BHARAT HEAVY ELECTRICAL LIMITED

UNIT'S ADDRESS: BAP, RANIPET

Enquiry No. : **2791542E Dated: 20/03/2020**

Due Date : **11-04-2020**

Supplier Qtn. No.:

CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.) :

Mr. SACHIN SAINI /Sr.Er / 04172283132 /sachin.saini@bhel.in

Mr. SUNNY GROVER / AE / 04172284343/ sunnygrover@bhel.in

Date :

SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR 3 AXIS MOVING GANTRY TYPE CNC ROUTER MACHINE

NOTE:-

1. Vendor (OEM) must submit complete information against clause no. 26 The offer meeting this clause would only be processed"

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

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

ADDRESS OF THE SUPPLIER :					
TELEPHONE NOS.:					
FAX NOS.:					
E-MAIL ADDRESS :					
Ref: BAP:CAPEX: 1.2					
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF 3 AXIS MOVING GANTRY TYPE CNC ROUTER MACHINE WITH SPECIFICATION AS BELOW:					
SNO	**DESCRIPTION FOR BHEL REQUIREMENT**	**SPECIFIED / TO BE CONFIRMED BY**	**OFFERED**	**DEVIATIONS**	**REMARKS**
(A)	**Description:**				
	High speed 3-Axis (simultaneously controlled) moving gantry fixed bed, precision CNC router machine for Routing, Milling and Drilling of Structural Aircraft Aluminium components with thickness varying from 4 mm to 12 mm.	Vendor to note			
1	The machine shall have following mode of operation:				
1.1	**Milling Mode:** The machine shall be configured as a CNC programmable simultaneously interpolate 3-axis machine, 2 axis in horizontal plane and one axis perpendicular to that plane.	Vendor to note			
1.2	**Axis definition:**	Vendor to note			
	X axis : Linear traverse along the larger length of the working table.				
	Y axis : Linear traverse along the width of the working table.				
	Z axis : Linear traverse perpendicular to X and Y axis.				
1.3	**Constructional Feature:**				

	The machine should be high Speed 3 Axis fixed table moving gantry type CNC Router simultaneously controlled axis, with FEM analysed base frame for vibration free performance at higher accelerations. It should have a. Heavy duty segmented base frame, stress relieved and machined base frame. b. Ribbed Gantry for maximum stiffness. c. Precision linear rails on all axis. d. Heavy preload linear bearings with bidirectional end seals for high dust protection and scrappers for large aluminium chips. e. Dual axis drive Synchronised gantry system. f. Machine Should be capable of doing multi sided machining in single set up to ensure parallelism and perpendicularity of the final product.	Vendor to note			
	The details of various machine elements (Table, Gantry, Spindle Head Stock, etc.) material shall be clearly indicated in the offer. Special design and constructional features of the machine elements (Table, Gantry, Spindle Head Stock, etc.) must be fully explained in the offer.	Vendor to note			
2	**SPECIFICATIONS:**				
2.1	**MACHINE CONFIGURATION**				
2.1.1	3 Axis fixed table moving gantry type CNC router machine.				
2.2	**CAPACITY AND SIZE**				
2.2.1	**Axis Travels:**				
2.2.1.1	X-Axis : 8000 mm or more	Vendor to specify			
2.2.1.2	Y-Axis: 3000 mm or more	Vendor to specify			
2.2.1.3	Z-Axis: 300 mm or more	Vendor to specify			
2.2.1.4	Overall size (foot print of the machine)	Vendor to specify			
2.3	**Work Table**				
	The work surface should be a precision machined high flow vacuum table sub-surface with a composite grid table that presents a modular work area for easy setup. The modular design should facilitates quick part changeover for a variety of material sizes. It should be designed to hold Aluminium alloy sheet with dimensions: 8000X3000X12 mm. It should be provided with provision for both vacuum and mechanical clamping system for the job.	Vendor to specify			
2.3.1	Vacuum Pump system				
	For vacuum clamping system, bidder has to provide following information:				
	a. No of pumps	vendor to specify			
	b. Maximum vacuum pressure	vendor to specify			
	c. Pumping speed	vendor to specify			
	d. Vendor should provide manual of the vacuum pump system containing necessary constructional and maintenance details.	vendor to confirm.			
2.3.2	For Mechanical clamping:				
	Size of Holes, Size of suitable nuts and pitch of the hole matrix to be provided by the vendor.	vendor to specify			
2.4	**Routing head details:**				
2.4.1	Milling Spindle				
2.4.1.1	The main milling spindle shall be driven by a dynamically balanced digitally controlled AC spindle motor/Electrospindle. The spindle motor RPM and position shall be programmable. Overload *protection for main spindle drive shall be provided. A suitable load meter shall be provided to indicate the spindle power during machining process* . The spindle motor shall be capable of delivering constant power over wide range of spindle speed and the range of speed over which constant power/torque are available. Details to be provided	Vendor to specify			

