	BHARAT HEAVY ELECTRICAL LIMITED		**Indent No. :**	
	UNIT'S ADDRESS: **HEEP, RANIPUR** **HARIDWAR - 249403** **UTTARAKHAND, INDIA**		**Enquiry No. :** **Due Date :**	
	UNIT'S PHONE NOS.		**Supplier Qtn. No.:**	
	CONTACT PERSON FROM PURCHASE DEPTT.: **NAME: MR. KAUSHIK ROY** **DESIGNATION: MANAGER (CAPITAL PURCHASE)** **PHONE NO.: 0091 - 1334 - 285291 / 281147** **E-MAIL: kroy@bhelhwr.co.in** **FAX NO. : 0091 - 1334 - 226462**		**Date :**	

SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC LATHE

NOTE:-

1. Vendor (OEM) must submit complete information against clause no. 25.0 (Qualifying Conditions). The offer meeting this clause would only be processed. (OEM - Original Equipment Manufacturer)

2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.

3. The offer and all documents enclosed with offer should be in English language only.

ADDRESS OF THE SUPPLIER :	
TELEPHONE NOS.:	
FAX NOS.:	
E-MAIL ADDRESS :	

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC LATHE COMPLYING WITH SPECIFICATION AS BELOW

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
1.0	**PURPOSE & WORKPIECE MATERIAL**				
1.1	**Purpose:** The machine is required for rough and finish machining of shafts/rotors of Steam Turbines which are components of high precision. The machine shall be used for all types of turning/grooving/threading operations, grinding operations on cylindrical & radial (LH&RH) surfaces, rolling operations on diameter/faces/fillet radii etc. on shafts/rotors.	Vendor to accept			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
1.2	**Work Piece Material:** **Rotor Shaft:** Forging of high alloy steels like 26NiCrMoV145 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			
2.0	**SPECIFICATION:**				
2.1	**CAPACITY & SIZE :**				
2.1.1	Max.Turning Diameter	3000mm			
2.1.2	Max.Turning Length	11000mm			
2.1.3	Max. Weight of Work-piece between centres without steady	80000Kg or more			
2.1.4	Max. Weight of Work-piece:				
2.1.4.1	In head stock with one steady rest (i.e. one end of work piece clamped in chuck and supported on one steady rest at other end)	120000Kg or more			
2.1.4.2	Only on two steady rests (i.e. one end of work piece clamped in chuck through cardan shaft and supported on two steady rests)	120000Kg or more			
2.1.4.3	Only in chuck	Vendor to inform			
2.1.5	Min. & max. bore diameter at center of flange of rotor	80mm - 500mm			
2.1.6	Max boring depth (Sl.No. 2.1.5) from flange face	300mm			
2.1.7	Admit between centres (ABC) / Center Distance {Machine should be capable of facing at maximum length}	11000mm or more			
2.1.8	Center Height	Vendor to inform			
2.1.9	Swing over bed (SOB)	Vendor to inform			
2.1.10	Swing Over Carriage (SOC)	3000mm or more			
2.1.11	Distance of center of gravity from face plate, in case the workpiece is held only in chuck (Sl.No. 2.1.4.3)	Vendor to inform			
2.1.12	Face plate Diameter	Vendor to inform			
2.1.13	No. of Hard Jaws provided on the chuck.	8 nos.			
2.1.13.1	It should be possible to set/align and machine the rotor of weight 120000Kg using 4 jaws only. Remaining set of 4 jaws should be used as and when required in case of any problem with any of jaws of first set. Each jaw should be equipped with Force Multipliers of sufficient capacity for easy movement & clamping of jaws to suit machining of rotor of largest possible size and weight as per specifications. Clamping and setting of rotor of largest weight/size available with BHEL at the time of machine's commissioning shall be tested and demonstrated by vendor.	Vendor to confirm			
2.1.14	Max. & Min. Chucking Diameters Chucking should be provided with single set of jaws & their screws and also single radial clamping location of each jaw for the complete specified clamping range.	Vendor to offer & confirm			
2.1.14.1	External (with 4 jaws) - Min. 250mm or less, Max. 1400mm or more External (with 8 jaws) - Vendor to inform	Vendor to inform			
2.1.14.2	Internal (with 4 / 8 jaws)	Vendor to inform			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.1.15	Min distance between Head stock & Tail stock	Vendor to inform			
2.1.16	Min and Max facing diameters without Tool holder extension (Tool holder/carrier at its reference position)	Vendor to inform			
2.2	**HEAD STOCK**				
2.2.1	Spindle Motor Rating (Min.) AC, S1 Continuous Duty	150kw or more			
2.2.2	Spindle Motor Make (Either Siemens or Fanuc), Model etc.	Vendor to inform			
2.2.3	Spindle Bearing Type & Diameters (Radial & Axial)	Vendor to inform			
2.2.4	Spindle nose details (Drawing to be submitted)	Vendor to inform			
2.2.5	Spindle speed (Infinitely variable)	Min. 2rpm or less, Max. 200rpm or more			
2.2.6	Detail of speed ranges (Selectable through program)	Vendor to inform			
2.2.7	Range of spindle speed at constant power.	Vendor to inform			
2.2.8	Max permissible torque at face plate	Vendor to inform			
2.2.9	RPM at which max. permissible torque is available	Vendor to inform			
2.2.10	Torque/Power/Speed diagram of spindle motor	Vendor to submit			
2.2.11	Head stock center, either 60^0 or 90^0 with cover plate to cover the space when headstock center is removed.	Vendor to offer			
2.2.12	Spindle bore diameter and its depth from chuck face	Vendor to inform			
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 to inform			
2.2.14	Clamping force on each jaw	Vendor to inform			
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 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 X and Z axes, (Details should be submitted)	Vendor to offer & submit			
2.3.4	Hardness of guideways	Vendor to inform			
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 is to be provided. Bellow type telescopic Covers to be provided under the Metallic Telescopic Covers.	Vendor to offer			
2.4	**FEEDS AND DRIVE SYSTEM:**				
2.4.1	Feed range in X & Z axes (Infinitely variable)	0 - 4000mm/min or more			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.4.2	Rapid traverse in X & Z axes (Infinitely variable)	0 - 4000mm/min or more			
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 to offer & submit			
2.4.4	Feed back system for X & Z axes. Heidenhain linear scales with pressurised compressed air cleaning (Details - Model Nos. should be submitted)	Vendor to offer & submit			
2.4.5	Details of System to ensure zero backlash for X & Z axis	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 :** Quantity - Two sets complete in all respects. Each set shall include following : One no. of each type of top portion offered for each sub-range to cover the specified range. One nos. of each type of common base. (In case only one common base is offered for all types of offered top portions for specified range, only one common base/set is to be offered)	Vendor to offer			
2.5.1	Range of supporting dia for Hydrostatic Steady Rests	Min. 200mm or less, Max. 1300mm or more			
2.5.3	Nos. of Top Portions and Range of each Top Portion to cover the specified range for Hydrostatic Steady Rest. (The complete range to be covered with atleast two top portions with overlapping of atleast 50mm in their supporting dia ranges in view of Sl.No. 2.5.3.1)	Vendor to inform			
2.5.3.1	Specified range should be covered in a way that use of manually replaceable extension pieces, spacers, shifting of screw bases etc. could be minimised to the extent possible.	Vendor to confirm			
2.5.5	Availability of sufficient gap on Top Portion of Steady Rest for job loading/unloading. (Swiveling type upper portion of steady rests for job loading/unloading is to be provided, if required)	Vendor to confirm			
2.5.6	No. of Common Bases which shall be used with top Portions (Sl.No. 2.5.3) for Hydrostatic Steady Rests for specified supporting range	Vendor to inform			
2.5.7	Mounting of Steady Rest on Base shall be through quick-clamping fasteners (Details should be submitted) The steady rest unit should be compact with minimum possible total width (along Z-axis) to avoid its obstruction with nearby flanges/faces or carriage/tool post 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.	Vendor to offer & confirm			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.5.8	Motorised movement on bedways with positive clamping (Details should be submitted)	Vendor to offer			
2.5.9	Clamping force of base on bedways	Vendor to inform			
2.5.10	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			
2.5.11	Adjustable Chip Protection Guards on steady rests to avoid falling of small chips on hydrostatic steady pad/ side pads etc. and also spilling of oil out of steady from its pad etc.	Vendor to offer			
2.5.12	Weight Capacity of Steady Rest unit (top portion with common base) (It should suit maximum weight of the rotor as per Sl.No. 2.1.4.1)	Vendor to inform			
2.5.13	Mechanism of motion of Side pads & Hydrostatic Pad at center - to be informed. Movement of Hydrostatic Pad of the steady rests should be motorised or hydraulically operated motion with positive locking.	Vendor to inform & confirm			
2.5.14	Manufacturing Drawings, showing material/dimensional/machining requirements, of Hydrostatic Steady Pads, Side Supporting Pads and Spacers/Extension Pieces (if used) for following diamaters shall be submitted by vendor after PO, in case of PO. Diameters 250mm, 380mm, 472mm : for rotor of weight 20T ; 450mm, 747mm, 760mm : for rotor of weight 40T ; 400mm, 597mm, 605mm : for rotor of weight 60T ; 450mm, 697mm, 705mm : for rotor of weight 80T ; 500mm, 847mm, 855mm, 1200mm : for rotor of weight 120T.	Vendor to confirm			
2.5.15	Hydrostatic steady pad should not be bulky to enable easy colour matching with supporting diameter of the rotor by the operator, as and when required.	Vendor to confirm			
2.6	**TAIL STOCK :**				
2.6.1	Motorised movement on bed by Push Buttons on Tail Stock	Vendor to offer			
2.6.2	Quill stroke	Vendor to inform			
2.6.3	Quill movement to be equipped with following features :				
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	Tail stock centre - Either 60 degree or 90 (Drawing to be submitted)	Vendor to offer			
2.6.8	Detail of Positive Clamping & Unclamping of tail stock on bed	Vendor to inform			
2.6.9	Max thrust on the Quill	Vendor to inform			
2.7	**CARRIAGE/ CROSSSLIDE :**				
2.7.1	Z-axis travel	Vendor to inform			

