


			Annexure-V			
	<u>BHARAT HEAVY ELECTRICAL LIMITED</u>				Enquiry No. :	E-588-09-0004-69-1
	<u>Heavy Equipment Repair Plant, Tarna, Shivpur, Varanasi-221003, Uttar Pradesh, India</u>				Due Date :	05/08/2009
	<u>CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)</u>				Supplier Qtn. No.:	
					Date :	
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATE OF "CNC TURN MILL CENTRE "</u>						
NOTE:-						
1. Vendor must submit complete information against clause no. 31 i.e. Qualifying Conditions). The offer meeting this clause would only be processed.						
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.						
3. The offer and all documents enclosed with offer should be in English language only.						
NAME & ADDRESS OF THE SUPPLIER :						
TELEPHONE NOS.:						
FAX NOS.:						
E-MAIL ADDRESS :						
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF "CNC TURN MILL CENTRE" COMPLYING WITH SPECIFICATIONS AS BELOW						

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose: A CNC Turn Mill Centre is required for External Turning, Boring and Drilling, Angular Drilling, Reaming, Milling, Key way milling on cylindrical as well as taper portion of shafts, Grooving in Bore and outer dia of components.	Vendor to confirm			
1.2	Work Piece Material: The machine shall be suitable for machining of casting/ forging to Specn. ASTM A216 Gr. WCC, GRADE : 40 Ni Cr Mo 65 /AISI 4340, IS2004 CL.3, CLASS 4, DIN EN 10269 – 1999 Gr: 20CrMoVTiB 410 , HARDNESS 180 to 320 BHN.	Vendor to confirm			
2	SPECIFICATION:				
2.1	MACHINE CONFIGURATION: The Turn Mill Centre should have 5 axes, namely X (Cross travel of slide), Y (Vertical to cross-slide), Z (longitudinal travel of slide), C (Spindle indexing), B (tool post swivelling).				
2.2	Capacity				
2.2.1	Maximum Work Piece Turning diameter (between centres).	1000 mm			
2.2.2	Max Workpiece length (including face machining).	3000 mm			
2.2.3	Max Workpiece weight that can be machined.				
	a) Only in chuck (without tail stock or steady support).	1600 Kgs.			
	b) In chuck with tail stock.	4500 Kgs.			
	c) In head stock with one steady rest.	Vendor to specify			
2.2.4	Max distance between centres(Suitable gap to be provided for loading / unloading of job and machining operations like 300 mm long boring (max) and facing on end face of the job).	Vendor to specify			
2.2.5	Swing Over Bed (min.).	1050 mm			
2.2.6	Swing Over Cross Slide (min.).	800 mm			
2.3	Headstock				
2.3.1	Spindle drive power (AC Continuous Rating) min.	60 kW			
2.3.2	Spindle speed (Infinitely variable with digital speed control). Min.	800 rpm			
2.3.3	No. of speed ranges (Hydraulically operated gear shifting).	Vendor to specify			
2.3.4	Spindle Diameter in front bearing.	Vendor to specify			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.3.5	Spindle Bore.	Vendor to specify			
2.3.6	3 jaw self centering hydraulic hollow chuck with matching cylinder and with one set hard and soft JAWS. Minimum.	φ630mm			
	Maximum and Minimum Chucking diameters with single set of jaws.				
