

<b>BHARAT HEAVY ELECTRICALS LIMITED</b>		<b>Indent No. :</b> C / 3991 /8/3969/T
<b>UNIT'S ADDRESS:</b> HEEP, RANIPUR		<b>Enquiry No. :</b>
		<b>Due Date :</b>
		<b>Supplier Qtn. No.:</b>
<b>CONTACT PERSON FROM PURCHASE DEPTT.:</b> <b>NAME: MR. A.SANYAL</b> <b>DESIGNATION: DGM (PPX-CAP)</b> <b>PHONE NO.: 0091 - 1334 - 285291</b> <b>E-MAIL: asanyal@bhelhwr.co.in</b> <b>FAX NO. : 0091 - 1334 - 226462</b>		<b>Date :</b>

**SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR**  
**CNC VERTICAL MILLING MACHINE WITH DIGITIZING FACILITY (Qty= 2 Nos)**

**NOTE :-**

1. Vendor(OEM) must submit complete information against clause at Sl.No. 5.0 (Qualifying condition)The offer, complying this clause, would only be considered.(OEM : Original Equipment Manufacturer)
2. The vendor should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be 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 :****ADDRESS OF THE INDIAN AGENT(S) :****TELEPHONE NOS.:****TELEPHONE NOS.:****FAX NOS.:****FAX NOS.:****E-MAIL ADDRESS :****E-MAIL ADDRESS :**

**SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC VERTICAL MILLING MACHINE WITH DIGITIZING FACILITY AS PER SPECIFICATIONS MENTIONED BELOW : No of Machines : 2 Nos**

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.0	<b>PURPOSE &amp; WORKPIECE MATERIAL</b>				
1.1	<b>Purpose:</b> The CNC Vertical Milling Machine, with digitising facility shall be required to mill the internal and external fillets in 3-D mode, milling of inlet and exit edges & tip thinning of Low Pressure blades of various sizes of Steam Turbines of various ratings, finish and accuracy. <b>Work Piece material:</b> Generally the blade material is made of high temperature and creep resistant alloy steel like X20Cr13, X10CrNiMoV1, X9CrMoVNbN11.1 and X5CrNiCuNb 16-4 having tensile strength of about 1050 N/mm <sup>2</sup> and hardness about 350 in HB30. The machine should be capable of machining still tougher material if required.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.1.1	<b>MACHINE CONFIGURATION:</b> The Machine shall be of Bridge/Bed Type with Integral Orthogonal/Universal Automatic CNC Indexable Head and having high rigidity, Cross Carriage, Vertical Slide with Cast iron multi ribbed structure & LM Roller guides along with spindle mounted digitising facility.	Vendor to accept & confirm			
1.2	<b>Technical Specification:</b>				
1.2.1	Longitudinal X Axis:	2500 mm or more			
1.2.2	Cross Transverse Y Axis:	1400 mm or more			
1.2.3	Vertical travel Axis Z:	750 mm or more			
1.2.3.4	Rapid Feed (Infinitely Variable) of all Axes	12 meters/minute or more			
1.3	<b>TABLE</b>				
1.3.1	Clamping Surface:	3200 mm X 1100 mm or more			
1.3.2	Load carrying capacity of Table:	3000 Kg. or more			
1.3.3	A. The table top should be provided with longitudinal T-slots at suitable pitch. The No, size, pitch and T-Slot tolerance is to be specified in the technical offer. (DIN Standard) B. Table top sketch to be provided along with the offer	Vendor to confirm and inform technical details.			
1.3.4	Clamping Force	Vendor to intimate			
1.4	<b>Integral Orthogonal/ Universal Automatic CNC Indexable Head</b>	Vendor to offer			
1.4.1	Spindle position	Vertical			
1.4.2	No.of Spindles	1			
1.4.3	Spindle taper	ISO 50			
1.4.4	Maximum Spindle drive power (S6- 60% Duty Cycle)	35 KW or more			
1.4.5	Maximum Spindle drive power (S1- 100% Duty Cycle)	25 KW or more			
1.4.6	Spindle speed (Infinitely variable)	40 or less to 4000 or more RPM.			
1.4.7	No. of speed ranges	Vendor to specify			
1.4.8	Max torque on the spindle (S6- 60% Duty Cycle)	1000 Nm or more			
1.4.9	Max torque on the spindle (Continuous Power)	750 Nm or more			
1.4.10	Indexing Resolution for A & C Axes	1 Deg or less			
1.4.11	Distance -Spindle face to table top(max)	Vendor to intimate			
1.4.12	Mechanism for Locking / Clamping of the Rotary Axes	Vendor to intimate			
1.4.13	Clamping Force of each axes to be furnished	Vendor to intimate			
1.4.14	Spindle Motor make , model etc (Should comply with IEC / IS specifications)	Vendor to intimate			
1.4.15	Torque/Power-Speed characteristics diagram to be submitted by the vendor.	Vendor to submit			
1.4.16	Vendor shall provide a suitable customised program/software on the offered CNC system/PC based for indexing the head at any desired angle.	Vendor to confirm			
1.5	<b>FEEDS AND DRIVE SYSTEM</b>				
1.5.1	Feed Rate in X-Axis ( Infinitely variable)	1 to 12,000 mm/min or more			
1.5.2	Feed Rate in Y-Axis ( Infinitely variable)	1 to 12,000 mm/min or more			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.5.3	Feed Rate in Z-Axis ( Infinitely variable)	1 to 12,000 mm/min or more			
1.5.4	Feed Rate for Digitizing ( Infinitely variable)	1 to 4000mm/min or more			
1.5.5	Feed drives/ motors (AC Servo motors) : Seimens make , Digital type (Detail of motor , make , type etc to be submitted)	Vendor to intimate			
1.5.6	Feed back system for X, Y, Z axes : Heidenhain Linear scales ( 1Vpp-coded Scale)	Vendor to intimate			
1.5.7	Feedback system for Rotary axes : Heidenhein Rotary encoder (Details to be submitted)	Vendor to intimate			
1.5.8	Details of system to ensure zero backlash for the axes	Vendor to intimate			
1.5.9	All linear axes shall be provided with suitable covers of rust resistant material with wipers. Joints of telescopic covers should be so sealed to avoid coolant and other lubricating oil seepage.	Vendor to confirm			
1.5.10	Vendor to furnish material , hardness of guidways & constructional details , including explanatory drawings of various components/ assemblies like gear box , spindle assembly, Guideways / Slides , covers, Accessories , Table , Feed transmission system , Hydraulic and Lubrication system , Coolant system etc. of the machine.	Vendor to submit			
1.60	<b>Tool Change - Manual</b>	Vendor to confirm			
1.70	<b>COOLANT SYSTEM</b>				
1.7.1	Coolant system with all accessories shall be provided. Selection of all variants shall be through program and push buttons as well.	Vendor to confirm			
1.7.2.a	Recirculating type External Coolant system through adjustable trajectory multiple nozzle around the spindle.	Vendor to confirm			
1.7.3	The length of the External coolant nozzle / External coolant pressure / External coolant flow rate should be such that it should be sufficient to flood the tool cutting tip while cutting. Vendor to intimate the coolant pressure, flow rate etc.	Vendor to Submit details			
1.7.4	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			
1.7.5	Coolant Filtration System: It should comprise of coolant tank, coolant pump, flushing pump, oil separator etc.& shall be offered as part of basic machine. The Technical details including make , model to be furnished with the offer.	Vendor to confirm and intimate: make , model no.and its technical details.			
