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BHARAT HEAVY ELECTRICALS LIMITED
RAMACHANDRAPURAM, HYDERABAD – 32

(A GOVERNMENT OF INDIA UNDERTAKING)

PURCHASE DEPARTMENT (CG)

TENDER SCHEDULE

TENDER NO : M2/07/CG7A0110/BRK

DESCRIPTION : CNC CENTRE LATHE 2 Mtrs X 10Mtrs

QUANTITY : ONE NUMBER

LAST DATE FOR SALE OF DOCUMENTS: 28.11.2007

DUE DATE : 29.12.2007, 14.00Hrs

COST OF TENDER DOCUMENTS : Rs.5000/-

FORWARDED TO:

	<u>BHARAT HEAVY ELECTRICAL LIMITED</u>				Enquiry No. :
	<u>RAMACHANDRAPURAM:: HYDERABAD - 502 032</u>				Due Date :
	<u>Telefax: 91 (0) 40 23020173</u>				Supplier Qtn.
	<u>E-MAIL PURCHASE DEPT: burre@bhelhyd.co.in</u>				Date :
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR</u>					
<u>CNC CENTRE LATHE(2Mtrs X 10 Mtrs)</u>					
NOTE:-					
1. Vendor must submit complete information against clause no. 25.0 The offer meeting this clause would only be processed.					
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/ requirements shall be treated as non-compliance. <u>One soft copy of the offer is also to be submitted by Vendor along with hardcopy.</u>					
3. The offer and all documents enclosed with offer should be in English language only.					
ADDRESS OF THE SUPPLIER :			ADDRESS OF THE INDIAN AGENTS :		
TELEPHONE NOS.:			TELEPHONE NOS.:		
FAX NOS.:			FAX NOS.:		
E-MAIL ADDRESS :			E-MAIL ADDRESS :		
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC LATHE COMPLYING WITH SPECIFICATION AS BELOW					

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose: (Operations/Jobs involved) : A)To finish turn the Steam Turbine Rotors(Steam Turbines & Utility sets from 10MW to 120MW) B)To Machine T-Root,TT root & Fork Root grooves. C)To Turn the Taper portion on Rotor. D)To Face the Flange at the end of rotor. E)To machine the Internal and External threads at the end of Rotor. F)To Roll,Polish & Burnish the Rotor Journals. G)When Rotor/Job is held in Chuck & at one steady, it should be able to machine or face easily through out the length. H) To machine blade insertion groove openings using milling attachment.	Vendor to Confirm.			
1.2	Work Piece Material: (Material detail, Hardness etc.) Piece : Steam Turbine Rotor Steel Grade : 28 CrMoNiV59 Tensile Strength: 850N/mm2 Hardness : 280BHN	Work Vendor to Confirm.			
2.0	SPECIFICATION:				
2.1	CAPACITY & SIZE :				
2.1.1	Max.Turning Diameter	2000mm			
2.1.2	Max.Turning Length				
	a) Basic size	8000mm			
	b) Vendor to quote per Metre Extra length from basic size up to 12000mm.	Vendor to Confirm & Quote seperately			
2.1.3	Max. Weight of Work-piece between centres without steady.(Tail stock to take care of 70% of max wt of job also)	60Tons			
2.1.4	Max. Weight of Work-piece:				
	a) In head stock with one steady rest without tail stock support	70Tons			
	b) In head stock with two steady rests without tail stock support.	80 Tons			
	c) Only in chuck	Vendor			
2.1.5	Min. & max. bore diameter	dia 50mm to 150mm			
2.1.6	Max boring depth	400mm			

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2.1.7	Admit between centres (ABC) / Center Distance {Machine should be capable of facing at maximum length}	Vendor			
2.1.8	Center Height	Vendor			
2.1.9	Swing over bed (SOB)	Vendor			
2.1.10	Swing Over Carriage	minimum Dia 2000mm			
2.1.11	Distance of center of gravity from face plate, in case the workpiece is held only in chuck.	Vendor			
2.1.12	Face plate Diameter	Vendor			
2.1.13	No. of Hard Jaws	4			
2.1.14	Max. & Min. Chucking Diameters	Vendor			
	a) External	Preferred Min.200mm and Max: 1000mm			
	Vendor to provide additional facilities to clamp min. dia of 90mm in chuck	Vendor to furnish details			
	b) Internal	Vendor			
2.1.15	Min distance between Head stock & Tail stock	Vendor			
2.1.16	Min and Max facing diameters without Tool holder extension	Vendor			
2.1.17	C-Axis (Optional item; Should be quoted seperately)	Required			
2.1.17.1	Independent fully programmable C-axis should be provided for positioning, interpolation and clamping at exact angular position.	Required			
2.1.17.2	Max. continuous speed of C-axis	Vendor			
2.1.17.3	Min. continuous speed of C-axis	0.005 rpm			
2.1.17.4	No. of Indexing Positions	360000			
2.1.17.5	Min. increment in C-axis	0.001 degree			
2.1.17.6	Details of C-axis servomotor like torque, rating, type, make etc.	Vendor			
2.1.17.7	Detail of Clamping System of C-axis	Vendor			
2.1.17.8	Clamping Force for indexing	Vendor			
2.2	HEAD STOCK				
2.2.1	Spindle Motor Rating (Min.) AC, S1 Continuous Duty	Min. 100KW			
2.2.2	Spindle Motor Make (Either Siemens or Fanuc), Model	Vendor			
2.2.3	Spindle Bearing Type & Diameters (Radial & Axial)	Vendor			