	a) External	φ600mm			
	b) Internal	φ100mm(Min)/Vendor to Specify			
2.3.7	Max Torque at 100 % duty cycle	Vendor to specify			
2.3.8	Centres (2 sets of 60 deg and 90 deg centres are to be provided).	Vendor to Confirm			
2.3.9	Spindle Torque/ Power / Speed characteristics.	Vendor to specify			
2.4	C Axis				
2.4.1	Smallest Programmable Increment.	0.005 degree			
2.4.2	Max continuous speed of rotation.	Vendor to specify			
2.4.3	Min. continuous speed of rotation.	0.005 rpm			
2.4.4	Torque of the drive.	Vendor to specify			
2.4.5	Clamping Torque.	Vendor to specify			
2.4.6	Transmission mechanism.	Vendor to specify			
2.4.7	Details of C-axis servomotor like torque ,rating,type.make etc.	Vendor to specify			
2.5	Live Milling & Boring Spindle on Tool Post				
2.5.1	Min. power	25 KW			
2.5.2	Max spindle torque	Vendor to Specify			
2.5.3	Speed range	400-4000 RPM			
2.5.4	Spindle taper	HSK A 100/ Capto C8			
2.5.5	Tool Cooling System (Details to be submitted)	Vendor to specify			
2.5.6	Spindle diameter in the front bearing	Vendor to specify			
2.6	B - Axis				
2.6.1	Range of Angular Rotation	-100 to + 90 deg			
2.6.2	Speed of Angular Rotation	Vendor to specify			
2.6.3	Resolution	0.001 deg			
2.6.4	Max. Torque	Vendor to specify			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.6.5	Max. Holding Torque	Vendor to specify			
2.6.6	Power Transmission arrangement (details to be given)	Vendor to confirm			
2.7	Z Axis (Longitudinal Travel of Slide)				
2.7.1	Axis Resolution	0.001 mm			
2.7.2	Longitudinal travel	Vendor to specify			
2.7.3	Feed rate (Infinitely variable)	0.5 - 5000 mm per minute			
2.7.4	Rapid traverse rate	10 m/min approx.			
2.7.5	Feed force	Vendor to specify			
2.7.6	Ball screw Dimensions	Vendor to specify			
2.8	Y Axis (Vertical Travel of Live Spindle on Tool Post)				
2.8.1	Axis Resolution	0.001 mm			
2.8.2	Vertical travel	500 mm			
2.8.3	Traverse Range	- 200 to + 300 mm			
2.8.4	Feed rate (Infinitely variable)	0.5 -5000 mm/min			
2.8.5	Rapid traverse rate	12.5 m/min			
2.8.6	Y axis feed force	Vendor to specify			
2.8.7	Ball screw Dimensions	Vendor to specify			
2.9	X Axis (Cross travel of Slide)				
2.9.1	Resolution	0.001 mm			
2.9.2	Feed rate ,Infinitely variable	0-5000 mm per minute			
2.9.3	Rapid traverse rate	10 m/ min.			
2.9.4	Axis -Travel (minimum)	580 mm			
2.9.5	Feed force	Vendor to specify			
2.9.6	Ball screw Dimensions	Vendor to specify			
2.10	Tailstock (Motorised)				
2.10.1	Quill Diameter (Minimum)	150 mm			
2.10.2	Quill Travel (minimum)	150 mm			
2.10.3	Quill Force (Adjustable) maximum	35100 N			
2.10.4	Clamping of the tailstock with bed should be electro-hydraulic (details to be given)	Vendor to Confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.11	FEED AND DRIVE SYSTEM:				
2.11.1	Feed drives/ motors for X,Y,Z,C & B axes [AC servo motors] shall be digital type of Siemens make (Details of model, make, type etc. to be submitted).	Vendor to confirm			
2.11.2	Maximum feed force for all axes	Vendor to specify			
2.11.3	Feed back system for X, Y, & Z axes: Heidenhain linear scales with pressurised compressed air cleaning. C & B axes: Heidenhain Rotary Encoder (Details to be submitted by the vendor)	Vendor to specify			
2.11.4	Type of power transmission: 1. Pre-loaded backlash free re-circulating Ballscrew with pre-loaded double nut for X, Y and Z axes 2. For B and C Axes transmission to be specified.	Vendor to specify			
2.11.5	Mechanism for locking X, Y, Z,C, B axes	Vendor to specify			
2.12	MACHINE BED AND GUIDEWAYS				
2.12.1	Type of bed	Slant Bed			
2.12.2	Details of guide ways for all axes and Spindle are to be submitted with offer.	Vendor to confirm			
2.12.3	Details of lubrication system provided on Spindle and all axes are to be submitted with the offer.	Vendor to confirm			
2.12.4	Hardness of guideways	Vendor to specify			
2.12.5	Metallic Telescopic Covers of rust resistant material to be provided with wipers wherever possible for guide ways. Joints of telescopic covers should be sealed to avoid mixing of coolant & lubrication oil.	Vendor to confirm			
2.13	Steady Rest Type-1 (1 Nos):				
2.13.1	Hydraulic, Roller Type	Vendor to Confirm			
2.13.2	Size (Diameter)	150 to 400 mm			
2.13.3	Weight Carrying Capacity per steady	3 Tons			
2.13.4	Steady to be positioned by using Z axis drive with mechanical linkages.	Vendor to confirm			
2.14	Steady Rest Type-2 (1 No):				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.14.1	Hydraulic Roller Type	Vendor to Confirm			
