

	BHARAT HEAVY ELECTRICAL LIMITED		Enquiry No. :		
	UNIT'S ADDRESS: HEEP, RANIPUR HARIDWAR - 249403 UTTARANCHAL, INDIA		Due Date :		
			Supplier Qtn. No.:		
CONTACT PERSON FROM PURCHASE DEPTT.: NAME: DESIGNATION: PHONE NO.: E-MAIL: FAX NO. :			Date :		
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC VERTICAL BORER</u>					
NOTE :-					
1. Vendor (OEM) must submit complete information against Qualifying Conditions at SI.No. 27.0 The offer meeting this clause would only be processed. (OEM - Original Equipment Manufacturer) 2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance. 3. The offer and all documents enclosed with offer should be in English language only.					
ADDRESS OF THE SUPPLIER :					
TELEPHONE NOS.:					
FAX NOS.:					
E-MAIL ADDRESS :					
SCOPE:	SUPPLY, ERECTION & COMMISSIONING OF CNC VERTICAL BORERS COMPLYING WITH SPECIFICATIONS AS BELOW :				
SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose: This machine is required to rough & finish machine components of Steam Turbines/Gas Turbines etc. including Bearings demanding high accuracies & surface finish.	Vendor to note & accept			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.2	Work Piece Material: Carbon Steel, Nimonic Steel, Alloy Steel, Stainless Steel, Inconel, Cast Iron, Stellite and Non-Ferrous materials like Aluminium Alloys, Bronze, Copper, Babbit material etc. having Hardness up to 500 BHN.	Vendor to note & accept			
2.0	SPECIFICATION:				
2.1	MACHINE CONFIGURATION				
2.1.1	Single or Double Column CNC Vertical Borer with Single Ram	Vendor to offer			
2.2	CAPACITY & SIZE				
2.2.1	Maximum Height for Turning & Facing	1500mm or more			
2.2.2	Maximum Turning Diameter	2000mm or more			
2.2.3	Maximum Workpiece Weight	12000Kg or more			
2.2.4	Maximum Swing Diameter	Vendor to inform			
2.2.5	Minimum Boring Diameter (using standard turning tool holder & tool clamped on the ram)	350mm or less			
2.3	TABLE				
2.3.1	Table Diameter	Minimum 1600mm			
2.3.2	Load Capacity	12000Kg or more			
2.3.3	Table Speed (Infinitely Variable)	0.5-250 rpm or more			
2.3.3.1	No. of Speed Ranges	Vendor to inform			
2.3.4	Power of Main Drive (S1 - Continuous Rating) AC	50 kw or more			
2.3.5	Details of Main Drive viz.Type, Make, Model etc.	Vendor to inform			
2.3.6	No. of Hard Jaws/Vices	4			
2.3.7	Maximum External Clamping Diameter	Vendor to inform			
2.3.8	Minimum External Clamping Diameter	250mm or less			
2.3.9	Maximum Internal Clamping Diameter	Vendor to inform			
2.3.10	Minimum Internal Clamping Diameter	Vendor to inform			
2.3.11	Clamping Force of each Jaw.	Vendor to inform			
2.3.12	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	Vendor to inform & submit			
2.3.13	Type of Force Multiplier Mechanism used in Jaws should be explained and Drawings should be submitted.	Vendor to inform & submit			
2.3.14	Maximum permissible Cutting Force	Vendor to inform			
2.3.15	Maximum permissible Torque	Vendor to inform			
2.3.16	RPM at which Max. Torque is available.	Vendor to inform			
2.3.17	Table Torque - Speed diagram should be submitted.	Vendor to submit			
2.3.18	Type of Bearing for the Table (Details to be submitted)	Vendor to inform			

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2.3.19	Size of T - slots, their position and accuracy. Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to submit			
2.3.20	Two perpendicular accurate Slots should be provided at the Center of the table to use for alignment purposes. Sizes (Width & Depth), accuracy etc. of these slots should be furnished along with a Drawing.	Vendor to inform & submit			
2.3.21	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	Vendor to submit			
2.3.22	Diameter, Depth and Accuracy of Center Bore on Table Top Surface.	Vendor to inform			
2.3.23	Single piece construction of machine table	Vendor to confirm			
2.3.24	Position of machine table - with ref. to shop floor in vertical direction.	Vendor to inform			
2.4	CROSS RAIL				
2.4.1	Vertical Travel.	Vendor to inform			
2.4.2	Vertical Traverse Rate.	Vendor to inform			
2.4.3	No. of Positions.	Vendor to inform			
2.4.4	Distance between each Position/Step	100mm or less			
2.4.5	Distance of lowest Step from Table Top	Vendor to inform			
2.4.6	Distance of highest Step from Table Top	Vendor to inform			
2.4.7	Maximum Height of Cross Rail bottom from Table Top	Vendor to inform			
2.4.8	Minimum Height of Cross Rail bottom from Table Top	Vendor to inform			
2.4.9	Movement of Cross Rail : Through NC Program as well as manually by Push Buttons	Vendor to offer			
2.4.10	Machine Reference Point should be at Ram Reference Point and it should be updated automatically with movement of Cross Rail	Vendor to offer			
2.4.11	Details of crossrail movement/positioning/locking mechanism	Vendor to submit			
2.5	TOOL HEAD and RAM				
2.5.1	No. of Columns	Vendor to inform			
2.5.2	No. of Rams	1			
2.5.3	Cross - Section of Ram (It should be rigid enough for troublefree machining with maximum projection of ram and also suitable for specified minimum bore dia)	Vendor to inform & confirm			
2.5.4	Thread Cutting Capacity - maximum Pitch	Vendor to inform			
2.5.5	Clamping details for mounting Turning Tool Holders/Attachments on ram, should be submitted.	Vendor to submit			
2.5.6	Clamping Force Available for clamping of Turning Tool Holders/Attachments.	Vendor to inform			
2.5.7	Mounting of Turning Tool Holders and Attachments should be automatic through Program as well as manually through push buttons.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.6	MAIN TRAVERSES				
2.6.1	Vertical Travel of Ram (Z-Axis)	Minimum 1000mm			
2.6.2	Horizontal Travel of Ram (positive X-Axis)	Vendor to inform			
2.6.3	Horizontal Travel of Ram beyond Center of the Table (negative X-Axis)	Minimum 200mm			
2.6.4	Maximum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
2.6.5	Minimum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
2.7	MACHINE GUIDEWAYS				
