	BHARAT HEAVY ELECTRICAL LIMITED			**Enquiry No. :**	
	UNIT'S ADDRESS:			**Due Date :**	
	CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)			**Supplier Qtn. No.:**	
				Date :	

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF FLOOR TYPE CNC HORIZONTAL BORING MACHINE

NOTE:-

1. **Vendor (OEM) must submit complete information against clause no. 25 (Qualifying condition). The offer meeting this clause would only be processed (OEM : Original Equipment Manufacturer).**
2. **This tender is for two machines of identical configuration. However, proveout components will be different for both the machines as specified at clause no. 20.0**
3. **The following format must be completely filled and deviations mentioned in the appropriate columns. Inadequate /incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.**
4. **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 FLOOR TYPE CNC HORIZONTAL BORING MACHINE COMPLYING WITH SPECIFICATIONS AS BELOW

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	**PURPOSE & WORKPIECE MATERIAL**				
1.10	**Purpose :** **Machine no. 1:** The machine is required for machining of Turbine Casings and Bearing Pedestals of Steam Turbines of various ratings. The Machine should be suitable for heavy duty Milling, heavy Drilling, Boring, Threading-Metric & Buttress Threads, Reverse Counter Boring, Core Drilling, Reaming, etc. on high alloy steel castings. The machine is to be used mainly for Joint Plane facing, drilling, boring, threading, reverse counter boring, complete peripheral finish machining of Turbine casings and Bearing **Machine no.2 :** The machine is required for machining of components of IV & CV Casing of Steam Turbine of 250MW & 500MW only, involving Milling, Drilling, Boring, Reaming, Tapping/ Thread Cutting/ Thread Whirling including machining of deep bores with a high degree of finish and accuracy.				
1.20	**Work Piece Material:** **Machine no. 1:** Castings of High Alloy Steel, like GS17CrMoV511, The components to be machined will be mainly high temperature & creep resistant alloy steel castings of Mat. grade 17CrMoV511, X22CrMoV121 having tensile strength 40-95 Kg/mm2, %Elongation 15-22% & Hardness up to 300BHN. **Machine no.2:** The machine shall be suitable for machining of castings of steel grade G17 Cr Mo V511 as per DIN 17245, with Boring Head, and components of Ferrous and non-ferrous metals like Carbon Steel, low & High Alloy Steel, Cast Steel, Cast Iron and similar other materials.				
2.0	**SPECIFICATION:**				
2.10	MACHINE CONFIGURATION: The Machine shall be Floor Type CNC Horizontal Boring Machine with a Rotary Table. Looking from spindle side, AAC is to be on Right side of Rotary Table. Linear movement of Table is to be perpendicular to X-axis.				

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2.2	**HEAD STOCK**				
2.2.1	Boring spindle diameter	200MM			
2.2.2	Milling spindle diameter	vendor to inform			
2.2.3	Ram Cross section (LxB)	460x520min.			
2.2.4	Spindle drive power (AC Continuous Rating - S1)	vendor to inform			
2.2.5	Spindle speed (Infinitely variable)	100 KW or more			
2.2.6	No. of speed ranges	1 TO 2000 RPM or more			
2.2.7	Max torque on the boring spindle (N-m)	4000Nm min.			
2.2.8	Max torque on the milling spindle (N-m)	4000Nm min.			
2.2.9	Spindle taper	ISO50/BT50			
2.2.10	Torque-Power-Speed characteristics of the spindle system to be submitted by the	Vendor to submit			
2.2.11	Oriented Spindle Stop (Any position)	Vendor to offer			
2.2.12	Spindle Cooling System (Details to be submitted)	Vendor to offer			
2.3	**COLUMN:**				
2.3.1	**Column longitudinal travel (X-Axis)**	6500			
2.3.2	X-axis feed rate (Infinitely variable)	1 to 6000 mmpm or more			
2.3.3	X-axis rapid traverse rate	10 M/ Min. or more			
2.3.4	Axis Resolution	0.001			
2.4	**HEADSTOCK TRAVERSE ON COLUMN:**				
2.4.1	Headstock vertical travel (Y-Axis)	5000 mm			
2.4.2	Traverse Range (wrt Table top)	0-5000			
2.4.3	Y-axis feed rate (Infinitely variable)	1 to 6000 mmpm or more			
2.4.4	Y-axis rapid traverse rate	10 M/ Min. or more			
2.4.5	Axis Resolution	0.001			
2.5	**RAM/ SPINDLE TRAVERSE:**				
2.5.1	Boring spindle axial travel (W-Axis)	1000 mm or more			
2.5.2	Ram axial travel (Z-Axis)	1200 mm or more			
2.5.3	Spindle + Ram travel (W+Z)	2200 mm or more			
2.5.4	Lowest spindle position from Table Top (zero level at Table top).	Vendor to confirm and submit			
2.5.5	Boring Spindle axis feed rate (Infinitely variable)	1 to 5000 mmpm or more			
2.5.6	Boring Spindle axis rapid traverse rate	5 M/ Min. or more			
2.5.7	Ram axis feed rate (Infinitely variable)	1 to 5000+D164 mmpm or more			
2.5.8	Ram axis rapid traverse rate	10 M/ Min. or more			
2.5.9	Axis Resolution	0.001			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.5.10	Spindle & Ram Axes should be independently programmable with Independent Drives and Feed back system.	Vendor to offer			
2.6	**FEED AND DRIVE SYSTEM:**				
2.6.1	Feed drives/ motors for X,Y,Z & W axes [AC servo motors] shall be digital type of either Siemens or Fanuc make (Details of model, make, type etc. to be submitted)	Vendor to offer			
2.6.2	Maximum feed force for all axes	Vendor to inform			
2.6.3	Feed back system for X, Y & Ram (Z) axes: Heidenhain linear scales with pressurised compressed air cleaning (Details to be submitted by the vendor)	Vendor to offer			
2.6.4	Feed back system for Spindle (W) Axis: Heidenhain Rotary Encoders (Details to be submitted by the vendor)	Vendor to offer			
2.6.5	**Type of power transmission:**1. Pre-loaded backlash free Hydrostatic worm OR Pre loaded backlash free double pinion & rack drive for X-axis. (indentor to select and specify based on application) 2. Backlash free re-circulating ball screw with Pre-loaded double nut for all other axes. (Complete description of the aforesaid including diameter of Ball Screw for each axis, to be submitted with the offer)	Vendor to offer			
2.6.6	Mechanism for locking X, Y & Z axis	Vendor to offer			
2.6.7	Maximum thrust rating of all axes.	Vendor to offer			
2.7	**MACHINE GUIDEWAYS:**				
2.7.1	Width of bed guideways, X-axis	Vendor to inform			
2.7.2	Width of column guideways, Y-axis	Vendor to inform			
2.7.3	Details of Guide ways for Ram axis and bearing details of Spindle axis are to be submitted with offer.	Vendor to inform			
2.7.4	Guide ways for X-axis, Y-axis & Z-axis: Hydrostatic (Details to be submitted). Details of lubrication system provided on Spindle axis are also to be submitted with	Vendor to inform			
2.7.5	Hardness of guideways	Vendor to inform			
2.7.6	**Metallic Telescopic Covers** of rust resistant material to be provided with wipers for X & Y axes guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & hydrostatic oil is to be provided.	Vendor to inform			
2.8	**ROTARY TABLE :**				
2.8.1	Table size (LxB)	4000x4000 mm			
2.8.2	Maximum load carrying capacity (Tons)	100 Ton or more			