2.14.2	Size (Diameter)	50 to 200 mm			
2.14.3	Weight Carrying Capacity	1 Ton			
2.14.4	Steady to be positioned by using Z axis drive with mechanical linkages.	Vendor to confirm			
NOTE	Common base for both types of steadies should be provided so that these can be quickly interchanged.	Vendor to confirm			
2.15	CONSTRUCTION:				
2.15.1	Vendor to submit details of material, hardness & constructional details, including explanatory drawings, of various components/assemblies like Head stock, Tailstock, Tool post, Live Spindle , Tool Magazine, Automatic Tool Changer, Steady Rests, Transmission details of various axes, details of motor and drives, lubrication flow diagram, Automatic lubrication units , type of sliding/guideway arrangement etc. of the machine.	Vendor to confirm			
2.15.2	Video images on CD (in addition to hard copy) and drawings explaining the technical features / literature with photographs, should be enclosed with the offer.	Vendor to confirm			
2.16	OPERATION AND CONTROL SYSTEM:				
2.16.1	OPERATOR'S PANEL:				
2.16.1.1	Swiveling type operator's panel with requisite machine controls and CRT of required configuration shall be provided. Operator's panel should be ergonomically designed for average operator height of 5' 5" for convenient, efficient & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details of the panel should be submitted. Suitable AC is to be provided.	Vendor to confirm			
2.16.2	CNC SYSTEM & FEATURES :				
2.16.2.1	Make :	Siemens			
2.16.2.2	Type : Open Architecture system	Vendor to confirm			
2.16.2.3	Model (Latest version, as available at the time of ordering, should be supplied).	Siemens 840 D latest version at the time of supply			
2.16.2.4	Details of standard features. List to be submitted.	Vendor to specify			
2.16.2.5	Details of optional features, recommended by vendor, to be submitted.	Vendor to specify			
2.16.2.6	Details of other optional features available.	Vendor to specify			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.16.2.7	The system should have full alphanumeric keyboard, TFT colour display(10.4" or more), additional Qwerty Key Board and mouse in suitable enclosure, 2 nos of RS232C serial interfaces, parallel interface for printer, COM port for telediagnosics, network ready with LAN, electronic hand wheel for all axes, DVD drive unit for data input/output, hard disk of sufficient capacity, graphic simulation, On line ladder display or PG for PLC diagnosis and pre-installed system software & other required softwares etc.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.17	ATC Bypass Control :				
	It should be possible to run the machine in manual mode without ATC in operation.	Vendor to confirm			
2.18	HAND HELD UNIT:				
2.18.1	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 confirm			
2.19	UPS FOR CNC SYSTEM:				
2.19.1	UPS of 30 minutes backup time for CNC system with inbuilt cooling and charge status display.	Vendor to confirm			
2.19.2	Provision for automatic safe shut down of CNC Control in case of power failure.	Vendor to confirm			
2.20	MACHINE LIGHTS:				
2.20.1	Machine lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to confirm			
2.20.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to specify			
2.20.3	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
2.20.4	Flashing / rotary type End of Cutting and Program Stop lights.	Vendor to confirm			
2.21	AIR CONDITIONERS:				
2.21.1	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 confirm			
2.22	COOLANT SYSTEM :				
2.22.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons provided on the Operator's panel as well.	Vendor to confirm			
	a) Recirculating Type Flood Coolant System with nozzles around spindle.	Vendor to confirm			
	b) High Pressure Coolant thru Spindle.	Vendor to confirm			
2.22.2	All attachments, tool holders, boring bars, etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.22.3	Coolant collection and recirculation system should be leakproof to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to confirm			
2.22.4	Coolant Filtration System: Recirculating type coolant system to be provided. Details to be given with various options.	Vendor to confirm			
2.22.5	Coolant flow diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to confirm			
2.22.6	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.	Vendor to confirm			
2.22.7	Coolant Tank Capacity.	Vendor to specify			
2.22.8	Coolant pump & motor details for all variants of coolant system are to be submitted with the offer.	Vendor to specify			