1.7.6	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor to confirm and furnish details			
1.7.7	Coolant Tank Capacity	Vendor to intimate			
1.7.8	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			
1.8	<b>CHIP CONVEYOR SYSTEM</b>				
1.8.1	Suitable Chip conveyor to discharge chips to BHEL Centralised Conveyor System				
1.8.2	Following technical details of chip conveyor shall be submitted :				
	Type of conveyor	Vendor to inform			
1.8.2.1	Width of conveyor	Vendor to inform			
1.8.2.2	Elevation of chip conveyor for chip bin	Vendor to inform			
1.8.2.3	Material of chip conveyor (should be rust resistant)	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.8.2.4	In case configuration of Chip Conveyor is different than specified above details of same may be furnished.				
1.9	<b>Spindle Cooling System</b>				
1.9.1	Closed loop water-oil Cooling System for the milling spindle, etc. shall be offered, if required for working in centrally air conditioned environment having temperature of about 30 degree Celsius. Following details of compressor cooling system shall be submitted with the offer:	Vendor to confirm			
1.9.2	Type of Refrigerant	Vendor to inform			
1.9.3	Refrigerating Capacity	Vendor to inform			
1.9.4	Cooling Medium	Vendor to inform			
1.9.5	Following information shall also be supplied with the offer for applicable items: Type of Refrigeration/ Chiller unit. Capacity of the chiller unit. Type of compressor with complete specifications. Type of Thermostatic Expansion Valve with complete specifications. Fan size and flow in CFM (cubic feet meter ) of the Condenser unit. Specifications of the Evaporator Unit (Width Plate type/ Coil type) Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2. Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to inform			
1.10	<b>AIR CONDITIONERS:</b>				
1.10.1	Air Conditioners with Dehumidifiers of suitable/ sufficient capacity and proper drainage pipes for condensate, are to be provided, if required for operating the machine under ambient conditions mentioned in clause 1.35.2, for all Electrical/ Electronic Panels/ Cabinets including operator's Panel considering specified ambient conditions. Detailed specifications of the same are to be submitted. The Air Conditioners are not to be mounted on top of the panels.	Vendor to offer and submit details			
1.10.2	Type of Refrigeration/ Chiller unit. Vendor to confirm to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine:Capacity of the chiller unit. Type of compressor with complete specifications. Type of Thermostatic Expansion Valve with complete specifications. Fan size and flow in CFM (cubic feet meter ) of the Condenser unit. Specifications of the Evaporator Unit (Width Plate type/ Coil type) Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2. Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to confirm			
1.11	<b>Machine Enclosure with Access Door</b>				
	Machine shall have enclosure with interlocked doors in workpiece area .Enclosure shall have large polycarbonated , window for viewing the job and ongoing process. The sliding door positioned in front of operator allowing access to the work area which needs to be electrically interlocked.Gaurding on all around four sides.	Vendor to confirm and intimate technical details.			

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1.12	<b>Machine Lights</b>				
1.12.1	Machine light (Halogen light) for illumination of complete encapsulated working area for clear visibility	Vendor to confirm			
1.12.2	Tube lights in electrical cabinets for maintenance purpose	Vendor to confirm			
1.12.3	4 coloured signal light mounted on top of machine displaying operational status of the machine and shall be visible from distance.	Vendor to confirm			
1.13	<b>Electrical Control Cabinet &amp; Operator's Pendant</b>				
	Electrical Control Cabinet & Operator's Pendant shall be fitted with proper cooling arrangement for working in a centralized air-conditioned hall having temperature up to 30 degree Celsius. Electrical cabinet shall be provided with a 220V, 5 Amp socket for maintenance purpose.	Vendor to confirm			
1.14	<b>Hand held unit</b>				
	Hand Held Pendant with all relevant features such as Axis Selection Switch, Direction Selection, Emergency Stop, Tool Clamp/Unclamp, Hand Wheel (Manual Pulse Generator) along with sufficient length of interfacing cable shall be offered.	Vendor to inform with details			
1.16	<b>OTHER TECHNICAL FEATURES</b>				
	The offered machine should have following features to facilitate working/extended life of the machine:				
1.16.1	All the traversing axis shall have direct measuring type closed loop feed back system for positioning and measurement.	Vendor to confirm			
1.16.2	In Cycle hour counter with reset facility.	Vendor to confirm			
1.16.3	Coolant flushing gun with sufficient length of pipe for manual cleaning of workpiece.	Vendor to confirm			
1.16.4	Compressed air point with manually operated ON/OFF valve and flexible piping for work piece/ pallet cleaning.	Vendor to confirm			
1.16.5	Percentage type spindle load meter on CNC screen	Vendor to confirm			
1.16.6	Centralized Automatic Lubrication System for lubrication of all moving and rotating parts. It should have system of alarm/ interlock in case of lubrication failure.	Vendor to confirm			
1.16.7	Air filter, Regulator & Lubricator (FLR) and Air Dryer unit of appropriate capacity to arrest moisture, other suspended particle etc. for providing dry and cleans air for machine operation.	Vendor to confirm			
1.16.8	One set of tools for service and maintenance.	Vendor to confirm			
1.16.9	First filling of all required Oils , lubricants, & Grease etc. for the machine and auxiliary system. to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor. The vendor shall also submit estimated annual consumption of all these items on 7000 hours per year working basis.	Vendor to confirm			
1.16.10	The Machine should have provision for programmable/manual hydraulic clamping of fixtures mounted on the table. The clamping pressure should be adjustable manually/ through program. ( This feature will be essentially required for Machining of Blades) Refer point no 1.34 for details. Vendor to intimate Hydraulic pressure range for clamping	Vendor to confirm and intimate			
1.16.11	Machine should have provision to switch from direct position feed back system to indirect position feed back system (built in motor encoder )through PLC required for service purpose only.	Vendor to confirm			
