

<b>BHARAT HEAVY ELECTRICAL LIMITED</b>		<b>Indent No. :</b> C / 3991 / 8/1254/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>Date :</b>			
<b><u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC HORIZONTAL MACINING CENTRE= Qty 6 Nos</u></b>					
<b>NOTE :-</b>					
<p>1. Vendor must submit complete information against clause at Sl.No. 5.0 The offer, complying this clause, would only be considered.</p> <p>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.</p> <p>3. The offer and all documents enclosed with offer should be in English language only.</p>					
<b>ADDRESS OF THE SUPPLIER :</b>		<b>ADDRESS OF THE INDIAN AGENT(S) :</b>			
<b>TELEPHONE NOS.:</b>		<b>TELEPHONE NOS.:</b>			
<b>FAX NOS.:</b>		<b>FAX NOS.:</b>			
<b>E-MAIL ADDRESS :</b>		<b>E-MAIL ADDRESS :</b>			
<b>SCOPE: SUPPLY, ERECTION &amp; COMMISSIONING OF CNC HORIZONTAL MACHINING CENTRE WITH SPECIFICATIONS AS BELOW :</b>					
<b>SL. NO.</b>	<b>DESCRIPTION OF BHEL REQUIREMENT</b>	<b>REQUIRED</b>	<b>OFFERED</b>	<b>DEVIATION</b>	<b>REMARKS</b>
1.0	<b>PURPOSE &amp; WORKPIECE MATERIAL</b>				
1.1	<p><b>Purpose:</b> This Machining Center is mainly intended for machining of technological steps in the blanks of Steam turbine blades, FirTree roots of Low Pressure Steam Turbine blades and root &amp; shroud end radius machining.</p> <p><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 and also for other heavy and accurate machining jobs requiring various machining operations like milling, drilling, boring, tapping etc.</p>	Vendor (to accept)			
1.2	<b>Major Technical Specification:</b> WORKING RANGES: MAXIMUM TRAVERSES:				
1.2.1	Longitudinal table travel Axis X:	1000 mm or more			

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1.2.2	Vertical travel Axis Y:	900 mm or more			
1.2.3	Transverse / Lateral Column travel )Axis Z	800 mm or more			
1.3	<b>WORK PIECE CARRIER</b>				
1.3.1	Clamping Surface:	630 mm X 630 mm			
1.3.2	No. Of changeable pallets:	2			
1.3.3	Pallet change time	Vendor to intimate			
1.3.4	N.C. Rotary Table:	630 mm X 630 mm			
1.3.5	Resolution:	0.001 degree			
1.3.6	Height of work piece and fixture that can be accommodated for automatic pallet changing:	Vendor to intimate			
1.3.7	Load carrying capacity of N.C.Rotary Table:	1000 Kg. or more			
1.3.8	<b>Swing Diameter:</b>	1000 mm or more			
1.3.9	<b>Max. Job envelope (LXBXH)</b>	Vendor to intimate			
1.3.10	<b>Maxm. Rotating speed of Table</b>	Vendor to intimate			
1.3.11	<b>Min. Rotating speed of table</b>	Vendor to intimate			
1.3.12	<b>Clamping Force</b>	Vendor to intimate			
1.3.13	A. The tabletop should be provided with T-slots at suitable pitch. The No, size and pitch of T-slot, Central Slot tolerance , Lateral slot size and tolerance is to be specified in the technical offer. (Preferably 18 mm T-slots) B. The tabletop and central tennon shall be accurately machined for using as reference surface.	Vendor to confirm and inform technical details.			
1.4	<b>MAIN SPINDLE:</b>				
1.4.1	<b>Spindle diameter (mm)</b>	Vendor to intimate			
1.4.2	Power rating at 100 % duty cycle (KW)	30 KW or more			
1.4.3	Spindle Motor make , model etc (Should comply with IEC / IS specifications)	Vendor to intimate			
1.4.4	Spindle torque at 100% duty cycle (Nm).	680 Nm or more			
1.4.5	Torque/Power/Speed Diagram of spindle motor is to be submitted with the offer.	Vendor to provide details indicated.			