2.22.9	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			
2.23	ELECTRICAL SYSTEM :				
2.23.1	415V + /- 10% , 50Hz +/-1.5 Hz, 3 Phase AC (3 wire system without neutral) Power Supply Source will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets shall be the responsibility of the vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that the same could be incorporated during construction of foundation.	Vendor to confirm			
2.23.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm			
2.23.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm			
2.23.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm			
2.23.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220 Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
2.23.6	Motors shall conform to IEC Standard	Vendor to confirm			
2.23.7	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			
2.23.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.24	SAFETY ARRANGEMENTS:	Vendor to confirm			
2.24.1	Following safety features in addition to other standard safety features should be provided on the machine:				
2.24.2	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			
2.24.3	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm			
2.24.4	All the pipes, cables etc. on the machine should be well supported and protected.	Vendor to confirm			
2.24.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to confirm			
2.24.6	Emergency Switches at suitable locations as per International Norms are to be provided.	Vendor to confirm			
2.24.7	Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm			
2.25	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :				
	The Machine shall conform to following factors related to environment :	Vendor to confirm			
2.25.1	Maximum noise level shall be 85 dB(A) at normal load condition, 1 M 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 so required.	Vendor to confirm			
2.25.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.25.3	There should not be any effluent from the machine. In case there are any effluent from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm			
2.25.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.25.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.25.6	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
3.0	CHIP CONVEYOR :				
3.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin to be provided. One chip bin of appropriate size with wheels & handle for movement, should also be supplied.	Vendor to specify			
3.2	Type of chip conveyor (suitable)	Vendor to specify			
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 (to be rust resistant)	Vendor to specify			
3.6	Provision for smooth flow of chips to the conveyor.	Vendor to confirm			
3.7	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor.	Vendor to confirm			
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.	OPTIONAL			
4.2	Make	NEEL			
4.3	Rating	Vendor to specify			
NOTE	It is optional item, price of this item to be quoted separately.	Vendor to confirm			
5.0	ULTRA ISOLATION TRANSFORMER				
5.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. should be supplied.	OPTIONAL			
5.2	Make	NEEL			
5.3	Rating	Vendor to specify			
NOTE	It is optional item, price of this item to be quoted separately.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.0	PNEUMATIC SYSTEM:				
6.1	AIR COMPRESSOR:				
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 before Refrigerated type Air Dryer so that BHEL compressed air supply having pressure at 3 bars could be used as and when required. The compressor unit should be suitable for continuous duty operation.	Vendor to confirm			
6.1.2	Make & Model of Air Compressor and Refrigerator type Dryer.	Vendor to specify			
6.1.3	Make & Model of Refrigerator type Dryer.	Vendor to specify			
6.1.4	Capacity (Flow, Pressure & KW)	Vendor to specify			
6.2	COMPRESSED AIR POINTS:				
6.2.1	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning. to be provided.	Vendor to confirm			
7.0	TOOLINGS:				
7.1	Vendor to offer all the cutting tools required for two jobs. Two drawings are enclosed for ready reference. Common tooling should be selected to minimise the variety.	Vendor to specify			
7.2	All cutting tools, tool holders, arbors, boring bars, clamping elements etc. recommended for machining of proveout components are to be supplied. Two Nos of components will be required to be proven for toolings, timing and performance. The supplier has to prove the committed time during proveout.	Vendor to confirm			