1.16.12	One set of special maintenance/ calibration tools for geometrical accuracy tests including calibration mandrel, granite block cylinder dial gauges, Fluke multimeter and other special tools as required for service and maintenance of the machine shall be offered. Also, tools required for accuracy tests after replacement of spindle.	Vendor to confirm			
1.17	<b>HYDRAULIC SYSTEM : Details should be Submitted by the Vendor</b>				

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1.17.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank location to be specified.	Vendor to offer and confirm			
1.17.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
1.17.3	Filtration System: Sufficient no. of filters ( with electric clogging indicator and alarm on PLC ) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hydac.	Vendor to offer and confirm			
1.17.4	Failure indication	Vendor to offer			
1.17.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
1.17.6	Hydraulic pump capacity ( flow / pressure ) to be intimated.	Vendor to inform			
1.17.7	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.	Vendor to confirm & offer			
1.18	<b>CNC SYSTEM</b>				
1.18.1	The machine shall be equipped with Sinumerik 840D / Fanuc / Fidia C10 CNC System with latest Windows XP based operating system. The CNC System will have, preferably 2 separate CPUs one for workstation (Intel Pentium-IV 2.8 GHz or higher at the time of order) & other for machine operation ( min 400MHz or higher). It should consist of Operator's panel having 15 inches TFT colour display, suitable machine control panel and Integrated Key Board with mouse. All standard features should be listed in technical offer. Also all recommended optional features of CNC system shall be offered and item wise price be indicated in commercial offer.	Vendor to confirm			
1.18.2	The CNC System should have the following features:				
1.18.2.1	Hard disk of 80GB (easily replaceable) or of highest rating available at the time of submission of order	Vendor to confirm			
1.18.2.2	1GB DDR RAM or of highest rating available at the time of order.	Vendor to confirm			
1.18.2.3	RS232-C interface, 4 USB ports, RJ45 100MBPS Ethernet Port and other standard port(s) for each machine.	Vendor to confirm			
1.18.2.4	2GB PEN DRIVE - 2 Nos. with each machine.	Vendor to confirm			
1.18.2.5	CD R/W Drive - 1 No. with each machine.	Vendor to confirm			
1.18.2.6	Circular interpolation & Helical interpolation	Vendor to confirm			
1.18.2.7	Auto Feed reduction for inner corners	Vendor to confirm			
1.18.2.8	Digitizing, Individual axis scaling, Parametric programming & Program Error indication	Vendor to confirm			
1.18.2.9	Rotation in Space and Plane	Vendor to confirm			
1.18.2.10	User Accessible Variable Look Ahead of 200mm or more	Vendor to confirm			
1.18.2.11	User parameter/tool data save /restoring facility	Vendor to confirm			
1.18.2.12	Multiple M-codes in a single block	Vendor to confirm			
1.18.2.13	Canned cycles (drilling, milling, tapping & boring)	Vendor to confirm			
1.18.2.14	Dry run, Single block,MDI, Auto, Skip function operation	Vendor to confirm			
1.18.2.15	Two dimensional tool length and radius compensation	Vendor to confirm			
1.18.2.16	Mirror Image function	Vendor to confirm			
1.18.2.17	Program shift through parameter as well as by hand wheel during program execution for each Axes	Vendor to confirm			
1.18.2.18	Axes swapping Function	Vendor to confirm			
1.18.2.19	Graphic Simulation	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.18.2.20	Machine running time display	Vendor to confirm			
1.18.2.21	Virtual quill for movement along Tool direction.	Vendor to confirm			
1.18.2.22	Locking of any Axes in program and manual movements of the same axis during program execution.	Vendor to confirm			
1.18.2.23	1 KVA on-line UPS to ensure automatic unattended shutdown of the system in case of power failure or even in normal machine shutdown.	Vendor to confirm			
1.19	<b>DIAGNOSTIC FEATURES FOR CNC System</b>				
1.19.1	Pitch error, backlash, beam sag compensation & variable backlash compensation	Vendor to confirm			
1.19.2	Display of input/output, memory flag, timers, parameters used in plc on same page	Vendor to confirm			
1.19.3	PLC message help on-line with the display of related information like i/o hardware position, cable no, remedy with photograph of related machine part	Vendor to confirm			
1.19.4	On-screen help for all error messages,	Vendor to confirm			
1.19.5	Servo-waveform display & adjustment / servo step response function	Vendor to confirm			
1.19.6	Circular & linear interpolation tests with graphical study report	Vendor to confirm			
1.19.7	Display of following error and error of following error	Vendor to confirm			
1.19.8	Oscilloscope function with 24 hrs. storage data capacity with play back facility for 8 nos. input/outputs simultaneously	Vendor to confirm			
1.20	<b>DIGITIZING FEATURES</b>				
1.20.1	Chordal Error principle-based digitizing or equivalent (override for min pitch selected, depending on chordal error)	Vendor to confirm			
1.20.2	Self-Learn Mode with Auto Feed Reduction in complex area	Vendor to confirm			
1.20.3	Automatic Weight & Length compensation for different styli (Gain calibration cycle).	Vendor to confirm			
1.20.4	Cancellation/Compensation of Residual deflection	Vendor to confirm			
1.20.5	Digitizing modes:	Vendor to confirm			
1.20.5.1	2D Lace Cycle mode	Vendor to confirm			
1.20.5.2	2D Contour mode with and without Limit facility	Vendor to confirm			
1.20.5.3	Box Cycle mode	Vendor to confirm			
1.20.5.4	Manual Pencil Tracing mode	Vendor to confirm			
1.20.5.5	3D Free Auto Tracing mode	Vendor to confirm			
1.20.6	Digitizing Uphill and Downhill surface with inclination up to 85 deg	Vendor to confirm			
1.20.7	Limit facility : Setting of Rectangular limits as well as Setting of non-regular limit by points in Pencil mode (Limits by polyline with different polyline storage selection)	Vendor to confirm			
1.20.8	Scaling during digitizing	Vendor to confirm			

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1.20.9	Three dimensional radius compensation to compensate the wear in the tool diameter (upto 10% less in dia.)	Vendor to confirm			
1.20.10	Tracer to retract automatically to safety position & controls should be off at the end of scanning or after interruption of scanning	Vendor to confirm			
1.20.11	Auto step execution at limit line. However, Manual push button to force forward or reverse step execution during digitizing should also be available.	Vendor to confirm			
1.20.12	Digitizing on imaginary plane	Vendor to confirm			
1.20.13	Angular digitizing	Vendor to confirm			
1.20.14	Tracer deflection range	Vendor to specify			
