

[illegible]

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
<b>1.0</b>	<b>PURPOSE &amp; WORKPIECE MATERIAL</b>		
1.1	Purpose: (Operation/Jobs involved)	<i>Annexure 01</i>	
1.2	Work Piece Material: (Material detail, Hardness etc.)	Annexure 02	
<b>2.0</b>	<b>MACHINE SPECIFICATION</b>		
<b>2.1</b>	<b>MACHINE CONFIGURATION</b>	<i>Annexure 03</i>	
2.1.1	Spindle Orientation (Horizontal or Vertical)	Vertical	
<b>2.2</b>	<b>TABLE :</b>		
2.2.1	Size of Clamping Surface (LxB)	2000x1000	
2.2.2	Max. Weight of Work-piece	2000 kg	
2.2.3	Details of T-Slots: No / Size / Pitch	5x18x125	
<b>2.3</b>	<b>SPINDLE:</b>		
2.3.1	Spindle Diameter	Vendor to specify	
2.3.2	Spindle Motor Power (AC Continuous Duty S1)	21.5 KW	
2.3.3	Spindle Motor Make, Model etc.(Should comply with IEC / IS specifications)	Vendor to specify	
2.3.4	Spindle Bearing Diameters (Radial & Axial)	Vendor to specify	
2.3.5	Taper in Spindle	ISO 50	
2.3.6	Spindle speed (Infinitely variable)	1-4000 rpm	
2.3.7	Detail of speed ranges (Selectable through program)	Vendor to specify	
2.3.8	Range of spindle speed at constant power.	Vendor to specify	
2.3.9	Max Spindle Torque	Vendor to specify	
2.3.10	RPM at which max. permissible torque is available	Vendor to specify	

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2.3.11	Torque/Power/Speed diagram of spindle motor is to be submitted with the offer.	Vendor to specify	
2.3.12	Spindle Orientation	Programmable	
2.3.13	Distance from Spindle Face to Table Top :	Vendor to specify	
	(a)Min:	150mm	
	(b)Max:	950mm	
<b>2.4</b>	<b>TRAVERSES:</b>		
2.4.1	Longitudinal Travel (X-Axis)	2000mm	
2.4.2	Spindle Head Vertical Travel ( Z Axis)	810mm	
2.4.3	Column/ <i>Table</i> Cross Travel (Y-Axis )	810mm	
<b>2.5</b>	<b>FEEDS AND DRIVE SYSTEM:</b>		
2.5.1	Rapid Traverse X-Axis	15000 mm/min	
2.5.2	Rapid Traverse Y-Axis	15000 mm/min	
2.5.3	Rapid Traverse Z-Axis	15000 mm/min	
2.5.4	Feed Rate in X Axis (Infinitely variable)	0-10000 mm/min	
2.5.5	Feed Rate in Y-Axis (Infinitely variable)	0-10000 mm/min	
2.5.6	Feed Rate in Z-Axis (Infinitely variable)	0-10000 mm/min	
2.5.7	Feed drives/motors [AC servo motors] Either Siemens or Fanuc (Indenter to Specify) digital type (detail of model, make, type etc. to be submitted)	Vendor to confirm	
2.5.8	Feed back system for X, Y & Z axes through linear scale of Heidenhein make	Vendor to confirm	
2.5.9	Details of System to ensure zero backlash for the axes	Vendor to furnish	
2.5.10	Mechanism for locking / clamping the axes	Vendor to furnish	
2.5.11	Clamping force of each axes to be furnished	Vendor to specify	
2.5.12	Detail of axes feed mechanism (Details should include informations like diameter of Ball Screws of each axis)	Vendor to furnish	

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2.5.13	All linear traversing axes shall be provided with Steel Telescopic covers of rust resistant material with wipers. Joints of telescopic covers should be so sealed to avoid mixing of coolant and other lubricating oil.	Vendor to confirm	
2.6	<b>CONSTRUCTION:</b>		
2.6.1	Vendor to furnish material, hardness of guideways & constructional details , including explanatory drawings, of various components/ assemblies like Gear Box, Guideways/ slides, Telescopic covers, Accessories, Table, feed transmission system, hydraulic and lubrication system, feed back system etc. of the machine.	Vendor to furnish	
2.6.2	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 furnish	
2.7	<b>AUTOMATIC TOOL CHANGER:</b>		
2.7.1	Type Chain Type / Drum Type	Vendor to specify	
2.7.2	Tool selection method	Random & Shortest Path	
2.7.3	Tool Taper	ISO 50	
2.7.4	Number of Tools in the Magazine	Minimum 16	
2.7.5	Maximum Diameter of Tool: (a) With all Pockets Full: : (b) With adjacent Pockets Empty:	125mm 220mm	
2.7.6	Max Length of Tool	250mm	
2.7.7	Max Weight of Tool	10kg.	
2.7.8	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation	Vendor to specify	