2.4.1.2	Spindle assembly shall be made of suitable grade of alloy steel as per design requirement. Bidder shall furnish full details of the system. Temperature sensors shall be provided on the spindle system and interfaced with the controller for activation of safety related alarm functions.	Vendor to specify			
2.4.1.3	The spindle shall be supported on adequate number of preloaded bearings preferably of roller type/taper roller type. The bearing shall preferably be of P4/SP class accuracy or better of reputed make.	Vendor to specify			
2.4.1.4	Spindle Power: 15kW or more	vendor to specify			
2.4.1.5	Spindle speed: upto 24000 RPM	vendor to specify			
2.4.1.6	Spindle torque: 29Nm at 10000rpm	vendor to specify			
2.4.1.7	Spindle Runout < 0.005mm	vendor to specify			
2.4.1.8	Tool holder: HSK A63 with suitable collet nut.	vendor to specify			
2.4.1.9	Cooling system: Liquid cooling	vendor to specify			
2.4.1.10	Lubrication: oil/air (DLS)	vendor to specify			
2.4.1.11	Tool Clamping&Unclamping:	vendor to specify			
2.4.1.12	Clamping force of Tool and Tool Holders as per global standard.	Vendor to confirm			
2.4.1.13	**Safety sensors for indicating following:**				
	a. Spindle stop	Vendor to confirm			
	b. Tool in spindle	Vendor to confirm			
	c. Tool clamp/Unclamp	Vendor to confirm			
2.4.1.14	Suitable counterbalance should be provided.	vendor to specify			
2.4.1.15	Bidder to provide the full details of the system offered. Vendor to specify Speed characteristics of the offered system	Vendor to specify			
2.5	**Dust and chip extraction system**				
	Vendor should provide suitable dust and chip extraction system near the spindle area. Vendor should provide details like extraction rate, Motor/Pump details, Valve details, Filter specifications (If any used in the system)	Vendor to specify			
2.6	**Axis and Spindle drives**				
2.6.1	Machine should have digitally Synchronized gantry axis system to achieve precise squarness. All axis and Spindle should be driven by high performance Siemens/Fanuc drives. Linear bearings used in the machine should be heavy preloaded with bidirectional end seals for high dust protection and metallic scrappers for large aluminium chips should be provided.	Vendor to confirm			
2.7	**FEEDS AND DRIVE SYSTEM:**				
2.7.1	The drive system shall be fully integrated to the CNC control system.	Vendor to Confirm			
2.7.2	All the drive motors shall be three phase AC servo (IP64 protection). The AC servomotor shall be of same make as those of CNC control system i.e. Siemens/ Fanuc (latest of either two). The AC servomotors shall be provided with inbuilt absolute encoders. Details of the drive systems including designation of modules proposed for each axis to be provided	Vendor to Confirm			
2.7.3	X & Y axis with high precision ball screws with pre-loaded double nuts or rack & pinion with electronically pre-loaded double pinion arrangement. The Z-Axis shall have ball screws for linear motion. Digital drives and AC Servo motors shall be used to provide precise linear motion of X, Y & Z , and shall be fully integrated to the machine controller.	Vendor to specify			
2.7.4	The drive system shall be adequately sized for each linear axis.	Vendor to confirm			
2.7.5	Adequate provision shall be made for backlash compensation.	Vendor to specify			
2.7.6	Feedback system for all the linear motions shall be fully integrated to the machine control.	Vendor to confirm			

2.7.7	Ball screws/Rack and pinion shall be of reputed make such as THK/NSK/INA/Tsubaki/Steinmayer/Rexroth/Sheenburger/Gamfior/Shuton etc. The accuracy class of ball screws shall be C3 or better to provide specified positional accuracy and repeatability. There shall be suitable mechanism for compensation of the thermal expansion of ball screw. The equivalent makes e.g. Gudel/Atlanta etc and accuracy class shall be applicable in case rack and pinion mechanism is used. Mention about the bearings, make &preload. The ball screws shall be supported on adequate number of preloaded bearings preferably of roller type/taper roller type	Vendor to specify			
2.7.8	The guideways and ball screws/rack & pinion are to be protected from metallic chips/dust etc. by providing adequate protection gear. Rollers & ball screws to be protected by suitable scrapers. Protection by metallic covers made of rust proof material.	Vendor to confirm			
2.7.9	All slide-way system shall be equipped with hydraulic/electromagnetic/power clamping system with safety switches. Clamping system shall be controlled by CNC system. It shall be possible to operate it through part program.	Vendor to confirm			
2.7.10	The bidders shall provide the details of the offered drive system along with Catalogues	Vendor to specify			
2.7.11	Rapid feed in X - Axis	20 m/min or more			
2.7.12	Rapid feed in Y - Axis	20 m/min or more			
2.7.13	Rapid feed in Z - Axis	10 m/min or more			
2.7.14	For X, Y & Z - Axis Feed Drives / Motors [AC servo motors] Either Siemens or Fanuc digital type (detail like model, make, type, rating etc. should be submitted)	Vendor to specify			
2.7.15	Maximum milling force permissible	Vendor to specify			
2.7.16	Details of backlash free movement mechanism in X, Y& Z axes should be submitted.	Vendor to specify			
2.7.17	Mechanism for locking X,Y& Z axis (Preferably hydraulic automatic locking system)	Vendor to specify			
2.8	**CNC Control System:**				
2.8.1	Make	Fanuc / Siemens.			
2.8.2	Type	PC based latest version			
2.8.3	Model	Siemens 840DSL / Fanuc32i (Latest version, as available at the time of ordering, should be supplied).			
2.8.4	Details of optional features, recommended by vendor.	Vendor to specify			
2.8.5	The system should have full alphanumeric keyboard, additional draw-out type Querty Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for tele diagnostics, network ready with LAN, electronic hand wheels for all axes, 3 nos. USB Ports for data input/output, hard disk of sufficient capacity **(Largest size available at the time of order shall be supplied)**, graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor)	Vendor to specify			
2.8.6	Provision for automatic safe shut down of CNC System in case of Power Failure	Vendor to specify			
2.8.7	Resolution	Vendor to specify			
2.8.8	Programmable axes	3 (X, Y,Z)			
2.8.9	Block Processing time	Vendor to specify			
2.8.10	Display	19" TFT Colour graphic display			
2.8.11	HMI (PCU 50.3 OF Siemens/ Fanuc equivalent)	Vendor to specify			
2.8.12	NC Memory	4 GB or more			
2.8.13	Solid state drive capacity	128 GB or more			
2.8.14	Backup of all data (NC, CNC, HMI, etc.) to be provided in a working mirror SSD needed for replacement in the event of failure of original SSD	Vendor to Confirm			
2.8.15	ISO Programming in Metric	Vendor to Confirm			
2.8.16	Remote Diagnosis	Vendor to Confirm			
2.8.17	An automatic tool retract system for Z axis, shall be offered to prevent tool digging in case of power failure.	Vendor to Confirm			