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2.8.3	Eccentric Loading of job on the table.	Vendor to confirm and submit load chart			
2.8.4	Table rotation (B-axis)	360000 indexing positions			
2.8.5	Accuracy of Rotary axis:	Vendor to inform			
2.8.6	Maximum machining torque on B-axis (N-m)	Vendor to inform			
2.8.7	Maximum clamping torque on B-axis (N-m)	Vendor to inform			
2.8.8	Feed rate for Table Rotary Axis. Infinitely variable (Deg / min or rpm)	Vendor to inform			
2.8.9	Rapid Traverse Rate for Rotary Axis (Deg / min. or rpm)	Vendor to inform			
2.8.10	Size of T-slots	Suitable for Studs of M36			
2.8.11	T-slots pitch (as per DIN standard)	Vendor to inform			
2.8.12	Central slot tolerance	Vendor to inform			
2.8.13	Perpendicular Lateral slot size/ tolerance	Vendor to inform			
2.8.14	Size of bore at the center.	Vendor to inform			
2.8.15	Linear traverse	3000 mm			
2.8.16	Feed Force on Linear Axis	Vendor to inform			
2.8.17	Feed Rate for Linear axis (mm/min Infinitely variable)	1 to 10000 mmpm or more			
2.8.18	Rapid Traverse rate for Linear axis (mm/ min)	10 M/ Min. or more			
2.8.19	Minimum distance between ram face and table face.	Vendor to inform			
2.8.20	**Cheveron type Metallic Telescopic Covers** of rust resistant material are to be supplied with wipers for Table Linear axis. Joints of telescopic covers should be so sealed to avoid mixing of coolant and Hydrostatic oil.	Vendor to offer			
2.8.21	Feed back devices :				
	a) Heidenhain rotary encoder for B-Axis	Vendor to offer			
	b) Heidenhain Linear Scale with pressurised compressed air cleaning system for linear (V)-Axis	Vendor to offer			
2.8.22	Feed drives : Fanuc/Siemens digital AC Servo drives. Details of Make, Model, Type etc. to be submitted by Vendor.	Vendor to offer			
2.8.23	Loading chart of the table to be submitted.	Vendor to submit.			
2.8.24	Mechanism for locking/ clamping of Table axes	Vendor to offer			
2.8.25	X traverse from centre of Rotary Table should be equal on eitther side.	Vendor to offer			
2.8.26	Spindle should reach 500 mm beyond extreme end of rotary table.	Vendor to confirm			
2.8.27	Hydrostatic Guideways for Table Rotation	Vendor to confirm			
2.8.28	Hydrostaic Guideways for Table Linear Traverse	Vendor to confirm			
2.8.29	4 x 90 deg Precision Positioning .	Vendor to confirm and submit			

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2.8.30	Backlash free re-circulating ball screw with Pre-loaded double nut for Table Linear axis. Complete description of the same including diameter of Ball Screw, to be submitted with the offer)	Vendor to submit.			
2.10	**CONSTRUCTION:**				
2.10.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various components/assemblies like Column, bed, head stock, ram, spindle, table etc. of the machine.	Vendor to submit.			
2.10.2	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.			
2.10.3	Automatic deflection compensation for ram and column effective at any extension of the ram plus spindle is to be provided taking into consideration weight of all posssible cutters/ attachments offered. Details of the offered system should be submitted with offer.	Vendor to submit.			
2.10.4	Head Stock and Column Counterbalancing System.	Vendor to submit.			
2.11	**OPERATOR'S PLATFORM:**				
2.11.1	Operator's platform of sufficient load carrying capacity to be provided. The platform shall be Headstock Mounted Type or with Independent Motorised Vertical Movement for total Vertical Traverse as well as forward stroke of sufficient length . Push Button switches are to be provided on the Operator's Platform at suitable location for motorised movement. A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform. (Independently moving/ Headstock mounted type to be selected and specified by indentor as required)	Vendor to offer			
2.11.2	Horizontal movement of complete Platform.	Vendor to inform			
2.11.3	Weight carrying Capacity of the Platform should be Min. 300 Kg..	Vendor to inform			
2.11.4	Minimum Height of Platform from Shop Floor.	Vendor to inform			
2.11.5	Splash / Chip guards on operator platform for protection of operator, operator's panel and to avoid spillage of coolant & chips on operator's platform.	Vendor to offer			
2.12	**OPERATION AND CONTROL SYSTEM:**				
2.12.1	**OPERATOR'S PANEL:**				

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2.12.1.1	Swiveling type operator's panel having complete CNC and machine control system with CRT of required configuration shall be provided on the operators platform. All switches on the Operator's panel including that for table rotation should be within reach of operator of average height (Indian, 5'6" approx.) for convenient, efficient & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details of the panel should be submitted.	Vendor to offer			
2.12.1.2	An auxiliary pendant, which can be taken to the table for job setting and similar other purposes, sould be provided.	Vendor to offer			
2.11.2	**CNC SYSTEM & FEATURES :**				
2.11.2.1	Make : Fanuc / Siemens.	Vendor to confirm			
2.11.2.2	Type : PC based latest version	Vendor to confirm			
2.11.2.3	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			
2.11.2.4	The system should, preferably, have OP 15 Operator's Panel with TFT colour display (15 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			