8.0	MEASURING SYSTEMS:				
8.1	Automatic job measuring system, comprising of special cartridge mounted Renishaw/ Marposs make Wireless system, with measuring cycles, calibration system and all types of probes/ stylus required for measuring all machined dimensions of the prove-out components are to be supplied (Vendor to give full details).	Vendor to confirm			
9.0	TIME STUDY:				
9.1	Time study of the two components specified is to be given. Time shall be proven by Vendor at the time of Proveout.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
10.0	DIAGNOSTIC SYSTEM:				
10.1	TELE-DIAGNOSTIC SERVICE :				
10.1.1	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 confirm			
10.2	FAULT DIAGNOSTIC SYSTEM:				
10.2.1	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 confirm			
10.3	Help guide should be provided to use both diagnostic systems.	Vendor to confirm			
11.0	LEVELING & ANCHORING SYSTEM				
11.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc shall be supplied for the Machine, Floor Plates etc.should be supplied.	Vendor to confirm			
12.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :				
12.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer .	Vendor to confirm			
12.2	Test mandrel for checking spindle run-out & alignment should be supplied.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
13.0	ACCESSORIES:				
13.1	AUTOMATIC TOOL / ATTACHMENT CHANGER:				
13.1.1	All Tools/ attachments shall be suitable for loading / unloading through ATC.	Vendor to confirm			
13.1.2	No. of storage positions required.	30			
13.1.3	Max. Tool Dia.	250 mm			
13.1.4	Max. Tool Length.	800 mm			
13.1.5	Max. weight of tool (Suitable for job specified).	25 Kg			
13.1.6	Location of the attachment changer	Vendor to specify			
13.1.7	Mounting plates as required for various Tools/ Attachments should be supplied.	Vendor to confirm			
13.1.8	Additional Longitudinal Traverse of Z-axis required to accommodate and use of ATC beyond the specified Z=0 position (i.e. Spindle Face position) to be provided.	Vendor to confirm			
14.0	Centralised Lubrication System				
14.1	An individual motor driven gear pump for supplying lubricating oil under pressure to the headstock unit with an adequate distribution to all the parts to be provided. The oil temperature conditioning is to be incorporated in the system to guarantee for thermal stabilization of the headstock and consequently for high precision.	Vendor to confirm			
15.0	ELECTRONIC TOOL PRE-SETTER:				
15.1	Electronic Tool Presetter suitable for Tool Dia, Tool Length mentioned to be supplied. Slide shall be motorized for rapid movement with manual micrometric adjustment. Complete details like make (Zoeller, Elbo or Kelsch makes only), model and technical description should be submitted along with offer (X 20 Magnification. Max Tool Dia 500mm, Max Tool Length 500mm).	Vendor to confirm			
NOTE: This item is optional and rate to be quoted separately.					
16.0	OTHER ATTACHMENTS				
	Supplier to indicate any other attachment required to suit our job drawings.	Vendor to specify			
17.0	AUTOMATIC SLIDING DOOR:				
	Vendor to incorporate automatic sliding door on the machine.	Vendor to confirm			
18.0	AUTOMATIC WISIPOINT WINDOW:				
	Automatic Wisipoint Window to be incorporated. Vendor to give details.	Vendor to Specify			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
19.0	SPARES:				
	Itemwise breakup of mechanical, hydraulic, electrical and electronic and CNC system spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered).	Vendor to Specify			
19.1	a) Mechanical & Hydraulic Spares: All types of pumps, All types of Valves, All types of pressure switches / transducers, All types of filters, All types of seals.	Vendor to Specify			
19.2	b) Electrical /Electronic / CNC Spares: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Scanning Heads for Linear Scales, MMC module, NCU module, 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			
19.3	Availability of all types of spares for total machine and accessories should be ensured by the vendor 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			
19.4	Recommended set of spares for all attachments are to be offered with details.	Vendor to Specify			
19.5	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			
20.0	DOCUMENTATION : Three sets of following documents (Hard copies) in English language should be supplied along with the machine.				