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2.7.9	Tool Change Time (Tool-to-Tool)	5 sec.	
2.7.10	Tool Change Time (Chip-to-Chip)	12 sec.	
2.7.11	The machine shall have manual Tool loading / unloading through push button provided on machine / Auxilliary Hand pendant.	Vendor to confirm	
2.7.12	The spindle taper 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 for manual tool change.	Vendor to confirm	
2.7.13	Auxiliary Control, with suitable interlocks, for manual insertion / withdrawal of tool from the spindle shall be provided.	Vendor to confirm	
2.7.14	One push button for retrieval cycle to be provided to extract a tool trapped anywhere in the ATC cycle.	Vendor to confirm	
2.7.15	The Machine operation should be possible with or without referencing ATC.	Vendor to confirm	
2.7.16	One set of tool holder retention stud equal to Tool magazine capacity shall be provided as standard item with the machine.	Vendor to confirm	
2.7.17	Working of Tool Changer Arm should be explained in details. Full ATC catalogue should be submitted with the offer.	Vendor to furnish	
<b>2.8</b>	<b>OPERATION AND CONTROL SYSTEM:</b>		
<b>2.8.1</b>	<b>OPERATOR'S PANEL:</b>		
2.8.1.1	Fixed / Swiveling type operator's panel having complete CNC and machine control system with 10.4" Color TFT/LCD of required configuration shall be provided on the operators platform. All switches with suitable interlock with table rotation should be within reach of operator of average height (Indian) for easy & safe operation. All displays/indications should also be conveniently placed accordingly. <i>Machine Operator Panel with hard switches for selection of Mode, Axes, Feed/Spindle over-ride, Direction to be provided.</i> Layout showing complete details should be submitted.	Vendor to furnish	

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<b>2.8.2</b>	<b>CNC SYSTEM &amp; FEATURES :</b>		
2.8.2.1	Make : Fanuc / Siemens.	<i>Vendor to specify</i>	
2.8.2.2	Type : <i>Digital</i> based latest version	Vendor to specify	
2.8.2.3	Model: Seimens 840D with 611D drives/ Fanuc 18 i If Seimens then should have NCU572.4,OP10C,PCU50 (Latest version, as available at the time of ordering should be supplied)	Vendor to specify	
2.8.2.4	Details of Standard features	Vendor to specify	
2.8.2.5	Details of optional features, recommended by vendor.	Vendor to specify	
2.8.2.6	Details of other optional features which are to be selected by indentor	Vendor to specify	
2.8.2.7	The system should have full alphanumeric keyboard, TFT colour display(10.4" or more), additional draw-out type Qwerty Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, network ready with LAN, electronic hand wheels for all axes,Hard disk of sufficient capacity ( <b>Largest size available at the time of order shall be supplied</b> ), Static graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor)	Vendor to specify	
2.8.2.8	Provision for automatic safe shut down of CNC Control in case of Power Failure	Vendor to specify	
<b>2.8.3</b>	<b>MANUAL CONTROL:</b>		
2.8.3.1	Complete manual control of machine with required switches/ keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, table/ spindle speed, cutting feed on/off, display of axis position values etc. for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagrams/ sketches witches for switches/ keys provided on operator's pendent should be submitted.	Vendor to confirm	

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<b>2.8.4</b>	<b>HAND HELD UNIT:</b>		
2.8.4.1	Hand Held unit, Type B-MPI of Siemens make or equivalent alongwith sufficient length of interfacing cable is to be offered with complete details.	Vendor to confirm	
<b>2.8.5</b>	<b>UPS FOR CNC SYSTEM:</b>		
2.8.5.1	UPS of 120 minutes for CNC system with inbuilt cooling and charge status display (Battery charging /discharging time should be specified by vendor)	Vendor to confirm	
<b>2.9</b>	<b>MACHINE LIGHTS:</b>		
2.9.1	Machine Lights for sufficient illumination of complete working area should be provided for clear visibility.	Vendor to confirm	
2.9.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to confirm	
2.9.3	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to confirm	
2.9.4	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm	
<b>2.10</b>	<b>AIRCONDITIONERS:</b>		
2.10.1	Air Conditioners with Dehumidifiers of suitable / sufficient capacity should be provided for all Electrical / Electronic Panels / Cabinets considering specified ambient conditions. Detailed specifications of the same to be submitted.	Vendor to confirm	
<b>2.11</b>	<b>HYDRAULIC SYSTEM : ( If required )</b>		
	<b>Details should be submitted by the vendor</b>		
2.11.1	System should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to confirm	
2.11.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to confirm	
2.11.3	Filtration System	Vendor to specify	