1.4.6	Speed ranges (continuously variable): (RPM)	20 RPM or Less to 6000 RPM or more			
1.4.7	Spindle taper:	SK 50 (DIN 69871)			
1.4.8	Distance from spindle face to pallet / Table center Maxm./ Min. (mm)	Vendor to intimate			
1.4.9	Distance from spindle center Line to pallet / table top Maxm/ Min. (mm)	Vendor to intimate			
1.5	<b>FEEDS AND DRIVE SYSTEM</b>				
1.5.1	Rapid traverse X-Axis	32 m/min or more.			
1.5.2	Rapid traverse Y-Axis	32 m/min or more.			
1.5.3	Rapid traverse Z-Axis	32 m/min or more.			

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1.5.4	Feed Rate in X-Axis ( Infinitely variable)	1 to 32,000 mm/min or more			
1.5.5	Feed Rate in Y-Axis ( Infinitely variable)	1 to 32,000 mm/min or more			
1.5.6	Feed Rate in Z-Axis ( Infinitely variable)	1 to 32,000 mm/min or more			
1.5.7	Contouring Feed of Rotary axis	Vendor to intimate			
1.5.8	Feed drives/ motors (AC Servo motors) Seimens make , digital type (Detail of motor , make , type etc to be submitted)	Vendor to intimate			
1.5.9	Feed back system for X, Y, Z axes. Heidenhain or equivalent linear scales with pressurised compressed air cleaning ( Details to be submitted)	Vendor to intimate			
1.5.10	submitted)	Vendor to intimate			
1.5.11	Details of system to ensure zero backlash for the axes	Vendor to intimate			
1.5.12	Mechanism for locking / Clamping the axes	Vendor to intimate			
1.5.13	Clamping force of each axes to be furnished	Vendor to intimate			
1.5.14	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 coolant and other lubcirating oil seepage.	Vendor to confirm			
1.5.15	Vendor to furnish material , hardness of guidways & constructional details , including explanatory drawings of various components/ assemblies like gear box , Guideways / slides , telescopic covers,assessories , Table , Feed transmission system , hydraulic and lubrication system , feed back system etc. of the machine.	Vendor to intimate			
1.6	<b>AUTOMATIC TOOL CHANGER</b>				
1.6.1	Type	Vendor to intimate			
1.6.2	Tool selection method	Random & Shortest path			
1.6.3	No.of Tools in the magazine	50 tools or more			
1.6.4	Diameter of tool : a) With all pockets full.	125 mm or more			
1.6.5	b) With adjacent pocket empty	250 mm or more			
1.6.7	Tool Change Time (Chip-to-Chip)	Vendor to intimate			
1.6.8	Tool Change Time (Tool-to-tool)	Vendor to intimate			
1.6.9	Tool Length:	325 mm or more			
1.6.10	Tool Weight	35 Kg or more			
1.6.11	ATC shall have following features:				
1.6.12	? Machine operation should be possible even in situation when the ATC is out of order due to some Mechanical / Electronic problem.	Vendor to Confirm			

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1.6.13 a	? Provision of compressed air blow through push button for cleaning of spindle mounted on machine headstock during manual tool change. The Push Button to be provided either in the Headstock or hand held terminal.	Vendor to Confirm			
1.6.13 b	? Sutitable M code based system and Software based system shall have to be provided to retrieve the struck up tool in the tool loading and un-loading cycle.	Vendor to Confirm			
1.6.14	? Provision of cleaning of spindle taper by compressed air blow during ATC cycle.	Vendor to Confirm			
1.6.15	? Provision of manual tool loading and unloading with push button mounted on headstock at a convenient location or on the Hand Held terminal.	Vendor to Confirm			
1.6.16	? One set of tool holder retention studs to suit tool magazine pockets and quantity sufficient to cover all the pockets shall be offered as part of the basic machine.	Vendor to Confirm Qty			
1.6.17	<b>PALLET CHANGER</b>				
1.6.18	An automatic pallet changing equipment with twin pallets and pallet sizes equal to table size shall be supplied with the machine.	Vendor to confirm			
1.6.19	Pallet change time	Vendor to intimate			
1.6.20	Pallet Loading Height	Vendor to intimate			
