring System using electronic probes with measuring cycles, calibration system etc. suitable for all types of required tools & tool holders for prove-out components considering all specified machining applications. Vendor to furnish detailed description of the system along with offer.	Vendor to offer			
7.2.2	Details of Automatic calibration of the probes.	Vendor to submit			
7.2.3	Repeatability and accuracy of the probe	Vendor to inform			
7.2.4	Spares Package for the Measuring system for 2 years trouble free working should also be offered. The spares should include Tool Probes, Interface Unit & Special Probes if any. List to be submitted.	Vendor to offer & submit			
7.2.5	Operating Manuals, Maintenance Manuals & Catalogues for offered Automatic Tool Offset Measuring System.	Vendor to offer			
7.2.6	During proveout, all tools shall be set & checked by supplied Automatic tool offset Measuring System using required program supplied by vendor.	Vendor to accept & offer			
8	DIAGNOSTIC SYSTEM :				
8.1	TELE-DIAGNOSTIC SERVICE : Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. 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 & inform			
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 & submit			

8.2.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the tool carriers of the Tool Post to its initial/nearest position in case of interruption of tool carrier's positioning cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of Tool carriers positioning cycle manually. Separate Hand Held Pendant should also be provided, if required for ease of operation & visibility, to retrieve the tool carrier to it's initial position.	Vendor to offer			
8.2.3	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			
8.2.4	Help guide should be provided to use both diagnostic systems	Vendor to offer & submit			
9	LEVELING & ANCHORING SYSTEM: Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment of bed and to fix the machine to the foundation should be supplied. Details to be submitted.	Vendor to offer			
10	TOOLS FOR ERECTION, OPERATION & MAINTENANCE				
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 offer			
10.2	Set of Test Mandrels/Cylindrical Bars for checking spindle run-out & alignment of headstock/tailstock etc. should be supplied with protection boxes.	Vendor to offer			
11	ACCESSORIES :				
11.1	GRINDING UNIT :				
11.1.1	The Grinding Unit should be suitably mounted on the Tool Post to enable troublefree grinding on journal diameters, Journal & flange faces on the TG rotor as per drawing accuracy & surface finish. All operations of the grinding unit should be programmable including swiveling of base of grinding unit/spindle for grinding on different surfaces. The grinding Unit should be supplied with its all required accessories for its' mounting/clamping on tool post, coolant supply/connections using same offered flood coolant through Vacuum Rotary Drum Type Filter + Magnetic Separator + Paper Filter and tools for mounting of grinding wheel on the unit etc.. Details with relevant drawings/sketches/catalogue including list of offered accessories to be submitted.	Vendor to offer			
11.1.2	Provision of Balancing of Grinding Wheel mounted on grinding unit should be provided. The requirement is to be mutually discussed and agreed. Details to be submitted.	Vendor to offer			

11.1.3	Provision of Wheel Dressing Device, programmable for its auto-operation through M-codes, suitably located (preferably on Headstock) for dressing of wheels for accurate alignment of the wheel with working axis considering all types of specified grinding applications. Details to be submitted.	Vendor to offer			
11.1.4	Programmable Grinding Cycles for all types of specified grinding operations should be provided.	Vendor to offer			
11.1.5	Additionally, provision for manual grinding i.e. without CNC program should also be there for grinding on diameters & faces.	Vendor to offer			
11.1.6	Details of grinding spindle motor like make, rating, type, torque etc.	Vendor to inform			
11.1.7	Max. and Min. dia of Grinding Wheels for all types of specified grinding applications.	Vendor to inform			
11.1.8	Width of Grinding Wheel	Vendor to inform			
11.1.9	Min. & Max. Dia. For Cylindrical Grinding	150 - 1200mm			
11.1.10	Min. & Max. Dia. For Facial Grinding	0 - 1200mm			
11.1.11	Limitations, if any for grinding on Journal LH/RH faces.	Vendor to inform			
11.1.12	Swiveling Positions of base of Grinding Unit	+90deg, 0deg, -90deg			
11.1.13	Accuracy of angular positioning	Vendor to inform			
11.1.14	Tool Post, with Grinding Unit & wheel mounted on it, should clear Steady rests.	Vendor to confirm			
11.1.15	Drawings showing mounting details of grinding unit on tool post	Vendor to submit			
11.1.16	Drawing showing extreme movements of grinding unit mounted on tool post in both X and Z axes for unit's complete swiveling range and different wheel diameters etc. to be submitted.	Vendor to submit			
11.1.17	Grinding Wheels – 2 Nos. of each type or dia. shall also be supplied in addition to quantity recommended & supplied for the proveout component.	Vendor to offer			
11.1.18	Specifications & source of offered grinding wheels shall be informed by vendor for future procurement of same by BHEL.	Vendor to inform			
11.1.19	Sufficient protection to bearing and guide ways from ground dust / slurry to be provided.	Vendor to confirm			
11.2	ROLLING DEVICE :				
11.2.1	Fully programmable Rolling Device with required tools, rollers & accessories etc. for rolling of Journal diameters, adjacent LH/RH fillet radii with/without taper entry, faces of Turbine rotors.	Vendor to offer			