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2.11.4	Failure indication	Vendor to specify	
2.11.5	Automatic shut off provision (Details to be submitted)	Vendor to confirm	
2.11.6	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. at a temperature not exceeding 40 deg C irrespective of the ambient conditions. Complete details should be submitted	Vendor to confirm	
2.11.7	Hydraulic pump capacity (flow / pressure)	Vendor to specify	
2.11.8	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to confirm	
2.11.9	<b>First filling of all required oil &amp; grease etc.</b> should be supplied by vendor. Indigenous (Indian) source, or Indian Equivalent, and specifications of oils/ greases also should be provided by the vendor.	Vendor to confirm	
<b>2.12</b>	<b>COOLANT SYSTEM :</b>		
2.12.1	Coolant System with all accessories for following variants shall be provided. Selection of the	Vendor to confirm	
	a) Recirculating Type Flood Coolant System through adjustable trajectory multiple nozzles around the spindle	Vendor to confirm	
	b) High Pressure Coolant through Spindle	Vendor to confirm	
2.12.2	All attachments, tool holders, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to confirm	
2.12.3	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 confirm	
2.12.4	<b>Coolant Filtration System:</b> Recirculating type coolant system with Cartridge Type Filtration System and magnetic separator.	Vendor to confirm	
2.12.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted.	Vendor to furnish	
2.12.6	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 pressure.	Vendor to confirm	



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2.12.7	Coolant Tank Capacity	Vendor to confirm	
2.12.8	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 confirm	
2.12.9	Coolant pump and motor details for all variants	Vendor to specify	
2.12.10	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm	
<b>2.13</b>	<b>ELECTRICAL:</b>		
2.13.1	415V + 10% / -10%, 50HZ +/-3 HZ, 3 Phase AC (3 wire system <b>with out neutral</b> ) Power Supply Voltage will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm	
2.13.2	<b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized	Vendor to confirm	
2.13.3	All electrical & electronic control cabinets & panels should be dust and rodent proof	Vendor to confirm	
2.13.4	All electrical components should be mounted on DIN Rail	Vendor to confirm	
2.13.5	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 confirm	
2.13.6	Motors shall conform to IEC or Indian Standards	Vendor to confirm	
2.13.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm	

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2.13.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
2.13.9	In-cycle hour counter with reset facility.	Vendor to confirm	
2.14	<b>SAFETY ARRANGEMENTS:</b>		
	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
	1. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.		
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.		
	3. All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.		
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.		
	5. Emergency Switches at suitable locations as per International Norms are to be provided.		
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.		

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2.15	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b> The Machine shall conform to following factors related to environment : (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 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.		
	(c) There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.		
	(d) No hazardous chemicals shall be required to be used in the machine.		
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.		
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.		
3.0	<b>CHIP CONVEYOR:</b>		
3.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on the floor, should be provided at the side of the machine. Two chip bins of appropriate size of Indian make, with wheels and handle for movement, should also be supplied.	Vendor to specify	
3.2	Chip conveyor to remove scrap generated by drilling, boring and milling mainly of mild steel	Vendor to specify	
3.3	Width of conveyor	Vendor to specify	
3.4	Elevation of chip conveyor for chip bin	Vendor to specify	

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3.5	Material of chip conveyor (to be rust resistant)	Vendor to specify	
3.6	Provision for smooth flow of chips to the conveyor.	Vendor to specify	
3.7	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to confirm	
3.8	Layout showing location of chip conveyor should be submitted.	Vendor to confirm	
<b>4.0</b>	<b>SERVO STABILIZER:</b>		
4.1	Indian make Oil / Air Cooled Servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc. with no undesirable Harmonics in the stabiliser output.	Vendor to confirm	
4.2	Make (To be specified by indentor as per the practice of units.)	M/s NEEL/ reputed make	
4.3	Model & Rating	Vendor to specify	
4.4	Spares Package for the Voltage Stabiliser for 2 years working should also be offered.	Vendor to specify	
4.5	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to furnish	
<b>5.0</b>	<b>ULTRA ISOLATION TRANSFORMER</b>		
5.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc.	Vendor to confirm	
5.2	Make (To be specified by indentor as per the practice of units.)	M/s NEEL/ reputed make	
5.3	Model & Rating	Vendor to specify	
5.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to specify	
5.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to furnish	