2.7.1	Width of Cross Rail guideways	Vendor to inform			
2.7.2	Width of column guideways	Vendor to inform			
2.7.3	Hardened (60 HRC or more) and Ground Guide ways for complete X and Z axes, equipped with automatic self lubrication. Details to be submitted.	Vendor to inform			
2.7.4	Hardness of guideways	Vendor to inform			
2.7.5	Metallic Telescopic Covers: Waterproof Telescopic Covers of rust resistant steel should be provided with pads/wipers on both left and right sides of tool head on the crossrail and also above & below the crossrail on both columns covering the guide ways. Joints of telescopic covers should be sealed to avoid mixing of coolant & hydrostatic oil . The movement of telescopic covers should be troublefree and requiring minimum maintenance.	Vendor to offer			
2.8	FEEDS AND DRIVE SYSTEM				
2.8.1	Cutting feed in X & Z Axes (Infinitely Variable)	0 - 5000mm/min or more			
2.8.2	Rapid feed in X & Z Axes	Min. 5000mm/min			
2.8.3	Feed drives/motors X & Z axes [AC servo motors] of Siemens or Fanuc digital type (detail of model, make, type, rating etc. should be submitted)	Vendor to offer			
2.8.4	Maximum cutting force permissible on Ram & at what extension	Vendor to inform			
2.8.5	Maximum permissible Cutting Force at Maximum Ram extension	Vendor to inform			
2.8.6	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to submit			
2.8.7	Feed back system for X & Z axes should be Heidenhain linear scales with pressurised compressed air cleaning (Details should be submitted)	Vendor to offer			
2.8.8	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to submit			
2.8.9	Mechanism for locking X & Z axis	Vendor to inform			
2.9	CONSTRUCTION				

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2.9.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various components/ assemblies like Column, Cross Rail, Ram head, Table, Guideways/slides, Feed Transmission system, Ram, Hydraulic and Lubrication system, Feedback system etc .of the machine.	Vendor to submit			
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 submit			
2.10	OPERATION AND CONTROL SYSTEM				
2.10.1	OPERATOR'S PANEL				
	Floor mounted, swiveling type operator's panel having complete CNC and machine control system with all displays of required configuration shall be provided and suitably located near table for convenient, efficient & safe operation of the machine. All switches with suitable interlocks with table rotation should be within reach of operator of average height (5' 5") for easy & safe operation. All displays/indications should also be conveniently placed accordingly. A protection cover made of steel sheet or equivalent should be provided above the operator's panel. Layout showing complete details should be submitted.	Vendor to offer			
2.10.2	CNC SYSTEM & FEATURES				
2.10.2.1	Make : Fanuc / Siemens.	Vendor to confirm			
2.10.2.2	Type : PC based latest version	Vendor to confirm			
2.10.2.3	Model: Sinumerik 840D with PC Version PCU 50, NCU 573.5 or higher with Intel Pentium III, 1GHz, 512 MB SDRAM (or higher), Windows XP Operating System or equivalent Fanuc system. (Latest version, as available at the time of ordering, should be supplied)	Vendor to offer and submit details			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.10.2.4	The system should have Operator's Panel with TFT colour display (12 inch or more), 19 Inch Machine Control Panel , Full CNC Keyboard with Qwerty keys and Mouse/Trackball or equivalent for Fanuc system, RS232-C interface for I/O devices, COM1(V.24), COM (V.24), LPT1 Parrallel Interface for Printer, VGA, MPI interface & USB, 2 Channels and Expansion slots. The operator Panel configuration will be as per Rittal VIP6000 or equivalent. The CNC System shall also have Electronic hand wheels selectable for all axes, USB Port with 1 GB Pen drive (for each machine) for data input/output, Hard disk of 10 GB or higher (Largest size available at the time of order shall be supplied), Graphic Simulation, COM port for telediagnostics, Network ready with LAN and preinstalled system software & other required softwares etc. (Details should be submitted by Vendor)	Vendor to offer and submit details			
2.10.2.5	The CNC System should necessarily have the following features: Access locks on the operator panel, Look Ahead of Minimum 70 blocks, Process oriented Canned Cycles for Grooving, Turning, Grooving, Stock removal & Threading operations. The system shall also have SITOP Power, DC-UPS Module 15 with AKKU module to ensure automatic unattended shutdown of the system in case of power failure or even in normal machine shutdown, Display of PLC ladder on 840D monitor & Simatic S-7 loaded on the hard disk and Display of servo-waveforms on 840D monitor or equivalent features in Fanuc system.	Vendor to offer and confirm			
2.10.2.6	Details of other optional features to suit specified requirements.	Vendor to inform			
2.10.2.7	Fast & user-friendly Graphic Simulation for checking of program prior to actual running, Block-search with calculation while running the program & Automatic retraction of tool during threading (in case of power failure) should be pre-installed in the CNC system in addition to all other required/recommended software & features.	Vendor to confirm			
2.10.2.8	Additionally, a QWERTY keyboard and optical mouse, properly interfaced and suitably inhoused in the system's panel on covered sliding type tray for editing/input of programs by programmer.	Vendor to offer			
2.10.3	MANUAL CONTROL				

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2.10.3.1	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, table rpm, cutting feed on/off, display of axis position values etc, for manual machining operations without using CNC program / CNC option MANUAL TURN (of Siemens control or equivalent from Fanuc control) / MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor to confirm. Layout of panel showing requisite switches to be submitted.			