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2.7.2	X-axis travel Specify movement along x-axis beyond center i.e. X -negative side also.	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 (should be confirmed)	Vendor to confirm			
2.8	**TOOL POST :**				
2.8.1	**Type of Tool Post:** Rigid fixed type tool post should have atleast two extendable Plate type Tool Carriers. Design of tool post and tool carriers should enable all types of machining operations without any difficulty on the rotor and should comply following requirements.	Vendor to offer			
2.8.2	**Plate/Blade Type Tool Carriers :**				
2.8.2.1	**Tool Carrier No.1 :** This tool carrier will be used for turning, facing, grooving, threading and rolling operations etc.. This shall have provision to mount cassettes (as per VDI 3425, size 40, DIN 69881, size 140, with open & through slot of 40mmx40mm for clamping of square shank tools) radially on both left and right hand face of carrier. In addition to VDI type clamping, vendor may offer additional better options for tool clamping. Max. Projection of tool carrier should be 700mm or more. Width of tool carrier should be 120mm. This carrier should be located on left side (towards chuck) of tool post. Provision should be there to mount same cassette with tool clamped with their inserts facing upwards and downwards as well on both left and right hand face of carrier. Cross section of tools in cassettes shall be 40x40mm & 32x32mm (using 8mm packing plate). It should be possible to reach up to face plate with this tool carrier (without tool/cassette).	Vendor to offer			
2.8.2.2	**Tool Carrier No. 2 :** This tool carrier will be used for deep grooving, contouring, turning etc. using special left & right hand plunging/ copying/ turning tool holders mounted on it. Max. Projection of tool carrier should be 700mm or more. Width of tool carrier for suitable starting length (to be mutually agreed) should be around 35mm. Width for the rest of carrier length is to be decided by vendor and it is to be informed. This carrier should be located on right side (towards tailstock) of tool post. The tool carrier shall have provision to clamp both types of tool holders i.e. tool holder with their inserts facing downwards and tool holders with their inserts facing upwards maintaining center height. It should be possible to reach up to face plate with this tool carrier (without tool holder). The tool holders which shall be mounted on this tool carrier may be of Kennametal WK 160 type or other equivalent/superior system from other reputed tool manufacturers.	Vendor to offer			
2.8.3	Tool shank size for different tool holders having provision for square shank tools.	40mm x 40mm			
2.8.5	Provision for coolant to reach upto tool tip in all types of tool holders clamped in all tool carriers in both upward & downward clamping positions.	Vendor to offer			
2.8.6	Mechanism of positioning of all tool carriers.	Vendor to inform			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.8.7	Automatic operation / selection / positioning of tool carriers through CNC program :- The movement/clamping/unclamping of tool carriers should be Hydraulically operated/Motorised with CNC program controlled positioning. Automatic updation of tool offsets should be there in case of change of projection of carrier during execution of CNC program.	Vendor to offer			
2.8.8	Additional manual operation / selection through push buttons	Vendor to offer			
2.8.9	Drawing of tool post showing configuration of the tool post and all tool carriers.	Vendor to submit			
2.8.10	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for troublefree operation				
2.8.11	Projection of the tool carriers (without tool holder/cassette) with which the tool carriers can clear all offered steady rests during movement along Z-axis.	Vendor to inform			
2.8.13	Following safety features to be provided for all the tool carriers. * The tool carrier should not go to its reference position unless cassette/tool, mounted on it, is removed, in case the reference position is inside the tool post housing. * Movement of a tool carrier should be possible only when other two carriers are at reference position. * Movement of tool carriers should be interlocked with chuck rotation and feed motion in X & Z-axes.	Vendor to offer			
2.8.14	Limitation regarding length & weight of tool / tool holder / cassette, if any, clamped in different tool carriers for troublefree operation.	Vendor to inform			
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 inform			
2.9.2	Video/images on CD/ hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer	Vendor to submit			
2.10	**OPERATOR'S PLATFORM:**				
2.10.1	Independent operator's platform should be provided on both sides of tool post with staircases (two different staircases parallel to Z-axis for left and right portions of platform). and having sufficient space for left to right & vice versa movement without any obstruction and stepping down for convenient and safe operation from both sides. A 15 Amp. Plug Point (Indian type) with ON/ OFF switch is also to be provided on the Platform. Operator's platform should have suitably located sufficient illumination (for clear view of tool, job, operator's panel, drg. display area etc.) and a board for display of component drawing (A0 size) for ease of operator.	Vendor to offer			