1.6.21	Software based system and M-code based system shall be provided for step by step retrieval of pallet stuck up / trapped in the pallet changing operation .	Details to be furnished			
1.6.22	Written instructions on how to extract a Pallet trapped anywhere in the APC cycle and complete M code list for individual functions involved during APC cycle shall be provided with the machine.	Details to be furnished			
1.70	<b>COOLANT SUPPLY SYSTEM</b>				
1.7.1	Coolant system with all accessories for following 2 variants 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 flood coolant system through adjustable trajectory multiple nozzle around the spindle.	Vendor to confirm			
1.7.2. b	High Pressure Coolant through Spindle	Vendor to confirm			
1.7.3	All attachments, tool holders, adapters etc. shall have the provision for internal / through coolant , otherwise 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 confirm			
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: Vacuum type coolant filtration unit (KNOLL make or equivalent) comprising of coolant tank, vacuum rotational filter, filter drum (made of high quality steel net), vacuum pump, 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			

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1.7.7	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 and furnish details			
1.7.8	Coolant Tank Capacity	Vendor to intimate			
1.7.9	Coolant pump and motor details for all variants	Vendor to confirm			
1.7.10	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm			
1.7.11	Filtration Purity	Vendor to inform			
1.8	<b>CHIP CONVEYOR SYSTEM</b>				
1.8.1	Elevated type chip conveyor integrated with coolant system, conveniently located shall be offered . The machines are proposed to be connected with centralized chip disposal system, components of chip conveyors need to be procured with machine shall be specifically indicated in both technical and commercial offers.	Vendor to confirm			
1.8.2	Following technical details of chip conveyor shall be submitted :				
a	Type of chip conveyor	Vendor to inform			
b	Width of conveyor	Vendor to inform			
c	Elevation of chip conveyor for chip bin	Vendor to inform			
d	Material of chip conveyor (should be rust resistant)	Vendor to inform			
1.9	<b>Compressor Cooling System</b>				
1.9.1	Closed loop compressor Cooling System for the milling spindle, servo-/torque motors, recirculating lubricating oil, hydraulic system oil 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			
1.10.1	<b>Machine Enclosure with Access Door</b>				

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1.10.2	Machine shall have sound dampening enclosure with interlocked doors in the tool and workpiece area and access door at operator's panel. Enclosure shall have large safety glass, viewing window like ROTOCLEAR or equivalent for viewing the job and ongoing process.	Vendor to confirm and intimate technical details.			
1.11	<b>Machine Lights</b>				
1.11.1	Machine light (Halogen light/CFL) for illumination of complete encapsulated working area for clear visibility.	Vendor to confirm			
1.11.2	Tube lights in electrical cabinets for maintenance purpose	Vendor to confirm			
1.11.3	4 coloured signal light displaying operational status of the machine and visible from distance.	Vendor to confirm			
1.12	<b>Electrical Control Cabinet &amp; Operator's Pendant</b>				
1.12.1	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			
1.13	<b>Hand held unit</b>				
1.13.1	Vendor to offer type B-MPI of Siemens make with all its features or equivalent along with sufficient length of interfacing cable.	Vendor to inform with details			
1.14	<b>Mist/Flue Gas Extraction System</b>				
1.14.1	Machine shall have Mist Extraction System/ Flue Gas Extraction System such as Electro Suction Filter unit including all connection and installation at convenient location.	Vendor to confirm and also intimate make and Model with Technical details.			
