

	<b><u>BHARAT HEAVY ELECTRICAL LIMITED</u></b>	<b><u>UNIT'S ADDRESS</u></b>	<b><u>UNIT'S PHONE NOS.</u></b>	<b><u>CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)</u></b>																							
<b><u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR</u></b>																											
<b><u>CNC LATHE</u></b>																											
<b>NOTE:-</b>																											
<b>1. Vendor must submit complete information against clause no. 24.0 The offer meeting this clause would only be processed.</b>																											
<b>2. The "Offered" Column and where applicable, the "Deviations" &amp; "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.</b>																											
<b>3. The offer and all documents enclosed with offer should be in English language only.</b>																											
<b>ADDRESS OF THE SUPPLIER :</b>																											
<b>TELEPHONE NOS.:</b>																											
<b>FAX NOS.:</b>																											
<b>E-MAIL ADDRESS :</b>																											
<b>SCOPE: SUPPLY, ERECTION &amp; COMMISSIONING OF CNC LATHE COMPLYING WITH SPECIFICATION AS BELOW</b>																											
<b>SNO</b>	<b>DESCRIPTION FOR BHEL REQUIREMENT</b>																	<b>SPECIFIED / TO BE CONFIRMED BY</b>	<b>OFFERED</b>	<b>DEVIATIONS</b>	<b>REMARKS</b>						
<b>1.0 PURPOSE &amp; WORKPIECE MATERIAL</b>																											

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.1	Purpose: (Operations/Jobs involved): The CNC Lathe is required for turning of the motor shafts. The turning involves Shaft turning at both side of the shaft, journal turning, flange turning, central core turning (continuous as well as intermittent). Pl see the enclosed sketch for the various styles of motor shafts	Vendor to confirm			
1.2	Work Piece Material: (Material detail, Hardness etc.) Work Piece Material: (1) Normalised Manganese steel forgings, complying generally to IS 4367 - 1991 & UTS upto 640 N/mm2, Hardness 200 BHN. (2) Carbon Steel Forgings normalised class 4 (45C8) complying to IS 2004 - 1981, UTS 530 N/mm2 & 200 BHN. (3) Alloy steel forging hardened and tempered, with UTS upto 740 N/mm2.	Vendor to confirm			
	<b>2.0 SPECIFICATION:</b>				
	<b>2.1 CAPACITY &amp; SIZE :</b>				
2.1.1	Max.Turning Diameter , 600 mm	Vendor to confirm			
2.1.2	Max.Turning Length, 4000 mm	Vendor to confirm			
2.1.3	Max. Weight of Work-piece between centres without steady 4800 Kg	Vendor to confirm			
2.1.4	Max. Weight of Work-piece:				
	a) In head stock with one steady rest 4800 Kg	Vendor to confirm			
	b) Only on two steady rests 5000 Kg	Vendor to confirm			
	c) Only in chuck 1000 Kg	Vendor to confirm			
	d) with steadies and tailstock and hadstock 6000 Kg	Vendor to confirm			
2.1.5	Min. & max. bore diameter	Vendor to specify			
2.1.6	Max bore & depth	Vendor to specify			
2.1.7	Admit between centres (ABC) / Center Distance {Machine should be capable of facing at maximum length} 4000 mm	Vendor to confirm			
2.1.8	Center Height	Vendor to specify			
2.1.9	Swing over bed (SOB) , mm	Vendor to specify			
2.1.10	Swing Over Carriage (SOC) , mm	Vendor to specify			