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2.2.4	Spindle nose details (Drawing to be submitted)	Vendor			
2.2.5	Spindle speed (Infinitely variable)	1 to 200 RPM			
2.2.6	Detail of speed ranges (Selectable through program)	Vendor			
2.2.7	Range of spindle speed at constant power.	Vendor			
2.2.8	Max permissible torque at face plate	Vendor			
2.2.9	RPM at which max. permissible torque is available	Vendor to indicate			
2.2.10	Torque/Power/Speed diagram of spindle motor	Vendor			
2.2.11	Hardened Head stock center, for 90deg with cover plate to cover the space when headstock center is removed.	Vendor			
2.2.12	Spindle bore diameter and its depth from chuck face	Vendor			
2.2.13	Detail of Hard Jaws, Force Multipliers for easy movement & clamping of jaws, T-slots on chuck etc. (Face plate drawing showing slot position etc also should be submitted)	Vendor			
2.2.14	Clamping force on each jaw	Vendor			
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 & interlock to prevent chuck rotation when guard is behind chuck face.	Vendor			
2.2.16	Male & Female Guages for checking the headstock angle should be provided.	Vendor			
	2.3 MACHINE BED :				
2.3.1	No. of Guide ways	Four			
2.3.2	Bed width across ways	Vendor			
2.3.3	Type of guide ways: Hydro-static Guideways for X and Z axes, (Details should be submitted)	Vendor			
2.3.4	Hardness of guideways	Vendor			
2.3.5	Metallic Telescopic Covers of rust resistant material should be provided with wipers for X & Z axes guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & hydrostatic oil.. Telescopic covers should be sloping towards chip conveyor. Provision for drain of coolant on uncovered areas in case of independent bed shall be provided by vendor.	Vendor			

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2.4	FEEDS AND DRIVE SYSTEM:				
2.4.1	Feed range in X & Z axes (Infinitely variable) :	0.5mm to 4000mm/min(X-axis) & 0.5mm to 6000mm/min(Z-axis)			
2.4.2	Rapid traverse in X & Z axes (Infinitely variable)	4000mm/min(X-axis) & 6000mm/min(Z-axis)			
2.4.3	Feed drives/motors X & Z axes [AC servo motors] Either Siemens or Fanuc digital type (detail of model, make, type etc. should be submitted)	Vendor			
2.4.4	Feed back system for X & Z axes. Heidenhain linear scales with pressurised compressed air cleaning (Details should be submitted)	Vendor			
2.4.5	Details of System to ensure zero backlash for X & Z axis	Vendor			
2.4.6	Mechanism for locking X & Z axis	Vendor			
2.4.7	Maximum feed force in X and Z axes	Vendor			
2.4.8	Maximum Torque in X and Z axes	Vendor			
2.4.9	Detail of X and Z axes feed mechanism	Vendor			
2.5	STEADY RESTS : (Refer & Consider clause 2.1.3 & 2.1.4)				
2.5.1	Range of supporting dia for Open force lubricated steady rests with three pads in lower half. Vendor to furnish details of locking the supports after setting.	Dia 150 to 1200mm. Vendor to provide details.			
2.5.2	Vendor to provide replaceable babbit metal pad constructional details for Open force lubricated steady rests with manufacturing drawings .	Vendor to provide details.			
2.5.3	No. and Range of each open force lubricated Steady Rest to cover the specified range	Vendor			
2.5.4	Swiveling type upper portion of steady rests for job loading/unloading (Details should be submitted)	Vendor			
2.5.5	No. of common bases for steady rests for complete supporting range	Vendor			
2.5.6	Mounting of Steady Rest on Base shall be through quick-clamping fastener (Details should be submitted)	Vendor			
2.5.7	Motorised movement on bedways with positive clamping (Details should be submitted)	Vendor			
2.5.8	Clamping force of base on bedways	Vendor			

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2.5.9	Independent, recirculating (with provision to avoid mixing of oil with coolant) lubrication system , fixed on steady, shall be provided for lubrication between 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			
2.5.10	Adjustable Chip Protection Guards on steady rests to avoid falling of small chips on open force steady rest pads.	Vendor			
2.6	TAIL STOCK :				
2.6.1	Motorised movement on bed by Push Buttons on Tail Stock	Vendor			
2.6.2	Quill stroke	Vendor			
2.6.3	Quill movement with	Vendor			
	a) Presetting, display & automatic control of thrust applied	Vendor			
	b) Compensation for thermal expansion of work piece	Vendor to provide details.			
	c) Motorised Drive with provision for manual adjustment	Vendor			
2.6.4	Quill diameter	Vendor			
2.6.5	Rapid Traverse rate of tail stock body on bed	Vendor			
2.6.6	Traverse of quill with traverse rate	Vendor			
2.6.7	Hardened Tail stock centre - for 90degree (Drawing to be submitted) as per standard.	Vendor			
2.6.8	Detail of Positive Clamping & Unclamping of tail stock on bed	Vendor			
2.6.9	Max thrust on the Quill (to suit 50 Ton load).	Vendor			
2.7	CARRIAGE/ CROSSSLIDE :				
2.7.1	Z-axis travel	Vendor			
2.7.2	X-axis travel (specify movement beyond center i.e. X -ve side, if any)	Vendor			
2.7.3	Cutting force available at the carriage	Vendor			
2.7.4	Layout showing extreme positions of the all axes movements	Vendor			
2.7.5	Carriage to clear chuck, tailstock and all steady rests (should be confirmed)	Vendor			
2.8	TOOL POST :				