1.20.15	Digitizing Output data (ready to mill NC Program) to be in ISO format. Also deflection data to be outputted in NC file if required	Vendor to confirm			
1.21	<b>DIGITIZER</b>				
1.21.1	Analog Tracer Head	Vendor to offer			
1.21.2	Connector position : side	Vendor to accept			
1.21.3	Deflection Force (in N-m)	Vendor to inform			
1.21.4	Precision at 1 mm deflection : min +/- 20 microns	Vendor to offer			
1.21.5	Safety feature of reassemblable Brake point in horizontal plane.	Vendor to confirm			
1.21.6	Test stylus, Spanners, Breakage points & Keys	Vendor to offer			
1.21.7	Adapter suitable for ISO50 taper ( 2 Nos. for each machine)	Vendor to offer			
1.21.8	Stylii set (dia 2 to 50mm in steps of min 1mm) with length & weight suitable for offered Tracer.	Vendor to offer			
1.21.9	Following Special Lightweight Aluminum Stylii of following shape & sizes shall also be supplied. Stylii should be of lightweight suitable for the offered Tracer. (All type for each machine) i) Dia 20 (Ballnose) with Body length = 130mm Holding length=45mm Total Length = 175mm ii) Dia 30 (Ballnose) with Body length = 130mm Holding length=45mm Total Length = 175mm iii) Dia 40 (Ballnose) with Body length = 120mm Holding length=70mm Total Length = 190mm iv) Dia 50 (Ballnose) with Body length = 120mm Holding length=65mm Total Length = 185mm v) Dia 50/20 (Cyl.) with Body length = 15/50mm Holding length=30mm Total Length = 95mm vi) Dia 40/20 (Cyl.) with Body length = 15/50mm Holding length=30mm Total Length = 95mm vii) Origin set pointer dia 10mm, Total length=100mm	-	-		
1.21.10	Output data (ready to mill NC Program) in ISO format.	Vendor to confirm			
1.22	<b>PC Based Reverse Engineering Software</b>	Vendor to confirm			
	PC based Reverse Engineering software shall have the following features : Installable on Windows XP with features for preparation of CAD model from component drawing as well as acceptance of CAD models of the components from other CAD systems in VDA, IGES format. It should also be capable of preparation & generation of CAD model of the component from digitized data obtained from offered machine. It shall also have CAM features for tool path preparation, simulation and generation of NC programs for roughing & finishing of the component from all variety of above mentioned CAD models. It should also have postprocessor for offered CNC System and other features like easy inputs by softmenu, stock material definition, rest material detection and remilling feature,online help etc.	Vendor to offer			
1.23	<b>MACHINE NETWORKING</b>				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.23.1	Machine control should have necessary hardware & software so that it is ready for interfacing with gigabit Ethernet Local Area Network with 100MB/ sec. speed available on machine on UTP cables for NC program & other related DATA transfer . This network to be connected to Wide Area Network / Internet. : The following is the details of existing networking in BHEL : a. Base Networking protocol : TCP/IP b. Physical layer connection : 100 Mbps RJ 45 UTP connection. c. Operating system : Windows XP It should cover following features also:	Vendor to confirm			
1.23.2	The machine should appear as a node just as any other PC in the entire network (Network Neighbourhood).	Vendor to confirm			
1.23.3	The program transfer should be simple copy & paste method just as it is done in case of PCs.	Vendor to confirm			
1.23.4	The networking should be capable to transfer programs from/to machine across the network in CNC mode.	Vendor to confirm			
1.23.5	All necessary Anti-Virus measures shall be incorporated.	Vendor to confirm			
1.23.6	The above Networking features shall be completely demonstrated and established on all the supplied machines by the vendor during pre-acceptance at vendor's works as well as at BHEL, Haridwar during commissioning of the machines.	Vendor to confirm			
1.24	<b>MACHINE MONITORING SYSTEM(MMS) SIGNALS</b>				
	Following MMS signals would be made available on a specifically earmarked terminal strip . These MMS signals would be sourced from a I/O card seperately.	Vendor to offer			
1.24.1	➤ Cycle ON	Vendor to offer			
1.24.2	➤ Spindle running	Vendor to offer			
1.24.3	➤ Feed Active - Any of the axes running				
1.24.4	➤ M30 Program Stop.	Vendor to offer			
1.25	<b>SIGNALS FOR AREA MANAGER SYSTEM</b>	Vendor to offer			
	The PLC on each machine shall have one additional 24 Input +24 Output card for tapping of signals for Area Manager System. These inputs and outputs should be left unprogrammed for use with Area Manager System.				
1.26	<b>TELE DIAGNOSTIC SERVICE</b>	Vendor to inform along with make , model and technical details			
	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software for the supplied CNC system to access both CNC and PLC. 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. Help guide should be provided for use of the system/service.	Vendor to offer			
1.27	<b>FAULT DIAGNOSTIC SYSTEM</b>	NEEL, Aplab or Auto Electric			

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1.27.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book along with software ( licensed copy), necessary cables ( for Communication ) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to inform with technical details.			
1.27.2	Machine should have provision to switchover from position feedback system -2 ( direct) to Position feedback system-1 ( Motor encoder ) through PLC program ( for service personnel only).	Vendor to inform with technical details.			
1.27.3	DIAGNOSTIC SYSTEM.: Machine should be equipped with help texts for all type of alarms and messages .This page must contain the probable reasons,remedial action to be taken,location and circuit reference.	Vendor to inform and offer.			
1.28	<b>VOLTAGE STABILIZER:</b>	Vendor to inform			
1.28.1	Power Supply 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, Voltage Stabilizer, Isolation Transformer, control cabinets etc. shall be supplied by the vendor. A suitable servo-controlled voltage stabilizer of either NEEL/SUVIK/Servomax/Automatic Electric-make ( All these are Indian Make) and of appropriate rating shall be supplied and connected to the machine by the vendor. The Oil / Air Cooled Servo Controlled Voltage Stabilizer (of reputed Indian make) should be suitable for the complete machine, its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply ambient conditions.Catalogue of the same shall be submitted along with the offer.				
1.28.2	The offer should be submitted with spares package (Variacs-2 nos., Correcting servomotors- 4 nos., Control cards-2 nos) required for long term maintenance of this stabilizer.				