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2.1.11	Distance of center of gravity from face plate, in case the workpiece is held only in chuck, mm	Vendor to specify			
2.1.12	Face plate Diameter , mm	Vendor to specify			
2.1.13	No. of Hard Jaws, 4	Vendor to confirm			
2.1.14	Max. & Min. Chucking Diameters (with single set of jaws)	Vendor to specify			
	a) External 60 to 300 mm	Vendor to confirm			
	b) Internal, mm	Vendor to specify			
2.1.15	Min distance between Head stock & Tail stock, mm	Vendor to specify			
2.1.16	Min and Max facing diameters without Tool holder extension , mm	Vendor to specify			
	<b>2.2 HEAD STOCK</b>				
2.2.1	Spindle Motor Rating (Min.) AC, S1 Continuous Duty (suitable for 200 m/min cutting speed, max depth of cut radial (at 350 mm diameter) of 12 mm and feed rate of 1 mm per revolutions for roughing operation . (power calculations to be given)	Vendor to specify			
2.2.2	Spindle Motor Make (Either Siemens or FANUC Ekvleant), Model etc.	Vendor to specify			
2.2.3	Spindle Bearing Type & Diameters (Radial & Axial)	Vendor to specify			
2.2.4	Spindle nose details (Drawing to be submitted)	Vendor to specify			
2.2.5	Spindle speed (Infinitely variable) ( 0 to 1500 RPM or more)	Vendor to specify			
2.2.6	Detail of speed ranges (Selectable through program)	Vendor to specify			
2.2.7	Range of spindle speed at constant power.	Vendor to specify			
2.2.8	Max permissible torque at face plate	Vendor to specify			
2.2.9	RPM at which max. permissible torque is available	Vendor to specify			
2.2.10	Torque / Power / Speed diagram of spindle motor	Vendor to specify			
2.2.11	Head stock center, either 60° or 90° with cover plate to cover the space when headstock center is removed.	Vendor to specify			
2.2.12	Spindle bore diameter and its depth from chuck face	Vendor to specify			



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2.4.9	Detail of X and Z axes feed mechanism	Vendor to specify			
	<b>2.5 STEADY RESTS :</b>				
2.5.1	Range of supporting dia for Roller Steady Rests 60 to 300 mm	Vendor to confirm			
2.5.2	No. and Range of each Roller Steady Rest to cover the specified range 60 to 300 mm	Vendor to confirm			
2.5.3	Swiveling type upper portion of steady rests for job loading/unloading (Details should be submitted)	Vendor to specify			
2.5.4	No. of common bases for steady rests for complete supporting range	Vendor to specify			
2.5.5	Mounting of Steady Rest on Base shall be through quick-clamping fastener (Details should be submitted)	Vendor to specify			
2.5.6	Motorised movement of steady rest on bedways with positive clamping (Details should be submitted)	Vendor to specify			
2.5.7	Clamping force of base on bedways	Vendor to specify			
	<b>2.6 TAIL STOCK :</b>				
2.6.1	Motorised movement on bed by Push Buttons on Tail Stock	Vendor to specify			
2.6.2	Quill stroke (mm)	Vendor to specify			
2.6.3	Quill movement with	Vendor to specify			
	a) Presetting, display & automatic control of thrust applied				
	b) Compensation for thermal expansion of work piece				
	c) Motorised Drive				
2.6.4	Quill diameter	Vendor to specify			
2.6.5	Rapid Traverse rate of tail stock body on bed	Vendor to specify			
2.6.6	Traverse of quill with traverse rate	Vendor to specify			
2.6.7	Tail stock centre - Either 60 degree or 90	Vendor to specify			
2.6.8	Rotating Centre also to be offered with major dimensions	Vendor to confirm			
2.6.9	Detail of Positive Clamping & Unclamping of tail stock on bed	Vendor to specify			
2.6.10	Max thrust on the Quill	Vendor to specify			

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<b>2.7</b>	<b>CARRIAGE/ CROSSSLIDE :</b>				
2.7.1	Z-axis travel	Vendor to specify			
2.7.2	X-axis travel (specify movement beyond center i.e. X -ve side)	Vendor to specify			
2.7.3	Cutting force available at the carriage	Vendor to specify			
2.7.4	Layout showing extreme positions of the all axes movements	Vendor to specify			
2.7.5	Carriage to clear chuck, tailstock and all steady rests (should be confirmed)	Vendor to specify			
<b>2.8</b>	<b>TOOL POST :</b>				
2.8.1	Type of Tool Post: Fixed type, Plate type tool carriers with no. & extension of tool carriers / Turret with stationary tools with 8 no. of positions / for large size. Thread cutting operation should be possible. Thread milling may also be offered as option. The tool holders should be best for the application, 2 packets for rotating tools to be kept.	Vendor to specify			
2.8.2	Type of Tool Holders for Turret / Tool Carriers / Boring Bar holders etc. (if VDI type then specify its no.)	Vendor to specify			
2.8.3	Tool shank size for different tool holders 32 x 25 or 32 x 32 mm or 25 x 25	Vendor to confirm			
2.8.4	Model, make & type of turret (auto. Indexing type)	Vendor to specify			
2.8.5	Provision for coolant to reach upto tool tip in all types of tool holders	Vendor to specify			
2.8.6	Mechanism for indexing / selection of tool location	Vendor to specify			
2.8.7	Automatic operation / selection / indexing of turret through CNC program	Vendor to specify			
2.8.8	Additional manual operation / selection through push buttons	Vendor to specify			
2.8.9	Drawing of tool post and adaptors for tools	Vendor to specify			
2.8.10	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for troublefree operation	Vendor to specify			
2.8.11	Turning tool holder, 8 to 12 Nos.	Vendor to confirm			
2.8.12	Boring bar Holder 60 dia, 2 Nos. (optional)	Vendor to confirm			
<b>2.9</b>	<b>CONSTRUCTION:</b>				