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2.11.2.5	The CNC System should necessarily have the following features: Access locks on the operator panel, Coordinate System Rotation, Coordinate System Transformation, Look Ahead of Minimum 70 blocks, Helical Interpolation, Scaling, Programmable mirror image machining, Process oriented Canned Cycles for Drilling, Milling & Turning operations, Rigid Tapping and Tool Management. 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			
2.11.2.6	Details of Standard features. List to be submitted.	Vendor to specify			
2.12.2.7	Features of CNC System required for identified jobs or foreseen by the vendor as required.	Vendor to specify			
2.12.3	**MANUAL CONTROL :**				
	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, spindle rpm, Direction of Spindle Rotation, i.e. CW/ CCW, cutting feed and spindle rpm on/off, display of axis position values etc, for manual operation without using CNC program or MDI mode. Diagram/ Sketches for switches/ keys provided on operators pendant to be submitted.	Vendor to cofirm. Layout of panel showing requisite switches to be submitted.			
2.12.4	**HAND HELD UNIT:**				
	Hand Held unit, Type B-MPI of Siemens make or equivalent alongwith sufficient length of interfacing cable is to be offered with complete details.	Vendor to offer			
2.12.5	**UPS FOR CNC SYSTEM:**				
	UPS of 30 minutes for CNC system with inbuilt cooling and charge status display. (Battery charging /discharging time should be specified by vendor)	Vendor to offer			
2.12.6	**PORTABLE FLOPPY DRIVE UNIT (I/O DEVICE):**				
2.12.6.1	Portable Floppy Drive Unit or its equivalent (Note Book PC with pen drive) for bi-directional transfer of program and data between the offered unit and supplied CNC system as well as any standard PC shall be supplied with all required interfaces, cables and software.	Vendor to offer and submit details			

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		Vendor to offer and submit details			
2.13	**MACHINE LIGHTS:**	Vendor to offer and submit			
2.13.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to offer and submit details			
2.13.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer and submit details			
2.13.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to offer and submit details			
2.13.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to offer and submit details			
2.13.5	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to offer and submit details			
2.14	**AIR CONDITIONERS:**				
2.14 .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 offer			
2.14.2	In case of order, vendor shall confirm to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Refrigeration/ Chiller unit. Capacity of the chiller unit. Type of compressor with complete specifications. Type of Thermostatic Expansion Valve with complete specifications. Fan size and flow in CFM (cubic feet meter) of the Condenser unit. Specifications of the Evaporator Unit (Width Plate type/ Coil type) Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2. Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to confirm			
2.14	**HYDRAULIC SYSTEM : Details should be Submitted by the Vendor**				
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			

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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 be of Make: EPE / Hydac.	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) to be intimated.	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			
2.16	**COOLANT SYSTEM :**				
2.16.1	Coolant System with all accessories for following variants shall be provided.	Vendor to offer and submit			
	a) Recirculating Type Flood Coolant System with nozzles around spindle.	Vendor to offer and submit			
	b) Air coolant system	Vendor to offer and submit			
	c) High Pressure Coolant thru Spinde	Vendor to offer and submit			
2.16.2	All offered 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 and submit details			
2.16.3	Coolant collection and recirculation system should be leakproof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to offer and submit details			
2.16.4	Coolant Filteration System: Recirculating type coolant system with Vaccum Rotary drum type System.	Vendor to confirm and submit details.			
2.16.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted	Vendor to offer and submit			
2.16.6	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 at full	Vendor to offer and submit details			

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2.16.7	Coolant Tank Capacity (Any specific requirement, like Deep Hole Drilling etc. to be specified by indentor)	Vendor to offer and submit details			
2.16.8	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to offer and submit details			
2.16.9	Coolant pump & motor details for all variants of coolant system are to be submitted	Vendor to offer and submit			
2.16.10	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer and submit details			
2.17	**ELECTRICAL SYSTEM :**				
2.17.1	415V with + 10% / -10% fluctuation, 50HZ with fluctuation of +/-3 HZ, 3 Phase AC (3 wire system with out 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 resposibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to comply			
2.17.2	**Tropicalisation:** All electrical / electronic equipment shall be tropicalized	Vendor to comply			
2.17.3	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to comply			
2.17.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to comply			
2.17.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to comply			
2.20.6	Motors shall conform to IEC or Indian Standards	Vendor to comply			
2.16.7	All cables moving with traversing axes should be installed in Caterpillar/ Drag chain mounted vertically. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm			
2.17.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to comply			
2.17.9	In-cycle hour counter with reset facility is to be included in the offer.	Vendor to comply			
2.18	**SAFETY ARRANGEMENTS:**	Vendor			

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	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to comply			
	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	Vendor to comply			
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to comply			
	3. All the pipes, cables etc. on the machine should be well supported and protected.	Vendor to comply			
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to comply			
	5. Emergency Switches at suitable locations as per International Norms are to be provided.	Vendor to comply			
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to comply			
	7. Safety Lights at both ends of moving column (preferably Flashing during X-travel).	Vendor to comply			
2.19	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE :**				
	The Machine shall conform to following factors related to environment :	Vendor to comply			
	(a) 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	Vendor to comply			
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to comply			
	(c) There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to comply			
	(d) No hazardous chemicals shall be required to be used in the machine.	Vendor to comply			
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to comply			
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and	Vendor to comply			
3.0	**CHIP CONVEYOR :**				

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3.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin to be provided on one end of the machine . Two Chips bins of appropriate size of Indian make, with wheels & handle for movement,should also be supplied.	Vendor to confirm			