20.1	Operating manuals of Machine & CNC system.	Vendor to confirm			
20.2	Programming Manuals of Machine & CNC system.	Vendor to confirm			
20.3	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 be supplied.	Vendor to confirm			
20.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
20.5	Manufacturing drawings for all supplied tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
20.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm			
20.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm			
20.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.	Vendor to confirm			
20.9	PLC program print-outs with comments in English.	Vendor to confirm			
20.10	PLC program on CD, NC data & PLC data on CD.	Vendor to confirm			
20.11	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.	Vendor to confirm			
20.12	Complete Master List of parts used in the machine shall be submitted by the vendor.	Vendor to confirm			
20.13	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm			
21.0	TRAINING:				
21.1	BHEL Persons should be trained at supplier's Works for a period of two weeks in the area of (a) CNC Part Programming/ Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (b) Maintenance of CNC, PLC, AC digital drives, measuring system & allied electronics, Electrical for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipment.	Vendor to confirm			
21.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.(Vendor to note).	Vendor to note			
21.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
21.4	Vendor to quote for training charges on weekly basis.	Vendor to confirm			
21.5	Vendor should commit to organize and quote for training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL.	Vendor to confirm			
21.6	Vendor to impart training to BHEL personnel in operation, maintenance and programming at BHEL works for a period of 7 days after successful erection, commissioning and proving of jobs.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
22.0	FOUNDATION:				
22.1	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 alongwith the approval. Complete Foundation Design including details, like Static/ Dynamic load details etc. and final Layout Drawings shall be submitted by the supplier within three months after getting BHEL's approval. The Layout should consist of all requirements pertaining to complete machine and all accessories, including space requirement for Voltage Stabiliser, Isolation Transformer, Air Compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm			
23.0	ERECTION & COMMISSIONING				
23.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control system & all types of other supplied equipment, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm			
23.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to confirm			
23.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause 27 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to confirm			
23.4	Test mandrel for checking run-out/taper & alignment should be supplied.	Vendor to confirm			
23.5	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm			
23.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
23.7	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 confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
23.8	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Required			
23.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm			
23.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
24.0	ACCURACY TESTS:				
24.1	GEOMETRICAL ACCURACIES :				
24.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 230-1 or equivalent applicable standard. Details of the standard along with 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			
24.1.2	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance tests at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm			
24.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.(Vendor to arrange the Interferometer)	Vendor to confirm			
24.2.1	Positioning Uncertainty (P per 1000mm) for X & Y axes	0.010 mm			
24.2.2	Positioning Deviation (Pa per 1000mm) for X & Y axes	0.01 mm			
24.2.3	Positional Scatter (Ps per 1000mm) for X & Y axes	0.005 mm			
24.2.4	Backlash on reversal (U) for X & Y axes	0.005 mm			
24.2.5	Positioning Uncertainty (P per 1000mm) for Z axis	0.030 mm			
24.2.6	Positioning Deviation (Pa per 1000mm) for Z axis	0.030 mm			
24.2.7	Positional Scatter (Ps per 1000mm) for Z axis	0.01 mm			
24.2.8	Backlash on reversal (U) for Z axis	0.01 mm			
24.2.9	Positioning Uncertainty P for B-Axis	0.010 deg			
24.2.10	Positioning Deviation Pa for B-axis	0.007 deg			
24.2.11	Positional Scatter Ps for B-axis	0.002 deg			
24.2.12	Backlash on reversal (U) for B-axis	0.003 deg			
24.2.13	Positioning Uncertainty P for C-Axis	0.010 deg			
24.2.14	Positioning Deviation Pa for C-axis	0.007 deg			
24.2.15	Positional Scatter Ps for C-axis	0.002 deg			
24.2.16	Backlash on reversal (U) for C-axis	0.003 deg			
24.2.17	Total positioning error P for entire travel for X,Y,Z,B & C axes	Vendor to confirm			
24.2.18	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
25.0	AMBIENT CONDITIONS & THERMAL STABILITY :				
25.1	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% Frequency: 50 Hz, +/- 1.5 Hz No. of phases = 3 (3 wire , No Neutral) Ambient Conditions: Temperature = 5 to 50 degree Celsius Relative Humidity = 95% max.	Vendor to confirm			
25.2	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. (Details of provisions on the machine for the same are required).	Vendor to confirm			
25.3	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. (Details of provisions on the machine for the same are required).	Vendor to confirm			
25.4	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 confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
26.0	PROVEOUT OF BHEL COMPONENTS :				
26.1	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, 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 prove the machining times committed.	1) Main Vertical Shaft Machining Drg.No. 26117600008/06 , Input Matl. drg. No. 36117690012/03 2) Main Vertical Shaft Drg.No.16110000239/05 , Input Matl. drg. No. 3610090172/01 Matl specn for above shafts : Ni Cr Mo 65/ AISI 4340, Hardness 260 -320 BHN.			
26.1.1	The following operations are excluded from job prove out. a) Deep Core hole drilling. b) Grinding operations showing surface finish 0.4 microns or better (These diameters are to be finished with grinding allowance of 0.5 mm on diameter).All other machining operations shown in finish machine drawing are to be covered in component prove out including Key way milling and angular drilling.				