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2.10.2	Splash / Chip guards (sliding door type with see-through sheet windows) 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 offer			
2.10.3	Additionally, Splash / Chip guard should be provided on rear side (opposite to operator's platform) to avoid spillage of coolant & chips on shop floor and control cabinets, if placed on that side as per layout. These guards should be manually movable, L or C shaped, of length around 2.0 m & height to suit tangential spillage of coolant at specified max. turning dia 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 or through channel for coolant to direct collected coolant to coolant recovery tank to avoid spillage of coolant on shop floor.	Vendor to offer			
2.10.4	Operator's Platform should clear all steady rests, tailstock and also headstock while working near chuck.	Vendor to offer			
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 flat colour 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.	Vendor to offer			
2.11.1.2	An auxiliary pendant, which can be taken near to the chuck for job setting and similar other purposes.	Vendor to offer			
2.11.2	**CNC SYSTEM & FEATURES :**				
2.11.2.1	Make : Fanuc / Siemens.	Vendor to inform			
2.11.2.2	Type : PC based latest version	Vendor to confirm			
2.11.2.3	Model (Latest verion, as available at the time of ordering, should be supplied).	Vendor to inform			
2.11.2.4	Details of optional features, recommended by vendor.	Vendor to inform			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.11.2.5	The system should have full alphanumeric keyboard, TFT colour display (10.4" or more - largest available with system manufacturer), additional draw-out type Querty Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for telediagnostics, network ready with LAN, electronic hand wheels for all axes, 4 nos. USB Ports for data input/output etc., 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 to confirm			
2.11.2.5 Contd.	In case of non-availability of COM(V.24), LPT1 interface, RS232-C etc. (if not provided by CNC system manufacturer at the time of supply), suitable separate ports (USB or equivalent) shall be provided for each functionality like networking with LAN, data input/output in CNC mode with pen drive, interface for telediagnostics, interface for printer & any other. In case, only USB ports are provided, suitable hardware/connectors/converters shall be provided to ensure functionalities as per tender specifications.	Vendor to offer			
2.11.2.6	Provision for automatic safe shut down of CNC System in case of Power Failure	Vendor to offer			
2.11.2.7	Loading of S7 (licensed) on hard disk & provision of ON screen PLC ladder display	Vendor to offer			
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 to offer			
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 to offer			
2.11.5	**UPS FOR CNC SYSTEM (STAND ALONE OR INBUILT):**				
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 to offer			
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 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	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	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 End of Cutting and Program Stop Light.	Vendor to offer			

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2.13	**AIR CONDITIONERS:**				
2.13.1	Air Conditioners (Door mounted - One no. for each cabinet / panel) with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets considering specified ambient conditions. The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/modules. Make & broad specifications of the same are to be submitted.	Vendor to offer			
2.13.2	In case of order, vendor shall provide following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Refrigeration/ Chiller unit, Capacity of the chiller 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 (Width Plate type/ Coil type), Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2, Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to confirm			
2.14	**HYDRAULIC SYSTEM : Details should be Submitted by the Vendor**				
2.14.1	The system should be centralised (preferably) and re-circulating type . Hydraulic Tank shall preferably be located at floor level. Complete hydraulic system should be designed to avoid any leakage or spillage.	Vendor to offer and confirm			
2.14.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to offer and confirm			
2.14.3	Filtration System, Details should be submitted. There should be provision of filters in delivery lines of pumps from oil collection tank to main hydrostat / hydraulic systems tanks. Filter elements should be of Make : EPE / Hydac / equivalent Internationally reputed manufacturer.	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 and electric heating (Elecrtic heating only if required) 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. Detail of warmup cycle for stabilisation of temperature of different oils and minimum time required for the same should be informed by Vendor. The warmup & stabilisation period should be discussed and mutually agreed.	Vendor to offer & submit			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform			
2.14.8	Each pump should have an independent motor. Tandem pumps should not be used.	Vendor to confirm & offer			

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2.14.9	**First filling of all required Oils & Grease etc**. to be supplied by vendor for complete machine & its peripherals including transformer & air-compressor and coolant oil for proveout machining. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to offer			
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.	Vendor to offer			
2.15.4	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. In case, any leakage is found, it shall be corrected by vendor.	Vendor to offer & confirm			
2.15.5	Coolant Filteration System: Recirculating type coolant system with Vaccum Rotary drum type System and magnetic separator.	Vendor to offer			
2.15.6	Paper Filter, in case of grinding facility, with indigenously (Indian) available consumables and its independent selection/operation only during grinding.	Vendor to offer			
2.15.7	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor to submit			
2.15.8	Coolant pump & motor details etc. including pressure & flow of coolant for different operations like turning & grinding etc.	Vendor to inform			
2.15.9	Coolant Tank Capacity	Vendor to inform			
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 to inform			
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 to offer			
2.15.12	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer			
2.16	**ELECTRICAL :**				