1.28.3	Make	Vendor to offer			
1.28.4	Model, Rating & Input/Output Voltage etc.	Vendor to offer			
1.28.5	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection. (Details to be submitted)	Vendor to offer			
1.28.6	Spares Package for Servo Voltage Stabilizer, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years of trouble free operation considering three shifts continuous running of the machine. Detailed list is to be submitted. Price of unit quantity of each item is to be quoted.	Vendor to offer			
1.29	<b>ULTRA ISOLATION TRANSFORMER</b>	Vendor to offer			
1.29.1	Ultra Isolation Transformer (of reputed Indian make like NEEL/SUVIK/SERVOMAX/ AUTOMATIC ELECTRIC) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
1.29.2	Make	Vendor to offer			
1.29.3	Model, Rating & Input/Output Voltage etc.	Vendor to offer			
1.30	<b>SPARES:</b>	Vendor to offer			
	Following spare parts of electrical/electronics and CNC system shall be offered itemwise per machine:	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.30.1	Master CPU Board/PCU/Fanuc equiivalent- 1 No.	Vendor to offer			
1.30.2	Multifunctional board/NCU/Fnuc equivalent- 1 No.	Vendor to offer			
1.30.3	PLC input and output cards- 2 Nos each type (Digital, fast I/O & analogue)				
1.30.4	Axis Interface Board/NCU/Fanuc equivalent - 1 No.	Vendor to offer			
1.30.5	Power & controller Modules for Spindle X-axis, Y-axis, Z-axis and rotary -axes - 2 Nos each	Vendor to offer			
1.30.6	Complete position feed back system including linear scales & Heidenhain Transducer (Scanning Head) for X-axis, Y-axis, Z-axis, Heidenhain encoder for the table - 1 Nos each type.	Vendor to offer			
1.30.7	Complete PC with mother boards, processor, RAMs etc.-1 No.	Vendor to offer			
1.30.8	Operator Panel with 15" coloured TFT flat screen unit/operator panel OP-10C/OP15/Fanuc equivalent- 2 No.s				
1.30.9	Intergrated key board with mouse -1 No. (As supplied with the machine)				
1.30.10	Complete push button panel with I/O transmission board/MCP/Fanuc equivalent.- 1 No.				
1.30.11	Spare Hard Disc loaded with all softwares installed supplied with the machine - 1 No.				
1.30.12	CD R/W Drive - 1 No. with each machine.				
1.30.13	Digitizer unit with spare cable & connector Set - 1 No.				
1.30.14	Signal cables duly ready with connectors including motor power cable, incoder cable - 1 Set.				
1.30.15	Hand Pendent unit complete with cable & connector Set - 1 No.				
1.30.16	EXE unit 1 Vpp 1 No. of each type.				
1.30.17	Main spindle drive module - 1 No.				
1.30.18	Spindle encoder- 1 No				
1.30.19	Rotary Axis encoder 1 No. each type.				
1.30.20	Power module/ I/R module - 1 No.				
1.30.21	1 KVA on-line UPS as supplied with the machine- 1 No.				
	Following spare parts shall be offered as essential spares for the machine				
1.30.22	All proximity switches used in the machine- 2 Nos each type	Vendor to offer			
1.30.23	Set of Push Buttons- 2 Nos each type	Vendor to offer			
1.30.24	Set of Indicating Lamp- 50 Nos each type	Vendor to offer			
1.30.25	Set of Contactors- 5 Nos. each type.	Vendor to offer			
1.30.26	Set of Overloads/ Automats- 2 Nos. each type	Vendor to offer			
1.30.27	Machine Status Indicating Lamp (Complete unit) - 4 Nos	Vendor to offer			
1.30.28	Axis Servo motors -1 Nos of each type	Vendor to offer			
1.30.29	Spindle motor with encoder - 1 No	Vendor to offer			
1.30.30	Spares Package for all Accessories	Vendor to offer			
1.30.31	All types of spares for total machine and accessories should be available for atleast ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor to offer			
1.30.33	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 offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.30.34	Mechanical, Hydraulic, Electrical and Electronic spares used on the machine, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years trouble free operation of the complete machine including CNC system and its accessories considering three shifts continuous running of the machine. Detailed list is to be submitted. Price of unit quantity of each item is to be quoted. The offered package should include items mentioned below, in addition to other recommended spares.	Vendor to offer			
1.30.35	<b>Mechanical , Hydraulic &amp; Lubrication System Spares:</b> * Main Machine Spindle- 1 No. * All types/varieties of pumps used on machines i.e.Hydraulic, lubrication, coolant and oil cooling pumps (1 No. each type) * All types of D.C. Control valves (1 No.. each type) * All types of flow control, pressure regulators, pressure reducer valves, coolant gun, Nozzles used on m/c. (1 No. each type) * All types of pressure switches, flow switches and float switches (2 No.. each type) * All types of Pressure Gauges (1 No. each type) * All types of filter inserts (2 nos. each of regenerative type &5 nos. each of disposal type) * Shaft seals (1 No.. each type) * O-Rings and Piston rings (2nos. of each type) * Accumulator with charging kit if the same is used in the m/c (1 no each type) * All types of pneumatic valves (1 No.. of each type) * All types of Hydraulic Hoses (1 No.. of each type)	Vendor to offer			
1.30.36	* Special Bearings (1 set each type ) , spindle bearing 1 set, *All types of Belts (2 Nos. each type) * Flexible Bellow Cover (1 No.. each type) * Special Oil/ Grease/ Cooling Agent (if any)- Sufficient qty. for 1 year (operatio on 3 shift basis. * Hydro Motor (1 No. each type) * Coiled Flexible air/coolant pipes ( 1 No. each type) * Coolant Gun (1 No..) * Coolant Flexible Nozzl	Vendor to offer			
1.30.37	<b>COOLANT &amp; PNEUMATIC SYSTEM</b> :Spare for Coolant Filtration System comprising Filter Drum (1 No.), All types of Pumps (1 No.. Each type), All types of Valves (1 No. each type), Alltypes of Pressure Switches (1 No. Each type), All types of Pressure Gauges (1 No. Each Type), All types of Filter Cartridges (2 Nos. Each type), All types of Air Pressure Regulators (1 No. Each type),	Vendor to offer			
1.30.38	Additionally the vendor shall recommend essential spare package for 2 years 3 shift trouble free working of the machine with detailed list along with <b>item wise price in commercial offer, specification and source of supply.</b>	Vendor to offer			
1.30.39	<b>All the spares should be offered individually priced.</b>	Vendor to offer			
1.31	<b>DOCUMENTS:</b>	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.31.1	3 hard copies of all programming (Basic and Advance), Cycles, Tool management etc. and all operational manuals shall be supplied in English language.	Vendor to offer			
1.31.2	Following manuals/diagrams/ list/ specifications shall be supplied in English language along with the machine documentation:	Vendor to offer			
1.31.3	Basic Machine operation and maintenance/ service manual - 5 copies	Vendor to offer			
1.31.4	Electrical schematic and wiring diagram of the machine- 5 copies	Vendor to offer			
1.31.5	PLC print-out in Operand form with comments in English- 5 copies	Vendor to offer			
1.31.6	GHOST back up of hard disk on CD	Vendor to offer			
1.31.7	Complete list of parts used in the machine along with specification, part/ ordering numbers and address of manufacturer in case of purchased item- 5 copies.	Vendor to offer			
1.31.8	Detailed assembly drawing with clear marking of each component and giving reference of manufacturer of each assembly/sub-assembly- 5 copies.Assembly drawing of spindle assembly.	Vendor to offer			
1.31.9	Hydraulic, Pneumatic, Lubrication and Coolant circuit diagram along with part list, complete specification and make of each element used – 5 copies.	Vendor to offer			
	Wiring diagram indicating lay out of cables, plugs, junction boxes, terminal strips etc.- 5 s	Vendor to confirm			