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3.2	Type of chip conveyor	Slat type Vendor to confirm			
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 (to be rust resistant)	Vendor to inform			
3.6	Provision for smooth flow of chips to the conveyor.	Vendor to inform			
3.7	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to inform			
3.8	Layout showing location of chip conveyor to be submitted.	Vendor to inform			
4.00	**SERVO VOLTAGE STABILIZER:**				
4.01	Indian make Oil/ Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc. with no undesirable Harmonics in the stabiliser output.	Vendor to offer with details			
4.02	Make	NEEL, Aplab or Auto Electric			
4.03	Model & Rating	Vendor to specify			
4.04	Spares Package for the Voltage Stabiliser for 2 years trouble free working should also be offered with item wise list.	Vendor to specify			
4.05	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to submit			
5.00	**ULTRA ISOLATION TRANSFORMER**				
5.01	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be offered with complete details.	Vendor to offer			
5.02	Make	NEEL, Aplab or Auto Electric			
5.03	Model and Rating	Vendor to specify			
5.50	Catalogue of the Isolation Transformer shall be submitted with the offer.	Vendor to submit			
6.0	**PNEUMATIC SYSTEM:**				
6.01	**AIR COMPRESSOR:**				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.1.1	Independent Air Compressor (of reputed Indian make Elgi, Chicago Pneumatic or Ingersol Rand) 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 5 Kg/sq.cm with high moisture could be used as and when required. The compressor unit should be suitable for continuous duty operation.	Vendor to offer with details.			
6.1.2	Make & Model of Air Compressor and Refrigerator type Dryer.	Vendor to specify			
6.1.3	Capacity (Flow, Pressure & KW)	Vendor to specify			
6.1.4	Spares Package for the compressor for 2 years trouble free working should also be offered.	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.	Vendor to offer			
7.0	**TOOLINGS:**				
7.1	Complete Description of offered Tooling System	Vendor to offer			
7.2	**Machine no. 1:** All cutting tools, tool holders, arbors, boring bars, clamping elements etc., recommended for machining of proveout component shall be offered by the vendor. Consummables for offered Tools, like inserts,screws etc., should be quoted for machining of 2 more similar casings in addition to the prove-out casings. **Machine no. 2**All cutting tools, tool holders, arbors, boring bars, clamping elements etc., recommended for machining of proveout component shall be offered by the vendor. Consumables for offered Tools, like inserts, screws etc., should be quoted for machining of 2 more similar casings in addition to the prove-out casings.	Vendor to offer			
7.30	Vendor shall be responsible, financially or otherwise, 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..	Vendor to comply			
8.0	**MEASURING SYSTEMS:**				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
8.01	Automatic job measuring system with measuring cycles, calibration system and all types of probes / styli required for measuring dimensions of the prove-out components. Vendor to furnish detailed description of the system along with offer. The measurement system shall be customised so that the measured result file shall be genarated 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 party.	Vendor to offer with details.			
8.01.1	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 Tips if any.	Vendor to offer with list.			
8.02	Automatic Tool Offset measuring system with measuring cycles, calibtration system etc suitable for all types of tools recommended for prove-out components. The system shall be capable of measuring tool length ,tool radius and loading these values into tool offset memory of the machine. The system shall be such that the measurement should be with an accuracy of 10 microns or less. In addition, the system shall be capable of monitoring of runout of tools.Vendor to furnish detailed description of the system along with offer.	Vendor to offer with details.			
8.02.1	Spares Package for the Automatic Tool Offset Measuring system for 2 years trouble free working should also be offered.	Vendor to offer with list.			
9.00	**DIAGNOSTIC SYSTEM:**				
9.01	**TELE-DIAGNOSTIC SERVICE :**				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
9.1.1	Tele diagnostic service package consisting of Modem and other hardware with all necessary software package for remote diagnosis and resolution of faults of CNC System and PLC of the machine should be offered. 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. Tele-diagnostic service should be provided through International telephone lines. 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.			
9.02	**FAULT DIAGNOSTIC SYSTEM:**				
9.2.1	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			
9.2.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the tool carriers of the ATC/AAC to its initial/nearest position in case of interruption of tool carrier's positioning cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of Tool carriers positioning cycle manually. Separate Hand Held Pendent should also be provided to retrieve the tool carrier to it’s initial position.	Vendor to offer			
9.2.3	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer			
9.2.4	Help guide should be provided to use both diagnostic systems shall be provided.	Vendor to confirm			
10.00	**LEVELING & ANCHORING SYSTEM**	Required.			
10.01	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc shall be supplied for the Machine and Rotary Table.	Vendor to offer and submit details.			
11.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE :**				