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.16.1	Voltage = 415V ± 10%, Frequency= 50Hz ± 3%, No. of phases = 3 phase with neutral. Power Supply will be provided by BHEL at a single point near the machine (at shop column), 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 including Voltage Stabilizer, Transformer & Air-Compressor etc. shall be the resposibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to 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 shoul 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. 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	**SAFETY ARRANGEMENTS:** Following safety features in addition to other standard safety features should be provided on the machine:				
2.17.1	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 confirm			
2.17.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm			
2.17.3	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.	Vendor to confirm			
2.17.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to confirm			
2.17.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm			
2.17.6	Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
2.18	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE :** The Machine should conform to following factors related to environment :				
2.18.1	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.	Vendor to confirm			
2.18.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.18.3	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			
2.18.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.18.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.18.6	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm			
2.19	**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			
3.00	**CHIP CONVEYOR :**				
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 or at appropriate location (as recommended by the vendor).	Vendor to offer			
3.1.1	Two nos. of Chip Bins of appropriate size of Indian make, with wheels, lifting hooks & handle for movement, should also be supplied.	Vendor to offer			
3.2	Type of chip conveyor	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 confirm			
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. 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.	Vendor to offer			
3.7	In case of grinding, provision for flushing out grinding dust to avoid clogging of conveyor's holes should be provided.	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to offer			
3.9	Layout showing location of chip conveyor should be submitted.	Vendor to submit			
4.0	**SERVO VOLTAGE 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.	Vendor to offer			
4.2	Make (Neel or Servomax or Aplab or equivalent reputed Indian Manufacturer)	Vendor to inform			
4.3	Model & Rating	Vendor to inform			
4.4	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to submit			
5.0	**ULTRA ISOLATION TRANSFORMER**				
5.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied	Vendor to offer			
5.2	Make (Neel or Servomax or Aplab or equivalent reputed Indian Manufacturer)	Vendor to inform			
5.3	Model and Rating	Vendor to inform			
5.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to submit			
6.0	**PNEUMATIC SYSTEM:**				
6.1	**AIR COMPRESSOR:**				
6.1.1	Independent Air Compressor (Screw Type of reputed Indian make Elgi or Ingersollrand) with refrigerated type Dryer & Filter of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure (around 4-5 bar with moisture/oil contents) could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to offer			
6.1.2	Make & Model of Air Compressor	Vendor to inform			
6.1.3	Make & Model of Refrigerated Air Dryer	Vendor to inform			
6.1.4	Capacity (Flow, Pressure & KW)	Vendor to inform			
6.1.5	In case compressed air is also used in offered grinding unit, suitable provision should be there to keep machine running if there is any leakage through any part of grinding unit.	Vendor to confirm			
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 should be suitably provided on carriage near tool post.	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
7.0	**TOOLINGS :** * Quantity- one no. of each item should be offered, unless specified. Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering. * LH - Left Hand / RH - Right Hand. * All tool holders, which are not handy, to have holes for lifting and suitable no. of eye-bolts are to be offered for the same. * All tool holders/boring bars should be complete with their fasteners with their spanners/wreches, coolant connections and packing plates for clamping of 32x32mm tools in slot of 40x40mm for square shank tools (as applicable) * Detail of consumables/spares like screws, keys etc., used on offered items, shall be provided by vendor in case of order. * Vendor may offer equivalent from any reputed manufacturer. * Vendor to accept that final drawings for offered items shall be submitted to BHEL after PO, in case of order, for BHEL's perusal prior to their manufacturing & supply.	Vendor to accept & offer			
7.1	**TOOL HOLDERS FOR TOOL CARRIERS :**				
7.1.1	**Cassettes as per VDI 3425 size 40/ DIN 69881 size 140 for Tool Carrier no. 1 :** Preliminary representative drgs. to be submitted.	Vendor to submit			
7.1.1.1	LH cassette, approx. length 200mm, with open & through slot for tool shank 40mm x 40mm to be clamped in radial direction. (Ref. : OLAB make no. MC5.03 SX SIZE 40 L=224 without PLATE DETAIL X)	Vendor to offer			
7.1.1.2	RH cassette, approx. length 200mm,with open & through slot for tool shank 40mm x 40mm to be clamped in radial direction. (Ref. : OLAB make no. MC5.3 DX SIZE 40 L=224 without PLATE DETAIL X)	Vendor to offer			
7.1.1.3	LH long cassette, approx. length 400mm, with open & through slot for tool shank 40mm x 40mm to be clamped in radial direction. (Ref. : OLAB make no. MC5.03 SX SIZE 40 L=400 without PLATE DETAIL X)	Vendor to offer			
7.1.1.4	RH long cassette, approx. length 400mm, with open & through slot for tool shank 40mm x 40mm to be clamped in radial direction. (Ref. : OLAB make no. MC5.3 DX SIZE 40 L=400 without PLATE DETAIL X)	Vendor to offer			
7.1.1.5	LH cross cassette, approx. length 200mm, with open & through slot for tool shank 40mm x 40mm to be clamped in axial direction. (Ref. : OLAB make no. MC5.02 SX SIZE 40 L=209)	Vendor to offer			
7.1.1.6	RH cross cassette, approx. length 200mm, with open & through slot for tool shank 40mm x 40mm to be clamped in axial direction. (Ref. : OLAB make no. MC5.2 DX SIZE 40 L=209)	Vendor to offer			
7.1.1.7	LH long cross cassette, approx. length 400mm, with open & through slot for tool shank 40mm x 40mm to be clamped in axial direction. (Ref. : OLAB make no. MC5.02 SX SIZE 40 L=400)	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
7.1.1.8	RH long cross cassette, approx. length 400mm, with open & through slot for tool shank 40mm x 40mm to be clamped in axial direction. (Ref. : OLAB make no. MC5.2 DX SIZE 40 L=400)	Vendor to offer			
7.1.1.9	LH conventional type cassette, approx. length 200mm with open & through slot for tool shank 40mm x 40mm to be clamped in axial & radial direction. (Ref. : OLAB make no. MC5.01 SX SIZE 40 L=209)	Vendor to offer			
7.1.1.10	RH conventional type cassette, approx. length 200mm with open & through slot for tool shank 40mm x 40mm to be clamped in axial & radial direction. (Ref. : OLAB make no. MC5.1 DX SIZE 40 SIZE 40 L=209)	Vendor to offer			
7.1.2	**Boring Bar Holder for Tool Carrier no. 1 :** Preliminary representative drgs. to be submitted.	Vendor to submit			
7.1.2.1	Boring Bar Holder with through hole for boring bar dia 60, complete with set of fasteners. Holding length for boring bar in the holder should be sufficient (approx. 4xdia i.e. 240mm) for vibration/chattering free boring operation.	Vendor to offer			
7.1.2.1.1	Reduction Sleeve, dia 60 - dia 50, for Boring Bar Holder	Vendor to offer			
7.1.2.1.2	Reduction Sleeve, dia 60 - dia 40, for Boring Bar Holder	Vendor to offer			
7.1.3	**Tool Holders for Tool Carrier no. 2 :** Preliminary representative drgs. to be submitted. Suitable special rigid tool holders for deep grooving, contouring, turning etc. 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. Tool holders from Sl.Nos. 7.1.3.1 to 7.1.3.12 should be mountable on tool carrier with inserts facing downwards only. Tool holders from Sl.Nos. 7.1.3.13 to 7.1.3.19 should be mountable on tool carrier with inserts facing downwards (one no. each) and also facing upwards (additional one no. each).	Vendor to offer & submit			
7.1.3.1	LH Grooving Tool Holder, Grooving Width= 11.5 mm / Depth= 60 mm.	Vendor to offer			
7.1.3.2	RH Grooving Tool Holder, Grooving Width= 11.5 mm / Depth= 60 mm.	Vendor to offer			
7.1.3.3	LH Grooving Tool Holder, Grooving Width= 15.0 mm / Depth= 70 mm.	Vendor to offer			
7.1.3.4	RH Grooving Tool Holder, Grooving Width= 15.0 mm / Depth= 70 mm.	Vendor to offer			
7.1.3.5	LH Grooving Tool Holder, Grooving Width= 18.5 mm / Depth= 80 mm.	Vendor to offer			
7.1.3.6	RH Grooving Tool Holder, Grooving Width= 18.5 mm / Depth= 80 mm.	Vendor to offer			
7.1.3.7	LH Grooving Tool Holder, Grooving Width= 23.5 mm / Depth= 90 mm.	Vendor to offer			
7.1.3.8	RH Grooving Tool Holder, Grooving Width= 23.5 mm / Depth= 90 mm.	Vendor to offer			
7.1.3.9	LH Grooving Tool Holder, Grooving Width= 25.0 mm / Depth= 120 mm.	Vendor to offer			
7.1.3.10	RH Grooving Tool Holder, Grooving Width= 25.0 mm / Depth= 120 mm.	Vendor to offer			
7.1.3.11	LH Grooving Tool Holder, Grooving Width= 30.0 mm / Depth= 140 mm.	Vendor to offer			
7.1.3.12	RH Grooving Tool Holder, Grooving Width= 30.0 mm / Depth= 140 mm.	Vendor to offer			
7.1.3.13	LH Turning Tool Holders with Round Insert Dia 25.0 mm for Depth= 140 mm.	Vendor to offer			
7.1.3.14	RH Turning Tool Holders with Round Insert Dia 25.0 mm for Depth= 140 mm.	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
7.1.3.15	LH Turning Tool Holders with Round Insert Dia 12.0 mm for Depth= 60 mm.	Vendor to offer			
7.1.3.16	RH Turning Tool Holders with Round Insert Dia 12.0 mm for Depth= 60 mm.	Vendor to offer			
7.1.3.17	Neutral Tool Holders for square SNMM type or equivalent Insert for turning operations.	Vendor to offer			
7.1.3.18	LH Tool Holder for clamping of square shank tool holders in radial direction.	Vendor to offer			
7.1.3.19	RH Tool Holder for clamping of square shank tool holders in radial direction.	Vendor to offer			
7.2	**TOOLING FOR MACHINING OF PROVE-OUT COMPONENT:** All types of required tools, inserts, tool holders, cassettes, adapters, grinding wheels, measuring probes/styli, steady pads (with their manufacturing drawings), special measuring instruments etc. in sufficient quantity for all types of operations like turning, grooving, grinding, boring, rolling, measurement operations etc., as recommended by the vendor & agreed with BHEL for complete proveout machining as mentioned at Sl.No. 20 to meet required drawing accuracy & surface finish . Portable/fixed type mechanism/device for easy and safe lifting & clamping of tool holder on tool carrier by operator, is to be provided by vendor in case the holder is bulky and not handy. These tooling items shall be in addition to the items mentioned above at Sl.No. 7.1.	Vendor to offer			
7.2.1	Preliminary list of items recommended and offered against Sl.No. 7.2 shall be submitted with offer. Final list shall be submitted as per Sl.No. 20.1. In case of any addition/shortage in offered items (w.r.t. submitted preliminary list), required by vendor for complete proveout machining (Sl.No. 20.0) after the order prior to or during actual proveout, the total requirement shall be supplied by vendor without any financial implications to BHEL. Modifications, if any, in supplied items shall also be vendor's responsibility.	Vendor to offer & submit			
9.0	**DIAGNOSTIC SYSTEM**				
9.1	**TELE-DIAGNOSTIC SERVICE :**				
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.	Vendor to offer & inform			
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.	Vendor to offer & submit			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
9.2.2	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer			
9.3	Help guide should be provided to use both diagnostic systems	Vendor to offer			
10.0	**LEVELING & ANCHORING SYSTEM**				
10.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied.	Vendor to offer			
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 to offer			
11.2	Test mandrel for checking spindle run-out & alignment of headstock/tailstock etc. should be supplied.	Vendor to offer			
12.0	**ACCESSORIES :**				
12.1	**GRINDING UNIT :**				
12.1.1	The Grinding Unit should be suitably mounted on the Tool Post/Carriage to enable troublefree grinding on journal diameters, Journal & flange faces as per drawing accuracy & surface finish. All operations using grinding unit should be programmable 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			
12.1.2	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			
12.1.3	Provision of Wheel Dressing Device, suitably located for CNC program controlled dressing of wheels for accurate alignment of the wheel with working axis considering all types of specified grinding applications. Location of device is to be informed. Mechanism for angular adjustment/positioning of dressing device to suit required angle is to be informed.	Vendor to offer			
12.1.4	Programmable Grinding Cycles & respective Wheel Dressing Cycles for all types of specified grinding operations should be provided.	Vendor to offer			
12.1.5	Additionally, provision for manual grinding i.e. without CNC program should also be there for grinding on diameters & faces and if possible, for angular tip grinding also.	Vendor to offer			
12.1.6	Details of grinding spindle motor like make, rating, type, torque etc.	Vendor to inform			
12.1.7	Max. and Min. dia of Grinding Wheels for all types of specified grinding applications.	Vendor to inform			
12.1.8	Width of Grinding Wheel	Vendor to inform			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
12.1.9	Min. & Max. Dia. For Cylindrical Grinding (Minimum 200mm or less - Maximum 1500mm or more)	Vendor to inform			
12.1.10	Min. & Max. Dia. For Facial Grinding	Vendor to inform			
12.1.11	Limitations, if any for grinding on journal LH/RH faces.	Vendor to inform			
12.1.12	Swiveling positions of base of Grinding Unit/Spindle	+90deg, 0 & -90deg			
12.1.13	Tool Post, with Grinding Unit & wheel mounted on it, should clear Steady rests.	Vendor to confirm			
12.1.14	Drawings showing mounting details of grinding unit on tool post	Vendor to submit			
12.1.15	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			
12.1.16	Specifications & source of offered grinding wheels shall be informed by vendor for future procurement of same by BHEL.	Vendor to inform			
12.1.17	Sufficient protection to bearing and guide ways from ground dust / slurry to be provided.	Vendor to confirm			
12.2	**ROLLING DEVICE :**				
12.2.1	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 and in some cases, on portion of relief grooves/contours with dia in place of fillet radii.	Vendor to offer			
12.2.2	The Rolling process should induce residual compressive stresses equivalent to 300N/mm^2 or more at depth of 0.5mm (radially) and 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.	Vendor to confirm & offer			
12.2.3	Required hardware & software for measurement, setting and display of applied pressure on roller shall be supplied and installed with rolling device.	Vendor to offer			
12.2.4	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			
12.2.5	Details like drawing of rolling tool, catalogue, drawing of roller, hardness of roller etc. are to be submitted.	Vendor to submit			
12.2.6	Smallest & Largest fillet radii which can be rolled using offered tool.	Vendor to inform			
12.2.7	Smallest & Largest entry angle of fillet radii which can be rolled using offered tool.	Vendor to inform			
12.2.8	Carriage/Tool Post, with Rolling Device mounted on it, should clear Steady rests.	Vendor to confirm			
12.2.9	Drawings showing mounting details of Rolling Device on tool post	Vendor to submit			
12.2.10	Rollers – 2 Nos. of each type shall also be supplied in addition to quantity recommended & supplied for the proveout component.	Vendor to offer			
12.2.11	One additional set of offered rolling tools (one of each type) - without accessories offered at Sl.No. 12.2.1.	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
12.2.12	Specifications & source of offered Rolling Tool & Rollers shall be informed by vendor for future procurement of same by BHEL.	Vendor to inform			
12.2.13	In case of special coolant requirements for rolling operation, vendor should offer suitable system. Details to be submitted.	Vendor to inform & offer			
12.3	**CARDAN SHAFT :**				
12.3.1	Suitable Cardan Shaft (Double Jointer Shaft) for driving large size rotor shaft (like length 11m, weight 120 tons) supported on two hydrostatic steady rests to perform troublefree rough and finish turning/grooving operations on the shaft at required rpm (max. 200rpm). Drg./catalogue of cardan shaft to be submitted.	Vendor to offer & submit			
12.3.2	The cardan shaft should have provision of torque transmission through universal joint for 150kw 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. Complete drg. of end connections showing all dimensional details shall be submitted by vendor after PO, in case of PO.	Vendor to offer			
12.3.3	Length (Approx. 1000mm), flange diameters and coupling/fixing details etc.	Vendor to inform			
12.3.4	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			
12.3.5	Torque transmitted by the Cardan Shaft	Vendor to inform			
12.3.6	Set of Intermediate Flanges (2 nos. - one each for chuck side & rotor side) to suit offered Cardan Shaft & flanges of proveout component (L.P.Rotor) with their manufacturing drawings considering clamping of rotor through Cardan Shaft for machining, suitable supporting stand/frame to avoid dropping of shaft from its universal joint while clamping it with rotor flange and also chuck side and set of fasteners required for its use are to be offered by vendor. The flange on chuck side should have direct clamping to chuck instead of clamping in jaws.	Vendor to offer			
12.4	**STORAGE & HANDLING FACILITY FOR ACCESSORIES/ATTACHMENTS :** Suitably located, effective and safe storage stations/bases are to be provided for adequate storage of the accessories like grinding unit, rolling device, Cardan Shaft & Steady Rests etc., when they are not in use. To be shown on preliminary layout by vendor.	Vendor to offer			
13.0	**SPARES:**				
	Following spares are to be quoted in item wise / sl.no. wise separate packages :	Vendor to confirm			
13.1.1	**Mechanical & Hydraulic Spares :** Following Spares are to be offered.	Vendor to offer			
13.1.1.1	All types of Pumps used on machine i.e. Hydraulic, Hydrostatic, Lubrication, coolant and oil cooling system (1 no. each type)	Vendor to offer			
13.1.1.2	All types of 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			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
13.1.1.3	All types of pressure switches, flow switches and pressure transducers used in Hydraulic, Lubrication, Pneumatic & Coolant circuit. (1 no. of each type)	Vendor to offer			
13.1.1.4	All types of filter inserts of regenerative type (5 nos. of each type)	Vendor to offer			
13.1.1.5	All types of filter inserts of disposal type & size (10 nos. each type)	Vendor to offer			
13.1.1.7	One set of belts (including timing belt) used in the machine.	Vendor to offer			
13.1.1.11	All types of Seals (2 no. of each type), Wipers & O-rings (5 nos. of each type) used in the machine.	Vendor to offer			
13.1.2	**Electrical /Electronic / CNC Spares :** Following Spares are to be offered in case the machine is equipped with Siemens CNC System. In case of Fanuc system equivalent to specified spares are to be offered.	Vendor to offer			
13.1.2.1	Relays (2 Nos each type)	Vendor to offer			
13.1.2.2	Contactors (2 Nos each type)	Vendor to offer			
13.1.2.3	Semi-conductor Fuses (2 No each type & rating)	Vendor to offer			
13.1.2.4	Proximity Switches (2 Nos each type)	Vendor to offer			
13.1.2.5	Push Buttons (10 Nos each type)	Vendor to offer			
13.1.2.6	Indicating Lamps (10 Nos each type)	Vendor to offer			
13.1.2.7	Circuit Breakers (2 Nos each type)	Vendor to offer			
13.1.2.9	Encoder for spindle (1 No)	Vendor to offer			
13.1.2.10	Encoders & Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
13.1.2.11	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
13.1.2.12	NCU module	Vendor to offer			
13.1.2.13	I/O Cards for PLC & I/R Module (1 No each type)	Vendor to offer			
13.1.2.14	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type) with Main Power Switch	Vendor to offer			
13.1.2.16	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
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 to confirm			
13.3	Recommended set of spares for all attachments/accessories etc., as below:				
13.3.1	Spares Package (Mechanical & Electrical/Electronic Spares) for the Voltage Stabiliser (Sl.No. 4.0) for two years troublefree operation. List ot items with their quantity is to be submitted by vendor.	Vendor to offer & submit			
13.3.2	Spares Package (Mechanical & Electrical/Electronic Spares) for the Air Compressor and Refrigerator type Dryer etc. (Sl.No. 6.1) for two years troublefree operation. List ot items with their quantity is to be submitted by vendor.	Vendor to offer & submit			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
13.3.3	Spares Package (Mechanical & Electrical/Electronic Spares) for offered Grinding Unit (Sl.No. 12.1) and its accessories including spares for the drive motor (of grinding attachment) for two years troublefree operation. List ot items with their quantity is to be submitted by vendor.	Vendor to offer & submit			
13.3.4	Spares Package (Mechanical & Electrical/Electronic Spares) for offered Rolling Unit (Sl.No. 12.2) and its accessories for two years troublefree operation. List ot items with their quantity is to be submitted by vendor.	Vendor to offer & submit			
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 to confirm			
14.0	**DOCUMENTATION :** Three sets of following documents (Hard copies) & soft copies (wherever specifed) in English language should be supplied along with the machine	Vendor to offer			
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 Assembly/ Sub Assembly Drawings shall be supplied with the part list also. Complete details including make, tolerance and precision class of all the critical bearings such as spindle bearings, ball screw support bearings, ball lead screw etc. with replacement procedure and approximate life of these bearings to be furnished.				
14.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.				
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 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.				
14.12	Complete Master List of parts used in the machine shall be submitted by the vendor.				