2.11	UPS FOR CNC SYSTEM				
2.11.1	UPS unit including Siemens UPS module SITOP with rechargeable battery of sufficient time and having provision for unattended automatic shutdown feature for Windows operating system & also to suit feature for automatic retraction of tool during threading in case of power failure to avoid damage to job/tool.	Vendor to offer & inform			
2.12	MACHINE LIGHTS				
2.12.1	Machine Lights for sufficient illumination of complete working area on the table, on the ram to view tool inside long casing type jobs and also on/near to operator's panel, should be provided for clear visibility.	Vendor to offer			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer			
2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to offer			
2.12.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to offer			
2.12.5	Flashing/Rotary type light indicating end of cutting, program stop, alarm etc. at a easily visible & suitable place.	Vendor to offer			
2.13	AIR CONDITIONERS				
2.13.1	Door mounted Air Conditioners of reputed make with Dehumidifiers for all Electrical / Electronic Panels / Cabinets including Operator's Panel (One no. of sufficient capacity for each cabinet / panel considering specified ambient & operating conditions). The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/modules. Detailed specifications of the same are to be submitted.	Vendor to offer & submit			

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2.13.2	In case of order, vendor shall provide following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Refrigeration/ Chiller unit, Capacity of the chiller unit, Type of compressor with complete specifications, Type of Thermostatic Expansion Valve with complete specifications, Fan size and flow in CFM (cubic feet meter) of the Condenser unit, Specifications of the Evaporator Unit (Width Plate type/ Coil type), Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2, Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to offer and confirm			
2.14	HYDRAULIC SYSTEM :				
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			
2.14.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
2.14.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hyda	Vendor to offer and confirm			
2.14.4	Failure indication	Vendor to offer			
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
2.14.6	Refrigerated type cooling and electric heating (Electric heating, only if required) system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. keeping in view the specified ambient conditions to be offered with complete details. The temperature of Hydraulic Oil should not go beyond 40 deg. C.	Vendor to offer & submit			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform			
2.14.8	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.	Vendor to confirm & offer			
2.14.9	First filling of all required Oils & Grease etc. to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to offer & submit			
2.15	COOLANT SYSTEM				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.15.1	Recirculating type Flood Coolant System with all accessories suitable for all types of turning, boring & grooving operations , selectable through program and push buttons as well (available on operator's panel). Emulsion with oil content, as recommended by vendor, should be used.	Vendor to offer & confirm			
2.15.1.1	Provision should also be there to use air coolant (only pressurised air) instead of flood coolant through same outlet using program.	Vendor to offer & confirm			
2.15.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to offer			
2.15.3	Coolant collection and recirculation system should be leak proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc. Additionally, suitable equipment/pump should be provided at deepest point of foundation pit to pump out collected oil/coolant up to shop floor.	Vendor to confirm			
2.15.4	Coolant Filtration System: Recirculating type coolant system with Vacuum Rotary drum type Coolant Filtration System and magnetic separator. The filtration system should be mounted at shop floor level, if possible, with provision to avoid leakage/spillage of coolant.	Vendor to confirm and submit details.			
2.15.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to submit			
2.15.6	Coolant pumps & motor details etc. for all types of coolant variants	Vendor to inform			
2.15.7	Coolant Tank Capacity	Vendor to inform			
2.15.8	Coolant Tank may preferably be placed on the Floor Level. The details of the sysytem, including requisite sump, pump etc., should be clearly indiated.	Vendor to specify			
2.15.9	Pressure & flow of coolant for Turning/Grooving/Boring operations. The Pressure should be sufficient for the coolant to reach the tool tip at full pressure.	Vendor to specify & confirm.			
2.15.10	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches should be provided on the Operator's Panel.	Vendor to confirm			
2.15.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Required.			
2.16	REQUIREMENT FOR ELECTRICAL EQUIPMENT				

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2.16.1	Voltage = 415V +10% / -10% , Frequency= 50Hz +3 / -3 , No. of phases = 3 phase with neutral. Power Supply source, as above, 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 including Voltage Stabilizer, Transformer & Air-Compressor etc. 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 confirm & specify			
2.16.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized.	Vendor to confirm			
2.16.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm			
2.16.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm			
2.16.5	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be Indian or should have compatibility with Indian equivalents.	Vendor to confirm			
2.16.6	All motors shall conform to IEC or Indian Standards	Vendor to confirm			
2.16.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm			
2.16.8	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to confirm			
2.17	SAFETY ARRANGEMENTS Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm			

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2.17.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to confirm			
2.17.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier, in case of order.	Vendor to confirm			
2.17.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to confirm			
2.17.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm			
2.17.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm			
2.17.6	Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm			
2.18	ENVIRONMENTAL PERFORMANCE OF THE MACHINE : The Machine should conform to following factors related to environment :	Vendor to confirm			
2.18.1	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.	Vendor to confirm			
2.18.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.18.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm			
2.18.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.18.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.18.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			
2.19	A board, suitably located near operator's panel, for display of component drawing (A2 size) at sufficient height for ease of operator	Vendor to confirm			

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2.20	In-cycle hour counter with reset facility for counting table & axis movement time, machine idle time, machine under maintenance time etc. and display the counted data on CNC display on video pages created by vendor.	Vendor to confirm			
2.21	Tool Storage Cabinets (3 nos.) of reputed (Indian) make having covered heavy duty drawers of suitable sizes with lock facility to store offered tooling items etc. Catalogue/sketch etc. to be submitted.	Vendor to confirm			
3.0	CHIP CONVEYOR				
3.1	Elevating chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on floor, should be provided at suitable location near to machine table and elevated to left side of the machine. Metallic chutes should be provided all around the table for smooth collection of chips upto opening of chip conveyor.	Vendor to offer			
3.2	Type of chip conveyor	Hinged type or superior			
3.3	Width of conveyor	Vendor to inform			
3.4	Elevation of chip conveyor for chip bin	Vendor to inform			
3.5	Material of chip conveyor (should be rust resistant)	Vendor to inform			