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6.0	<b>PNEUMATIC SYSTEM: ( If required )</b>		
6.1	<b>AIR COMPRESSOR: If required pressure is more than 4 bar</b>		
6.1.1	Independent Air Compressor (of reputed Indian make) with refrigerated type Dryer & Filter of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure (to be specified by indenter) could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to specify	
6.1.2	Make & Model of Air Compressor	Vendor to specify	
6.1.3	Make & Model of Refrigerated Air Dryer	Vendor to specify	
6.1.4	Capacity (Flow, Pressure & KW)	Vendor to specify	
6.2	<b>COMPRESSED AIR POINTS:</b>		
6.2.1	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	Vendor to confirm	
7.0	<b>LEVELLING &amp; ANCHORING SYSTEM :</b>		
7.1	Complete anchoring system including foundation bolts,anchoring materials,fixators,leveling shoes etc should be supplied		
8.0	<b>TOOLS FOR ERECTION,OPERATION &amp; MAINTENANCE</b>		
8.1	Special Tools and equipment required for erection and 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.		
8.2	Test Mandrel for checking run-out/taper & alignment should be supplied,		
9.0	<b>ACCESSORIES :</b>		
9.1	Centring Device (Hole & Edge)	Vendor to confirm	
9.2	Full enclosure for the machine	Vendor to confirm	

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9.3	Fume/mist extractor for fumes generated by m/c	Vendor to confirm	
<b>10.0</b>	<b>SPARES:</b>		
10.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares:	Vendor to furnish	
	<b>a) Mechanical &amp; Hydraulic Spares:</b> All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to furnish	
	<b>b) Electrical /Electronic / CNC Spares:</b> All types of Proximity Switches, Push Buttons, Indicating Lamps, Encoders, Scanning Heads for Linear Scales, PCV 50, MCP483C, NCU572.4, Operator's panel with Display Unit, I/O Cards for PLC, Dual axis control card of drives, dual axis power card for drives ( 2 X 50A ) one each	Vendor to furnish	
10.2	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 them in advance, if required	Vendor to furnish	
10.3	Recommended set of spares for all attachments are to be offered with details.	Vendor to furnish	
10.4	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to furnish	
<b>11.0</b>	<b>DOCUMENTATION :</b> Five sets of following documents (Hard copies) in English language should be supplied along with the machine	Vendor to confirm	
11.1	Operating manuals of Machine & CNC system		
11.2	Programming Manuals of Machine & CNC system		

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11.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also		
11.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.		
11.5	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.		
11.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.		
11.7	Detailed specification of all rubber items and hydraulic/lube fittings		
11.8	Operating Manuals, Maintenance Manuals & Catalogues for Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.		
11.9	PLC program print-outs with comments in English.		
11.10	PLC program on CD, NC data & PLC data on CD.		
11.11	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.		
11.12	Complete Master List of parts used in the machine shall be submitted by the vendor.		
11.13	One additional set of all the above documentation on CD ROM, wherever possible.		
12.0	TRAINING		

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12.1	<p>4 BHEL Persons should be trained at supplier's Works for mutually agreed period in the area of</p> <p>(a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems &amp; supplied accessories etc.</p> <p>(b) Electrical, Electronic &amp; CNC maintenance for machine &amp; other supplied equipments</p> <p>(c) Mechanical &amp; Hydraulic maintenance of the machine &amp; other supplied equipments</p> <p>(d) Operation of the machine &amp; other supplied equipments.</p>	Vendor to confirm	
12.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.		
12.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm	
12.4	Vendor to quote for training on man / week basis	Vendor to confirm	
12.5	Vendor should commit to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL	Vendor to confirm	
<b>13.0</b>	<b>FOUNDATION :</b>		
13.1	<p>Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. whichever is earlier. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin &amp; any other accessories. BHEL shall construct complete foundation for the machine. 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.</p>	Vendor to confirm	



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<b>14.0</b>	<b>ERECTION &amp; COMMISSIONING</b>		
14.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm	
14.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to confirm	
14.3	All tests, as mentioned at <b>clause 17</b> (Machine Acceptance) shall form part of the commissioning activity.	Vendor to confirm	
14.4	Test mandrel for checking run-out/taper & alignment should be supplied	Vendor to confirm	
14.5	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier. .	Vendor to confirm	
14.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm	
14.7	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates should be sourced from India	Vendor to confirm	
14.8	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 to confirm	
14.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
14.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm	