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2.8.1	Type of Tool Post: Plate type tool post with two blades mounted on either side suitable for conventional & downturning with additional provision of boring bar holder for boring bars(to bore from dia 50 to 150mm) and mounting of milling & grinding attachment.	Vendor			
	a) Thickness of blades :	Vendor			
	b) Positioning of blades : Through two independent CNC programmable axes X1 & X2 with positioning at four steps of 100mm,300mm,500mm & 700mm.	Vendor			
	c) Maximum cutting forces/parameters to be employed during upturning with blades positioned in max. position.				
	d) Maximum cutting forces/parameters to be employed during downturning with blades positioned in max. position.				
	e) Traverse of blades(X1 & X2) : Sufficient enough to make a recess of 700mm depth on dia of 1800mm.	Vendor			
	f) Blades to accept standard block type cartridges capable of accomodating shank tools & boring bars(dia 32, dia 40 & dia 50)	Vendor			
	d) Vendor to submit laoyout of blade positions X. X1 & X2 axes showing possible recessing depth on maximum turning diameter.	Vendor			
2.8.2	Type of Tool Holders for Tool carriers/Boring bars/Milling/Grinding attachment.	Vendor			
2.8.3	Tool shank height for different tool holders	70mm,50mm,40mm,32mm & 25mm			
2.8.4	Provision for coolant to reach upto tool tip in all types of tool holders	Vendor			
2.8.5	Automatic operation / selection through CNC program	Vendor			
2.8.6	Additional manual operation / selection through push buttons	Vendor			
2.8.7	Drawing of tool post	Vendor			
2.8.8	Vendor to indicate maximum length of shank tools that can be accomodated.	Vendor			
2.8.9	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for troublefree operation	Vendor			
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,Steady rest pads,Chuck, Tailstock, Carriage, Tool post, Machine bed, Feed Transmission system, Feedback system etc.of the machine.	Vendor			

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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			
2.10	OPERATOR'S PLATFORM:				
2.10.1	Independant operator's platform should be provided on both sides of tool post with staircases and having sufficient space for left to right & vice versa movement without any obstruction while stepping down for convenient and safe operation from both sides. A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform..	Vendor			
2.10.2	Splash / Chip guards on operator platform for protection of operator, operator's panel and to avoid spillage of coolant & chips on shop floor and operator's platform.	Vendor to provide details.			
2.10.3	Additionally, movable type Splash / Chip guard should be provided on rear side (opposite to operator's platform) to avoid spillage of coolant & chips on shop floor.	Vendor to provide details.			
2.11	OPERATION AND CONTROL SYSTEM:				
2.11.1	OPERATOR'S PANEL:				
2.11.1.1	Swiveling and sliding type operator's panel having complete CNC and machine control system with TFT color display of required configuration shall 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 (Indian) for easy operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details should be submitted. Bypass switches to be provided in electric control panel for attending to break downs.	Vendor			
2.11.1.2	An auxiliary pendant, which can be taken near to the chuck for job setting and similar other purposes.	Vendor			
2.11.2	CNC SYSTEM & FEATURES :				
2.11.2.1	Make : Fanuc / Siemens.	Fanuc 18i /Sinumeric 840D			
2.11.2.2	Type : PC based latest version	PC based latest version			
2.11.2.3	Model (Latest verion, as available at the time of ordering, should be supplied).	PC based latest version			

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2.11.2.4	Details of Standard features to be specified	Vendor			
2.11.2.5	Details of optional features, recommended by vendor.	Vendor			
2.11.2.6	Details of other optional features (should be selected by indentor)	Vendor			
2.11.2.7	The system should have full alphanumeric keyboard, TFT colour display(10.4" or more), additional draw-out type Qwerty Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for telediagnosics, network ready with LAN,Ethernet card supporting TCP/IP protocols with necessary software and proveout on machine, electronic hand wheels for all axes,USB port with pen drive unit for data input/output, hard disk of sufficient capacity (Largest size available at the time of order shall be supplied), graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor)	Vendor			
2.11.3 MANUAL CONTROL :					
2.11.3.1	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed spindle rpm, cutting feed on/off, display of axis position values etc, for manual turning operation without using CNC program, CNC option MANUAL TURN & MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor			
2.11.4 HAND HELD UNIT:					
2.11.4.1	Hand Held unit, Type B-MPI of Siemens make or equivalent alongwith sufficient length of interfacing cable is to be offered with complete details.	Vendor			
2.11.5 UPS FOR CNC SYSTEM:					
2.11.5.1	UPS of 30 minutes for CNC system with inbuilt cooling and charge status display (Battery charging /discharging time should be specified by vendor)	Vendor			
2.12 MACHINE LIGHTS:					
2.12.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor			

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2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor			
2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor			
2.12.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents				
2.12.5	Flashing / rotary type End of Cutting and Program Stop Light.	Required			
2.13	AIR CONDITIONERS:				
2.13.1	Air Conditioners with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Detailed specifications of the same are to be submitted.	Vendor			
2.14	HYDRAULIC SYSTEM : Details should be Submitted by the Vendor				
2.14.1	The System should be centralised. Hydraulic Tank shall preferably be located at floor level.	Vendor			
2.14.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer.(Details to be submitted).	Vendor			
2.14.3	Filtration System, Details should be submitted.	Vendor			
2.14.4	Failure indication: Minimes adapters with hose & guage to be provided on all actuators for diagnostic purposes. Analog Flow indicator with built-in thermometer & port for pressure guage to be provided near all pumps.	Required			
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor			
2.14.6	Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. at a temperature not exceeding 40 deg C irrespective of the ambient conditions. Complete details should be submitted.	Vendor			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor			
2.14.8	Each pump should have an independent motor. Tandem pumps should not be used	Required			
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			