3.6	Provision for smooth collection of chips from all-around table to the conveyor and for avoiding clogging of chips should be provided. Removable Grill/Mesh type rigid covers should be provided above some portion of the chip conveyor (which is under shop floor) 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 offer			
3.7	Operation of chip conveyor (forward & reverse) should be possible through push buttons on operator's panel and also near chips disposal point/chip bin.	Vendor to offer			
3.8	Layout showing location of chip conveyor should be submitted.	Vendor to submit			
3.9	One no. Chip Bin of appropriate size of Indian make, with wheels, lifting hooks & handle for movement, should also be supplied.	Vendor to offer			
4.0	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 stabilizer output for unbalanced load & supply conditions considering specified power supply	Vendor to offer			

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4.2	Make	NEEL, Aplab or Auto Electric			
4.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
4.4	Spares Package for the Voltage Stabilizer for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit			
4.5	Catalogue of the Voltage Stabilizer shall be submitted with the offer.	Vendor to submit			
5.0	ULTRA ISOLATION TRANSFORMER				
5.1	Ultra Isolation Transformer (of reputed Indian make e.g. Neel Mumbai) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
5.2	Make	Vendor to inform			
5.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
5.4	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection. (Details to be submitted)	Vendor to offer			
5.5	Spares Package for Isolation Transformer, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years of trouble free operation considering three shifts continuous running of the machine. Detailed list is to be submitted. Price of unit quantity of each item is to be quoted.	Vendor to offer			
6.0	PNEUMATIC SYSTEM				
6.1	AIR COMPRESSOR				
6.1.1	Independent Air Compressor (of reputed Indian make Elgi, Chicago Pneumatic or Ingersol Rand) with refrigerated type Dryers & Filters of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be offered. The system should be so designed to have additional provision and required accessories so that BHEL's centralized compressed air supply having pressure (around 4-5 bar) with certain moisture/oil contents could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to offer			
6.1.2	Make & Model of Air Compressor	Vendor to inform			
6.1.3	Capacity (Flow, Pressure & KW)	Vendor to inform			
6.1.4	Refrigerant used	Vendor to inform			
6.1.5	Output Air Quality : Pressure dew point, Residual Mist and oil content in ppm.	Vendor to inform			

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6.1.6	Noise level (Maximum 80 db)	Vendor to inform			
6.1.7	Flow diagram	Vendor to submit			
6.1.8	Spares Package for the Air Compressor and Refrigerator type Dryer etc. for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit			
6.2	COMPRESSED AIR POINTS				
6.2.1	Compressed Air Point with connections for Air Coolant System mentioned at Sl. No. 2.15.1.1	Vendor to offer			
6.2.2	Suitable located Compressed Air Point near machine table with manually operated ON/ OFF Valve and flexible pipe of suitable length for cleaning of workpiece, tools and work area (full table) etc.	Vendor to offer			
7.0	TOOLINGS * Price of unit quantity of each offered item should be quoted. * For inserts, price for ten inserts should be quoted. * Each type of Tool Holder is to be offered with 50 nos. of suitable inserts. If same insert is to be used for more than one holder, then the offered quantity should be 100. * Vendor may recommend and offer any other type of tool holders/adapters/cassettes in addition to tooling items mentioned below considering specified requirements/applications and submit their details. * Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering. * LH - Left Hand / RH - Right Hand	Vendor to note			
7.1	TOOL HOLDERS All tool holders & boring bars shall be available on ATC for direct clamping in ram through ATC cycle. All tool holders & boring bars should have holes for lifting by suitable eye-bolts. Drawings/Sketches of the offered tool holders are to be submitted with the offer. Reference drawing of cassette drawing no. R6300-0965 is enclosed, in case cassette type clamping is offered by vendor for tool holders at Sl.Nos. 7.1.1--7.1.4 otherwise vendor may recommend different clamping with provision for clamping of square shank tools of size 32*32mm suitable for the specified applications.	Vendor to offer			
7.1.1	Tool Holder suitable for radial clamping of square shank tools for external turning	Vendor to offer			
7.1.2	Tool Holder suitable for radial clamping of square shank tools for internal turning	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.1.3	Tool Holder suitable for axial clamping of square shank tools for LH facing	Vendor to offer			
7.1.4	Tool Holder suitable for axial clamping of square shank tools for RH facing	Vendor to offer			
7.1.5	Conventional tool holder for 32*32mm tool shank with direct radial & axial clamping of tools for internal / external turning and LH/RH facing operations.	Vendor to offer			
7.1.6	Tool holder with provision to clamp standard dia 50mm boring bar with clamping length of approx. 300mm	Vendor to offer			
7.1.6.1	Reduction Sleeve, dia 50 - dia 40, for Boring Bar Holder	Vendor to offer			
7.1.6.2	Reduction Sleeve, dia 50 - dia 32, for Boring Bar Holder	Vendor to offer			
7.1.7	Boring Bar, dia. around 100mm, length around 500mm, for minimum bore dia around 120mm suitable for clamping of 32*32mm shank tools radially & axially as well with provision for clamping 25*25mm shank tools using packing pieces.	Vendor to offer			
7.1.8	Boring Bar, dia. 70-80mm, length 350-400mm, for minimum bore dia around 100mm with heads/holders suitable for clamping of 25*25mm shank tools radially & axially.	Vendor to offer			
7.1.9	General adapter for turning with flange type clamping or equivalent so that special tool holders manufactured by BHEL could be clamped for use in future.	Vendor to offer			
7.2	Set of cassettes or adapters (one no. of each type) used for clamping of square shank tools in tool holders at Sl.Nos. 7.1.1--7.1.4	Vendor to offer			
7.3	TOOLING FOR MACHINING OF PROVE-OUT COMPONENTS	Vendor to offer			
7.3.1	All types of required tools, inserts, holders, adapters, fixtures & clamping elements, special measuring instruments (if required) etc. in sufficient quantity for all types of operations like turning, grooving, boring operations etc., as recommended by the vendor, should be offered for complete proveout machining to meet required drawing accuracy & surface finish. These tooling items shall be in addition to the tools mentioned above at Sl. No. 7.1 & 7.2. List with item's nomenclature, quantity & copies of relevant pages of catalogue to be submitted by vendor. Separate Package Price for recommended tools etc. for each proveout component is to be quoted.	Vendor to offer			
7.4	ADDITIONAL TOOLING REQUIREMENTS				
7.4.1	Mounting details of each type of toolings to be explained & submitted with the help of drawings / sketches.	Vendor to submit			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.4.2	Offered tooling system to be rigid to carryout machining without undue vibration, which can effect job accuracy and surface finish in extreme machining conditions like max. overhang of ram etc. .	Vendor to confirm			
7.4.3	In case of order, manufacturing drgs., catalogues & source of all tooling items should be submitted by vendor.	Vendor to confirm			
7.4.4	Supplier should offer all tools & inserts with latest cutting geometries & grades to achieve high productivity and cutting parameters.	Vendor to confirm			
7.4.5	All supplied tool holders, boring bars, cassettes, adapters etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations like grooving, turning etc. Provision for external coolant should also be provided.	Vendor to offer			
8.0	DIAGNOSTIC SYSTEMS				
8.1	TELE-DIAGNOSTIC SERVICE				
8.1.1	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. With this facility, complete Graphic User Interface of CNC system can be looked at and operated from remote controlled PC of supplier so that errors can be recognized and changes or correction can be made from supplier's end. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future.	Vendor to offer and submit details.			