1.31.10	List of all bearings, L.M. guides, ball bushings etc. with full specification and make.- 5 sets.				
1.31.11	Alarm list and fault diagnostic manual- 5 sets	Vendor to Confirm and offer.			
1.31.12	Spare part list along with specification, part number and address of manufacturers- 5 sets.	Details to be finalized during			
1.31.13	Service and user manuals of all bought out items- 5 sets.	Vendor to offer			
1.31.14	CDs of latest CNC Documentation.	Vendor to offer			
1.31.15	Documents comprising Operating manuals, Signals, Interfacing and diagnostic guide- 1 set	Vendor to offer			
1.31.16	Help guides for tele-diagnostic service systems- 5 sets	Vendor to offer			
1.31.17	PLC print out with comments in english(Hard copy)of auxiliary systems(if used)-5 sets.	Vendor to offer			
1.31.18	All O&M manuals including electrical schematic ,wiring diagram,cable layout,junction box details and connector diagrams soft copy on CD-3nos.	Vendor to offer			
1.31.19	Detailed specification of all rubber items and hydraulic/ lube oil fittings are to be supplied.	Vendor to offer			
1.31.20	Manufacturing drawings/ catalogue copies for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.	Vendor to offer			
1.31.21	Functional description of drive controllers	Vendor to offer			
1.31.22	Machine parameters, drive parameters on CD	Vendor to offer			
1.31.23	Digitiser maintenance manual.	Vendor to offer			
1.31.24	System interface commissioning/ Start-up manual.	Vendor to offer			
1.31.25	Hardware description manual.	Vendor to offer			
1.31.26	PLC programming manual.	Vendor to offer			
1.31.28	Vendor to submit one set of all documents in best available condition one month prior to training cum pre acceptance of BHEL Engineers.	Vendor to offer			
1.32	<b>JOB HOLDING ARRANGEMENT :</b>				
	Job Holding arrangement for the blades mentioned at clause no. 1.33.1 & 1.33.2 including changeable parts (Right and left hand for each type of mentioned blades) if any for carrying out machining of blades as per clause PROVEOUT (point no. 1.45 of tender specs) and elaborated in the attached sketch at Annexure-1 shall be supplied along with the machine for each machine. Detailed manufacturing drawings of job holding to be supplied in the event of order.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.33	<b>TOOLING PACKAGE</b>				
a)	The tooling package shall consist of all toolings including consumables, tool holders, cutter bodies as per enclosed Annexure "Toolings" for carrying out machining of following operations on the offered machines in the blades as mentioned at clause no. 1.33.1 & 1.33.2: a) External and Internal Fillet Machining b) Tip copying c) Tip Thinning Any other tooling not mentioned in Annexure" Toolings" but required for carrying out machining of above mentioned operations on the blades shall also be offered in requisite quantity. Item wise price and minimum ordering quantity, if any shall be clearly indicated in the price bid. Detailed drawing /catalogue of all the toolings are to be supplied in the event of order.	Vendor to offer			
1.33.1	Drawing No : 0-10307-41002				
1.33.2	Drawing No : 0-10307-41006				
1.34	<b>TROPICALISATION</b>				
1.34.1	All electrical / electronic equipment shall be tropicalized.	Vendor to confirm			
1.34.2	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm			
1.34.3	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm			
1.34.4	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be compatible with Indian equivalents.	Vendor to confirm			
1.34.5	All motors shall conform to IEC or Indian Standards	Vendor to confirm			
1.34.6	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all cable trays/chains etc. required for laying of cables should be included in the offer.	Vendor to confirm			
1.34.7	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest available location of the production shop.	Vendor to confirm			
1.35	<b>OPERATING CONDITION:</b>	Vendor to confirm			
1.35.1	415V + 10% / -10%, 50HZ +/-3 HZ, 3 Phase AC (3 wire system without neutral) 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 accept			
1.35.2	Total machine including all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. <b>Ambient Operating Conditions:</b> Temperature = 5 to 45 degree Celsius , Relative Humidity = 95% max.	Vendor to accept			
1.35.3	Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours.	-			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.35.4	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 shall be ensured by vendor.	-			
1.36	<b>SAFETY ARRANGEMENTS</b>	Vendor to confirm			
1.36.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm			
1.36.2	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to confirm			
1.36.3	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm			
1.36.4	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			
1.36.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm			
1.36.6	Emergency Switches at suitable locations as per International Norms should be provided.				
1.36.7	Oil & water pipe lines should not run with electrical cable in the same tray/trench.	Vendor to confirm and submit.			
1.37	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE</b>	Vendor to confirm and submit.			
	The Machine should conform to following factors related to environment :				
1.37.1	Maximum noise level shall be 85 dB (A) at 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to confirm			
1.37.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm			
1.37.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to inform			
1.37.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to inform			
1.37.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	[Approx =1/2 the positional accuracy] ; Vendor to inform			
1.38	<b>ACCURACY TESTS</b>	Vendor to confirm			
1.38.1	Geometrical Accuracy Tests shall be in accordance with relevant & prevailing international standards viz. ISO 1708 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 and submit.			