2.8.18	The full details of the control system offered including the designation of all the modules selected to execute the functionalities specified shall be provided. The same shall be substantiated by the OEM catalogues with appropriate markings.	Vendor to Confirm			
2.9	**MANUAL CONTROL :**				
2.9.1	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, feed, spindle rpm, feed on/off, display of axis position values etc, for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor to specify			
2.10	**UPS FOR CNC SYSTEM (STAND ALONE OR INBUILT):**				
2.10.1	UPS of 10 minutes for CNC system with inbuilt cooling and charge status display (Battery charging /discharging time should be specified by vendor)	Vendor to specify			
2.11	**The feedback system:**				
2.11.1	Position feedback for all the linear axes shall have absolute direct measurement systems for CNC control i.e. Pressurized linear Optical Glass/Metallic Scales with zero Multi-Reference System of latest design for linear axes of **Heidenhain make.**	Vendor to Confirm			
2.11.2	The bidder shall furnish the actual details of make, resolution, accuracy of measuring system provided for the various axis and details of means provided for the protection of Linear Scales.	Vendor to specify			
2.12	**Operator station& panel**				
2.12.1	The operator panel shall have complete CNC and machine control system with **TFT colour display of 19" size** or more. It shall be adjustable in all direction including vertical direction for the convenience of operation. All switches with suitable interlocks shall be within the reach of operator of average height (Indian) for easy & safe operation.	Vendor to specify			
2.12.2	Complete manual control of machine with required switches/ keys shall be provided on operator's panel for selection of required axis, axis direction, cutting feed, spindle speed, cutting feed on/off, display of axis position value single block / continuous, emergency stop for manual operation without using CNC program.	Vendor to specify			
2.12.3	**Hand operated auxiliary unit of Siemens/Fanuc make,** for the convenience of setting, all axis movement, rotation of spindle, tool clamping etc., shall be supplied. It shall be provided with manual pulse generator, axis selection, Jog buttons, and emergency stop button.	Vendor to specify			
2.12.4	Solid graphic simulation	Vendor to specify			
2.12.5	Feed and speed override rotary switches.	Vendor to Confirm			
2.12.6	In order to facilitate external communication RS232C port, USB ports, Ethernet interface shall be provided.	Vendor to Confirm			
2.13	**Automatic tool changer**				
2.13.1	The machine shall be equipped with a CNC controlled suitable automatic tool changer/Magazine for automatic changing of milling tools. It shall have a provision for minimum of 12 tools	Vendor to confirm			
2.13.2	The tool holders should be adequately protected against chips by means of a protective cover and equipped with automatic/manual doors for tool loading/unloading.	Vendor to confirm			
2.13.3	Type of milling tool: HSK-A63	Vendor to confirm			
2.13.4	Random selection of tool shall be possible. The tool magazine shall have a bi-directional rotation and tool shall be presented to ATC arm through shortest route.	Vendor to Confirm			
2.13.5	An effective power tool lock system shall be provided to ensure proper tool locking in the spindle.	Vendor to Confirm			
2.13.6	For manual ejection/loading of tools from spindle and magazine in manual mode, push button control shall be available.	Vendor to specify			
2.13.7	Maximum Permissible Weight on each Pocket.	Vendor to specify			
2.13.8	Maximum Permissible Weight on Complete ATC.	Vendor to specify			
2.13.9	The Machine operation should be possible with or without referencing ATC.	Vendor to specify			
2.13.10	ATC Drawing should be submitted with the offer.	Vendor to specify			
2.13.11	Suitable arrangement, Software based 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 specify			
2.13.12	Full details of the proposed system shall be provided.	Vendor to Confirm			

2.14	**CNC and Electrical cabinet**				
2.14.1	CNC and electrical control panel shall have IP54 or better degree of protection. The control cabinet shall be of reputed make such as RITTAL/ Siemens or of other reputed make conforming to ISO/DIN standards.	Vendor to specify			
2.14.2	The CNC and electrical cabinet of the machine shall be provided with air conditioning equipment consisting of filters, fan dehumidifier and temperature control. The air conditioning system shall be equipped with environment friendly refrigerant.	Vendor to Confirm			
2.14.3	Cabinets shall be sealed adequately to prevent rodent entry	Vendor to Confirm			
2.15	**Electrical & Pneumatic specifications**				
2.15.1	Voltage (415 V ± 10 % AC, 3Phase 3 wire system without neutral)	Vendor to Confirm			
2.15.2	Frequency(50 HZ ± 3%)	Vendor to Confirm			
2.15.3	Total Power required	Vendor to specify			
2.15.4	Panel Earthling	Vendor to specify			
2.15.5	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to Confirm			
2.15.6	Air supply : Piping, manifolds, circuits etc for air supply on the machine shall be provided by bidder. FM, reservoir capacity, air quality and operating pressure required to be mentioned.	Vendor to Confirm			
2.15.7	The compressor, filters, air dryer are in the scope of BHEL. (air pressure 5 to 6 bar)	Vendor to Note			
2.15.8	The party shall confirm satisfactory performance of the machine at the incoming power supply in the range of 415volt ±10 % AC, 3 phase, 50 Hz ±3%. All major 3 phase electrical items shall be of #Phase 415 volt operational only	Vendor to Confirm			
2.15.9	Power source of220V, 5 Amps, multi-pin Indian socket shall be provided in the machine panel as service sockets with facility to switch "ON" while machine is in switch "OFF" condition.	Vendor to Confirm			
2.15.10	The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.	Vendor to Confirm			
2.15.11	No Voltage protection- No voltage protection shall be provided so that the machine shall not start up again by itself when, following an interruption, supply is restored.	Vendor to Confirm			
2.15.12	Short circuit protection- To protect against short circuits due to insulation failure of faulty connections MCB shall be provided for each motor. The rating of the MCB shall be such as to take care of the over current due to motor starting.	Vendor to Confirm			
2.15.13	Over load protection- To prevent motors from overloading, overload protection shall be provided separately for each motor. Three phase motors shall be protected by overload tripping devices on each phase.	Vendor to Confirm			
2.15.14	Single phasing protection- A separate current sensitive delayed action single phasing preventer shall be provided for each motor separately. Overload protection shall not be treated as single phasing preventer.	Vendor to Confirm			
2.16	**SERVO VOLTAGE STABILIZER:**				
2.16.1	Indian make Oil / **Air** Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabiliser output.	Vendor to specify			
2.16.2	Make (To be specified by indentor as per the practice of units.)				
2.16.3	Model & Rating	Vendor to specify			
2.16.4	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to specify			
2.17	**ULTRA ISOLATION TRANSFORMER**				
2.17.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be supplied	Vendor to specify			
2.17.2	Make (NEEL, Aplab or Auto Electric)	Vendor to confirm			
2.17.3	Model and Rating	Vendor to specify			
2.17.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to specify			
2.18	**Lubrication:**				
2.18.1	The machine shall be provided with an automatic lubricating system activated directly by the machine control, for lubrication of spindle assembly, driveways, guide ways and other moving/rotating components. Suitable alarm systems shall be provided to alert / stop the machine in case of failure of the lubricating system.	Vendor to Confirm			
2.18.2	The system shall be provided with interlock to prevent machine operating/starting in the event of the failure of lubrication system.	Vendor to Confirm			
2.18.3	Full details of the lubrication system including the lubricant used, layout, circuits, filtering/pumping system etc shall be provided.	Vendor to Confirm			