1.15	<b>OTHER TECHNICAL FEATURES</b>				
	The offered machine should have following features to facilitate working/extended life of the machine:				
1.15.1	All the traversing axis shall have direct measuring type closed loop feed back system for positioning and measurement.	Vendor to confirm			
1.15.2	In Cycle hour counter with reset facility.	Vendor to confirm			
1.15.3	Coolant flushing gun with sufficient length of pipe for manual cleaning of workpiece.	Vendor to confirm			
1.15.4	Compressed air point with manually operated ON/OFF valve and flexible piping for work piece/pallet cleaning.	Vendor to confirm			
1.15.5	Percentage type spindle load meter.	Vendor to confirm			
1.15.6	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			
1.15.7	Standard Calibration mandrel for referencing and job setting.	Vendor to confirm			
1.15.8	Air filter, Regulator & Lubricator (FLR) and Air Dryer unit of appropriate capacity to arrest moisture, other suspended particle etc. for providing dry and clean air for machine operation.	Vendor to confirm			
1.15.9	One set of tools for service and maintenance.	Vendor to confirm			

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1.15.10	First filling of all required Oils , lubricants, & Grease etc. for the machine and auxilary 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			
1.15.11	<b>The Machine should have provision for programmable hydraulic clamping of fixtures (Hydraulic oil supply should be essentially through center of the table) mounted on the pallet/rotary table .The clamping pressure should be adjustable both manually and through programing. Vendor to intimate Hydraulic pressure range for clamping</b>	Vendor to confirm and intimate			
1.15.12	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			
1.15.13	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			
1.16	<b>HYDRAULIC SYSTEM : Details should be Submitted by the Vendor</b>				
1.16.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			
1.16.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
1.16.3	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			
1.16.4	Failure indication	Vendor to offer			
1.16.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
1.16.6	Hydraulic pump capacity ( flow / pressure ) to be intimated.	Vendor to inform			
1.16.7	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			
1.17	<b>CNC SYSTEM:</b>				
	The machine shall be equipped with Siemens SINUMERIK 840D CNC Control with latest Windows XP based operating system. THE CNC control 840D will have PC version PCU50 with Intel technology 566 MHz/ 512 MB , NCU 573.5 or higher version. It should consist of OP 15 A operator's panel having 15 inches TFT colour display, 19 inches machine control panel and MF-II PC Key Board with mouse on a folding/sliding tray. All standard features should be listed in technical offer. Also all available optional features of CNC 840 D system shall be offered and item wise price be indicated in commercial offer.	<b>Vendor to confirm</b>			
	The CNC System should have the following features:				

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1.17.1	Pentium -IV processor 1 GHz or of highest rating available with Siemens at the time of submission of order.	Vendor to confirm			
1.17.2	Hard disk of 10GB (easily replaceable) or of highest rating available with Siemens at the time of submission of order	Vendor to confirm			
1.17.3	512 MB SDRAM or of highest rating available with Siemens at the time of submission of order.	Vendor to confirm			
1.17.4	RS232-C interface for I/O device (Two Ports) and other standard port(s).	Vendor to confirm			
1.17.5	1GB PEN DRIVE WITH USB PORT- 1 No. with each machine.	Vendor to confirm			
1.17.6	Access lock on operator panel.	Vendor to confirm			
1.17.7	Co-ordinate system transformation.	Vendor to confirm			
1.17.8	Co-ordinate system rotation.	Vendor to confirm			
1.17.9	Look ahead of 70 blocks .	Vendor to confirm			
1.17.10	Helical/ Spline interpolation.	Vendor to confirm			
1.17.11	Scaling	Vendor to confirm			
1.17.12	Mirroring	Vendor to confirm			
1.17.13	Solid Tapping	Vendor to confirm			
1.17.14	All standard milling cycles.	Vendor to confirm			
1.17.15	Cylindrical interpolation.	Vendor to confirm			
1.17.16	Simulation.	Vendor to confirm			
1.17.17	Background editing.	Vendor to confirm			
1.17.18	Tool management.	Vendor to confirm			
1.17.19	SITOP power, DC-UPS Module 15 with AKKU module to ensure automatic unattended shutdown of the system in case of power failure or even in normal machine shutdown.	Vendor to confirm			
1.17.20	Display of PLC ladder on 840D monitor.	Vendor to confirm			
1.17.21	Siemens Diagonisting software to be supplied (Item wise price berak up if any to be indicated)				



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	The CNC system shall also have all other features required for:				
1.17.22	Machine Networking at point no. 1.18 below.	Vendor to confirm			
1.17.23	Machine Monitoring system as metioned at point no. 1.19 below.	Vendor to confirm			