1.38.2	All the Geometrical accuracy tests along with NAS test piece machining on each machine shall be demonstrated to BHEL engineers during pre-acceptance at Supplier's works. Further, a 3D Test piece demonstrating the capability of digitizing features shall also be machined during pre-acceptance as per clause no. 1.43.1 on each machine. The Raw blanks, master 3D Test piece for digitising and toolings required for it's machining shall be arranged by the vendor. Drawings of NAS test piece and 3D Test piece shall be submitted by the vendor with the offer. The repeat tests of the geometrical accuracies including NAS test piece shall also be demonstrated at BHEL Hardwar. NAS Test piece including toolings required for it's machining at vendor's works & BHEL, Haridwar shall be arranged by the vendor.	Vendor to confirm and submit.			
1.38.3	MACHINE POSITIONING ACCURACIES & REPEATABILITY:Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.38.3.1	Positioning accuracy in X / Y axis (Pa) per 1000 mm	Vendor to offer			
1.38.3.2	Positioning accuracy in Z axis (Pa) per 1000 mm	Vendor to offer			
1.38.3.3	Repeatability in X/Y/Z axis	Vendor to offer			
1.38.3.4	Positioning accuracy over entire traverse in X / Y axis (Pa)				
1.38.3.5	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to offer.			
1.38.3.6	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works. Laser Interferometer shall be arranged by the vendor.	Vendor to offer			
1.39	<b>LEVELING &amp; ANCHORING SYSTEM</b>	For vendor's information.			
	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment and fixing of the machine on the floor should be supplied. Details to be submitted.	Vendor to accept & confirm			
1.40	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE</b>				
1.40.1	Tools and Equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. required for operation and maintenance of the machine should also be supplied by the vendor. List of such tools should be submitted with offer.	Vendor to accept & confirm			
1.40.2	Set of Test Mandrels/Special Gauge for checking spindle run-out & alignment of headstock/tailstock etc. should be brought by the vendor.	Vendor to accept & confirm			
1.41	<b>FOUNDATION</b>				
1.41.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier. 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 for Preliminary layout Drgs. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air dryer, Chip Bin & all other accessories/offered items. The vendor shall provide an optimised layout of the offered machines. 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.	Vendor to confirm & offer			
1.41.2	Soil condition at BHEL, Haridwar is mentioned below : (a) Soil strata : Silty sand up to 2.5 meter depth (b) Average density of soil = $1.8 \text{ T/m}^3$ (c) Angle of internal friction = $35^\circ$ (up to 3.0 m depth) (d) Coefficient of elastic uniform compression "Cu" = $3.0 \text{ Kg/cm}^2$ - (at 7m depth for $10\text{m}^2$ base area and $1.0 \text{ Kg/cm}^2$ confining pressure) (e) Bearing capacity at 1.5 meter depth = $10\text{T/m}^2$ (f) Water table = 25 meter below ground level	Vendor to offer			
1.42	<b>TRAINING</b>	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.42.1	Four BHEL Persons should be trained at vendor's works for each machine for the area & period given below: (a) CNC Part Programming for the machine, application of all CNC Features, Digitizing system & Reverse Engineering software (Period 3 Weeks) (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments ( Period 2 weeks ) (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments ( Period 2 weeks ) (d) Operation of the machine & other supplied equipments ( Period 2 weeks ) Pre-dispatch inspection (ref. Sl.No. 1.43.1) of the machine shall also be carried out by the team during their stay at vendor's works for the training. Vendor may specify days required for pre-dispatch inspection. BHEL reserves the right to choose no. of persons, field & period of training, out of above, while deputing their engineers for training.	Vendor to confirm			
1.42.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm			
1.42.3	Competent, English speaking experts shall be arranged by the vendor for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
1.43	<b>MACHINE PRE-ACCEPTANCE AT VENDOR'S WORKS</b>	Vendor to offer			
1.43.1	BHEL persons deputed for training will be doing pre-acceptance at vendor's works and give dispatch clearance after checking the compliance of the vendor to all the clauses of 1.43 of tender specs. During pre-acceptance, all accuracy tests mentioned at point number 1.38 shall be witnessed by the team. Also during pre-acceptance, vendor shall demonstrate the machining of 3D Test piece submitted by the vendor at clause "Accuracy Tests" (point no.1.38.2) in three ways by using NC programs generated from following methods on each machine :	Vendor to accept & confirm			
1.43.2	Generation of ready to mill NC program through digitizing of Master 3D Test piece on the offered machines.	Vendor to accept & confirm			
1.43.3	Generation of CAD model & subsequent generation of NC program from digitized data of Master 3D Test piece obtained from offered machines and by using Reverse Engineering software offered by the vendor at point no. 1.22 of tender specs.	Vendor to accept & confirm			
1.43.4	Preparation of CAD model & subsequent generation of NC program from component drawing of 3D Test piece using Reverse Engineering Software offered by the vendor at point no. 1.22 of tender specs.	Vendor to accept & confirm			
1.43.5	Raw material (blanks), Fixturings and toolings required for machining the 3D Test piece on each machine shall be arranged by the vendor.	Vendor to accept & confirm			
1.44	<b>ERECTION &amp; COMMISSIONING</b>	Vendor to confirm & offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.44.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment/accessories, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane (capacity of EOT Crane in the shop is 5 Ton only) and helping personnel shall also be provided by BHEL. Details of these requirements should be informed/discussed by vendor and agreed with BHEL in advance. <b>In case crane of higher capacity is required, representative of vendor to hire mobile crane from local sources.</b> Compressed air pressure available in the shop is 5.0 Kg/Cm <sup>2</sup> . If the required compressed air pressure for operating of the machine is more than the stated pressure, the vendor to quote suitable compressor (of Indian make preferable) as an optional item.	Vendor to accept & confirm.			
1.44.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer, Air Dryer and other accessories with all electrical & mechanical connections shall also be responsibility of the vendor.	Vendor to accept & confirm.			
1.44.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Sl. No. 1.38 and testing/demonstration of tele-diagnostic service shall also be part of the commissioning activity.	Vendor to accept & confirm.			
1.44.4	Tools, Tackels, Test Mandrels, instruments and other necessary equipment (including Laser equipment, if required) required to carry out all erection & commissioning activities should be arranged and brought by the supplier.	Vendor to accept & confirm.			
1.44.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to accept & confirm.			
1.44.6	Broad Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to accept & confirm.			
1.44.7	Charges, duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to accept & confirm.			
1.44.8	Portion, if any, of the machine, accessories and other supplied items where paint got rubbed or peeled during transit or erection should be repainted and matched with the original adjoining paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours/shades of paints used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to accept & confirm.			