8.2	FAULT DIAGNOSTIC SYSTEM :				
8.2.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book along with Simatic S7 software (licensed copy), necessary cables, PCMCIA card / Adaptor (for Communication with MPI port) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer & submit			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
8.2.2	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer			
8.3	Help guide should be provided to use both diagnostic systems	Vendor to offer & submit			
9.0	LEVELING & ANCHORING SYSTEM				
9.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment of table/ram and to fix the machine to the foundation should be supplied. Details to be submitted.	Vendor to offer			
10.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE				
10.1	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 by the vendor. List of such tools should be submitted with offer.	Vendor to offer			
10.2	Set of Test Mandrels/Cylindrical Bars for checking table run-out & alignment of ram etc. should be supplied with protection boxes.	Vendor to offer			
11.0	AUTOMATIC TOOL CHANGER All tool holders & boring bars at Sl.No. 7.1 shall be mounted on ATC for direct clamping in ram through ATC cycle.	Vendor to offer			
11.1	Type	Vendor to specify			
11.2	No. of storage locations	Vendor to inform			
11.3	Tool selection method - Random	Vendor to confirm			
11.4	Maximum Tool Overhang out of different Holders in both directions i.e. radial & axial.	Vendor to inform			
11.5	Maximum Permissible Weight on each Pocket.	Vendor to inform			
11.6	Maximum Permissible Weight on Complete ATC.	Vendor to inform			
11.7	The Machine operation should be possible with or without referencing ATC.	Vendor to confirm			
11.8	ATC Drawing should be submitted with the offer.	Vendor to submit			
11.9	Provision for loading/unloading of different holders on ATC using overhead crane, if required.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
11.10	Provision of OEM Screen with soft keys enabling the service personnel to bring back the ATC to its initial position or last position in case of interruption of ATC rotation cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of ATC rotation cycle manually. Separate Hand Held Pendant or fixed panel should also be provided to retrieve the ATC to its initial position.	Vendor to offer			
12.0	CHIP & SPLASH GUARD				
12.1	Motorised or Hydraulically operated movable Chip / Splash Guards of sufficient height and made of rust resistant material, should be provided all around the Table (on front side of columns) to avoid spilling of Coolant and scattering of Chips on Operator's Panel and Shop Floor. Front part of splash guards should be provided with safety glass for clear visibility, if required.	Vendor to offer			
12.2	Additionally a fixed type of splash/ chip guard of atleast full turning height should be provided on rear side of machine i.e. around rear portion of table between columns .	Vendor to offer			
12.3	Movable splash guard should have interlock for table rotation. Opening of guards on front side of table should suit maximum possible size of the job which can be loaded on the table. The guards should not provide any hindrance with complete vertical movement of crossrail/ATC on both sides of the table.	Vendor to confirm			
12.4	Drawing of Chip/Splash Guards showing total height, layout and other details of the same should be submitted.	Vendor to submit			
13.0	PORTABLE DATA INPUT OUTPUT DEVICE				
13.1	Portable Data Input Output Device or its equivalent for bi-directional program & data transfer between the offered unit & supplied system and as well as standard PC available at BHEL works, using floppy drive or equivalent should be offered with all required hardware, software, interfaces, cables, protection cover etc.	Vendor to offer			
15.0	SPARES :				
15.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
15.1.1	Mechanical & Hydraulic Spares : Following Spares are to be offered.	Vendor to offer			
15.1.1.1	Pumps used on machine i.e. Hydraulic, Hydrostatic, Lubrication, Coolant and Oil Cooling etc. recirculating system (1 no. each type).	Vendor to offer			
15.1.1.2	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 no. of each type)	Vendor to offer			
15.1.1.3	Pressure switches, flow switches used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 No. of each type)	Vendor to offer			
15.1.1.4	All types of regenerative type filter inserts (10 No. of each type)	Vendor to offer			
15.1.1.5	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer			
15.1.1.6	All types of Accumulators with charging kit (1 no. of each type)	Vendor to offer			
15.1.1.7	One set of belts (including timing belt) used in the machine.	Vendor to offer			
15.1.1.8	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer			
15.1.1.9	One set of hose pipe with end connection used in the machine.	Vendor to offer			
15.1.1.10	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.	Vendor to offer			
15.1.1.11	All types of shaft seals (2 no. of each type), O-rings & Piston Rings (5 nos. of each type) used in the machine.	Vendor to offer			
15.1.1.12	One set of pneumatic filtration / condensate drain system.	Vendor to offer			
15.1.2	Electrical /Electronic / CNC Spares : Following Spares are to be offered.	Vendor to offer			
15.1.2.1	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
15.1.2.2	Relays (2 Nos each type)	Vendor to offer			
15.1.2.3	Contactors (2 Nos each type)	Vendor to offer			
15.1.2.4	RTD temperature transmitter (1 No each type)	Vendor to offer			
15.1.2.5	Proximity Switches (5 Nos each type)	Vendor to offer			
15.1.2.6	Push Buttons (5 Nos each type)	Vendor to offer			
15.1.2.7	Indicating Lamps (10 Nos each type)	Vendor to offer			
15.1.2.8	Semiconductor Fuses (5 Nos each type)	Vendor to offer			
15.1.2.9	Special Fuses (5 Nos each type)	Vendor to offer			
15.1.2.10	Circuit Breakers (1 No each type)	Vendor to offer			
15.1.2.11	Main Power Switch (1 No each type)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
15.1.2.12	Encoders (1 No each type)	Vendor to offer			
15.1.2.13	Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
15.1.2.14	Wave shape unit/ EXE unit (1 No each type)				
15.1.2.15	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
15.1.2.16	NCU module	Vendor to offer			
15.1.2.17	Operator's panel with Display Unit	Vendor to offer			
15.1.2.18	I/O Cards for PLC (1 No each type)	Vendor to offer			
15.1.2.19	Servo Motors for Feed Drives (1 No each type)	Vendor to offer			
15.1.2.20	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type)	Vendor to offer			
15.1.2.21	One each of the following items : CNC Power Supply, I/R Module, NCU BOX, Machine Control Panel, Hand Held Unit/ B-MPI, Any other auxiliary drive , if used, Complete Proportional Valve Controller, if used.	Vendor to offer			
15.2	All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor to confirm			
15.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm			
15.4	Repair service contract with supplier of offered CNC system for service & spares for motor drives & CNC Unit etc.	Vendor to offer			
16.0	DOCUMENTATION : 3 sets of following documents (Hard copies with Soft Copies wherever specified) in English language should be supplied along with the machine	Vendor to offer			
16.1	Operating manuals of Machine & CNC system	Vendor to offer			
16.2	Programming Manuals of Machine & CNC system	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
16.3	Detailed Maintenance manual of machine and supplied systems.	Vendor to offer			
16.4	Maintenance Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for spindle ,feed drives and auxiliary drive.	Vendor to offer			
16.5	Manufacturing drawings for all supplied clamping jaws and its lead screws, tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.	Vendor to offer			