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
11.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to offer			
11.2	Test mandrel for checking spindle run-out & alignment should be supplied	Vendor to offer			
12.0	**ACCESSORIES:**				
12.1	**AUTOMATIC TOOL CHANGER & TOOL MAGAZINE :**				
12.1.1	Type	Vendor to specify			
12.1.2	No. of storage locations	40 or more			
12.1.3	Tool shank	ISO50/BT50			
12.1.4	Max tool diameter (all pockets filled)	140mm or more			
12.1.5	Max tool diameter (adjacent pockets empty)	Vendor to specify			
12.1.6	Max tool length	500mm			
12.1.7	Tool change time (tool-to-tool)	Vendor to specify			
12.1.8	Tool change time (chip-to-chip)	Vendor to specify			
12.1.9	Tool selection method: Random with shortest path	Vendor to confirm			
12.1.10	The machine shall have manual Tool loading/ unloading through push button provided on machine head stock/ Auxilliary Hand pendant.	Vendor to confirm			
12.1.11	The spindle taper and tool pocket at changer station will have the provision of cleaning by compressed air blow during ATC cycle. The spindle taper will also have the provision of compressed air blow through push button provided on machine head stock/ Auxilliary Hand pendant during manual tool change.	Vendor to confirm			
12.1.12	Auxiliary Control, with suitable interlocks, for manual insertion / withdrawl of tool from the tool magazine.	Vendor to confirm			
12.1.13	Suitable arrangement, Software based customised screens and manual key based, should be provided to extract a tool trapped in the ATC cycle. Details of both the system to be provided along with the offer.	Vendor to submit			
12.1.14	Tool changing position should be at a convenient height from floor, which will be mutually agreed, so that it remains at an approachable position in order to work manually in case of emergency.	Vendor to confirm			
12.1.15	Maximum Tool Overhang out of different Holders.	Vendor to specify			
12.1.16	Maximum Permissible Weight on each Pocket. (It should not be less than 35 Kg.)	Vendor to specify			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.1.17	Maximum Permissible Weight on Complete ATC.	Vendor to specify			
12.1.18	The Machine operation should be possible with or without referencing ATC.	Vendor to confirm			
12.1.19	One set of tool holder retention stud equal to Tool Magazine capacity shall be provided as standard item with the machine. Drawing of Pull Stud should also be supplied.	Vendor to confirm & submit			
12.1.20	Tool Changer arm working should be explained in details. Full ATC catalogue should be submitted with the offer.	Vendor to confirm & submit			
12.2	**AUTOMATIC ATTACHMENT CHANGER (AAC) MACHINE NO. 1:**				
12.2.1	All attachments shall be suitabe for loading / unloading through AAC	Vendor to offer			
12.2.2	No. of storage positions	Vendor to inform			
12.2.3	Location of the attachment changer	On RHS of X-Traverse.			
12.2.4	Mounting plates as required for attachments should be supplied	Vendor to offer and submit			
12.2.5	Maximum Permissible Weight on each Position.	Vendor to offer and submit			
12.2.6	Maximum Permissible Weight on Complete AAC.	Vendor to offer and submit			
12.2.7	Additional Longitudinal Traverse of X-axis required to accommodate and use of AAC beyond the specified X-axis traverse shall be seperately offered by the vendor.	Vendor to offer and submit			
12.2.8	Suitable Software based and manual key based arrangement should be provided to extract an Attachment trapped in the AAC cycle. Details of both the system to be provided along with the offer.	Vendor to offer and submit			
12.30	**ATTACHMENTS FOR MACHINE NO. 1:**				
12.3	**SPECIAL PROGRAMMABLE ANGULAR MILLING HEAD:**				
12.3.1	Power:	40KW or more			
12.3.2	Max torque	Vendor to inform			
12.3.3	Speed Range (Infinitely Variable)	same as spindle			
12.3.4	Speed ratio (1:1 between spindle of Machine and Head)	Vendor to inform			
12.3.5	Spindle taper	ISO50/ BT50			
12.3.6	Traverse Range of C-axis	360°			
12.3.7	Resolution of C-axis	1 deg.			
12.3.8	Power-Torque-Speed characteristic diagram to be submitted	Vendor			
12.3.9	Wt. of the head	Vendor			
12.3.10	Length of Milling Head:	1400mm Approx.			
12.3.11	Coolant system: Internal (thru spindle) **&** External coolant with requisite flexible pipes on its snout is to be provided.	Vendor to offer and submit			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.3.12	Pull Stud for mounting the Head and for mounting the Tools in the taper of the Head shall be supplied by the vendor.	Vendor to offer and submit			
12.4	**PROGRAMMABLE UNIVERSAL MILLING HEAD:**				
12.4.1	Power	40 KW or more			
12.4.2	Max torque	Vendor to inform			
12.4.3	Speed Range	Vendor to inform			
12.4.4	Speed ratio	Same as spindle			
12.4.5	Spindle taper	ISO50/ BT50			
12.4.7	Traverse Range of A-axis in deg.	(+/ -) 95			
12.4.8	Resolution of A-axis	0.001 deg.			
12.4.9	Rotation of C-axis (Any number of rotation)	360 deg			
12.4.10	Resolution of C-axis	0.001 deg.			
12.4.11	Torque-Power-Speed chacteristic diagram to be submitted.	Vendor to submit			
12.4.12	Weight of the head	Vendor to inform			
12.4.13	Coolant system: Internal (thru spindle) **&** External coolant with requisite flexible pipes on its snout is to be provided.	Vendor to offer.			
12.4.14	Pull Stud for mounting the Head and for mounting the Tools in the taper of the Head shall be supplied by the vendor.	Vendor to offer.			
12.5	**PROGRAMMABLE BORING & FACING HEAD:MACHINE NO. 1 :**				
12.5.1	Model No. (Preferably UT5-630 or equivalent)	Vendor to inform			
12.5.2	Head body diameter	Vendor to inform			
12.5.3	Speed Range	0-250 rpm			
12.5.4	Radial axis independent positioning	Vendor to inform			
12.5.5	Slide stroke	200 mm			
12.5.6	Slide feed rate	1-400 mmpm			
12.5.7	Machining range in Boring for internal diameter	1250 mm Max.			
12.5.8	Accuracy of Bore Size (Bore Tolerance), Surface Finish of bores and Facial and Radial Run outs (Requirement to be specified by Indentor.)	H7, Ra 1.6 Micron, 0.03			
12.5.9	Diameter range for machining external diameter indicating max. depth	Vendor to inform			
12.5.10	Machining range in facing indicating maximum depth.	Vendor to inform			
12.5.11	Maximum boring depth without entry of Boring Head.	Vendor to inform			
12.5.12	Maximum torque	Vendor to inform			
12.5.13	Maximum cutting force in boring	Vendor to inform			
12.5.14	Maximum cutting force in facing	Vendor to inform			
12.5.15	Slide Counter Balance mechanism	Vendor to inform			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.5.16	Item wise details of complete set of standard Tool Holders and Tools, available with the offered Head, are to be submitted with the offer. Complete details of any special arrangement offered to meet the specified requirement of Boring range are also to be submitted.	Vendor to inform			
12.5.17	Tool Holder with BT 50 taper for presetting of the Tools for offered Boring and Facing Head is to be offered with complete details.	Vendor to offer.			
12.5.18	Catalogue of the offered Head is to be submitted with the offer.	Vendor to offer and submit			
12.5.19	Coolant system: External coolant with requisite flexible pipes on its snout is to be provided. The arrangement for its supply may be made through the coolant supply system available on the Head Stock.	Vendor to offer and submit			
12.6	**PROGRAMMABLE BORING & FACING HEAD:**				
12.6.1	Model No. (Preferably UT8-800/ 1000 or equivalent)	Vendor to inform			
12.6.2	Head body diameter	Vendor to inform			
12.6.3	Speed Range	0-160 rpm			
12.6.4	Radial axis independent positioning	Vendor to inform			
12.6.5	Slide stroke	300 mm approx.			
12.6.6	Slide feed rate	1-500 mmpm			
12.6.7	Machining range in Boring for internal diameter	Vendor to inform			
12.6.8	Accuracy of Bore Size (Bore Tolerance), Surface Finish of bores and Facial and Radial Run outs (Requirement to be specified by Indentor.)	H7, Ra 1.6 Micron, 0.03			
12.6.9	Diameter range for machining external diameter indicating max. depth	1200 mm			
12.6.10	Machining range in facing indicating maximum depth.	Vendor to inform			
12.6.11	Maximum boring depth without entry of Boring Head.	Vendor to inform			
12.6.12	Maximum torque	Vendor to inform			
12.6.13	Maximum cutting force in boring	Vendor to inform			
12.6.14	Maximum cutting force in facing	Vendor to inform			
12.6.15	Slide Counter Balance mechanism	Vendor to inform			
12.6.16	Item wise details of complete set of standard Tool Holders and Tools, available with the offered Head, are to be submitted with the offer. Complete details of any special arrangement offered to meet the specified requirement of Boring range are also to be submitted.	Vendor to inform			
12.6.17	Tool Holder with BT 50 taper for presetting of the Tools for offered Boring and Facing Head is to be offered with complete details.	Vendor to offer and submit			
12.6.18	Catalogue of the offered Head is to be submitted with the offer.	Vendor to offer and submit			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.6.19	Coolant system: External coolant with requisite flexible pipes on its snout is to be provided. The arrangement for its supply may be made through the coolant supply system available on the Head Stock.	Vendor to offer and submit			
12.70	**CNC ANGULAR HEAD/RIGHT ANGLE MILLING HEAD:**				
12.7.1	Power	Equal to spindle power			
12.7.2	Max torque	Vendor to inform			
12.7.3	Speed Range (Infinitely Variable)	1-2000rpm or more			
12.7.4	Speed ratio (1:1 between spindles of Machine and Head)	Vendor to confirm			
12.7.5	Spindle taper	ISO50/BT50			
12.7.6	Traverse Range of C-axis	360 deg.			
12.7.7	Resolution of C-axis	1 deg.			
12.7.8	Power-Torque-Speed characteristic diagram to be submitted	Vendor to submit			
12.7.9	Wt. of the head	Vendor to inform			
12.7.10	Coolant system: Internal (thru spindle) & External coolant with requisite flexible pipes on its snout is to be provided.	Vendor to confirm			
12.7.11	Pull Stud for mounting the Head and for mounting the Tools in the taper of the Head shall be supplied by the vendor.	Vendor to confirm			
12.7.12	Pull Stud for mounting the Head and for mounting the Tools in the taper of the Head shall be supplied by the vendor.	Vendor to offer and submit			
	ATTACHMENTS FOR MACHINE NO. 2:				
12.20	**AUTOMATIC ATTACHMENT CHANGER (AAC):**				
12.2.1	All attachments shall be suitabe for loading / unloading through AAC	Vendor to offer			
12.2.2	No. of storage positions (Matching with number of offered attachments). The storagrage rack of Attachment changer should be covered from all sides with provision of automatic opening and closing of doors of attachment rack during change of attachment.	Vendor to inform			
12.2.3	Location of the attachment changer	Vendor to offer and submit			
12.2.4	Mounting plates as required for attachments should be supplied	On RHS of X-Traverse.			
12.2.5	Maximum Permissible Weight on each Position.	Vendor to offer and submit			
12.2.6	Maximum Permissible Weight on Complete AAC.	Vendor to offer and submit			
12.2.7	Additional Longitudinal Traverse of X-axis required to accommodate and use of AAC beyond the specified X-axis traverse shall be seperately offered by the vendor.	Vendor to offer and submit			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.2.8	Suitable Software based and manual key based arrangement should be provided to extract an Attachment trapped in the AAC cycle. Details of both the system to be provided along with the offer.	Vendor to offer and submit			
12.03	**PROGRAMMABLE ANGULAR MILLING HEAD/ RIGHT ANGLE MILLING HEAD:**				
12.3.1	Power	Equal to Spindle Power			
12.3.2	Max torque	Vendor to confirm			
12.3.3	Speed Range (Infinitely Variable)	same as spindle			
12.3.4	Speed ratio (1:1 between spindles of Machine and Head)	Vendor to confirm			
12.3.5	Spindle taper	ISO50/BT50			
12.3.6	Traverse Range of C-axis	360 deg.			
12.3.7	Resolution of C-axis	1 deg.			
12.3.8	Power-Torque-Speed characteristic diagram to be submitted	Vendor to submit			
12.3.9	Wt. of the head	Vendor to submit			
12.3.10	Coolant system: Internal (thru spindle) & External coolant with requisite flexible pipes on its snout is to be provided.	Vendor to inform			
12.3.11	Pull Stud for mounting the Head and for mounting the Tools in the taper of the Head shall be supplied by the vendor.	Vendor to confirm			
12.04	**SPECIAL BORING AND FACING HEAD (Body Dia. 300mm Approx.):**				
12.4.1	Min. Boring Dia	300mm			
12.4.2	Max. Boring dia	600mm			
12.4.3	Max. Boring depth (With Tool.)	2000mm			
12.4.4	Min. Facing Dia	450mm			
12.4.5	Max. Facing dia	950mm			
12.4.6	Max. speed	200rpm			
12.4.7	Tool slide stroke	80mm Approx.			
12.4.8	Max. Boring depth. If the Ram of the machine can enter the Bore diameter 480 mm, the Boring head length may be shorter to the extent ram can enter the job set on Rotary Table, upto maximum 1000mm.	2000 with Tool			
12.4.9	Accuracy of Bore Size (Bore Tolerance), Surface Finish of bores and Facial and Radial Run outs	H7, 1.6 microns Ra, (Facial) 0.010 and (Radial) 0.020mm respectively.			
12.4.10	The radial axis of the offered Head may be programmable through Spindle Traverse or independent motor. Its details may be submitted with the offer	Vendor to offer			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.4.11	Item wise details of complete set of standard Tool Holders and Tools, to be used with the offered Head, are to be submitted with the offer. Complete details of any special arrangement offered to meet the specified requirement of Boring range are	Vendor to offer			
12.4.12	Tool Holder with BT 50 taper for presetting of the Tools for offered Boring and Facing Head is to be offered with complete details.	Vendor to submit			
12.4.13	Details, including scematic sketches, of the offered Head are to be submitted with the offer. Drawing of Pull Stud, if required, should also be submitted.	Vendor to submit			
12.4.14	Coolant system: External coolant with requisite flexible pipes on its snout is to be provided. The arrangement for its supply may be made through the coolant supply system available on the Head Stock.	Vendor to submit			
12.05	**SPECIAL BORING AND FACING HEAD (Body Dia. 500mm Approx.):**	Vendor to confirm			
12.5.1	Min. Boring Dia	480mm			
12.5.2	Max. Boring dia	750mm			
12.5.3	Max. Boring depth. (With Tool.)	2400mm			
12.5.4	Min. Facing Dia	670mm			
12.5.5	Max. Facing dia	1170mm			
12.5.6	Max.speed	200rpm			
12.5.7	Tool slide stroke	90mm Approx.			
12.5.8	Max. Boring depth. If the Ram of the machine can enter the Bore diameter 680 mm, the Boring head length may be shorter to the extent ram can enter the job set on Rotary Table, upto maximum 1000mm.	2400mm with Tool			
12.5.9	Accuracy of Bore Size (Bore Tolerance), Surface Finish of bores and Facial and Radial Run outs.	H7, 1.6 microns Ra, (Facial) 0.010 and (Radial) 0.020mm respectively.			
12.5.10	The radial axis of the offered Head may be programmable through Spindle Traverse or independent motor. Its details may be submitted with the offer	Vendor to offer			
12.5.11	Item wise details of complete set of standard Tool Holders and Tools, to be used with the offered Head, are to be submitted with the offer. Complete details of any special arrangement offered to meet the specified requirement of Boring range are	Vendor to offer			
12.5.12	Tool Holder with BT 50 taper for presetting of the Tools for offered Boring and Facing Head is to be offered with complete details.	Vendor to submit			
12.5.13	Details, including scematic sketches, of the offered Head are to be submitted with the offer. Drawing of Pull Stud, if required, should also be submitted.	Vendor to submit			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
12.5.14	Coolant system: External coolant with requisite flexible pipes on its snout is to be provided. The arrangement for its supply may be made through the coolant supply system available on the Head Stock.	Vendor to submit			
12.8	**JIB CRANE**				
12.8.1	Capacity	1 Ton			
12.8.2	Mounted on top of column with all power operated movements (including swivel	Vendor to offer and submit			
12.8.3	Swivelling range and speed	Vendor to submit			
12.8.4	Crane reach should cover the rotary table when fully drawn towards machine spindle.	Vendor to confirm			
13.0	**SPARES:**				
13.1	Itemvise 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 confirm			
13.1.1	**Mechanical & Hydraulic Spares:** The following spares are to be included.				
13.1.1.1	Pumps used on machine i.e Hydraulic / Hydrostatic, lubrication, coolant and oil cooling - recirculating system (1 no. each type).	Vendor to offer			
13.1.1.2	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hyd / Lub / Pneumatic/ coolant circuit. (I no. of each type)	Vendor to offer			
13.1.1.3	Pressure switches, flow switches used in Hyd / Lub / Pneumatic/ coolant circuit. (1 No. of each type)	Vendor to offer			
13.1.1.4	All types of regenerative type filter inserts (10 No. of each type)	Vendor to offer			
13.1.1.5	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer			
13.1.1.6	All types of Accumulators with charging kit (I no. of each type)	Vendor to offer			
13.1.1.7	One set of belts (including timing belt) used in the machine.	Vendor to offer			
13.1.1.8	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer			
13.1.1.9	One set of hose pipe with end connection used in the machine.	Vendor to offer			
13.1.1.10	All types of couplings used with different pumps (1 no. of each type) & pressure	Vendor to offer			
13.1.1.11	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			
13.1.1.12	One set of pneumatic filtration / condensate drain system.	Vendor to offer			