2.18.4	Suitable filters capable of filtering chips, dust particles etc. shall be provided. Indicators for showing clogged condition of filters shall be available. The filters shall be indigenously available.	Vendor to Confirm			
2.18.5	If reusable filter cannot be offered, the filter cartridges shall be readily available in India. Source of supply shall be indicated.	Vendor to specify			
2.18.6	Adequate number of filters for 3 years working shall be offered as spare.	Vendor to specify			
2.18.7	Lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine indicating: -	Vendor to Confirm			
2.18.8	Specific location of points on the machine to be oiled lubricated/greased.	Vendor to specify			
2.18.9	Periodicity of lubrication of these points	Vendor to specify			
2.18.10	Periodicity of cleaning filters.	Vendor to specify			
2.18.11	Periodicity of replenishing lubricating oil for the centralized system.	Vendor to specify			
2.18.12	Any other similar relevant information.	Vendor to specify			
2.18.13	Points where manual lubrication is needed shall be separately indicated. Frequency of lubrication shall be also clearly mentioned.	Vendor to specify			
2.18.14	First fill of the lubrication system shall be included in the offer.	Vendor to Confirm			
2.19	**Hydraulic system/Hydrostatic System**				
2.19.1	The System should be centralised.	Vendor to specify			
2.19.2	The Hydraulic / Hydrostatic / Lubrication power pack shall be REXROTH, VICKERS, HAWE,PARKER, ECKERIC, VOGEL, YUKEN, CENLUB or any other international reputed make which is having service facility in India.	Vendor to specify			
2.19.3	Hydraulic power pack may be provided for counterbalance of spindle, clamping/de-clamping of tool, etc. All functions using hydraulics shall be clearly described.	Vendor to specify			
2.19.4	Pressure gauges at all places where pressure has to be inspected.	Vendor to Confirm			
2.19.5	Safety valves for hydraulic/hydrostatic circuit, if relief valve does not fulfil this function.	Vendor to Confirm			
2.19.6	Equipment for checking of temperature in the circuit or in the pump wherever necessary.	Vendor to specify			
2.19.7	Pressure line filter (10 micron size)shall be provided for longer life of hydraulic equipment. All piping used in hydraulic system shall conform to DIN standard.	Vendor to specify			
2.19.8	The filters shall be of reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily available in India. Source of supply in India shall be indicated.	Vendor to Confirm			
2.19.9	Adequate number of filters for 3 years working shall be offered as spare.	Vendor to specify			
2.19.10	Alarm for low oil level to be provided	Vendor to specify			
2.19.11	Level float switches shall be used in the hydraulic tank for indicating safe and danger level of oil and it shall be interlocked with the machine control. Pressure switch for each feed line shall also be provided for controlling the maximum pressure.	Vendor to specify			
2.19.12	The temperature of oil in hydraulic/hydrostatic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.	Vendor to specify			
2.19.13	First fill of the hydraulic/hydrostatic oils used on the machine shall be provided with the machine. The bidders shall indicate brand names of approved oils supplied by various Oil Companies in India.	Vendor to Confirm			
2.19.14	The hydraulic/hydrostatic system and its elements like pump, valve etc. shall be from reputed manufacturers. Stackable valves and manifolds shall be used for ease of assembly, reduced piping and leakage through fittings.	Vendor to specify			
2.19.15	The make of different element of hydraulic systems such as make of pump, tank capacity, motor power in kW, filter size and safety devices, hydraulic equipment, size of tank, maximum pressure and flow rate, sizes of filters etc.shall be furnished along with the offer.	Vendor to specify			
2.20	**Cooling system for milling tool**				
2.20.1	Vendor should provide **Minimum quantity lubrication system (MQL) or Mist cooling system** with aerosol generator for internal and external lubrication/Cooling. The parameters should be CNC controlled based on the requirement of the cutting operation.	Vendor to Confirm			
2.20.2	No of nozzles required to be specified by the vendor.	Vendor to specify			
2.20.3	Pressure gauges shall be provided to individually indicate the compressed air pressure, lubricant pressure (Both before mixing) and final MQL fluid pressure.	Vendor to Confirm			

2.20.4	Vendor shall provide chart showing relationship between parameters like MQL fluid pressure/flow to the type of material/Cutting speed/feed etc for BHEL reference .	Vendor to Confirm			
2.20.5	First fill of the lubricant oil used on the machine shall be provided with the machine. The bidders shall indicate brand names of equivalent approved oils supplied by various Oil Companies in India.	Vendor to specify			
2.20.6	The system should be provided with automatic on/off on program start/stop and while tool changing using M commands.	Vendor to Confirm			
2.20.7	Additional on/off option on operator panel should also be provided	Vendor to Confirm			
3	**Machine Guarding**				
3.1	All moving parts/guide ways/ball screws/lead screws/rack & pinion shall be protected against metallic dust generated during machining by providing suitable covers/bellows wherever necessary.	Vendor to specify			
3.2	Machine shall be provided with guarding and doors for the safe working as per standards in vogue.	Vendor to specify			
3.3	Control system elements shall be enclosed in a dust-proof cabin with air conditioning for protection against dust generated during machining	Vendor to specify			
4	**Safety features:**				
4.1	The machine shall incorporate all safety devices so as to provide complete protection to the operator and machine. Some of the important safety features which shall be available on the machine are mentioned below:				
4.2	Software limit switches are to be provided to restrict the X and Y axis movement, maximum spindle speed. Hardware features shall be available for controlling the above movements.	Vendor to Confirm			
4.3	Improper tool clamping in the spindle nose shall inhibit spindle rotation and error is to be displayed on the control screen.	Vendor to specify			
4.4	The tool shall not get unclamped in the event of power failure or an emergency stop.	Vendor to Confirm			
4.5	Load meter shall be provided to indicate the load on spindle drive motor, so that the load on motor can be maintained with in safe limit.	Vendor to Confirm			
4.6	When any of the machine functions like spindle rotation, X, Y and Z axis movement etc. come to be a stop without being programmed to stop, the machine shall come to stop, and shall be operative only in the manual mode till the fault is rectified.	Vendor to Confirm			
4.7	Suitable interlocks shall be provided to protect the machine in the event of hydraulic oil failure, lubrication failure, pneumatic system failure, fluctuation in voltage and frequency.	Vendor to Confirm			
4.8	The safety features shall include safety devices against overloading of any drive, over travel of any axis and interlock against conflicting motions.	Vendor to Confirm			
4.9	Mushroom type emergency stop shall be provided on the machine, which shall be easily accessible and capable of disabling the machine, drives in case of emergency.	Vendor to Confirm			
4.10	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm			
4.11	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			
4.12	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm			
4.13	Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm			
5	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE :**				
5.1	The Machine shall conform to following factors related to environment :				
	(a) Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm			
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
	(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 confirm			
	(d) No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm			
	(g).The machine shall be capable of working in tropical weather conditions with ambient temperature of max 45°C and RH 95%. All electrical & electronic components shall be tropicalized. Bidder to confirm the suitability of operating machine for such conditions.	Vendor to confirm			