11.2.2	The Rolling process should induce residual compressive stresses equivalent to atleast 300N/mm ² at depth of 0.5mm (radially) and generate surface finish of Rz5 or better on cylindrical and fillet radii portions. The cylindricity & runout on dia after rolling operation should be within 0.01mm & 0.02mm respectively. While establishing rolling operation on proveout component , vendor shall have to verify & demonstrate that required surface finish and accuracies have been achieved.	Vendor to accept, confirm & offer			
11.2.3	Required hardware & software for measurement, setting and display of applied pressure on roller shall be supplied and installed with rolling device.	Vendor to offer			
11.2.4	The rolling tool shall be clamped on tool carrier no. 1 of tool post preferably in specified VDI cassette. Alternatively, the vendor may recommend better location. All other accessories of rolling device should be either portable or easily mountable on the tool post to use the rolling device as and when required. Details are to be submitted.	Vendor to offer & inform			
11.2.5	Details like drawing of rolling tool, catalogue, drawing of roller, hardness of roller etc. are to be submitted.	Vendor to submit			
11.2.6	Smallest & Largest fillet radii which can be rolled using offered tool.	Vendor to inform			
11.2.7	Smallest & Largest entry angle of fillet radii which can be rolled using offered tool.	Vendor to inform			
11.2.8	Carriage/Tool Post, with Rolling Device mounted on it, should clear Steady rests.	Vendor to confirm			
11.2.9	Drawings showing mounting details of Rolling Device on tool post	Vendor to submit			
11.2.10	Drawing showing extreme movements of Rolling Device mounted on tool post in both X and Z axes etc. considering both LH and RH rolling tools, to be submitted.	Vendor to submit			
11.2.11	Rollers – 2 Nos. of each type shall also be supplied in addition to quantity recommended & supplied for the proveout component.	Vendor to offer			
11.2.12	One additional set of offered rolling tools (one of each type)	Vendor to offer			
11.2.13	Specifications & source of offered Rolling Tool & Rollers shall be informed by vendor for future procurement of same by BHEL.	Vendor to inform			
11.2.14	In case of special coolant requirements for rolling operation, vendor should offer suitable system. Details to be submitted.	Vendor to inform & offer			
11.3	CARDAN SHAFT :				
11.3.1	Suitable Cardan Shaft (Double Jointer Shaft) for driving Turbine Rotors supported on two hydrostatic steady rests to perform troublefree finish turning operations at required rpm (max. 200rpm). Drg./catalogue of cardan shaft to be submitted.	Vendor to offer & submit			

11.3.2	The cardan shaft should have provision of torque transmission through universal joint for 120kw at approx. 6rpm with sufficient safety factor, tubular design of fixed length, flange yoke with face key connection, maximum operating angle 15 deg, no length compensation etc. Details to be submitted.	Vendor to offer			
11.3.3	Length (Approx. 1000mm), flange diameters and coupling/fixing details etc.	Vendor to inform			
11.3.4	Provision to avoid axial shifting/movement (along Z-axis) while driving through cardan shaft for machining of rotors is to be offered. Details to be submitted.	Vendor to offer			
11.3.5	Provision of suitably located stand for adequate storage of the cardan shaft, when it is not in use.	Vendor to offer			
11.3.6	Torque transmitted by the Cardan Shaft	Vendor to inform			
11.3.7	Base, which shall be kept on machine bed, to support cardan shaft from falling at universal joint when engaging or disengaging the shaft with flange of the rotor. Drg./sketch to be submitted.	Vendor to offer			
11.4	STORAGE & HANDLING FACILITY FOR ACCESSORIES/ATTACHMENTS: Suitably located, effective and safe storage stations are to be provided for adequate storage of the accessories like grinding unit, rolling device etc. & steady rests, when they are not in use. Fully power operated lifting & shifting arm or jib crane of suitable capacity should be provided at suitable place for troublefree, fast & safe mounting/dismounting of the accessories etc. Details are to be submitted.	Vendor to offer			
11.5	DATA PRINTING FACILITY: Indian make printer should be offered for printout/report of data generated by automatic job measurement system and any other required data from CNC system. The printer should be properly interfaced & suitably located. Details like size, type, make & broad specifications are to be submitted.	Vendor to offer			
12	SPARES :				
12.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to offer			
12.1.1	Mechanical & Hydraulic Spares : Following Spares are to be offered.	Vendor to offer			
12.1.1.2	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 no. of each type)	Vendor to offer			