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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 specify			
2.9.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer	Vendor to specify			
	<b>2.10 OPERATOR'S PLATFORM:</b>				
2.10.1	Independent 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 and stepping down for convenient and safe operation from both sides. if applicable A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform.	Vendor to specify			
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 specify			
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.	Vendor to specify			

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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 CRT 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 specify			
2.11.1.2	An auxiliary pendant, which can be taken near to the chuck for job setting and similar other purposes.	Vendor to specify			
2.11.2	CNC SYSTEM & FEATURES :				
2.11.2.1	Make : Siemens./ FANUC	Vendor to confirm			
2.11.2.2	Type Simens with open architecture : PC based latest version	Vendor to confirm			
2.11.2.3	Details of Standard features	Vendor to specify			
2.11.2.4	Details of optional features, recommended by vendor. For BHEL job	Vendor to specify			
2.11.2.5	Details of other optional features	Vendor to specify			
2.11.2.6	The system should have full alphanumeric keyboard, TFT colour display(10.4" or more), additional draw-out type Query Key Board and mouse in suitable enclosure, RS232C serial interfaces, USB port parallel interface for printer, COM port for telediagnosics, network ready with LAN, electronic hand wheels for all axes, hard disk of sufficient capacity ( <b>Largest size available at the time of order shall be supplied</b> ), graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor)	Vendor to specify			



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<b>2.11.3</b>	<b>MANUAL CONTROL :</b>				
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 specify			
<b>2.11.4</b>	<b>HAND HELD UNIT:</b>				
2.11.4.1	Hand Held unit, alongwith sufficient length of interfacing cable is to be offered with complete details. With Axis selection switch, jog incremental jog , Feedrate accurate, spaidle over ride switch etc.				
<b>2.11.5</b>	<b>UPS FOR CNC SYSTEM:</b>				
2.11.5.1	UPS of 30 minutes for CNC system with inbuilt cooling and charge status display	Vendor to specify			
<b>2.12</b>	<b>MACHINE LIGHTS:</b>				
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 specify			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to specify			
2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to specify			
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 should be provided..	Vendor to confirm			

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<b>2.13</b>	<b>AIR CONDITIONERS:</b>				
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 to specify			
<b>2.14</b>	<b>HYDRAULIC SYSTEM : Details should be Submitted by the Vendor</b>				
2.14.1	The System should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to specify			
2.14.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to specify			
2.14.3	Filtration System, Details should be submitted.	Vendor to specify			
2.14.4	Failure indication	Vendor to confirm			
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor to specify			
2.14.6	Hydraulic pump capacity (flow / pressure)	Vendor to specify			
2.14.7	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to confirm			
2.14.8	<u>First filling of all required Oils &amp; Grease etc.</u> to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/greases are also to be provided by the vendor.	Vendor to specify			
<b>2.15</b>	<b>COOLANT SYSTEM :</b>				
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 specify			
	a) Recirculating Type Flood Coolant System	Vendor to specify			
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 specify			

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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.	Vendor to specify			
2.15.5	Coolant Filtration System: Recirculating type coolant system with centrifugal Hydrocyclone System / Vacuum Rotary drum type System/ Cartridge Type Filtration System and magnetic separator.	Vendor to specify			
2.15.7	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor to specify			
2.15.8	Coolant pump & motor details etc. including pressure & flow of coolant	Vendor to specify			
2.15.9	Coolant Tank Capacity	Vendor to specify			
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 specify			
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 specify			
2.15.12	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			
	<b>2.16 ELECTRICAL :</b>				
2.16.1	415V + 10% / -10%, 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 to specify			
2.16.2	<b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized	Vendor to specify			