6	**Lighting(Preferably LED)**				
6.1	Integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient lighting of normal intensity shall be provided	Vendor to Confirm			
6.2	The manufacturer must ensure that there is no area of shadow likely to cause nuisance, there is no irritating dazzle and that there are no dangerous stroboscopic effects due to lighting provided by the manufacturer.	Vendor to Confirm			
6.3	Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.	Vendor to Confirm			
6.4	The machine lighting shall be low voltage so as to prevent any hazard to the operator.	Vendor to Confirm			
7	**DIAGNOSTIC SYSTEM**				
7.1	**TELE-DIAGNOSTIC SERVICE :**				
7.1.1	Tele-diagnostic service should be provided through International telephone lines/ Internet/ ISDN along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor.	Vendor to specify			
7.2	**FAULT DIAGNOSTIC SYSTEM:**				
7.2.1	Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include customised auto-diagnostic system with supporting hardware and software which shows detailed cause and remedy for the fault on the display with full video diagnostic help for faults related to mechanical and electrical maintenance.	Vendor to specify			
7.2.2	Help guide should be provided to use both diagnostic systems	Vendor to specify			
8	**PORTABLE DATA INPUT/OUTPUT UNIT**				
8.1	Portable data input/output unit, for bi-directional program & data transfer between the offered unit & supplied CNC system and as well as with standard PC (available at BHEL works), shall be provided with all required interfaces, hardware & software etc..	Vendor to confirm			
9	**AUTO-FOCUS VIDEO CAMERA**				
9.1	Auto focus video camera with zoom facility shall be provided to view tool while machining. Camera eye / lens and connecting cables shall be safe guarded against heat, chips, coolant, dust etc. to maintain clear visibility of the tool in these adverse machining conditions. Suitable sockets for power connection shall be provided for its positions. Clamping details of camera on different tool holders shall be shown on drawings of tool holders.	Vendor to specify			
9.2	The camera shall be capable of viewing the tool tip while machining and also dial gauge readings for job setting. It shall be possible to zoom in / zoom out /swivel the camera to view the dial indicator reading which at a distance of 3m from the camera. The camera shall also be capable of viewing the entire working area of machine. It shall have following parameters:	Vendor to Confirm			
9.2.1	• Exceptional low light sensitivity: 0.0077 Lx	Vendor to Confirm			
9.2.2	• High dynamic range: 120 db to view details of both bright area and dark area simultaneously	Vendor to Confirm			
9.2.3	• Robust and rugged design rated to Industry IP68, type 6P, IK10	Vendor to Confirm			
9.2.4	• Pan and tilt drive mechanism	Vendor to Confirm			
9.2.5	• Intelligent tracking	Vendor to Confirm			
9.3	Dedicated colour monitor 19" (or bigger size) for camera fixed on side/top of main switchboard panel or near operator panel	Vendor to Confirm			
9.4	Necessary software to view and zoom the real time images from the camera has to be installed in the PC and CD of software shall be supplied.	Vendor to Confirm			
10	**LEVELING & ANCHORING SYSTEM**				
10.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes etc should be supplied	Vendor to specify			
11	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE :**				
11.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. For operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm			
11.2	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor to confirm			
12	**Erection**				