12.1.1.1.3	Pressure switches, flow switches used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 No. of each type)	Vendor to offer			
12.1.1.4	All types of regenerative type filter inserts (6 No. of each type in hydraulic, pneumatic & coolant circuit)	Vendor to offer			
12.1.1.5	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer			
12.1.1.6	All types of Accumulator bladders (1 no. of each type) with charging kit	Vendor to offer			
12.1.1.7	One set of timing belts used in the machine.	Vendor to offer			
12.1.1.8	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer			
12.1.1.9	One set of hose pipe with end connection used in the machine.	Vendor to offer			
12.1.1.10	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.	Vendor to offer			
12.1.1.11	All types of shaft seals (2 no. of each type), O-rings & Piston Rings (5 nos. of each type) used in the machine.	Vendor to offer			
12.1.1.12	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	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
12.1.2.2	Relays (2 Nos each type)	Vendor to offer			
12.1.2.3	Contactors (2 Nos each type)	Vendor to offer			
12.1.2.4	RTD temperature transmitter (1 No each type)	Vendor to offer			
12.1.2.5	Proximity Switches (5 Nos each type)	Vendor to offer			
12.1.2.6	Push Buttons (5 Nos each type)	Vendor to offer			
12.1.2.7	Indicating Lamps (10 Nos each type)	Vendor to offer			
12.1.2.8	Semiconductor Fuses (5 Nos each type)	Vendor to offer			
12.1.2.9	Special Fuses (5 Nos each type)	Vendor to offer			
12.1.2.10	Circuit Breakers (1 No each type)	Vendor to offer			
12.1.2.11	Main Power Switch (1 No each type)	Vendor to offer			
12.1.2.12	Encoders (1 No each type)	Vendor to offer			
12.1.2.13	Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
12.1.2.14	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
12.1.2.15	NCU module	Vendor to offer			
12.1.2.16	I/O Cards for PLC (1 No each type)	Vendor to offer			
12.1.2.17	Power Module & Control Cards for Main Drive as well as Feed Drives (1 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) 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 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. Part names on all drgs & circuit diagrams should be written in English only.	Vendor to offer			
13.4	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, tailstock center, adapters, sleeves, fixtures etc.	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, Grinding Attachment, Rolling Device etc.	Vendor to offer			
13.9	PLC program print-outs (hard copy) with comments in English including PLC program for any other auxiliary system if used.	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	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 the area & period given below: (a) CNC Programming for the machine, measuring system, grinding attachment, rolling device 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. Sl.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 note			
14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
14.4	Vendor should commit & offer to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works/training school for advanced features and specialized training, if so required by BHEL.	Vendor to offer			
14.5	Training charges, if any, for training requirement at Sl.No. 14.1 & 14.4 should also be quoted on per Man-day basis so that training charges can be derived for the agreed period & persons, in case of any change.	Vendor to offer			
15	FOUNDATION :				

15.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of vendor and at vendor's responsibility. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Vendor should arrange equipments required for the testing of foundation, if required.	Vendor to offer			
16	ERECTION & COMMISSIONING :				
16.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance. 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 offer			
16.2	Erection & Commissioning of indigenously supplied items like Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to offer			
16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause no. 21 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to offer			
16.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be arranged and brought by the supplier. Out of the complete supply, all tools, tackles, mandrels etc. which may be required by BHEL to maintain the machine, after commissioning, shall not be taken back by vendor. Other equipment including Laser equipment shall be arranged by vendor on returnable basis. Vendor to offer accordingly.	Vendor to offer			