16.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer			
16.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer			
16.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor etc.	Vendor to offer			
16.9	Program print-outs (hard copy) with comments in English for PLC of main machine and auxiliary systems (if used) alongwith cross reference list and Input/Output list.	Vendor to offer			
16.10	PLC program, NC data & PLC data on CD.	Vendor to offer			
16.11	Complete back-up of PCU-50 or equivalent (in case of Fanuc) hard disk on GHOST CD and clear written Instructions to take back-up and reloading on a new hard disk.	Vendor to offer			
16.12	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer			
16.13	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer			
16.14	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer			
16.15	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 marked on it in English.	Vendor to offer			
17.0	PROVEOUT MACHINING OF BHEL COMPONENTS				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
17.1	Complete and successful machining of proveout components, to the specified design accuracy and surface finish, shall be done by the vendor after erection & startup of the machine at BHEL works using tools, equipment and CNC programs etc. supplied by the vendor. The forging/casting/material for the proveout components shall be provided by BHEL. Separate package price for proveout machining of each component is to be quoted.	Vendor to accept & offer			
17.2	The drawings of 2 proveout components, as listed below, are enclosed :				
17.2.1	The list of Component Drawings : 1. Valve Cone Drg No 11132002002 2. Valve Cone Casting Drg No 31132002902 3. Bearing Shell Drg No 01170327101 4. Bearing Shell Forging Drg No 41170327999	Vendor to note			
17.2.2	The enclosed drawings, as listed above, should be treated as BHEL's property. Strict confidentiality is to be maintained and under no circumstances these drawings or copy of these must be transferred to third party without permission of BHEL. These drawings must not be used directly or indirectly in any way detrimental to the interest of the BHEL.	Vendor to accept & confirm			
17.3	Proveout Components (Total 2 Nos.)	Vendor to offer			
17.3.1	Component no. 1 - "Valve Cone" : All types of internal & external turning operations including threading (Buttress) as per BHEL Drg. No. 11132002002 are to be performed. Generalised parametric subroutine (CNC Program) should be used for machining of Buttress Threads, preferably without using form tools, alongwith CNC Programs for rest of machining. By change in parametric values, the same subroutine should be usable for machining of similar threads of different pitch on different dia (internal as well as external) and for different lengths. Rough machined casting as per Drg No 31132002902 shall be provided to the vendor. Firstly, rough machining shall be carried out as per pre-stellite sketch shown in drg no 11132002002. Then, NiCro 82 and Stellite 306 material shall be deposited by BHEL as shown in drg. Thereafter the job shall be finished as per finished drawing shown above the pre-stellite sketch shown in drg no 11132002002.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
17.3.1.1	Material of Valve Cone : STEEL CASTING G17CRMOV5-10 FOR SERVICE TEMPERATURE <540 DEG. C 0.2% Proof Stress=440 N/Sq.mm, Tensile Strength 590-780 N/Sq.mm, Composition : C 0.15-0.20%, S max. 0.015%, Cr 1.2-1.5%, V 0.2-0.3%, Mn 0.5-0.9%, Si max. 0.6%, P max. 0.02%, Ni max. 0.7%, Mo 0.9-1.1%, Sn max. 0.025%, Al max. 0.04%, Cu max. 0.3%, Ti max. 0.025%				
17.3.2	Component no. 2 - "Bearing Shell" : All types of Turning & Grooving operations as per BHEL Drg. No. 01170327101 are to be performed. Rough machined forging as per Drg. no. 41170327999 shall be provided to the vendor.	Vendor to offer			
17.3.2.1	Material of Bearing Shell : STEEL FORGINGS FOR BEARINGS LINERS/SHELLS Gr.C22N Yield Strength minimum 240 N/sq.mm Tensile Strength 420-530 N/sq.mm Composition : C max. 0.17-0.24 %, S max. 0.045%, Cr max. 0.4%, Mn 0.4-0.7%, Si max. 0.4%, P max. 0.045%, Mo max. 0.1%, Ni max. 0.4%, H2 max. 3ppm, Cr+Mo+Ni max. 0.63%				
17.4	All operations in proveout machining shall be performed using CNC Programs supplied by vendor.	Vendor to accept & offer			
17.5	Vendor to submit preliminary process, time study & tool list recommended by them along with the offer for all proveout components. Change in process/tools may be mutually discussed and agreed during technical discussions.	Vendor to submit			
17.6	Vendor should submit the final CNC programs, setting schemes, process sheets, tooling layouts, time studies etc. in advance for the prove out components, in case of order.	Vendor to accept			
17.7	Vendor shall be fully responsible for machining of proveout components as per drawing and other specified requirements 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 got clarified by vendor during initial technical discussions.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
17.8	Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. The cost of such component shall be refunded by the vendor to BHEL in case of rejection of the component.	Vendor to accept & confirm			
18.0	TRAINING				
18.1	Four BHEL Persons should be trained at vendor's works for the area & period given below: (a) CNC Programming for the machine, application of all CNC Features & other supplied equipments (Period 3 weeks) (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (Period 2 weeks) (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (Period 2 weeks) (d) Operation of the machine & other supplied equipments (Period 2 weeks) Pre-dispatch inspection (ref. SI.No. 23.1)of the machine shall also be carried out by the team during their stay at vendor's works for the training. Vendor may specify days required for pre-dispatch inspection. BHEL reserves the right to choose no. of persons, field & period of training, out of above, while deputing their engineers for training.	Vendor to offer			
18.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	For vendor's information.			
18.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to accept & confirm			
18.4	Vendor should commit & offer to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works/training school for advanced features and specialized training, if so required by BHEL.	Vendor to offer			
18.5	Training charges, if any, for training requirement at SI.No. 18.1 & 18.4 should also be quoted on per Man-day basis so that training charges can be derived for the agreed period & persons, in case of any change.	Vendor to offer			
19.0	FOUNDATION				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
19.1	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. Complete Foundation Design including details viz. static / dynamic load details etc. and final Layout drawings shall be submitted by the supplier within two months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of vendor and at vendor's responsibility. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Vendor should arrange equipments required for the testing of foundation, if required.	Vendor to accept & offer			
19.2	Tentative Soil condition data at BHEL, Hardwar is as detailed below: a) The value of allowable bearing capacity is 11 ton/sq.m (Lowest obtained from shear and settlement criteria at 4.2m depth). The gross value of bearing capacity may be adopted as 17 ton/sq.m for an assumed footing size of 4m x 6m at a depth of 4.2m. b) The value of Angle of Internal Friction may be adopted as 32deg at 4.2m depth. c) The Coefficient of Elastic Uniform Compression (Cu) may be adopted as 3.0 kg/cubic cm at 4.2m depth for 10 sq.m or more contact area of foundation.	For vendor's information.			