12.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.				
12.2	Machine shall be transported in disassembled condition with Sea worthy packing and erected & commissioned at BHEL-Ranipet. Arrangements of Unloading and storage of same at BHEL work will only be under BHEL scope. However Vendor has to depute their representative during unloading at BHEL work for verifying the quantity and conditions of the items inside the container. BHEL will not pay any damarage charge for missing or damaged item during transit.	Vendor to Confirm			
12.3	Manufacturer shall depute/hire necessary skilled engineer/technicians for erection and commissioning.	Vendor to Confirm			
12.4	Bidder shall be solely responsible for arrangement of additional material handling equipment/tools/accessories if necessary at their expenses.	Vendor to Confirm			
12.5	Foundation plan, general arrangement plan showing layout with accessories and indicative drawings shall be enclosed as a part of technical bid.	Vendor to Confirm			
12.6	Detailed foundation design requirements, final foundation drawings, final layout drawings etc shall be provided by the bidder to BHEL well in advance before machine erection.	Vendor to Confirm			
12.7	The Bidder or their agent would be required to carry out a joint check at the consignee's end along with BHEL, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that the joint receipt inspection be done immediately on the receipt of the machine.	Vendor to Confirm			
12.8	The Bidder is responsible for any breakage / damage to the machine or its equipment / accessories / tools holders etc. during erection / commissioning done. Bidder shall rectify / replace such damage parts free of cost at site with original parts.	Vendor to Confirm			
12.9	The scope of foundation as per bidder's drawing is under BHEL scope	Vendor to Confirm			
12.10	Max weight and dimension of individual packings/parts shall be specified.	Vendor to Confirm			
12.11	Vendor representative at BHEL during Erection should be well verse in communicating in English directly or through a translator.	Vendor to Confirm			
13	**Commissioning**				
13.1	Successful proving of machine operations with Milling trials by the supplier shall be considered as part of commissioning. All tests, as mentioned at **clause 20** (Machine Acceptance) shall form part of the commissioning activity.	Vendor to Confirm			
13.2	Laser calibration and proving of accuracy values as per section 14.2 at Bidder's expense	Vendor to Confirm			
13.3	Geometrical accuracy tests proving the values reported during PDI as per section 14.1 at Bidder's expense	Vendor to Confirm			
13.4	Milling test for conforming machine accuracies and performance.	Vendor to Confirm			
13.5	Machining a component (to be identified by BHEL) requiring 3-axis interpolation and contour milling.	Vendor to Confirm			
13.6	Special tools and equipment required for erection and commissioning of the machine and necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance for Mechanical, Electrical, Electronics of the machine, Straight edge, parallelism checking equipment, Test mandrel for checking run-out/taper & alignment and Tools, Tackles, Instruments and other necessary equipment including Laser equipment and other latest optical instrument if any required to carry out all above activities shall be brought by the bidder on returnable basis.	Vendor to Confirm			
13.7	All **Cover Plates / chequered plates** required for the machine and for covering its peripherals including pits, if any, shall be supplied and installed by the bidder.	Vendor to Confirm			
13.8	Damaged surface, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection shall be repainted and merged with the original surrounding paint by the bidder. For this purpose, the bidder shall bring / supply sufficient quantity of touch-up paint of various colours of paint used at Bidder's expense.	Vendor to Confirm			
13.9	Vendor representative at BHEL during Commissioning should be well verse in communicating in English. Otherwise Vendor should hire translator(to speak in English) for the same at his expense)	Vendor to Confirm			
13.10	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on non returnable basis.	Vendor to confirm			
13.11	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm			
13.12	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm			

14	**ACCURACY TESTS:**				
14.1	**GEOMETRICAL ACCURACIES :**				
14.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 8636-2 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be Submitted with the offer.	Vendor to confirm			
14.1.2	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm			
14.2	**MACHINE POSITIONING ACCURACIES & REPEATABILITY:** **Should be measured as per VDI/ DGQ3441/ ISO 230-2 (Latest Revision) using LASER INTERFERO METER.**				
14.2.1	Positioning accuracy in X,Y axis (Pa) per 1000 mm : 0.015 mm or better(for entire Travel)	Vendor to confirm			
14.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm : 0.010 mm or better(for entire Travel)	Vendor to confirm			
14.2.3	Repeatability in X axis (Ps) : 0.02mm or Better	Vendor to Confirm			
14.2.4	Repeatability in y axis (Ps) : 0.02mm or Better	Vendor to Confirm			
14.2.5	Repeatability in Z axis (Ps) : 0.02mm or Better	Vendor to Confirm			
14.2.6	Positioning accuracy over entire traverse in X, Y & Z axis (Pa)	Vendor to specify			
14.2.7	Total positioning error along X, Y & Z axes per 1000 mm (P)	Vendor to specify			
14.2.8	Total positioning error along X, Y & Z axes over entire traverse (P)	Vendor to specify			
14.2.9	Clamping force of Tool and Tool Holders as per global standard.	Vendor to Confirm			
14.2.10	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor to confirm			
15	**SPARES:**				
15.1	Vendor to provide complete list of recommended spares with unit cost, for machine & accessories, for 2 years of continuous operation ,along with specification / type / model, and name & address of the spare supplier. Price fixation for these spares for next two years, to be confirmed by the vendor	Vendor to specify & Confirm			
15.2	Vendor to quote price of recommended spares along with the machine separately.	Vendor to Quote			
15.3	All types of spares for total machine and accessories should be available for 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			
16	**DOCUMENTATION :** **Five sets** of following documents (Hard copies) in English language should be supplied along with the machine	Vendor to confirm			
16.1	Operating manuals of Machine & CNC system	Vendor to confirm			
16.2	Programming Manuals of Machine & CNC system	Vendor to confirm			
16.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical/ Pneumatic/ Coolant/ Hydraulic circuit diagrams etc . All Assembly/ Sub Assembly Drawings shall be supplied with the part list also. Complete details including make, tolerance and precision class of all the critical bearings such as spindle bearings, ball screw support bearings, ball lead screw etc. with replacement procedure and approximate life of these bearings to be furnished.	Vendor to confirm			
16.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm			
16.5	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.	Vendor to confirm			
16.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm			
16.7	Detailed specification of all rubber items and hydraulic tube fittings and hoses.	Vendor to confirm			
16.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.	Vendor to confirm			
16.9	PLC program print-outs with comments in English.	Vendor to confirm			
16.10	PLC program on CD, NC data & PLC data on floppy.	Vendor to confirm			
16.11	Complete back-up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new hard disk.	Vendor to confirm			
16.12	Complete Master List of parts used in the machine shall be submitted by the vendor.	Vendor to confirm			
16.13	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm			
17	**Training**				
17.1.1	Training of two persons for each of the following modules at manufacturer's works. Lodging, fooding and travelling will be under BHEL's scope. Training charges to be borne by Bidder.	Vendor to Confirm			