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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			
	Recirculating Type Flood Coolant System	Vendor			
2.15.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor			
2.15.3	Coolant collection and recirculation system should be leakproof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor			
2.15.4	Coolant Filtration System: Recirculating type coolant system with centrifugal Hydrocyclone System and magnetic separator.	Vendor			
2.15.5	Paper Filter, in case of grinding facility, with indigenously (Indian) available consumables and its independent selection/operation only during grinding.	Vendor			
2.15.6	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor			
2.15.7	Main Coolant pump & motor details etc. including pressure & flow of coolant for different operations like turning , boring & grinding.	Vendor			
2.15.8	Standby Coolant pump & motor should be provided to supply coolant in case of failure of main set.	Vendor			
2.15.9	Coolant Tank Capacity	Vendor			
2.15.10	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			
2.15.11	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			
2.15.12	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Required.			
2.15.13	Coolant tank with pump, valves, filtration system shall be located above the ground.(Necessary arrangment for pumping the coolant from pit to main tank with level control shall be provided.	Vendor			

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2.16	ELECTRICAL :				
2.16.1	415V + 10% / -15%, 50HZ +/-3 Hz, 3 Phase AC (3 wire system with out neutral) Power Supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details should be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor			
2.16.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor			
2.16.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.				
2.16.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor			
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			
2.16.6	Motors shall conform to IEC or Indian Standards.	Vendor			
2.16.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Required			
2.16.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Required			
2.16.9	In-cycle hour counter with reset facility(Purpose is to evaluate Cutting time.)	Required			
2.16.10	Power Meter (To indicate power consumed)	Required			
2.17	SAFETY ARRANGEMENTS:	Vendor			
	Following safety features in addition to other standard safety features should be provided on the machine:				
	1. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.				

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	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.				
	3. All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hinderance to machine operator's movement for effective use of machine.				
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.				
	5. Emergency Switches at suitable locations as per International Norms should be provided.				
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.				
2.18	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :	Vendor			
	The Machine should conform to following factors related to environment :				
	(a) Maximum noise level shall be 85 dB(A) at normal load condition, 1meter 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.				
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.				
	(c) There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.				
	(d) No hazardous chemicals shall be required to be used in the machine.				
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.				
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.				
3.00	CHIP CONVEYOR :				