1.17.24	The CNC system shall have a suitable port along with cable (one for each machine) so that printer can be connected directly to the machine for taking listing/ output of measured result file of the probing system if required in future.The arrangement / configuration should be such that the operator can give the printing command from CNC mode of the CNC system without the need of going back to Window /PC mode. All necessary hardware& software required for above shall be provided by the Vendor. (One set of PC & printer will be connected to 3 machines to take out the measuring results so total 2 PCs & 2 printers, complete set, should be supplied along with the machines. ) The system shall be completely demonstrated & established on all the supplied machines by the vendor during commissioning of the machine at BHEL ,Hardwar.	Vendor to confirm			
1.17.25	2 Nos. of PC along with 2 Nos. Printers(one set of PC & printer for three machines) is also to be supplied for activity mention at clause no. 1.17.24 .	Vendor to offer			
1.18	<b>MACHINE NETWORKING</b>	Vendor to confirm			
1.18.1	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 2000 / XP and different variants of Unix d. Software for part program transfer : SIN DNC It should cover following features also:	Vendor to offer			
1.18.2	The machine should appear as a node just as any other PC in the entire network (Network Neighbourhood).	Vendor to confirm			
1.18.3	The program transfer should be simple copy & paste method just as it is done in case of PCs.	Vendor to confirm			
1.18.4	The networking should be capable to transfer programs from/to machine across the network in CNC mode.	Vendor to confirm			
1.18.5	The network should be capable to transfer programs with UNIX based stations.	Vendor to confirm			
1.18.6	All necessary Anti-Virus measures shall be incorporated.	Vendor to confirm			

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1.18.7	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			
1.19	<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 SIMATIC S-7 PLC output card seperately.	Vendor to confirm			
1.19.1	➤ Cycle ON				
1.19.2	➤ Spindle running				
1.19.3	➤ Feed Active - Any of the axes running				
1.19.4	➤ M30 Program Stop.				
1.20	<b>SIGNALS FOR AREA MANAGER SYSTEM</b>				
1.20.1	The PLC on each machine (SIMATIC S7-300 ) 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.	Vendor to confirm			
1.21	<b>TELE DIAGNOSTIC SERVICE</b>				
	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 confirm			
1.22	<b>FAULT DIAGNOSTIC SYSTEM</b>				
1.22.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book along with Simatic S7 software ( licensed copy), necessary cables, PCMCIA card / Adaptor ( for Communication with MPI port ) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer			
1.22.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the tool carriers of the ATC&APC to its initial/nearest position in case of interruption of tool carrier's positioning cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of Tool carriers positioning cycle manually. Separate Hand Held Pendant should also be provided to retrieve the tool carrier to it's initial position.	Vendor to offer			

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1.22.3	Machine should have provision to switchover from position feedback system -2 ( direct) to Position feed back system-1 ( Motor encoder ) through PLC program ( for service personnel only).	Vendor to offer			
1.22.4	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 offer			
1.23	<b>MEASURING SYSTEMS:</b>				
1.23.1	Automatic job measuring system, comprising of Renishaw make Wireless system, with measuring cycles, calibration system and all types of probes / styli required for measuring all machined dimensions of the prove-out components. Vendor to furnish detailed description of the system along with offer. Details of measuring system is to be provided during the visit of our engineer for Pre-acceptance. Programming details are also to be provided for checking various dimensions of Fir-Tree root and Root & Shroud end of various 3DS & F blades as per Annexure A,B,C,D. (Annexure A,B for Root & Shroud end machining and Annexure C,D for Fir Tree root machining). Measurement Protocol will be discussed & finalised during technical discussion.	Vendor to offer			
1.23.2	Automatic Tool Offset measuring system(Preferably Laser type) with measuring cycles, calibration system etc suitable for all types of tools recommended for prove-out components. Vendor to furnish detailed description of the system along with offer.	Vendor to offer			
1.24	<b>VOLTAGE STABILIZER:</b>				
1.24.1	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.	Vendor to inform along with make , model and technical details			
1.24.2	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.	Vendor to offer			
1.24.3	Make	NEEL, Aplab or Auto Electric			
1.24.4	Model, Rating & Input/Output Voltage etc.	Vendor to inform with technical details.			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.24.5	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 inform with technical details.			