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
13.1.2	**Electrical /Electronic / CNC Spares :** Following Spares are to be offered.	Vendor to offer			
13.1.2.1	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
13.1.2.2	Relays (2 Nos each type)	Vendor to offer			
13.1.2.3	Contactors (2 Nos each type)	Vendor to offer			
13.1.2.4	RTD temperature transmitter (1 No each type)	Vendor to offer			
13.1.2.5	Proximity Switches (5 Nos each type)	Vendor to offer			
13.1.2.6	Push Buttons (5 Nos each type)	Vendor to offer			
13.1.2.7	Indicating Lamps (10 Nos each type)	Vendor to offer			
13.1.2.8	Semiconductor Fuses (5 Nos each type)	Vendor to offer			
13.1.2.9	Special Fuses (5 Nos each type)	Vendor to offer			
13.1.2.10	Circuit Breakers (1 No each type)	Vendor to offer			
13.1.2.11	Main Power Switch (1 No each type)	Vendor to offer			
13.1.2.12	Encoders (1 No each type)	Vendor to offer			
13.1.2.13	Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
13.1.2.14	Wave shape unit/ EXE unit (1 No each type)				
13.1.2.15	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
13.1.2.16	NCU module	Vendor to offer			
13.1.2.17	Operator's panel with Display Unit	Vendor to offer			
13.1.2.18	I/O Cards for PLC (1 No each type)	Vendor to offer			
13.1.2.19	Servo Motors for Feed Drives (1 No each type)	Vendor to offer			
13.1.2.20	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type)	Vendor to offer			
13.1.2.21	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			
13.2	All types of spares for total machine and accessories should be available for atleast ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor to offer			
13.30	Recommended set of spares for all attachments, viz.; Angular Milling Head, and Boring Heads are to be offered with details. The spares are to include Motors, Set of Gears, Encoders, Limit/ Cam Switch Connectors with item wise details.	Vendor to offer			