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
14.13	One additional set of all the above documentation on CD ROM, wherever possible. This should include complete backup (on CD) of all cycles/subroutines (provided by both vendor and supplier of CNC System) and any other special programs pertaining to different applications/machining processes/accessories/measuring systems etc. including CNC programs for proveout machining.				
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 supplied accessories etc. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipments.	Vendor to offer			
15.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to note			
15.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
15.4	Vendor to quote for training on per man per day basis	Vendor to offer			
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 to confirm			
16.0	**FOUNDATION :**				
16.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within mutually agreed period preferably 1 month from the date of Letter of Intent (LOI) / P.O. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within mutually agreed period preferably three months after getting BHEL's approval. The layout should consist of all reqirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor to offer			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
16.2	Soil condition data at BHEL, Hardwar is as detailed below: Based on the Block Resonance Test, the Dynamic Soil Parameters may be taken as below: (i) Cu = 4.937 kg/cubic cm (for block size of 1.5m x 1m x 1m) Cu = 1.667 kg/cubic cm (for foundation size of 10square M or more, (ii) CΦ = 9.70 kg/cubic cm (iii) CΨ = 4.20 kg/cubic cm Bearing Capacity: Depth : 5 M From Shear consideration : 39 Tons/SquareM From Settlement consideration : 9-10 Tons/SquareM Recommended Bearing Capacity : 9 Tons/SquareM	Vendor to note			
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 shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to offer			
17.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to offer			
17.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Sl.No. 21 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to offer			
17.4	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to offer			
17.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to offer			
17.6	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates may be sourced from India.	Vendor to offer			
17.7	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.	Vendor to offer			
17.8	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
17.9	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to submit			
18.0	**ACCURACY TESTS:**				
18.1	**GEOMETRICAL ACCURACIES :**				