26.2	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			
27.0	MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)				
27.1	Following Tests/Activities should be carried out at supplier's works on the machine before dispatch :				
27.1.1.	Geometrical Accuracy Tests as per test chart. ISO 230-1	Vendor to confirm			
27.1.2	Positioning Accuracy and Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm			
27.1.3	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 the removal of breakdown and restarting of machine	Vendor to confirm			
27.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	Vendor to confirm			
27.1.5	Machining of NAS Test Piece . Vendor to supply test piece and tooling for it's machining..	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
27.2	Test to be carried out at BHEL works while commissioning the machine :	Vendor to confirm			
27.2.1	Geometrical Accuracy Tests as per test chart.ISO 230-1	Vendor to confirm			
27.2.2	Positioning Accuracy and Reapatability Tests as per VDI-DGQ/3441	Vendor to confirm			
27.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm			
27.2.4	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 confirm			
27.2.5	Demonstration of all features of the machine, CNC system & all accessories to the satisfaction of BHEL for their efficient and effective use.	Vendor to confirm			
27.2.6	Demostration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm			
27.2.7	Machining of NAS Test Piece . Vendor to supply test piece and tooling for it's machining.	Vendor to confirm			
27.2.8	Job prove out.	Vendor to confirm			
27.2.9	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			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
28.0	PACKING:				
28.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to confirm			
29.0	GUARANTEE :				
29.1	Guarantee regarding workmanship, material used, design and performance should be provided by the party for a period of 18 months from the date of commissioning or 24 months from the date of dispatch of the machine, which ever is earlier.	Vendor to confirm			
30.0	GENERAL : The vendor should submit the following information:				
30.1	Machine Model	Vendor to specify			
30.2	Total connected load (KVA):	Vendor to specify			
30.3	Floor area required (Length, Width, Height) for complete machine & accessories.	Vendor to specify			
30.4	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint).	Vendor to specify			
30.5	Total weight of the machine.	Vendor to specify			
30.6	Weight of heaviest part of machine.	Vendor to specify			
30.7	Weight of the heaviest assembly/ subassembly of the Machine.	Vendor to specify			
30.8	Dimensions of largest part/ subassembly/ assembly of the machine	Vendor to specify			
30.9	Vendor to submit, along with offer, the reference list of customers where similar machines have been supplied mentioning the customer, Machine Model, major specifications of the supplied machine, CNC System, Year of Supply etc.	Vendor to specify			
30.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to specify			
30.11	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 confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
31.0	QUALIFYING CONDITIONS :				
31.1	Only those vendors, who have supplied and commissioned at least one CNC Turn Mill Centre with minimum 5 axes having capacity to machine Job diameter of 1000 mm or higher x job length of 3000 mm or higher x job weight of 4000 Kgs or higher , for similar applications in the past ten years and such machine is presently working satisfactorily for more than one year (more than six months if supplied to BHEL) after commissioning , should quote. The following information is to 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 confirm			
	1. Name of the customer / company where similar machine is installed.	Vendor to specify			
	2. Complete postal address of the customer.	Vendor to specify			
	3. Year of commissioning.	Vendor to specify			
	4. Application for which the machine is supplied with details of accuracies achieved on the job.	Vendor to specify			
	5. Name and designation of the contact person of the customer.	Vendor to specify			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to specify			
	7. Performance certificate from the customers, on their letter head, regarding satisfactory performance of machine supplied to them.	V			
31.2	REVERSE AUCTION: Final price of the supply of machine including its agreed accessories, erection and commissioning charges, job prove out & training etc. shall be finalised through the process of Reverse Auction only. Party has to submit their acceptance to participate in reverse auction otherwise their offer will not be considered for processing. This is required from all the vendors for qualification of their offer.	Vendor to confirm their acceptance as per enclosed Reverse Auction conditions as per Annexure- VII			
32.0	OTHER FEATURES:				
32.1	NETWORKING:				
32.1.1.	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 confirm			
	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood).	Vendor to confirm			
	b) The program transfer shall be by simple copy and paste method, provided sharing access is allowed between any PC and the machine across the network.	Vendor to confirm			
	c) The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
32.2	MACHINE MONITORING SYSTEM (MMS) SIGNALS				
32.2.1	Following MMS signals should 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 confirm			
	a) Control ON				
	b) Cycle ON				
	c) Spindle Running				
	d) Feed Active (Any of the axes moving)				
	e) M30 (Program Stop)				
32.3	CAD / CAM SYSTEM				
32.3.1	CAD / CAM System complete with hardware and software should be supplied (Complete details should be furnished).	Vendor to confirm			