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13.40	Recommended set of spares for Job and Tool Measuring Systems are to be offered with details.	Vendor to offer			
13.50	Vendor to confirm that complete list of spares for machine and accessories, along with specification/ type/ model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor to confirm			
14.0	**DOCUMENTATION :** Three sets of following documents (Hard copies with Soft Copies wherever specfied) in English language should be supplied along with the machine	Vendor to offer			
14.1	Operating manuals of Machine & CNC system	Vendor to offer			
14.2	Programming Manuals of Machine & CNC system	Vendor to offer			
14.3	Detailed Maintenance manual of machine and supplied systems.	Vendor to offer			
14.4	Maintenance, Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for spindle ,feed drives and auxiliary drive.	Vendor to offer			
14.5	Manufacturing drawings for all supplied clamping elements, cutting tools, tool holders, arbors, boring bars, coolant connections, adapters, sleeves, fixtures etc.	Vendor to offer			
14.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer			
14.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer			
14.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor, Boring Attachments, Automatic Tool and Job Measurement system etc.	Vendor to offer			
14.9	User 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			
14.10	PLC program, NC data & PLC data on CD.	Vendor to offer			
14.11	Complete back-up of PCU-50 or equivalent (in case of Fanuc) hard disk on GHOST CD and clearly written Instructions to take back-up and reloading on a new hard disk.	Vendor to offer			
14.12	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer			
14.13	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer			
14.14	Drawings of machine assemblies/sub-assemblies/parts including 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			
14.15	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer			
15.00	**TRAINING:**				

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15.01	Four BHEL Persons should be trained at vendor's works for each machine for the area & period given below: (a) CNC Part Programming for the machine, application of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (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. Sl.No. 22.1) 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			
15.02	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm			
15.03	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
15.04	Vendor to quote for training on per man week basis	Vendor to quote			
15.05	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			
16.00	**FOUNDATION:**				
16.01	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within two month from the date of Letter of Intent (LOI)/ P.O., whichever is earlier. 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 accessory. 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 grouting of foundation bolts of the machine.	Vendor to confirm			

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16.02	Tenatative Soil condition data at BHEL, Hardwar is as detailed below: a) The value of allowable bearing capacity is 11 t/m2 (Lowest obtained from shear and settlement criteria at 4.2m depth). The gross value of bearing capacity may be adopted as 17t/m2 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/cm3 at 4.2m depth for 10m2 or more contact area of foundation.	For vendor's information.			
17.0	**ERECTION & COMMISSIONING**				
17.01	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. The available crane capacity at the proposed location of the machine will be Ton. The vendor will ensure to make requisite arrangement for lifting of heavier consignment/ items/ assembly of the machine not getting covered by this capacity.	Vendor to confirm			
17.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor toffer and submit details			
17.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at **clause 21** (Machine Acceptance) shall form part of the commissioning activity.	Vendor toffer and submit details			
17.4	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor toffer and submit details			
17.5	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 toffer and submit details			
17.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor toffer and submit details			
17.7	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 toffer and submit details			

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17.8	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor toffer and submit details			
17.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor toffer and submit details			
17.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor toffer and submit details			
17.11	The vendor shall supply sufficient quantity of paint of the machine and carry out touching wherever the paint is damaged during transit or errection of the machine.	Vendor to confirm			
18.0	**ACCURACY TESTS:**				
18.1	**GEOMETRICAL ACCURACIES :**				
18.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 3070 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 and submit details			
18.1.2	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 demonstrate			