1.24.6	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 inform and offer.			
1.25	<b>ULTRA ISOLATION TRANSFORMER</b>				
1.25.1	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			
1.25.2	Make	Vendor to inform			
1.25.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
1.26	<b>SPARES:</b>				
1.26.1	Following spare parts of electrical/electronics and CNC system shall be offered itemwise per machine:				
1.26.2	PCU-50 with system software and hard disk- 2 Nos.	Vendor to offer			
1.26.3	Operator panel with OP-15A, 15" colour flat screen- 2 Nos	Vendor to offer			
1.26.4	Portable 40 GB hard disk with USB interface - 2 Nos	Vendor to offer			
1.26.5	Portable Floppy Drive 2 Nos.	Vendor to offer			
1.26.6	NCU ( as used in the machine) module with NCU box having fan and battery- 2 Nos	Vendor to offer			
1.26.7	PLC input and output cards- 2 Nos each type (Digital, fast I/O & analogue)	Vendor to offer			
1.26.8	19" Machine Control Panel- 2 Nos.	Vendor to offer			
1.26.9	I/R Module for 611D/U and Power Modules for Spindle X-axis, Y-axis, Z-axis and B-axis - 2 Nos each	Vendor to offer			
1.26.10	Complete position feed back system including linear scales & Heidenhain Transducer (Scanning Head) for X-axis, Y-axis, Z-axis, Heidenhain encoder for the table - 2 Nos each	Vendor to offer			
1.26.11	SIEMENS UPS SITOP DC-USV-Module 15 with AKKU - 2 Nos	Vendor to offer			
1.26.12	Profibus control components- 2 Nos. each type	Vendor to offer			
1.26.13	Control Card of 611D- 2 Nos each type	Vendor to offer			
1.26.14	Filter and Choke Module- 2 Nos	Vendor to offer			
1.26.15	Simatic net card used for external PLC (if applicable) - 2 Nos	Vendor to offer			
1.26.16	External PLC CPU if used in the machine-2 Nos	Vendor to offer			
1.26.17	Proportional Control Valve Controller 2 Nos. each type(if applicable)	Vendor to offer			
1.26.18	Following spare parts shall be offered as essential spares for the machine				
1.26.19	All proximity switches used in the machine- 2 Nos each type	Vendor to offer			
1.26.20	Set of Push Buttons- 2 Nos each type	Vendor to offer			
1.26.21	Set of Indicating Lamp- 50 Nos each type	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.26.22	Set of Contactors- 5 Nos. EACH TYPE	Vendor to offer			
1.26.23	Set of Overloads/ Automats- 2 Nos. each type	Vendor to offer			
1.26.24	Machine Status Indicating Lamp (Complete unit) - 4 Nos	Vendor to offer			
1.26.25	Axis Servo motors -1 Nos of each type				
1.26.26	Spindle motor with encoder - 1 No				
1.26.27	Spares Package for Tool Monitoring System	Vendor to offer			
1.26.28	Spares Package for all Accessories	Vendor to offer			
1.26.29	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 confirm)			
1.26.30	Repair service contract with supplier of CNC system for service & spares for motor drives, CNC Unit and Milling Spindle should also be offered by the vendor.	Vendor to offer			
1.26.31	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor (to confirm)			
1.26.32	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			
1.26.33	<b>Mechanical, Hydraulic &amp; Lubrication System Spares:</b> Machine Spindle- 1 No. * All types/varieties of pumps used on machines i.e.Hydraulic, lubrication, coolant and oil cooling pumps (3 nos. each type) * All types of D.C. Control valves (6 nos. each type) * All types of flow control, pressure regulators, pressure reducer valves, coolant gun, Nozzles used on m/c. (3 nos. each type) * All types of pressure switches, flow switches and float switches (5nos. each type) * All types of Pressure Gauges (3Nos. each type) * All types of filter inserts (6 nos. each of regenerative type & 20 nos. each of disposal type) * Shaft seals (4 nos. each type) * O-Rings and Piston rings (5nos. of each type) * Accumulator with charging kit if the same is used in the m/c (1 no each type)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