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3.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin (on tailstock side) should be provided on rear side of the machine. Two Chip bins of appropriate size of Indian make, with wheels & handle for movement, should also be supplied.	Vendor			
3.2	Type of chip conveyor	Hinged Belt Type			
3.3	Width of conveyor	Vendor			
3.4	Elevation of chip conveyor for chip bin	Vendor			
3.5	Material of chip conveyor (should be rust resistant)	Vendor			
3.6	Provision for smooth flow of chips through bedways 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's access to chip conveyor from shop floor for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor (Easy removal & fitment shall be considered while designing layout of machine).	Vendor			
3.7	In case of milling & grinding, provision for flushing out grinding dust to avoid clogging of conveyor's holes should be provided.	Vendor			
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor			
3.9	Layout showing location of chip conveyor should be submitted.	Vendor			
4.0	SERVO VOLATGE STABILIZER:				
4.1	Indian make Oil / Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabiliser output.	Required			
4.2	Make	Vendor			
4.3	Model & Rating	Vendor			
4.4	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor			
5.0	ULTRA ISOLATION TRANSFORMER				
5.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied	Required			
5.2	Make	Vendor			
5.3	Model and Rating	Vendor			
5.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor			
6.0	PNEUMATIC SYSTEM:				
6.1	AIR COMPRESSOR:				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.1.1	Independent Air Compressor (of reputed Indian make) with refrigerated type Dryer & Filter of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied.The compressor unit should be suitable for continuous duty. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure 4 to 6bar with moisture could be used as and when required.	Vendor			
6.1.2	Make & Model of Air Compressor	Vendor			
6.1.3	Make & Model of Refrigerated Air Dryer	Vendor			
6.1.4	Capacity (Flow, Pressure & KW)	Vendor			
6.2 COMPRESSED AIR POINTS:					
6.2.1	Compressed Air Point with manually ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	Required			
7.0 TOOLINGS:					
7.1	Vendor to supply all types of required tool holders, adapters, sleeves etc.	As per Annexure-I			
7.2	All types of cutting tools, tool holders, adapters, sleeves, grinding wheels, probes/stylili etc. recommended by vendor in sufficient quantity for complete machining of proveout components.	Vendor			
7.3	Additional set of Jaws.(vendor should quote in optional list)	Vendor			
8.0 MEASURING SYSTEMS:					
8.1	Automatic Job Measuring System	Vendor			
8.1.1	Automatic wireless job measuring system comprising of Renishaw make wireless system.The system shall be capable of inspecting all the details of the complete rotor after machining The supplier shall furnish the details of the measuring system along with the quotation. Itemized break up of the system shall be furnished.	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
8.1.2	The supplier shall quote probes, stylus, software and measuring cycles for the system. The system shall perform automatic measurement of the following in a Single Program by using the Measuring Cycles. (1) Series of blade groove details(that include groove position, groove widths, groove depths and suspension) for all sizes of T root , TT root and fork root grooves on rotors .(2) Series of Outside Diameters (3) Series of Step Positions and Step Widths There shall be a provision for offline measurement programming.	Vendor			
8.1.3	There shall be a provision that, in case of an unwarranted trigger, the machine shall stop automatically to avoid probe damage.	Vendor			
8.1.4	The System shall facilitate formatted display of the nominal, tolerance, actual and deviation results in a Screen. The system shall print the results in a user defined format. The printer required for the same shall be quoted. Sufficient number of ports and driver software to transmit the formatted measurement data independently over LAN and to the supplied printer shall be available.	Vendor			
8.1.5	Suitable accessories to calibrate the Probe for Diameter and Step / Groove/ suspension measurements shall be quoted. There shall be provision to position the calibration accessories at a convenient place in the machine. Details of the calibration set up shall be furnished along with the quotation. Appropriate automatic Calibration cycles shall be quoted.	Vendor			
8.1.6	Supplier shall furnish the details of the accuracy and repeatability of measurement (of diameters, steps, groove widths, suspensions etc.) on the job by the probe.	Vendor			
8.1.7	Supplier shall quote the spares of the measuring system for 5 (five) years of trouble free operation. This shall include a minimum of 10 (ten) stylus and one probe head apart from other spares of this system recommended by the supplier	Vendor			
8.1.8	Supplier shall train BHEL Engineers in using the measuring system (with actual demonstration on the job) and writing measurement programs. The training on measuring system to be provided at OEM works during Pre-dispatch Inspection (at Supplier's works) and during commissioning (at BHEL works).	Vendor			
8.1.9	Supplier shall prove out the measuring system by measuring all the machined dimensions of the prove out component and printing a formatted measurement report for the same. Suitable measuring program for the prove-out component shall be prepared by the supplier. The source code of this sample program shall be explained to BHEL Engineers during training.	Vendor			
8.2	Laser blade Tip measuring system for measuring both straight and taper blade tip diameters .	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
8.3	Automatic Tool Offset Measuring System with measuring cycles, calibration system etc suitable for all types of tools recommended for prove-out components. Vendor to furnish detailed description of the system along with offer.	Vendor			
9.0	DIAGNOSTIC SYSTEM				
9.1	TELE-DIAGNOSTIC SERVICE :	Vendor			
9.1.1	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. At any event, Alarm controlled notification by e-mail in event of fault. The system shall have facility for storing and generating monthly report of alarms,occurring on the machine during the period.	Vendor			
9.2	FAULT DIAGNOSTIC SYSTEM:				
9.2.1	Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include customised auto-diagnostic system with supporting hardware and software which shows detailed cause and remedy for the fault on the display with full video diagnostic help for faults related to mechanical and electrical maintenance. PG/PC laptop unit supplied along with machine for debugging and diagnostic purpose of PLC system.	Required			
9.3	Help guide should be provided to use both diagnostic systems				
10.0	LEVELING & ANCHORING SYSTEM				
10.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor			
11.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :				
11.1	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			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
11.2	Test mandrel for checking spindle run-out & alignment of headstock/tailstock etc. should be supplied.	Vendor			
12.0	ACCESSORIES:				
12.1	Rolling Device for rolling of Journal diameters, adjacent LH/RH fillet radii and faces of turbine rotors.	Vendor			
12.2	Grinding unit mounted on swiveling base for grinding the centers.	Vendor			
12.3	Grinding unit for grinding Journals of rotors as well as tips of mounted blades on turbine rotors. The unit shall be mounted on angular rotating base for grinding the inclined tips of turbine rotor blades. Location of unit shall be suitable for grinding journals from a distance of 200mm onwards from chuck face.	Vendor			
12.4	Diamond dressing device for Grind wheel.	Vendor			
12.5	Super finishing attachment or finishing of Thrust collars and Journals of rotors to Ra 0.4 (to quote as optional item)	Vendor			
12.6	Milling attachment (Optional;Should be quoted seperately): To machine the lockway openings on rotor as per blade insertion groove details in groove plan drg no. 9-10304-62012-00.				
12.6.1	VERTICAL MOVEMENT FOR MILLING (Y-AXIS)	± 75mm			
12.6.2	Spindle speed range	Vendor			
12.6.3	Max spindle torque	Vendor			
12.6.4	RPM at which max spindle torque is available	Vendor			
12.6.5	Spindle Taper	Vendor			
12.6.6	Spindle Motor rating with make details	Vendor			
13.0	SPARES:	Vendor			
13.1	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			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
	a) Mechanical & Hydraulic Spares: All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses,couplings,springs etc.. Complete seal kit for the machine shall be included in stanadard spares list. A spare Headstock for 90 deg should be provided. Pads for Hydrostatic & open force lubricated steady rests, Spare pump for supply of oil to hydrosatic steady pads, Spare pump for Hydraulic system, Spare Thrust Indicator for tail stock.	Vendor			
	b) Electrical /Electronic / CNC Spares: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Emergency switches, Encoders, Scanning Heads for Linear Scales, MMC module, NCU module, Operator's panel with TFT Unit, Pen drive Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor			
13.2	All types of spares for total machine and accessories should be available for atleast ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor			