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
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 to confirm & submit			
18.1.2	Head Stock Spindle run out: (Radial & Axial)	≤ 0.015 mm			
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 to inform			
18.1.5	Cylindricity of turning	≤ 0.015 mm			
18.1.6	True roundness of turning	≤ 0.015 mm			
18.1.7	Facial run-outs	≤ 0.015 mm			
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.	Vendor to confirm			
18.2	**MACHINE POSITIONING ACCURACIES & REPEATABILITY:** Should be measured as per VDI/ DGQ3441/ ISO 230-2 (Latest Revision) using LASER INTERFERO METER.	Vendor to confirm			
18.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	≤ 0.015 mm			
18.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	≤ 0.015 mm			
18.2.3	Repeatability in X axis (Ps)	0.01mm or less			
18.2.4	Repeatability in Z axis (Ps)	0.01mm or less			
18.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform			
18.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform			
18.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform			
18.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform			
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 to confirm			
19.0	**OPERATING 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 (AC): Voltage = 415V ± 10%, Frequency= 50Hz ± 3%, No. of phases = 3 phase with neutral. Ambient Operating 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 to offer & confirm			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
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 20 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			
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 to accept & confirm			
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 to accept & confirm			
20.0	**PROVEOUT OF BHEL COMPONENTS :**				
20.1	Drawings of proveout components are enclosed. Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor (Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing). Complete machining of prove out 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 mutually agreed period preferably two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.	Vendor to offer			
20.1.1	The proveout component shall be one turbine rotor (L.P.Rotor of 500MW Steam Turbine) as per following drawing nos. or similar. The drawings are enclosed. * Forging of Shaft - 11030141999 * Shaft - 01030141000 * Groove Plan - 91030436051 * T-Groove - 41030436011 * T-Groove - 41030446011 * T-Groove - 41030405012 * T-Groove - 41030441011 Above drawings should be treated as BHEL property. Strict confidentiality is to be maintained and under no circumstances these drawings or copy of these must be transferred to third party without permission of BHEL. These drawings must not be used directly or indirectly in any way detrimental to the interest of the BHEL.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
20.1.2	The proveout machining shall include following operations:				
20.1.2.1	All turning and grooving operations for machining of Shaft including Groove Plan.	Vendor to accept & offer			
20.1.2.2	Grinding operations on journal diameters and flange faces.	Vendor to accept & offer			
20.1.2.3	Rolling operations on journal dia with fillet radii/contours & faces. Rolling operation shall be demonstrated first on allowance available for machining to establish the process and required surface finish. Process of estimation & setting of required pressure for generating required stresses & display of pressure etc. should be demonstrated during commissioning.	Vendor to accept & offer			
20.1.3	All operations shall be performed using CNC Programs supplied by vendor. The CNC Programs should consist of generalised parametric subroutines for repetitive type of operations like different operations of T-grooves etc. so that these subroutines could be adopted for other similar rotors by using different parameter's values and calling same subroutines in other main-program.	Vendor to accept & offer			
20.2	Vendor shall be fully responsible for machining of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.	Vendor to accept			
21.0	**MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)**				
21.1	**Tests/Activities to be carried out at supplier's works on the machine in the presence of BHEL Team before dispatch.** Report of the same shall be submitted to BHEL.	Vendor to accept & offer			
21.1.1	Geometrical accuracies as per test chart (ref. Sl.No. 18.1)	Vendor to accept			
21.1.2	Positioning accuracies as per VDI-DGQ/3441 (ref. Sl.No. 18.2)	Vendor to accept			
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.	Vendor to accept			
21.1.4	Demonstration of all features of the machine, control system & accessories	Vendor to accept			
21.1.5	Machining of test piece as per AFNOR/ISO. Vendor to supply test piece and tooling for it's machining.	Vendor to accept & submit			
21.2	**Tests/Activities to be carried out at BHEL works while commissioning the machine :**				
21.2.1	Geometrical accuracies as per test chart (ref. Sl.No. 18.1)	Vendor to accept			
21.2.2	Positioning accuracies as per VDI-DGQ/3441 (ref. Sl.No. 18.2)	Vendor to accept			
21.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept			
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.	Vendor to accept			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
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	Vendor to accept			
21.2.6	Demostration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to accept			
21.2.7	Machining test piece as per AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.	Vendor to accept			
21.2.8	Job Proveout machining as per Sl.No. 20.0 including prove out of time furnished by vendor for the specified component.	Vendor to accept			
21.2.9	Two weeks supervision of independent operation of machine by BHEL after job proveout	Vendor to accept			
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. This training is in addition to training requirements at Sl.No.15.0	Vendor to accept			
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 to accept & offer			
23.0	**GUARANTEE :**				
23.1	24 months from the date of acceptance of the machine. (for all supplied equipment)	Vendor to offer			
24.0	**GENERAL :**				
24.1	Machine Model No.	Vendor to inform			
24.2	Total connected load (KVA):	Vendor to inform			
24.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to inform			
24.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer			
24.5	Total weight of the machine	Vendor to inform			
24.6	Weight of heaviest part of machine	Vendor to inform			
24.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to inform			
24.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to inform			
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	Vendor to submit			
24.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm			