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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 to specify			
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 specify			
2.16.6	Motors shall conform to IEC or Indian Standards	Vendor to specify			
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			
2.16.9	In-cycle hour counter with reset facility.	Vendor to confirm			

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2.17	<b>SAFETY ARRANGEMENTS:</b> Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to specify			
	1. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.				
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.				
	3. All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.				
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.				
	5. Emergency Switches at suitable locations as per International Norms should be provided.				
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.				
2.18	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b>	Vendor to specify			
	The Machine should conform to following factors related to environment :				
	(a) Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.				
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.				

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	( 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.				
	<b>3.00 CHIP CONVEYOR :</b>				
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. Chip bins of appropriate size of Indian make, with wheels & handle for movement, should also be supplied.	Vendor to specify			
3.2	Type of chip conveyor    hinged belt type	Vendor to confirm			
3.3	Width of conveyor	Vendor to specify			
3.4	Elevation of chip conveyor for chip bin	Vendor to specify			
3.5	Material of chip conveyor (should be rust resistant)	Vendor to specify			
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.	Vendor to specify			
3.7	In case of grinding, provision for flushing out grinding dust to avoid clogging of conveyor's holes should be provided.	Vendor to specify			
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to specify			

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3.9	Layout showing location of chip conveyor should be submitted.	Vendor to specify			
	<b>4.0 SERVO VOLTAGE STABILIZER:</b>				
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 confirm			
4.2	Make (NEEL / Equivalent)	Vendor to confirm			
4.3	Model & Rating	Vendor to specify			
4.4	Spares Package for the Voltage Stabiliser for 2 years working should also be	Vendor to specify			
4.5	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to specify			
	<b>5.0 ULTRA ISOLATION TRANSFORMER</b>				
5.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied	Vendor to confirm			
5.2	Make NEEL / EQUIVALENT	Vendor to confirm			
5.3	Model and Rating	Vendor to specify			
5.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to specify			
5.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to confirm			
	<b>6.0 PNEUMATIC SYSTEM:</b>				
	<b>6.1 AIR COMPRESSOR:</b>				
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 system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure 4 bar could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to specify			

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6.1.2	Make & Model of Air Compressor	Vendor to specify			
6.1.3	Make & Model of Refrigerated Air Dryer				
6.1.4	Capacity (Flow, Pressure & KW)	Vendor to specify			
	<b>6.2 COMPRESSED AIR POINTS:</b>				
6.2.1	Compressed Air Point with manually ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	Vendor to confirm			
	<b>7.0 TOOLINGS:</b>				
7.1	List of all types of required tool holders, adapters, sleeves etc required for job proving . should be provided, with inserts.	Vendor to confirm			
7.2	All types of cutting tools, tool holders, adapters, sleeves, probes/stylii etc. recommended by vendor in sufficient quantity for complete machining of proveout components. ( No of each proveout component for which tooling is required should be indicated by Indentor)	Vendor to specify			
7.3	Additional set of Jaws	Vendor to specify			
	<b>8.0 MEASURING SYSTEMS:</b>				
8.1	Automatic Job Measuring System comprising of Renishaw make Wireless system, with measuring cycles, calibration system and all types of probes / styli required for measuring all machined dimensions of the prove-out components. Vendor to furnish detailed description of the system along with offer.	Vendor to specify			
8.2	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 to specify			
8.3	Runout Optimization System to perform runout measurement at different stages/diameters/discs of Motor shaft by probes/sensors, analysis of data, computation of correction parameters to reduce eccentricity of whole shaft <b>(optional)</b>	Vendor to specify			



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<b>9.0</b>	<b>DIAGNOSTIC SYSTEM</b>				
<b>9.1</b>	<b>TELE-DIAGNOSTIC SERVICE :</b>	Vendor to specify			
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 specify			
<b>9.2</b>	<b>FAULT DIAGNOSTIC SYSTEM:</b>				
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. The above to be included in the offer .	Vendor to confirm			
<b>9.3</b>	Help guide should be provided to use both diagnostic systems	Vendor to confirm			
<b>10.0</b>	<b>LEVELING &amp; ANCHORING SYSTEM</b>				
10.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to specify			