13.3	Recommended set of spares for all attachments are to be offered with details.	Vendor			
13.4	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor			
14.0	DOCUMENTATION : Five sets of following documents (Hard copies) in English language should be supplied along with the machine	Vendor			
14.1	Operating manuals of Machine & CNC system				
14.2	Programming Manuals of Machine & CNC system				
14.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Hydraulic circuit drawings shall be fixed on the machine on anodised sheet.All Assembly/ Sub Assembly Drawings shall be supplied with the part list also.				
14.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
14.5	Manufacturing drawings for all supplied tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.				
14.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.				
14.7	Detailed specification of all rubber items and hydraulic/lube fittings				
14.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.				
14.9	PLC program print-outs with comments in English.				
14.10	PLC program on CD, NC data & PLC data on floppy.				
14.11	Complete back-up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new hard disk. Spare hard disk with complete back-up loaded on it				
14.12	Complete Master List of parts used in the machine shall be submitted by the vendor.				
14.13	One additional set of all the above documentation on CD ROM.				
15.0	TRAINING				
15.1	BHEL Persons should be trained at supplier's Works for mutually agreed period in the area of (a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipments.	Vendor			
15.2	Air-fare, boarding & lodging for the trainees will be borne by BHEL.				
15.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor			
15.4	Vendor to quote for training on per man per week basis	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
15.5	Vendor should commit to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL	Vendor			
16.0	FOUNDATION :				
16.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. whichever is earlier. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor			
17.0	ERECTION & COMMISSIONING				
17.1	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 will 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 will also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor			
17.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor			
17.3	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			
17.4	All tools required for performing machine geometry test shall be supplied .	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
17.5	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor			
17.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor			
17.7	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor			
17.8	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Required			
17.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor			
17.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor			
18.0	ACCURACY TESTS:				
18.1	GEOMETRICAL ACCURACIES :				
18.1.1	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			
18.1.2	Head Stock Spindle run out: (Radial & Axial) :	Vendor			
18.1.3	All other accuracies to confirm to ISO 1708 (Latest Revision) or Suppliers Test chart whichever is finer.	Should be tested by Vendor			
18.1.4	Tail stock Quill taper run-out :	Vendor			
18.1.5	Cylindricity of turning :	Vendor			
18.1.6	True roundness of turning :	Vendor			
18.1.7	Facial run-outs	Vendor			
18.1.8	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works.	should be tested by Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
18.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.				
18.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	0.01mm			
18.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	0.01mm			
18.2.3	Repeatability in X axis (Ps)	0.005mm			
18.2.4	Repeatability in Z axis (Ps)	0.005mm			
18.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor			
18.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor			
18.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor			
18.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor			
18.2.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor			
19.0	AMBIENT CONDITIONS & THERMAL STABILITY :				
19.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V - 10%, +10% ; Frequency: 50 Hz +3%, - 3%; No. of phases = 3 Ambient Conditions: Temperature =5 to 45 degree celsius;Relative Humidity = 95% max. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor			
19.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition. Max. temperature variation is up to 25 deg Celsius in 24 hours. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor			
19.3	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			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.4	The machine, including attachments and accessories, should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure and confirm the same.	Vendor			
	20.0 PROVEOUT OF BHEL COMPONENTS :				
20.1	<p>Drawings of proveout components are enclosed. Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed & mutually agreed with Vendor (Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing). Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works..</p> <p>Vendor shall be fully responsible for machining of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions</p>	Vendor to accept & offer. Drawings as per Annexure-II			
20.2	<p>During proveout, all tools shall be set by using supplied Tool Offset Measuring System and final job inspection shall be done by supplied Job Measuring System.</p> <p>Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.</p>	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
21.0	MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)	Should be accepted & confirmed by Vendor			
21.1	Tests/Activities to be carried out at supplier's works on the machine before dispatch :				
21.1.1	Geometrical accuracies as per test chart.				
21.1.2	Positioning accuracies as per VDI-DGQ/3441				
21.1.3	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.				
21.1.4	Demonstration of all features of the machine, control system & accessories				
21.1.5	Machining of test piece as per AFNOR/ISO . Vendor to supply test piece and tooling for it's machining.				
21.2	Tests/Activities to be carried out at BHEL works while commissioning the machine :				
21.2.1	Geometrical accuracies as per test chart.				
21.2.2	Positioning accuracies as per VDI-DGQ/3441				
21.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.				
21.2.4	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.				
21.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine				
21.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.				
21.2.7	Machining test piece as per AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.				
21.2.8	Job Proveout machining.				
21.2.9	Two weeks supervision of independent operation of machine by BHEL after job proveout				
21.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
22.0	PACKING:				
22.1	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			
23.0	GUARANTEE :				
23.1	24 months from the date of acceptance of the machine at BHEL works	Vendor			
24.0	GENERAL :				
24.1	Machine Model No.	vendor			
24.2	Total connected load (KVA):	vendor			
24.3	Floor area required (Length, Width, Height) for complete machine & accessories	vendor			
24.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Required			
24.5	Total weight of the machine	Vendor			
24.6	Weight of heaviest part of machine	Vendor			
24.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor			
24.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor			
24.9	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 etc	Required			
24.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Required			
24.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
25.0	REFERENCE LIST / QUALIFYING CONDITIONS :				
25.1	Only those vendors(OEM's), who have supplied and commissioned at least one CNC LATHE of same (SOC, Load Carrying Capacity, At least half of the Admit Between Centers specified) or higher sizes for similar applications in the past ten years (On the Date of Opening of tender) and such machine is presently working satisfactorily for more than one year after commissioning (On the Date of Opening of tender) , should quote.However,if referred machine(s) has/had been supplied to BHEL, then referred machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (On the Date of Opening of tender) in BHEL, should quote. The following information should be submitted by the vendor about the companies where referred machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor			
	1. Name of the customer / company where referred machine is installed.	Vendor to inform.			
	2. Complete postal address of the customer.	Vendor to inform.			
	3. Month and year of commissioning.	Vendor to inform.			
	4. Parameters of machine(s) supplied (parameters specified in para 1 of clause 25.1 for each machine to be mentioned here by indentor) and application for which the machine	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 the customers regarding satisfactory performance of machine supplied to them (Original certificate or Through E-maildirectly from the customer).The Original performance certificate may be returned after verification by BHEL, if required.	Vendor to submit.			
	8. BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm.			