1.45	<b>PROVE OUT OF BHEL COMPONENTS</b>				
1.45.1	Complete and successful machining of proveout component, to the specified design accuracy and surface finish, shall be done by the vendor after erection & startup of the machine at BHEL works using Tools, Fixtures, equipment and CNC programs etc. supplied by the vendor. During Proveout, the vendor shall carry out machining of following operations on the blades ( Drg nos. 0-10307-41002 & 0-10307-41006) on each machine : a) External and Internal Fillet Milling b) Tip copying c) Tip Thinning The machining of above mentioned operations in the blades (0-10307-41002, 0-10307-41006) shall be carried out in three ways by using NC programs generated from following methods :	Vendor to accept & confirm.			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.45.1.1	Generation of ready to mill NC program by digitizing from a finished blade (Master) on the offered machines.	Vendor to accept & confirm			
1.45.1.2	Generation of CAD model from digitized data of finished blade & subsequent generation of NC program using Reverse engineering software offered by the vendor at point no. 1.22 of tender specs.	Vendor to accept & confirm			
1.45.1.3	Preparation of CAD model & subsequent generation of NC program from component drawing of Blade (0-10307-41002) using Reverse Engineering Software offered by the vendor at point no. 1.22 of tender specs.	Vendor to accept & confirm			
1.45.2	Toolings supplied against clause "Tooling package" (point no.1.33.1) and Fixture supplied against clause "Part Fixturing" (point no. 1.32 ) shall be used and proved during the machining of proveout				
1.45.3	Raw material (starting material) and a finished blade (Master) shall be provided by BHEL.	Vendor to accept & confirm			
1.45.4	Vendor shall be fully responsible for machining of proveout components as per drawing accuracies and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and got cleared by vendor during initial technical discussions.	Vendor to confirm			
1.45.5	Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper tooling etc.. Any change of toolings required during proveout shall be at the responsibility and cost of the vendor. The vendor shall supply the toolings changed at proveout stage as per quantity mentioned under the heading of 'Tooling Package'. In case the blade is rejected during job proving , vendor will have to reimburse forging cost.	Vendor to accept & confirm			
1.46	<b>FINAL MACHINE ACCEPTANCE</b>				
1.46.1	Final acceptance shall be made by BHEL Hardwar after completion of following activities:	Vendor to confirm			
1.46.2	Demonstration of specified/offered Geometrical accuracies as per test chart/standard after machine commissioning	Vendor to confirm			
1.46.3	Demonstration of specified/offered Positioning accuracies as per VDI-DGQ/3441 and specified values after machine commissioning	Vendor to confirm			
1.46.4	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine along with demonstration of Machine networking as indicated at point no: 1.23	Vendor to confirm			
1.46.5	Machining of NAS test piece machining. Vendor to supply test pieces.	Vendor to confirm			
1.46.6	Training of BHEL machine operators in operation of complete machine, software & accessories etc by the supplier's experts / engineers during their stay at BHEL works.				
1.46.7	Prove out of BHEL components as per point no.1.45	Vendor to confirm			
1.46.8	One Week supervision of continuous production on the machine after successful prove out.	Vendor to confirm & offer			
1.47	<b>PACKING</b>	Vendor to inform			
	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 submit			
1.48	<b>GUARANTEE</b>	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
	Guarantee for complete machine,CNC Control, softwares and all supplied accessories/equipments for 24 months from the date of final acceptance of the machine. Any spare required during guarantee period shall have to be arranged by the vendor free of cost and duty levied have to be borne by the vendor.	Vendor to inform			
1.49	<b>COLOUR OF THE MACHINE</b>	Vendor to inform			
	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to inform			
2.0	<b>ADDITIONAL INFORMATION</b>	Vendor to confirm			
2.1	Following information shall be supplied with the offer:	Vendor to confirm			
2.2	Machine Model No.				
2.3	Total connected load (KVA)	Vendor to confirm			
2.4	Space required (Length, Width, Height) for complete machine & accessories				
2.5	Catalogue of the machine	Vendor to accept & confirm.			
2.6	Total weight of the machine				
2.7	Weight of heaviest part of machine	Vendor to accept & confirm			
2.8	Weight of the heaviest assembly of the Machine				
2.9	Dimensions of largest part of the machine	Vendor to inform			
2.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to inform			
2.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to inform			
3.0	<b>OPERATION SAFETY</b>	Vendor to inform			
	The design of the machine will be such as to provide utmost operational safety. Mechanical and Electrical stoppers, electronic interlocks should be provided to ensure coordinated functioning and to prevent damage to various elements of the machine. Adequate safety interlocks to be provided. Headstock, Spindle, Guide ways etc. to protect against fall in oil level, overloads or fall in compressed air pressure.	Vendor to inform			
4.0	<b>GENERAL INFORMATION</b>	Vendor to inform			
	All the information and drawings attached with tender document are exclusive property of BHEL Hardwar. Under no circumstances these should be passed to any third party without prior permission of BHEL and must not be used directly or indirectly detrimental to the interest of BHEL.	Vendor to accept & confirm			
5.0	<b>QUALIFYING CONDITIONS</b>				
5.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC Vertical Milling Machine with digitising facility of same (Table size, Spindle power & torque rating, Load Capacity) or higher sizes for in the past ten years ( on the date of opening of Tender ) and referred machine is presently working satisfactorily for more than one year ( on the date of opening of Tender ) after commissioning, should quote. However, if referred machine (s) has/had been supplied to BHEL, then the machine should be presently working satisfactorily for more than six months ( on the date of opening of Tender ) after its commissioning and acceptance in BHEL. The following information should be submitted by the vendor about the companies where referred machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept & confirm.			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
5.2	Name of the customer / company, where refirred machine is installed.	Vendor to inform			
5.3	Complete postal address of the customer.	Vendor to inform			
5.4	Month & Year of Commissioning .	Vendor to inform			
5.5	Parametres of machine(s) supplied and Application for which the machine has been supplied.	Vendor to inform			
5.6	Name and designation of the contact person of the customer.	Vendor to inform			
5.7	Phone no., FAX no. and email address of the contact person of the customer.	Vendor to inform			
5.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them . The original certificate may be returned after verification by BHEL.if required	Vendor to submit			
5.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm			
5.10	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect,the offer shall be rejected.				
<b>(N Halder/DGM-WEX-M) (V.K.Chugh/DGM-TBM) (D.K.Chawla/SM-NCT) (S.K.Shukla/AGM-WEX-CNC) (T K Saha/Mgr-QC-B)</b>					