20.0	ERECTION & COMMISSIONING				
20.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment/accessories, 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 few helping personnel shall also be provided by BHEL. Details of these requirements should be informed/discussed by vendor and agreed with BHEL in advance.	Vendor to offer			
20.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer , Air Compressor and other accessories/attachments with all electrical & mechanical connections shall also be responsibility of the vendor.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
20.3	Successful proving of BHEL components by the supplier and all tests, as mentioned at Sl. No. 23.0 (Machine Acceptance) and testing/demonstration of tele-diagnostic service, attachments etc. shall also be part of the commissioning activity.	Vendor to offer			
20.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be arranged and brought by the supplier. Out of the complete supply, all tools, tackles, mandrels etc. which may be required by BHEL to maintain the machine, after commissioning, shall not be taken back by vendor. Other equipment including Laser equipment shall be arranged by vendor on returnable basis. Vendor to offer accordingly.	Vendor to accept			
20.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to accept			
20.6	All cover plates, plates for chutes for chips flow etc. required for the complete machine and its peripherals/accessories shall be supplied by the vendor.	Vendor to accept			
20.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
20.8	Duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to submit			
20.9	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer			
21.0	ACCURACIES				
21.1	GEOMETRICAL ACCURACIES				
21.1.1	Geometrical Accuracy Tests shall be in accordance with DIN 8609 / ISO 3655 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 offer			
21.1.2	Table Flatness	Vendor to inform			
21.1.3	Table Radial Runout	Vendor to inform			
21.1.4	Table Axial Runout	Vendor to inform			
21.1.5	Cylindricity of turning	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
21.1.6	True roundness of turning	Vendor to inform			
21.1.7	Facial run-outs	Vendor to inform			
21.1.8	All other accuracies to conform to specified standard (Latest Revision) or Suppliers Test chart whichever is finer and more accurate.	Vendor to inform			
21.1.9	All the Geometrical accuracies including test pieces machining for turning operations etc. should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works. Test pieces are to be supplied by vendor for test pieces machining both at vendor's works & at BHEL's works. Drawings of test pieces to be submitted with the offer.	Vendor to offer, confirm & submit			
21.1.10	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
21.2	POSITIONING & REPEATABILITY ACCURACIES (Should be measured as per VDI/DGQ 3441 - Latest Revision) CHECKING BY USING LASER INTERFEROMETER.				
21.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
21.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
21.2.3	Repeatability in X axis (Ps)	0.007mm			
21.2.4	Repeatability in Z axis (Ps)	0.007mm			
21.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform			
21.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform			
21.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform			
21.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform			
21.2.9	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
21.2.10	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works.	Vendor to offer			
22.0	OPERATING CONDITIONS & THERMAL STABILITY :				
22.1	Total machine including all supplied items should work trouble free and should give specified accuracies under existing power supply and ambient operating conditions, as mentioned below at Sl. Nos. 22.1.1 & 22.1.2	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
22.1.1	Power Supply (AC): Voltage = 415V +10% / -10% , Frequency= 50Hz +3 / -3 , No. of phases = 3 phase with neutral. Ambient Operating Conditions: Temperature = 5 to 45 degree Celsius , Relative Humidity = 95% max.	Vendor to accept			
22.1.2	Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor.	Vendor to accept			
22.2	Thermal Stability: Thermal Stability of the complete machine and all supplied items keeping in view the specified Ambient Conditions, accuracies, requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. Since the machine shall be installed in shop with operating conditions as per SI.No. 22.1.2, the vendor shall ensure achieving the drawing accuracies on the job throughout the year. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the suitability should be furnished by Vendor. No temperature controlled enclosure shall be provided.	Vendor to offer & confirm			
22.3	The machine should be suitable for continuous operation to its full capacity for 24 hours a day and 7 days a week throughout year. Vendor to ensure and confirm the same.	Vendor to offer & confirm			
23.0	MACHINE ACCEPTANCE (Tests/Activities to be performed & demonstrated by Vendor)	Vendor to accept & confirm			
23.1	Tests/Activities to be carried out at vendor's works on the machine before dispatch : All these activities shall be part of pre-dispatch inspection of the machine which shall be carried out by BHEL's team during their stay at vendor's works for the training (Ref. SL.No. 18.1). Report of the same shall be submitted to BHEL.				