ANNEXURE-I (with respect to Clause 7.1 of NIT spec)**TOOLING REQUIRED FOR SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC CENTRE LATHE /SOC:2M(INDENT.NO:CG7A0110)**

SL. NO	TOOL HOLDER DESCRIPTION	PURPOSE	HOLDERS QTY	INSERTS QTY	REMARKS FOR REFERENCE
1	PCLNR 3225 P12	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
2	PCLNL 3225 P12	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
3	PCLNR 4040 S19	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
4	PCLNL 4040 S19	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
5	PCBNR 4040 S19	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
6	PCBNL 4040 S19	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
7	R 171.35 - 5032 -15	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
8	L 171.35 - 5032 - 15	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
9	PDJNR 4040 V15 (LENGTH = 400)	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
10	PDJNL 4040 V15(LENGTH = 400)	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
11	PDNN 4040 S15	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
12	PDNN 4040 V15(LENGTH = 400)	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
13	SVJBR 3225 P16	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
14	SVJBL 3225 P16	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
15	SVVBN 3225 P16	TURNING	2	50	M/S SANDVIK OR EQUIVALENT
16	PRGCR 2525 M10	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
17	PRGCL 2525 M10	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
18	N176.39 2020 M10	NEUTRAL	2	50	M/S SANDVIK OR EQUIVALENT
19	R X123G04 - 2525 B-045	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
20	L X123G04 - 2525 B-045	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
21	R X123J05 - 3225 B-045	RELIEF	2		M/S SANDVIK OR EQUIVALENT
22	L X123J05 - 3225 B-045	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
23	R X123J16 - 3225 B-070	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
24	L X123J16 - 3225 B-070	RELIEF	2	50	M/S SANDVIK OR EQUIVALENT
25	R G123K08-2525 CM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
26	L G123K08-2525 CM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
27	R G123L20-2525B-075 BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
28	L G123L20-2525B-075 BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
29	R G123L20-2525B-140 BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
30	L G123L20-2525B-140 BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT

ANNEXURE-I (with respect to Clause 7.1 of NIT spec)**TOOLING REQUIRED FOR SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC CENTRE LATHE /SOC:2M(INDENT.NO:CG7A0110)**

31	R F123K25-2525B-168BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
32	L F123K25-2525B-168BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
33	R F123K25-2525B-220BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
34	L F123K25-2525B-220BM	FACE GRV	2	50	M/S SANDVIK OR EQUIVALENT
35	R F123G20 3225 B	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
36	L F123G20 3225 B	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
37	R F123H25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
38	L F123H25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
39	R F123J25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
40	L F123J25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
41	R F123K25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
42	L F123K25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
43	R F123L25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
44	L F123L25 3225 BM	EXT GRV/Shank Type	2	50	M/S SANDVIK OR EQUIVALENT
45	HOLDER 151.2 - 2020 - 21M BLADE 151.2 - 25 - 40	EXT GRV/Blade Type	2	50	M/S SANDVIK OR EQUIVALENT
46	HOLDER 151.2 - 3232 - 25 BLADE 151.2 - 25 - 50	EXT GRV/Blade Type	2	50	M/S SANDVIK OR EQUIVALENT
47	HOLDER 151.2 - 3232 - 25 BLADE 151.2 - 25 - 60	EXT GRV/Blade Type	2	50	M/S SANDVIK OR EQUIVALENT
48	HOLDER 151.2 - 4040 - 45 BLADE 151.2 - 45 - 80	EXT GRV/Blade Type	2	50	M/S SANDVIK OR EQUIVALENT
49	S50W - PCLNR 12	BORING	2	50	M/S SANDVIK OR EQUIVALENT
50	S50W - PCLNL 12	BORING	2	50	M/S SANDVIK OR EQUIVALENT
51	S50W - PDUNR 15	BORING	2	50	M/S SANDVIK OR EQUIVALENT
52	S50W - PDUNL 15	BORING	2	50	M/S SANDVIK OR EQUIVALENT
53	S12M - SCLCR 06	BORING	2	50	M/S SANDVIK OR EQUIVALENT
54	S12M - SCLCL 06	BORING	2	50	M/S SANDVIK OR EQUIVALENT
55	R 166.4FG-3225-16	Threading	2	50	M/S SANDVIK OR EQUIVALENT
56	L 166.4FG-3225-16	Threading	2	50	M/S SANDVIK OR EQUIVALENT
57	R 166.4FG-4040-22	Threading	2	50	M/S SANDVIK OR EQUIVALENT
58	L 166.4FG-3225-22	Threading	2	50	M/S SANDVIK OR EQUIVALENT
59	Rollers for Journals Rolling to 0.4Ra	Rolling	2		
60	Diamond burnishing tools for Burnishing of Journals	Burnishing	2		

Annexure-II

Typical Job Prove out Drawings for CNC Centre Lathe/ 2Mtrs X 10 Mtrs

(With reference to clause 20.1 of NIT spec)

Forging drg	:	11030162901-00/06.
Rotor Drg (1 sht)	:	01030162003-00/01.
Blading Plan drg	:	91030462011-00/01.
Groove plan drg	:	91030462012-00/00.
LP Blade groove drg. (Pos.no-6)	:	41030062012-00/02.
LP Blade groove drg. (Pos.no-7)	:	41030062013-00/02.
LP Blade groove drg. (Pos.no-8)	:	41030062014-00/02.