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18.2	**MACHINE POSITIONING ACCURACIES & REPEATABILITY:** **Should be measured as per VDI/DGQ 3441 (Latest Revision)** **using LASER INTERFEROMETER.**				
18.2.1	Positioning uncertainty (Pa per 1000mm) for X,Y,Z,W & V axes	0.015 mm			
18.2.2	Positioning uncertainty Pa for B-axis	3.6 secs			
18.2.3	Positional scatter (Ps per 1000mm) for X,Y,Z,W & V axes	0.008 mm			
18.2.4	Positional scatter Ps for B-axis	1.8 secs			
18.2.5	Total positioning error P for entire travel for X,Y,Z,W & V axes	Vendor to specify			
18.2.6	Total positioning error P for B-axis	Vendor to specify			
18.2.7	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			
19.0	**OPERATING CONDITIONS & THERMAL STABILITY :**				
19.1	**Power Supply (AC):** Voltage = 415V +10% / -10% of fluctuations , 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 & confirm			
19.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition. Max. temperature variation is up to 20 deg Celsius in 24 hours. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor to accept & confirm			
19.2	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free	Vendor to accept & confirm			
19.3	The machine, including attachments and accessories, should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure and confirm the same.	Vendor to accept & confirm			
20.0	**PROVEOUT OF BHEL COMPONENTS :**				

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20.1	For Machine no. 1, HP Outer Casing Drg. no. 01050109500 will be likely proveout component. For Machine no. 2, IV & CV Casing Drg. no. 01132127010 and IV & CV Casing Drg. no. 01132103010 will be likely proveout components. *Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor (Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing).* Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. *Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order.*	Indentor to enclose component drawings with tender specs. Vendor to accept and offer.			
	Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.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.				
	During proveout, all tools should be preset by using supplied Tool offset Measuring System and measurement of machined dimensions of the job shall be done by supplied Job Measuring System.Vendor shall be responsible, financially or otherwise, for any deviation/ rejection in proveout component to the extent of cost of Casting/Forging, due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc..The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.	Vendor to confirm			
21.00	**MACHINE ACCEPTANCE: (Tests/Activities TO be Performed by Vendor)**	Should be accepted & confirmed by Vendor			
21.1	**Tests/Activities should be carried out at supplier's works on the machine before dispatch :**				
21.1.1	Geometrical Accuracy Tests as per test chart.	Vendor to offer and submit			
21.1.2	Positioning Accuracy Tests as per VDI-DGQ/3441	Vendor to offer and submit			
21.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to offer and submit details			
21.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	Vendor to offer and submit			
21.1.5	Machining of **NAS Test Piece.** Vendor to supply test piece and tooling for it's machining.	Vendor to offer and submit			
21.2	**Test to be carried out at BHEL works while commissioning the machine :**				
21.2.1	Geometrical Accuracy Tests as per test chart.	Vendor to offer and submit			
21.2.2	Positioning Accuracy Tests as per VDI-DGQ/3441	Vendor to offer and submit			
21.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to offer and submit			

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21.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to offer and submit details			
21.2.5	Demonstration of all features of the machine, CNC system & all accessories to the satisfaction of BHEL for their efficient and effective use.	Vendor to offer and submit details			
21.2.6	Demostration by actual use of all supplied attachments and accessories to their full	Vendor to offer and submit			
21.2.7	Machining of **NAS Test Piece.** Vendor to supply test piece and tooling for it's machining.	Vendor to offer and submit details			
21.2.8	Job prove out.	Vendor to offer and submit details			
21.2.9	Two weeks supervision of independent operation of machine by BHEL after job	Vendor to offer and submit			
21.2.10	Training of BHEL machine operators in operation of complete machine &	Vendor to offer and submit			
22.0	**PACKING:**				
22.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all	Vendor to confirm			
23.0	**GUARANTEE :**				
23.1	24 months from the date of acceptance of the machine.	Vendor to confirm			
24.0	**GENERAL : The vendor should submit the following information:**				
24.1	Machine Model	Vendor to inform			
24.2	Total connected load (KVA):	Vendor to inform			
24.3	Floor area required (Length, Width, Height) for complete machine & accessories.	Vendor to inform			
24.4	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)	Vendor to inform			
24.5	Total weight of the machine	Vendor to inform			
24.6	Weight of heaviest part of machine	Vendor to inform			
24.7	Weight of the heaviest assembly/ subassembly of the Machine	Vendor to inform			
24.8	Dimensions of largest part/ subassembly/ assembly of the machine	Vendor to inform			
24.9	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 submit			
24.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to submit			

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24.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to submit			
24.12	Ladder is to be provided to access the machine elements located at the top of the column.	Vendor to offer & confirm			
25.0	**QUALIFYING CONDITIONS :**				
25.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC HORIZONTAL BORING MACHINE of same (Spindle Diameter 200mm, Ram+Spindle Travel of 2200mm) or higher sizes **with features for machining of deep bores of dia 300 mm or more at L/D ratio of minimum 5 and bore run outs of max. 30 microns *in high alloy steel components,*** in the past ten years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year (on the date of opening of Tender) after commissioning, should quote. However, if referred machine (s) ***with aforesaid features*** has/had been supplied to BHEL, then the machine should be presently working satisfactorily for more than six months (on the date of opening of Tender) after its commissioning and acceptance in BHEL. The following information should be submitted by the vendor about the companies where referred machine (s) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept & confirm			
25.2	Name of the customer/ company where referred machine is installed.	Vendor to inform			
25.3	Complete postal address of the customer.	Vendor to inform			
25.4	Month & Year of commissioning.	Vendor to inform			
25.5	Parameters of machine(s) supplied (Spindle Diameter, Ram+Spindle Travelwith features for machining of deep bores of dia 160mm or more with L/D ratio of minimum 5 in high alloy steel components) and application for which the machine is supplied.	Vendor to inform			
25.6	Name and designation of the contact person of the customer.	Vendor to inform			
25.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform			
25.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original Certificate or Through E-mail directly from the customer). The original performance certificate may be returned after verification by BHEL, if required.	Vendor to submit			
25.9	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			
	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood)				
	b) The program transfer shall be by simple copy and paste method provided				
	c) The program transfer between CNC system and network should also be possible				

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26.00	**OTHER FEATURES:**	Vendor to confirm			
26.1	**NETWORKING:**				
	Machine control should have necessary hardware and software for interfacing	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			
26.2	**MACHINE MONITORING SYSTEM (MMS) SIGNALS**				
	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.				
	a) Control ON	Vendor to offer			
	b) Cycle ON				
	c) Spindle Running				
	d) Feed Active (Any of the axes moving)				
	e) M30 (Program Stop)				