16.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to offer			
16.6	All Cover Plates, sheets/plates for chutes for chips flow through bed ways etc. required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor to offer			
16.7	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer			
16.8	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
16.9	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to submit			
17	ACCURACY TESTS :				
17.1	GEOMETRICAL ACCURACIES :				
17.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 1708 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 & submit			
17.1.2	Head Stock Spindle run out: (Radial & Axial)	Vendor to inform			
17.1.3	Tail stock Quill run-out	Vendor to inform			
17.1.4	Cylindricity of turning	Vendor to inform			
17.1.5	True roundness of turning	Vendor to inform			
17.1.6	Facial run-outs	Vendor to inform			
17.1.7	Axial Float of Headstock	Vendor to inform			
17.1.8	All other accuracies to confirm to ISO 1708 (Latest Revision) or Suppliers Test chart whichever is finer.	Should be tested by Vendor			
17.1.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works under specified ambient and operating conditions.	Vendor to confirm			
17.1.10	It should be possible to achieve offered accuracies on the components in all types of setups i.e. job held in chuck & supported on steady at other end, job held in chuck & tailstock center at other end and job held in chuck only.	Vendor to confirm			

17.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER. (To be arranged by vendor on returnable basis)	Vendor to confirm			
17.2.1	Positioning accuracy in X axis (Pa) per 1000 mm (Bi-directional)	≤ 0.015 mm			
17.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm (Bi-directional)	≤ 0.015 mm			
17.2.3	Repeatability in X axis (Ps) per 1000 mm (Bi-directional)	≤ 0.008 mm			
17.2.4	Repeatability in Z axis (Ps) per 1000 mm (Bi-directional)	≤ 0.008 mm			
17.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform			
17.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform			
17.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform			
17.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform			
17.2.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works under specified ambient and operating conditions.	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	OPERATING CONDITIONS & THERMAL STABILITY : Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies.	Vendor to offer & confirm			
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 accept & confirm			
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 without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor.	Vendor to accept & 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 accept & confirm			

18.4	The machine, including attachments and accessories, should be suitable for continuous operation to its full capacity for 24 hour a day and 7 days a week throughout the year. Vendor to ensure and confirm the same.	Vendor to accept & confirm			
18.5	Provision should be there in Headstock Assembly to compensate for thermal expansion in it during continuous running of the machine for specified applications and to have its axial float within specified limits as per Sl.No.18.1.7.	Vendor to accept & confirm			
19	PROVEOUT OF BHEL COMPONENTS				
19.1	Complete and successful machining of proveout component, to the specified design accuracy and surface finish, shall be done by the vendor after erection & startup of the machine at BHEL works using tools, equipment and CNC programs etc. supplied by the vendor. The rough machined forging as per the reference forging drawing for the proveout component shall be provided by BHEL. In case of any change in proveout component, it shall be informed to vendor before final scope of supply & ordering. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and get cleared by vendor during initial technical discussions.	Vendor to offer			
19.2	The following Rotor shafts of Steam Turbine shall be machined on the "CNC Lathe" during proveout. Reference drawings are enclosed. - Rotor Shaft drawing no. 0-10301-46000 - Groove plan drawing no. 9-10304-46051 - T Groove drawing no. 4-10107-46012 - T Groove drawing no. 4-10107-46014 - T Groove drawing no. 4-10204-46014 - T Groove drawing no. 4-10304-46011 - T Groove drawing no. 4-10304-46012 NOTE: Groove plan drawing no. 9-10304-46051 shows both casing and rotor parts. Only rotor part is to be considered.	Vendor to accept & confirm			
19.3	The proveout machining shall include following operations:				
19.3.1	All turning and grooving operations for machining of Shaft.	Vendor to accept & offer			
19.3.2	Grinding operations on journal diameters, faces and flange faces only for the purpose of demonstration of functioning of Grinding unit. All the required dimensional accuracy, runouts etc. and surface finish must be achieved only by turning and rolling process.	Vendor to accept & offer			
19.3.3	Rolling operations on journal dia with fillet radii/contours & faces. Rolling operation shall be demonstrated first on allowance available for machining to establish values of achievable surface finish.	Vendor to accept & offer			