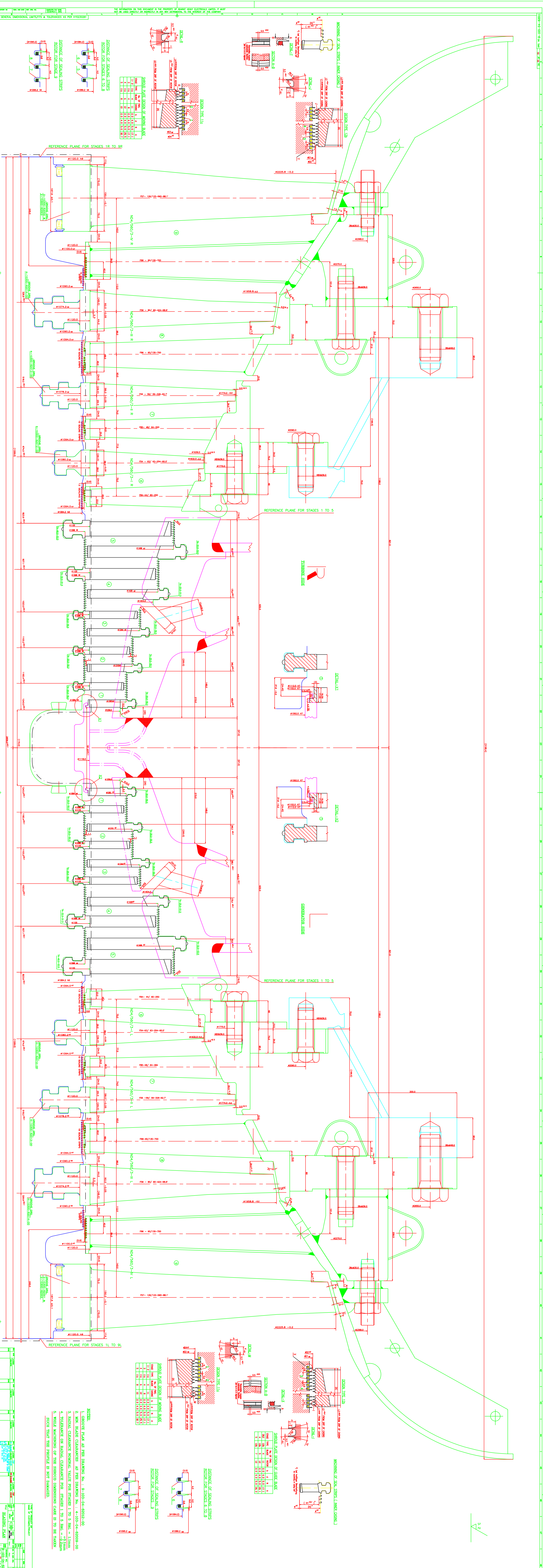
(or) any other similar Rotor.

Sequence of Machining Operations to be carried out :

- 1) Finish machining of Blading plan portion including groove machining. (i.e. Step dia's as per blading plan & groove as per groove plan drg. & journals machining with 2mm allowance on journal dia's as per rotor drg).**
- 2) Shrouds & Journals machining of Rotor along with Blade rows tip grinding.**
- 3) Rotor ends machining including polishing, burnishing, threading as per rotor drg.**

Note:

- 1.) A Typical rotor component to be machined is mentioned, however this job prove out (on any one rotor) will be done on any other nearly similar Rotor available at the time of Erection & commissioning. Modifications to carryout the same including CNC Programming, Tooling, Machining time etc.. Shall be part of contract.**
- 2.) Operations 2 & 3 are to be done after blade assembly operation , if similar bladed rotor is not available during job prove out ,it is proposed to do these operations on any other similarly constructed bladed rotor available at the time of Job prove out at M/s BHEL works(Because Blade assembly will take 2 or more months time).**



- NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
 2. ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTERLINE OF THE MEMBER UNLESS OTHERWISE SPECIFIED.
 3. ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTERLINE OF THE MEMBER UNLESS OTHERWISE SPECIFIED.
 4. ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTERLINE OF THE MEMBER UNLESS OTHERWISE SPECIFIED.
 5. ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTERLINE OF THE MEMBER UNLESS OTHERWISE SPECIFIED.

NO.	DESCRIPTION	UNIT	QTY	REMARKS
1	PLATE	MM		
2	STIFFENER	MM		
3	WELD	MM		
4	WELD	MM		
5	WELD	MM		
6	WELD	MM		
7	WELD	MM		
8	WELD	MM		
9	WELD	MM		
10	WELD	MM		
11	WELD	MM		
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99	WELD	MM		
100	WELD	MM		

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1/2