	a. The programming, operation and basic trouble shooting of the machine.	Vendor to Confirm			
	b. Training on specialised modules like milling programming and advanced maintenance functions.	Vendor to Confirm			
17.1.2	Post commissioning training at BHEL work's for operation & maintenance personnel.	Vendor to Confirm			
17.1.3	Training of three persons for each of the following modules at reputed training centre in India. Lodging, fooding and travelling will be under BHEL's scope. Training charges to be borne by Bidder.	Vendor to Confirm			
	a. The operation and programming of CNC system	Vendor to Confirm			
	b. Maintenance of CNC systems	Vendor to Confirm			
	c. Maintenance of Machine (Mechanical & Electrical)	Vendor to Confirm			
17.1.4	Two weeks training on CAM software by Software supplier, at Vendors expense	Vendor to Confirm			
17.2	**General:**				
17.2.1	Air-fare, boarding & lodging of BHEL Team shall be borne by BHEL.				
17.2.2	Competent, English speaking experts shall be arranged by the vendor during Training for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
17.2.3	Vendor to quote for Training on per man per Day basis within BHEL premises.	Vendor to confirm			
17.2.4	Vendor should commit to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL	Vendor to confirm			
18	**FOUNDATION :**				
18.1	Vendor shall submit the preliminary layout drawing along with the offer. Vendor to submit Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within one month of PO/LOI for BHEL approval. BHEL will approve the drawing within three weeks time from date of submission/clarification. Tentative Soil bearing capacity of BHEL Ranipet is 50KN/sqm. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor (if any), Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. **Note**:- Submission of above drawing should not have any implication on delivery schedule.	Vendor to confirm			
19	**OPERATING CONDITIONS & THERMAL STABILITY**				
19.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 3 Phase 440V (fluctuation ±10%) or single phase 210 V (fluctuation ±10%) Frequency: 50HZ (fluctuation ±3%) Ambient Conditions: Temperature = 5 to 45 degree Celsius Relative Humidity = 95% max. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor to 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 confirm			
19.3	The machine shall be equipped with **refrigeration type cooling system** for cooling lubricating oil, hydraulic oil. The cooling system shall be provided with thermostatic control having thermal sensors and provision of automatic regulation with the reference to the actual temperature of machine main body(spindle bearing)/environmental temperature(machine column) so as to minimise thermal expansion and keep high machining accuracy even during heavy duty continuous machining operations. The temperature control system shall be based on digital system for better accuracy.	Vendor to confirm			
19.4	The cooling system shall be of reputed make conforming to DIN/ISO and provide with environmental friendly refrigerant. The system shall be capable of working in maximum ambient temperature of 45°C, temperature change of 4°C/hour and RH 95%. The bidder shall furnish the details of systems such as make, maximum heat transfer rate, type of refrigerant(must be environmental friendly) used, temperature control logic and temperature sensing probes.	Vendor to specify			

19.5	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. (Confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished)	Vendor to confirm			
19.6	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 confirm			
20	**MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)**	Vendor to confirm			
20.1	**Tests/Activities to be carried out at supplier's works on the machine in the presence of BHEL Team before dispatch :**				
20.1.1	Geometrical accuracies as per test chart.	Vendor to confirm			
20.1.2	Positioning accuracies as per VDI-DGQ/3441	Vendor to confirm			
20.1.3	**Milling test** confirming simultaneous 3 axis machining	Vendor to Confirm			
20.1.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to confirm			
20.1.5	**Demonstration** of all features & options of machine, control system & accessories etc	Vendor to confirm			
20.1.6	**Presentation** of all original certificates, documents, reports, manuals of OEMs of all supplied connected to the machine.	Vendor to confirm			
20.1.7	All necessary tools, instruments and materials for above tests are to the arranged by bidder				
20.1.8	Machining of **test piece as per NAS/AFNOR/ISO**. Test piece will be supplied by Vendor.	Vendor to confirm			
20.2	**Tests/Activities should be carried out at BHEL works while commissioning the machine :**				
20.2.1	Geometrical accuracies as per test chart.	Vendor to confirm			
20.2.2	Positioning accuracies as per VDI-DGQ/3441	Vendor to confirm			
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm			
20.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to confirm			
20.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to confirm			
20.2.6	Machining test piece as per NAS/AFNOR/ISO. Test piece will be supplied by BHEL.	Vendor to confirm			
20.2.7	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm			
20.2.8	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm			
21	**Warranty**				
21.1	12 months from the date of acceptance of the machine.	Vendor to Confirm			
21.2	The bidder shall clearly spell out in the offer the facilities available with him or his agent for providing adequate after-sales service in India during the warranty period. The complete details such as organization for after-sales service, availability of technically competent engineers and warehousing facilities for spares shall be clearly indicated. **Bidders not offering complete servicing/repair facilities in India to ensure quick response to maintenance/servicing calls are not likely to be considered.**	Vendor to Confirm			
21.3	Bidders who are OEM, shall undertake to supply spare parts for a period of expected life of the machine. **Alternatively bidders shall also submit undertaking from OEM for supply of spare parts for a period of expected life of the machine**	Vendor to Confirm			
22	**GENERAL :**				
22.1	Machine Model	Vendor to specify			
22.2	Total connected load (KVA):	Vendor to specify			
22.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify			
22.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm			
22.5	Total weight of the machine	Vendor to specify			
22.6	Weight of heaviest part of machine	Vendor to specify			
22.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify			
22.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify			
22.9	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Table dimensions, Load Capacity, Main Drive Rating, CNC System etc.	Vendor to confirm			
22.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm			