19.4	All operations shall be performed using CNC Programs supplied by vendor.	Vendor to accept & offer			
19.5	Job setting plan, Process Plan for machining as well as Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.	Vendor to accept & confirm			
19.6	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 component shall be refunded by the vendor to BHEL in case of rejection of the component.	Vendor to accept & confirm			
20	MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)				
20.1	Tests/Activities to be carried out at supplier's works on the machine before dispatch : All these activities shall be part of pre-dispatch inspection of the machine which shall be carried out by BHEL's team during their stay at vendor's works for the training (Ref. SL.No. 15.1). Report of the same shall be submitted to BHEL.	Vendor to accept & offer			
20.1.1	Geometrical accuracies as per SI.No.18.1	Vendor to accept			
20.1.2	Positioning accuracies as per SI.No. 18.2	Vendor to accept			
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			
20.1.4	Demonstration of all features of the machine, control system & accessories	Vendor to accept			
20.1.5	Machining of test piece as per AFNOR/ISO. Vendor to supply test pieces and tools for their machining. Drawing of test pieces to be submitted.	Vendor to accept & submit			
20.2	Tests/Activities to be carried out at BHEL works while commissioning the machine :	Vendor to accept & offer			
20.2.1	Geometrical accuracies as per SI.No.17.1	Vendor to accept			
20.2.2	Positioning accuracies as per SI.No. 17.2	Vendor to accept			
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept			
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			

20.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to accept			
20.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to accept			
20.2.7	Machining of test piece as per AFNOR/ISO. Vendor to supply test pieces and required tools for their machining. Drawing of test pieces & list of offered tools to be submitted.	Vendor to accept & submit			
20.2.8	Job Proveout machining as per SI.No. 19.0.	Vendor to accept			
20.2.9	Two weeks supervision, by vendor's expert, of independent operation of machine by BHEL after job proveout	Vendor to accept			
20.2.10	Training of BHEL's machine operators in operation of complete machine & accessories etc. by the supplier's experts during their stay at BHEL works for commissioning of the machine. This training is in addition to training requirements at SI.No. 14.0	Vendor to accept			
21	PACKING : Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes. In case machine is despatched in container, the container shall be brought upto BHEL, Haridwar. De- stuffing of container shall be carried out at BHEL, Haridwar by the vendor's representative. Any type of material handling equipment required for the de-stuffing of the container shall be brought by the vendor at Haridwar on returnable basis.	Vendor to offer			
22	GUARANTEE : Guarantee for complete machine and all supplied accessories/equipments for 24 months from the date of acceptance of the machine.	Vendor to offer			
23	GENERAL :				
23.1	Machine Model No.	Vendor to inform			
23.2	Total connected load (KVA)	Vendor to inform			
23.3	Space required (Length, Width, Height) for complete machine & accessories	Vendor to inform			
23.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer			
23.5	Total weight of the machine	Vendor to inform			
23.6	Weight of heaviest part of machine	Vendor to inform			
23.7	Weight of the heaviest assembly of the Machine	Vendor to inform			
23.8	Dimensions of largest part of the machine	Vendor to inform			

23.9	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Swing Over Carriage, Center Distance, Load Carrying Capacity, Main Drive Rating, CNC System, Application etc	Vendor to submit			
23.10	Hydraulic, Pneumatic & oil piping should be preferably metallic except places where flexible piping are essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm			
24	QUALIFYING CONDITIONS :				
24.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC LATHE of same (Swing Over Carriage 1800mm, Load Carrying Capacity 80000Kg, Admit Between Centers/Center Distance 10000mm) or higher sizes 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			
24.2	Name of the customer / company where referred machine is installed.	Vendor to inform			
24.3	Complete postal address of the customer.	Vendor to inform			
24.4	Month & Year of commissioning.	Vendor to inform			
24.5	Parameters of machine(s) supplied (Swing Over Carriage, Load Carrying Capacity, Admit Between Centers/Center Distance) and application for which the machine is supplied.	Vendor to inform			
24.6	Name and designation of the contact person of the customer.	Vendor to inform			
24.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform			
24.8	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			
24.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm			
25	OTHER FEATURES :				
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 offer			

25.1.1	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm			
25.1.2	The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.	Vendor to confirm			
25.1.3	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			
25.2.1	Control ON	Vendor to confirm			
25.2.2	Cycle ON	Vendor to confirm			
25.2.3	Spindle Running	Vendor to confirm			
25.2.4	Feed Active (Any of the axes moving)	Vendor to confirm			
25.2.5	M30 (Program Stop)	Vendor to confirm			
25.2.6	Alarm Active	Vendor to confirm			
26	OPTIONAL ITEMS :				
26.1	ADDITIONAL HYDROSTATIC SUPPORT FOR CHUCK : Fully enclosed hydrostatic support for chuck in addition to offered spindle bearing (SI No. 2.2.3) for further extended life of spindle bearing and the machine, equipped with its hydrostatic oil circuit and leak-proof oil collection recirculation system.	Vendor to offer			