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
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. All pipe end connections should be in metric standard as per ISO 8434-1 / DIN 2353.	Vendor to confirm			
25.0	**QUALIFYING CONDITIONS :**				
25.1	Only those vendors (OEMs - Original Equipment Manufacturers) should quote a) Who have supplied and commissioned at least one CNC Lathe of same (SOC 3000mm, Load Carrying Capacity 120000Kg, At least Admit Between Centers/Center Distance 5500mm) or higher sizes in the past ten years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender). AND b) Who have previous experience of supply of at least one of the following types of machines which operate on hydrostatic guide-ways for its main linear axes, in the past ten years (on the date of opening of the Tender) and the referred machine is presently working satisfactorily. - CNC Lathe of above size (i.e. SOC 3000mm, Load Carrying Capacity 120000Kg, Center Distance 5500mm) or higher. or - CNC Vertical Borer of table dia 2.5M or higher. or - CNC Horizontal Boring Machine of spindle dia 160mm of higher. The following information should be submitted by the vendor about the companies where referred machines as at a) & b), above, have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to inform			
25.2	Name of the customer / company where referred machine is installed.	Vendor to inform			
25.3	Complete postal address of the customer.	Vendor to inform			
25.4	Month & Year of commissioning	Vendor to inform			
25.5	Parameters of machine(s) supplied (Swing Over Carriage, Center Distance, Load Carrying Capacity) and application for which the machine is supplied.	Vendor to inform			
25.6	Name and designation of the contact person of the customer.	Vendor to inform			
25.7	Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
25.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original Certificate or Through E-mail directly from the customer). The original performancecertificate may be returned after verification by BHEL, if required.	Vendor to submit			
25.9	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			
26.0	**OTHER FEATURES:**				
26.1	**NETWORKING:**				