22.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible piping's are essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to specify			
23	**Others**				
23.1	The bidder shall have requisite facilities for manufacture/testing and inspection as per international standards.	Vendor to Confirm			
23.2	Details of the foundation of the company, its financial stability and its turnover shall be provided.	Vendor to specify			
23.3	Consumable & list of deliverables shall be included in scope of supply. In case of foreign suppliers, Indian equivalent of oil, grease & other consumables (supplied along with the machine) shall be mentioned with complete technical specifications, bidder addresses and contact persons details.	Vendor to specify			
23.4	Complete address, contact person, telephone number and fax number of original manufacturer of the equipment.	Vendor to specify			
23.5	The bidders shall provide a comprehensive list of the OEM components used in the machine. The offer shall include the technical brochure indicating clearly the model used for each part / component.	Vendor to specify			
23.6	Technical leaflet and write-up of equipment and CNC system must be furnished by the applicant along with the quotation. Bids without catalogue for the offered machine shall not be considered.	Vendor to Confirm			
23.7	In case there is a mismatch between technical offer and standard catalogue value, BHEL reserve right to chose the final value for the comparison	Vendor to Confirm			
23.8	The manufacturer has to provide a compliance matrix mentioning point by point given in the specification. It will be assumed that points are acceptable to you if not given an objection/clarification on the point. Final specification in the purchase order will be based on the compliance matrix provided by the party and the party have to satisfy all the points in the specification at the time of supply and installation of the machine.	Vendor to Confirm			
23.9	The bid MUST contain clear, direct, required, actual information with respect to the tender specification/clauses. Descriptive data or words viz complied, confirmed are not acceptable for the numerical data. Offers violating these will be treated as rejected.	Vendor to Confirm			
23.10	Relevant proof / supplementary document for the compliances shall be furnished along with the offer. Party have to satisfy all these points in the specification at the time of supply and installation of the machine.	Vendor to Confirm			
23.11	The price bid shall be quoted for basic machine, recommended spares, standard accessories, optional accessories, etc explicitly. Split-up cost details may be inside each section of quoted price. **Optional accessories & recommended spares cost not to be taken for price bid evaluation**.	Vendor to Confirm			
24	**Standard Accessories (Must be supplied along with machine)**				
24.1	HyperMill CAM software (latest version) along with postprocessor with perpetual license.	Vendor to specify			
24.2	CAM software shall have all relevant modules for milling operation by interpolation of 3 axes.	Vendor to specify			
24.3	The supply of the software shall be sourced from India.	Vendor to specify			
24.4	Prove out on a mutually agreed component covering all the features of the machine. Responsibility of proveout lies with Bidder and Software Supplier	Vendor to Confirm			
24.5	Modules to be covered				
24.6	HyperCAD-S- Geometrical Engine (Surface & Curves)	Vendor to Confirm			
24.7	HyperMILLEXPERT :2D, 3D and 3D Advanced Milling Cycles, Drilling Cycles, Multi Axis Machining	Vendor to Confirm			
24.8	HyperMILL MAXX Machining - Roughing (HPC)	Vendor to Confirm			
24.9	Milling	Vendor to Confirm			
24.10	5X Automatic indexing	Vendor to Confirm			
24.11	Cavity Bundle (5X Profile Finishing,5X Z-Level Finishing,5X Equidistant Finishing,5X Rest Machining,5X Freepath Machining,5X Rework)	Vendor to Confirm			
24.12	Surface Bundle (5X ISO Top Milling, 5X Top Milling Multi surfaces, 5X SWARF Cutting, 5X Contouring)	Vendor to Confirm			
24.13	3 Axis Post Processor for indexing & simultaneous	Vendor to Confirm			
24.14	3 Axis Machine Model simulation (with 3D model of the machine)	Vendor to Confirm			
24.15	Installation of all software mentioned in the Scope of Supply are to be installed during on-site training sessions itself	Vendor to Confirm			
24.16	Levelling pads, foundation bolts etc for the machine installation.	Vendor to specify			
24.17	Spindle Test Mandrel				
	a. Type of Mandrel	Vendor to specify			
	b. Length : mm	Vendor to Confirm			

24.18	CAD model of the machine to be provided in STEP format which needed for carrying out thorough machining simulations through CAM software.	Vendor to specify			
24.19	First fill of oil & grease.	Vendor to specify			
24.20	Suitable Workstation for operation of CAM software defined in this section.	Vendor to specify			
24.21	Any relevant accessory pertaining to machinesafe/ operation /maintenance shall also be quoted.	Vendor to specify			
24.22	Machine consumables for 5 years (lubricants). Provide detailed list	Vendor to specify			
24.23	Hydraulic/Pneumatic spares. Please provide detailed list	Vendor to specify			
24.24	Electrical/Electronic spares. Please provide detailed list	Vendor to specify			
24.25	Any other relevant spares with details.	Vendor to specify			
25	**Ultrasonic thickness measurement system (Optional Accessories)**				
25.1	Machine should be provided with an Ultrasonic thickness measurement system integrated with CNC system. The offered system should be capable of measuring the thickness of workpiece at all points on the workpiece surface.	Vendor to specify			
	Note: Vendor has to quote the above system separately. It will not be included in evaluation of the main offer.				
26	**QUALIFYING CONDITIONS :**				
26.1	**a)** Only those vendors (OEMs) should quote who have commissioned in the past **(10) years** (o*n the date of opening of Tender)* at least **two Moving Gantry type 3 axis CNC Router machine** of same or higher sizes (Table dimensions, Axis travel, Max workpiece size) **to Aerospace industries** and capable of achieving machining accuracies as required in proveout component mentioned at **clause no. 20** **b)** The facility referred shall be installed in countries other than from where the facility was manufactured (Except for Indian Manufacturers having manufacturing facilities available in India). The referred facility shall be presently working satisfactorily for more than one years after commissioning (on the date of opening of Tender).References cited from countries within the war zone shall not be considered. c**)** However, such Indian machine tool vendors (OEMs), who do not meet specified qualifying conditions, *can quote* if they have running Collaboration/ Joint Venture/ Joint Working Arrangement for manufacture of Moving Gantry type 3 axis CNC Router machine of same or higher sizes (Table dimensions, Axis travel, Max workpiece size) with foreign machine tool manufacturer , who meets specified qualifying conditions. Such Indian machine tool vendors (OEMs) shall have to submit from their foreign partner a back to back guarantee for satisfactory performance of the offered machine in compliance to all specified tender requirements. d) BHEL reserves the right to accept or reject the OEMs based on the assessment of their technical and financial capability. In respect of Indian vendors (OEMs) against **(b)** above, BHEL reserves the right to accept or reject both the Indian vendors (OEMs) & their Foreign Partners based on the assessment of their technical and financial capability. e) Bidder should have Average annual financial turnover for last three years ending 31.03.2019 as INR 2 crore or equivalent amount.	Vendor to confirm			
26.2	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.				
	1. Name of the customer / company where referred machine is installed.	Vendor to inform			
	2. Complete postal address of the customer.	Vendor to inform			
	3. Month & Year of commissioning	Vendor to inform			
	4.Parameters of machine(s) supplied and application for which the machine is supplied	Vendor to inform			
	5. Name and designation of the contact person of the customer.	Vendor to inform			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
	7. 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			

	8. BHEL reserves the right to verify the information provided by the Vendor for the referred machine at their referred customer's works including machining accuracies. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works .The Travel and Boarding expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	Vendor to accept & confirm			
27.0	**OTHER FEATURES:**				
27.1	**NETWORKING:**				
27.1.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities.				
	a) The machine shall appear as a node in the Entire Network. (Network Neighbourhood)				
	b) The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.				
	c) The program transfer between CNC system and network should also be possible in CNC Mode.				
27.2	**MACHINE MONITORING SYSTEM (MMS) SIGNALS**				
27.2.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.				
	a) Control ON				
	b) Cycle ON				
	c) Spindle Running				
	d) Feed Active (Any of the axes moving)				
	e) M30 (Program Stop)				