23.1.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values (SI.No. 21.1)	Vendor to accept & confirm			
23.1.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values (SI.no.21.2)	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
23.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept & confirm			
23.1.4	Demonstration of all features of the machine, control system & accessories/attachments	Vendor to accept & confirm			
23.1.5	Machining of test piece as per AFNOR/ISO/NAS for turning operations etc. Vendor to supply test pieces.	Vendor to accept & confirm			
23.2	Tests/Activities to be carried out at BHEL works while commissioning the machine :				
23.2.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values (Sl.No. 21.1)	Vendor to accept & confirm			
23.2.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values (Sl.no.21.2)	Vendor to accept & confirm			
23.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept & confirm			
23.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept & confirm			
23.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine.	Vendor to accept & confirm			
23.2.6	Demonstration by actual use of all supplied accessories to their full capacity for required applications.	Vendor to accept & confirm			
23.2.7	Machining of test piece as per AFNOR/ISO/NAS for turning operations etc. Vendor to supply test pieces and required tools for their machining. Drawing of test pieces & list of offered tools to be submitted.	Vendor to accept & submit			
23.2.8	Successful machining of proveout components to required drawing accuracies as per Sl. No. 17.0.	Vendor to accept & confirm			
23.2.9	Two weeks supervision of independent operation of machine by BHEL after job proveout.	Vendor to accept & confirm			
23.2.10	Training of BHEL's machine operators in operation of complete machine & accessories etc. by the supplier's experts during their stay at BHEL works for commissioning of the machine. This training is in addition to training requirements at Sl.No.18.0	Vendor to accept & confirm			
24.0	PACKING				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to offer & confirm			
25.0	GUARANTEE				
	Guarantee for complete machine and all supplied accessories/attachments/equipments/items for 24 months from the date of acceptance of the machine.	Vendor to offer			
26.0	GENERAL				
26.1	Machine Model No.	Vendor to inform			
26.2	Total connected load (KVA)	Vendor to inform			
26.3	Total Space required (Length, Width, Height) for complete machine, accessories/attachments and other supplied items like Voltage Stabilizer, Isolation Transformer & Air compressor etc.	Vendor to inform			
26.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer			
26.5	Total weight of the machine	Vendor to inform			
26.6	Weight of heaviest part of machine	Vendor to inform			
26.7	Weight of the heaviest assembly of the Machine	Vendor to inform			
26.8	Dimensions of largest part of the machine	Vendor to inform			
26.9	Vendor to submit reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, CNC System, Table Dia, Max. Turning Dia, Max. Turning Height, RPM, Load Carrying Capacity, Main Drive Rating and detail of accessories/attachments, if any, etc.	Vendor to submit			
26.10	Detailed catalogues, sketches/drawings/photographs pertaining to the offered machines and accessories/attachments/items should be submitted with the offer.	Vendor to confirm			
26.11	Hydraulic, Pneumatic & Oil pipings should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be supplied by the vendor.	Vendor to confirm			
26.12	All Cables and Hoses etc. should be well supported & protected in trays/brackets/drag chains etc.	Vendor to confirm			
26.13	Ladder is to be provided to access the machine elements located at the top of the column.	Vendor to offer & confirm			
27.0	QUALIFYING CONDITIONS				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
27.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC VERTICAL BORING MACHINE of same or higher sizes (Table diameter 1600mm, Load Capacity 12000Kg & Max Turning Height 1500mm) 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 comply & submit with the offer			
27.2	Name of the customer / company where similar machine is installed.	Vendor to inform			
27.3	Complete postal address of the customer.	Vendor to inform			
27.4	Month & Year of commissioning.	Vendor to inform			
27.5	Parameters of machine(s) supplied (Table Dia, Turning Height, Table Load Carrying Capacity) and application for which the machine is supplied.	Vendor to inform			
27.6	Name and designation of the contact person of the customer.	Vendor to inform			
27.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform			
27.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original Certificate or Through E-mail directly from the customer). The original performance certificate may be returned after verification by BHEL, if required.	Vendor to submit			
27.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm			
28.0	NETWORKING				
28.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities:	Vendor to offer			
28.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
28.3	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 offer			
28.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to offer			
29.0	MACHINE MONITORING SYSTEM (MMS) SIGNALS				
29.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.	Vendor to offer			
29.2	Control ON	Vendor to offer			
29.3	Cycle ON	Vendor to offer			
29.4	Spindle Running	Vendor to offer			
29.5	Feed Active (Any of the axes moving)	Vendor to offer			
29.6	M30 (Program Stop)	Vendor to offer			
30.0	OPTIONAL ITEMS				
30.1	OPERATOR'S PLATFORM				
30.1.1	The machine should be equipped traveling type operator's platform with ladder. It should be independent of crossrail movement, equipped with all motorised movements, movable / adjustable in vertical and horizontal direction. It should be able to reach almost to center of the Table in horizontal direction at suitable height range considering height of chip/splash guards. Interlocks should be provided for its horizontal / downward movement against rotating Table and against the job (rotating or stationary) to avoid collision / accident. Positions of the gates provided in the platform for Operator's convenience should be informed by the Vendor . The platform should provide sufficient space for convenient and safe operation of the machine and its control. Drawing / Details of the Operator's Platform should be submitted.	Vendor to offer			
30.1.2	The platform should clear maximum swing dia and chip/splash guards at its reference position.	Vendor to confirm			
30.1.3	Operator's panel at Sl.No. 2.10.1 should be suitably located on operator's platform in case the machine is equipped with operator's platform.	Vendor to confirm			
30.1.4	Operator's platform should have suitably located sufficient illumination (for clear view of operator's panel, drg. display area etc.), 2 nos. power plug point (Indian type) of 220Volts, 15 Amp AC with on/off switch and a board (Sl.No.2.19) for display of component drawing (A2 size) for ease of operator.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
30.1.5	Reach of the platform up to center of machine table to view tool and its location inside long jobs during machining.	Vendor to confirm			
30.1.6	Horizontal movement of complete Platform.	Vendor to inform			
30.1.7	Vertical movement of complete Platform to cover total turning height.	Vendor to inform			
30.1.8	Height of Platform Railing.	Vendor to inform			
30.1.9	Weight Capacity of the Platform.	Vendor to inform			
30.1.10	Minimum Position of Platform from Shop Floor.	Vendor to inform			
30.2	ACCESSORIES Vendor may recommend suitable accessories, attachments, standard clamping elements/devices suitable for specified applications & specifications.				
30.3	AUTOMATIC JOB MEASURING SYSTEM :				
30.3.1	Automatic Wireless Job Measuring System using electronic probes with measuring cycles, automatic programmable calibration system. The probe adapters should be suitably located. Calibration block should be fixed at suitable location. Details to be submitted.	Vendor to offer & submit			
30.3.2	All types of standard & special probes/styli & their adapters required to measure all machined surfaces & dimensions (external & internal) of the prove-out components.	Vendor to offer			
30.3.3	Vendor to quote separately for the package of probes/styli & their adapters required for measurements, as above, of each of the proveout components specified at Sl.Nos. 17.0. Component wise list of offered items with quantity is to be submitted.	Vendor to offer & submit			
30.3.4	The measurement system shall be customised so that the measured result file shall be generated in the CNC System only and shall contain all relevant information such as nominal values, measured values, tolerances along with project details of measured component as per sample format at Annexure-I. Further , all the measurements done on the component shall appear in a single file in the above sample format. The selected probing results output file shall be printable from the CNC screen of the machine on a printer through a single key command/soft Key. All necessary hardware & software including Printer, all types of cables, communication software, CNC features required for above mentioned setup shall be provided by the vendor.	Vendor to offer with details.			
30.3.5	Spares Package for the Measuring system for 2 years trouble free working should also be offered.The spares should include Tool Probes, Interface Unit & Special Probes if any. List to be submitted.	Vendor to offer & submit			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
30.3.6	Details of Automatic calibration of the probes.	Vendor to submit			
30.3.7	Repeatability and accuracy of the probe	Vendor to inform			
30.3.8	Operating Manuals, Maintenance Manuals & Catalogues for offered Automatic Job Measuring System.	Vendor to offer			
30.3.9	During proveout machining, final inspection of the components shall be done by supplied Job Measuring System using required program supplied by vendor.	Vendor to accept & offer			
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