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15.0	<b>ACCURACY TESTS:</b>		
15.1	<b>GEOMETRICAL ACCURACIES :</b>		
15.1.1	Submit test chart for all accuracies as per DIN 8609/ ISO 10791 standard or equivalent applicable standard.	Vendor to furnish	
15.1.2	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at supplier's works and during erection & commissioning at BHEL works.	Vendor to confirm	
15.2	<b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.</b>		
15.2.1	Positioning accuracy in X / Y axis (Pa) per 1000 mm	0.02 mm	
15.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	0.015 mm	
15.2.3	Repeatability in X / Y axis (Ps)	0.01mm	
15.2.4	Repeatability in Z axis (Ps)	0.01mm	
15.2.5	Positioning accuracy over entire traverse in X / Y axis (Pa)	0.02 mm	
15.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	0.02 mm	
16.0	<b>AMBIENT CONDITIONS &amp; THERMAL STABILITY :</b>		
16.1	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: No. of phases = 3 Voltage: 415 V - 10%, +10% Frequency: 50 Hz +3%, - 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	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
16.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition. Max. temperature variation is up to 25 deg Celsius in 24 hours.(Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same to be furnished by him)	Vendor to confirm	
16.3	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. (Confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished)	Vendor to confirm	
17.0	<b>MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)</b>	Should be accepted & confirmed by Vendor	
17.1	<b>Tests/Activities should be carried out at supplier's works on the machine before dispatch :</b>		
17.1.1	Geometrical accuracies as per test chart.		
17.1.2	Positioning accuracies as per VDI-DGQ/3441		
17.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during		
17.1.4	Demonstration of all features of the machine, control system & accessories		
17.1.5	Machining of <b>test piece as per NAS/AFNOR/ISO</b> . Vendor to supply test piece and tooling for it's machining		
17.1.6	Machining of proveout component at vendor's works (if required by idantor). The required tooling shall be supplied by Vendor.		
17.2	<b>Tests/Activities should be carried out at BHEL works while commissioning the machine :</b>		
17.2.1	Geometrical accuracies as per test chart.		
17.2.2	Positioning accuracies as per VDI-DGQ/3441		
17.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
17.2.4	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.		
17.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine		
17.2.6	Two weeks supervision of independent operation of machine by BHEL after Tests & demonstration mentioned at 17.2.3 to 17.2.5		
17.2.7	Machining test piece as per NAS/AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.		
17.2.8	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works		
17.2.9	Demonstration by actual use of all supplied attachments and accessories to their full capacity.		
<b>18.0</b>	<b>PACKING:</b>		
18.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
<b>19.0</b>	<b>GUARANTEE :</b>		
19.1	24 months from the date of acceptance of the machine.	Vendor to confirm	
<b>20.0</b>	<b>GENERAL :</b>		
20.1	Machine Model	Vendor to specify	
20.2	Total connected load (KVA):	Vendor to specify	
20.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
20.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm	

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20.5	Total weight of the machine	Vendor to specify	
20.6	Weight of heaviest part of machine	Vendor to specify	
20.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify	
20.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
20.9	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 size, Spindle power, Load Capacity, Max job Envelope, CNC System etc	Vendor to furnish	
20.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to furnish	
20.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All pipes required for the same shall be included in the standard scope of the machine.	Vendor to specify	
21.0	<b>OTHER FEATURES:</b>		
21.1	Networking: Machine should have necessary hardware & software for interfacing with gigabit Ethernet local Area Networkwith 100MB/sec through UTP cables for NC programme & other related data transfer. This network to be connected to widw area network /Internet. The networking shall 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 & paste provided sharing access is allowed between any PC and the machine across the network c) The programme transfer between CNC system and network should also be possible in CNC mode	Vendor to specify	
21.2	<b>MACHINE MONITORING SYSTEMS ( MMS ) SIGNALS</b>		
21.2.1	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 sepaately		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
	a) Control ON		
	b) Cycle ON		
	Spindle running		
	Feed active ( any of the axes moving )		
	M30 ( programme stop )		
<b>22.0</b>	<b>REFERENCE LIST / QUALIFYING CONDITIONS :</b>		
22.1	Only those vendors, who have supplied and commissioned at least one CNC Vertical Machining Center with Table size 1450x 630 mm or higher,spindle power 11.0 kw or higher & job envelope 1200x500x600 mm or higher for similar applications in the past ten years and such machine is presently working satisfactorily for more than one year (more than six months if supplied to BHEL) after commissioning should quote. The following information should be submitted by the vendor about the companies where similar machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to confirm	
	1. Name of customer/company where similar machine is installed.		
	2. Complete postal address of the customer.		
	3. Year of commissioning.		
	4. Application for which the machine is supplied		
	5. Name and designation of the contact person of the customer.		
	6. Phone, FAX no.& email address of contact person of customer.		
	7. Performance certificate from the customers regarding satisfactory performance of machine supplied to them		