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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 specify			
11.2	Test mandrel for checking spindle run-out & alignment of headstock/tailstock etc. should be supplied	Vendor to specify			

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12.0	<b>SPARES:</b>				
12.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: <b>(Unit Price of each item of spare should be offered) .All hyd &amp; Lub system seals reqd.</b> Spare jaws reqd. Spare revolving centre reqd. Main spindle bearing reqd	Vendor to confirm			
	<b>a) Mechanical &amp; Hydraulic Spares:</b> All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to specify			
	<b>b) Electrical /Electronic / CNC Spares:</b> All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Scanning Heads for Linear Scales, CNC Controller, Operator's panel with Display Unit, Floppy Disk 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 to specify			
12.2	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 specify			
12.3	Recommended set of spares for all attachments are to be offered with details.	Vendor to specify			
12.4	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 specify			

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13.0	<b>DOCUMENTATION :</b> Five sets of following documents (Hard copies) in English language should be supplied along with the machine	Vendor to specify			
13.1	Operating manuals of Machine & CNC system				
13.2	Programming Manuals of Machine & CNC system				
13.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also				
13.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.				
13.5	Manufacturing drawings for all supplied tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.				
13.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.				
13.7	Detailed specification of all rubber items and hydraulic/lube fittings				
13.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.				
13.9	PLC program print-outs with comments in English.				
13.10	PLC program PNC data on CD, NC data & PLC data on floppy.				
13.11	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.				
13.12	Complete Master List of parts used in the machine shall be submitted by the vendor.				
13.13	One additional set of all the above documentation on CD ROM, wherever possible.				

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14.0	<b>TRAINING</b>				
14.1	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 to specify			
14.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.				
14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to specify			
14.4	Vendor to quote for training on per man per week basis	Vendor to specify			
14.5	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 specify			

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<b>15.0</b>	<b>FOUNDATION :</b>				
15.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. 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 to specify			

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<b>16.0</b>	<b>ERECTION &amp; COMMISSIONING</b>				
16.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to specify			
16.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to specify			
16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at <b>clause 20</b> (Machine Acceptance) shall form part of the commissioning activity.	Vendor to specify			
16.4	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 specify			
16.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to specify			
16.6	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates should be sourced from India	Vendor to specify			
16.7	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm			
16.8	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to specify			
16.9	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to specify			

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17.0	ACCURACY TESTS:				
17.1	GEOMETRICAL ACCURACIES :				
17.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 1708 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be submitted with the offer.	Vendor to specify			
17.1.2	Head Stock Spindle run out: (Radial & Axial) 0.01 mm	Vendor to confirm			
17.1.3	All other accuracies to confirm to ISO 1708 (Latest Revision) or Suppliers Test chart whichever is finer shall to be tested.	Vendor to confirm			
17.1.4	Tail stock Quill taper run-out	Vendor to specify			
17.1.5	Cylindricity of turning	Vendor to specify			
17.1.6	True roundness of turning	Vendor to specify			
17.1.7	Facial run-outs	Vendor to specify			
17.1.8	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			
17.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY:				
	Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.				
17.2.1	Positioning uncertainty in X axis (P) per 1000 mm (0.01 mm)	Vendor to confirm			
17.2.2	Positioning deviation in X axis (Pa) per 1000 mm (0.01 mm)	Vendor to confirm			
17.2.3	Positioning scatter in X axis (Ps) per 1000 mm (0.005 mm)	Vendor to confirm			
17.2.4	Backlash on reversal in X axis (U) (0.005 mm)	Vendor to confirm			



SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
17.2.1	Positioning uncertainty in Z axis (P) per 1000 mm (0.03 mm)	Vendor to confirm			
17.2.2	Positioning deviation in Z axis (Pa) per 1000 mm (0.03 mm)	Vendor to confirm			
17.2.3	Positioning scatter in Z axis (Ps) per 1000 mm (0.01 mm)	Vendor to confirm			
17.2.4	Backlash on reversal in Z axis (U) (0.01 mm)	Vendor to confirm			
17.2.7	Total positioning error along X & Z axes over entire travel X - 0.01 mm Z - 0.2 mm	Vendor to confirm			
17.2.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor to confirm			
	Note : LC of scale should be taken to achieve above				
	<b>18.0 AMBIENT CONDITIONS &amp; THERMAL STABILITY :</b>				
18.1	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% 50 Hz +3%, - 3% Frequency: No. of phases = 3 Ambient Conditions: Temperature = $\pm 5$ to 48 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 specify			