SL. NO.	DESCRIPTION FOR BHEL REQUIREMENT		OFFERED	DEVIATIONS	REMARKS
26.1.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities.	Vendor to offer			
26.1.1.1	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm			
26.1.1.2	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			
26.1.1.3	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm			
26.2	**MACHINE MONITORING SYSTEM (MMS) SIGNALS**				
26.2.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.	Vendor to offer			
26.2.1.1	Control ON	Vendor to confirm			
26.2.1.2	Cycle ON	Vendor to confirm			
26.2.1.3	Spindle Running	Vendor to confirm			
26.2.1.4	Feed Active (Any of the axes moving)	Vendor to confirm			
26.2.1.5	M30 (Program Stop)	Vendor to confirm			
27.0	**OPTIONAL ITEMS :**				
27.1	**HYDRAULIC MOVEMENT OF JAWS ON CHUCK:** Complete system to have hydraulically operated movement & locking of all Jaws of the offered chuck instead of mechanical force multipliers (Sl.No. 2.1.13.1 & 2.2.13). Technical Details of hydraulic system & its components are to be informed by vendor with relevant drgs. Additionally, Vendor may offer also any other type of system for power operated movement/locking of jaws as an option. Vendor to quote only additional cost.	Vendor to offer & submit			
27.2	**ADDITIONAL HYDROSTATIC SUPPORT FOR CHUCK :** Fully enclosed Hydrostatic Support for chuck in addition to offered spindle bearings (Sl.No. 2.2.3) for further extended life of spindle bearings & the machine. Technical Details of Hydrostatic Oil circuit and its leakproof oil collection & re-circulation system are to be informed by vendor with relevant drgs.	Vendor to offer & submit			
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