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18.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition. Max. temperature variation is up to 25 deg Celsius in 24 hours. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor to specify			
18.3	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished by Vendor)	Vendor to specify			
18.4	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 specify			
<b>19.0</b>	<b>PROVEOUT OF BHEL COMPONENTS :</b>				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.1	Drawings of proveout components are enclosed. Vendor to submit preliminary process, time study & tool list recommended by them along with the offer. Change in process/tools may be mutually discussed and agreed. Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. Vendor should submit the CNC programs, setting schemes, process sheets, tooling layouts, tools and accessories inserts etc. time studies etc. in advance for the prove out components. Vendor shall be fully responsible for machining of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.	Vendor to offer .			
19.2	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. Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.	Vendor to specify			

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20.0	<b>MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)</b>	Vendor to confirm			
20.1	<b>Tests/Activities to be carried out at supplier's works on the machine before dispatch :</b>				
20.1.1	Geometrical accuracies as per test chart. ISO				
20.1.2	Positioning accuracies as per VDI-DGQ/3441				
20.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.				
20.1.4	Demonstration of all features of the machine, control system & accessories				
20.1.5	Machining of test piece as per AFNOR/ISO. Vendor to supply test Full load test as per specified depth of cut & feed piece and tooling for it's machining.				
20.2	<b>Tests/Activities to be carried out at BHEL works while commissioning the machine :</b>				
20.2.1	Geometrical accuracies as per test chart. ISO				
20.2.2	Positioning accuracies as per VDI-DGQ/3441				
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.				
20.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.				
20.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine				
20.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.				
20.2.7	Machining test piece as per AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.				
20.2.8	Job Proveout machining.				

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20.2.9	Two weeks supervision by the OEM of independent operation of machine by BHEL after job proveout commissioning of machine by the OEM	Vendor to confirm			
20.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm			
	<b>21.0 PACKING:</b>				
21.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes	Vendor to specify			
	<b>22.0 GUARANTEE :</b>				
22.1	24 months from the date of acceptance of the machine.	Vendor to specify			
	<b>23.0 GENERAL :</b>				
23.1	Machine Model No.	Vendor to specify			
23.2	Total connected load (KVA):	Vendor to specify			
23.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify			
23.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm			
23.5	Total weight of the machine	Vendor to specify			
23.6	Weight of heaviest part of machine	Vendor to specify			
23.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify			
23.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify			
23.9	Vendor to submit , along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Swing Over Carriage, Center Distance, Load Carrying Capacity, Main Drive Rating, CNC System etc	Vendor to confirm			
23.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm			

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23.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to specify			
	<b>24.0 REFERENCE LIST / QUALIFYING CONDITIONS :</b>				
24.1	Only those vendors, who have supplied and commissioned at least one CNC LATHE of same (600 mm SOC, 4800 kg weight carrying capacity between centers 4 m ABC.) 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 such machine(s) has/had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months after its commissioning and acceptance(on the date of opening of Tender) in BHEL should quote. The following information should be submitted by the vendor about the companies where similar machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to specify			
	1. Name of the customer / company where similar machine is installed.				
	2. Complete postal address of the customer.				
	3.Month & Year of commissioning.				
	4. Application for which the machine is supplied .				
	5. Name and designation of the contact person of the customer.				
	6. Phone, FAX no. and email address of the contact person of the customer.				
	7. Performance certificate from the customers regarding satisfactory performance of machine supplied to them in original.				
	8. BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect,the offer shall be rejected.				

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25.0	OTHER FEATURES: ( required)				
25.1	NETWORKING:	Vendor to confirm			
25.1.1	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.				
	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood)				
	b) The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.				
	c) The program transfer between CNC system and network should also be possible in CNC Mode.				
25.2	MACHINE MONITORING SYSTEM (MMS) SIGNALS	Vendor to confirm			
25.2.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals should be sourced from a PLC output card separately.				

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	a) Control ON				
	b) Cycle ON				
	c) Spindle Running				
	d) Feed Active (Any of the axes moving)				
	e) M30 (Program Stop)				