	* Bearings (5 sets ) * All types of Belts (5 Nos. each type) * Flexible Bellow Cover (2 Nos. each type) * Special Oil/ Grease/ Cooling Agent (if any)- Sufficient qty. for 1 year (operation on 3 shift basis. * Hydro Motor (2 Nos. each type) * Coiled Flexible air/coolant pipes ( 5 Nos. each type) * Coolant Gun (4 Nos.) * Coolant Flexible Nozzle (4 Nos.)	Vendor to offer			
1.26.34	<b>COOLANT &amp; PNEUMATIC SYSTEM:</b> Spare for Coolant Filtration System comprising Filter Drum (2 Nos), All types of Pumps (3 Nos. Each type), All types of Valves (3 Nos. each type), All types of Pressure Switches (3 Nos Each type), All types of Pressure Gauges (3 Nos. Each Type), All types of Filter Cartridges (6 Nos. Each type), All types of Air Pressure Regulators (3 Nos. Each type),				
1.26.35	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>				
1.26.36	<b>All the spares should be offered individually priced.</b>				
1.27	<b>DOCUMENTS:</b>				
1.27.1	3 hard copies of all Siemens programming (Basic and Advance), Cycles, Tool management etc. and all operational manuals shall be supplied in English language.	Vendor to offer			
1.27.2	Following manuals/diagrams/ list/ specifications shall be supplied in English language along with the machine documentation:	Vendor to offer			
1.27.3	Basic Machine operation and maintenance/ service manual - 5 copies	Vendor to offer			
1.27.4	Electrical schematic and wiring diagram of the machine- 5 copies	Vendor to offer			
1.27.5	PLC print-out in Operand form with comments in English- 5 copies	Vendor to offer			
1.27.6	GHOST back up of PCU-50 hard disk on CD	Vendor to offer			
1.27.7	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			
1.27.8	Detailed assembly drawing including that of spindle with clear marking of each component and giving reference of manufacturer of each assembly/sub-assembly- 5 copies.	Vendor to offer			
1.27.9	Hydraulic, Pneumatic, Lubrication and Coolant circuit diagram along with part list, complete specification and make of each element used – 5 copies.	Vendor to offer			
1.27.10	Wiring diagram indicating lay out of cables, plugs, junction boxes, terminal strips etc.- 5 sets	Vendor to offer			
1.27.11	List of all bearings, L.M. guides, ball bushings etc. with full specification and make.- 5 sets.	Vendor to offer			
1.27.12	Alarm list and fault diagnostic manual- 5 sets	Vendor to offer			
1.27.13	Spare part list along with specification, part number and address of manufacturers- 5 sets.	Vendor to offer			
1.27.14	Service and user manuals of all bought out items- 5 sets.	Vendor to offer			
1.27.15	CDs of latest Siemens 840D/611D documentation.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.27.16	840D documents comprising Operating manuals, Signals, Interfacing and diagnostic guide- 1 set	Vendor to offer			
1.27.17	Help guides for tele-diagnostic service systems- 5 sets	Vendor to offer			
	PLC print out with comments in english(Hard copy)of auxiliary systems(if used)-5 sets.				
1.27.18	All O&M manuals including electrical schematic ,wiring diagram,cable layout,junction box details and connector diagrams soft copy on CD-3nos.				
1.27.19	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 confirm			
1.28 A	<b>TOOLING PACKAGE -I</b>				
1.28A.1	<p>The machine should be tooled up for machining Technological step (as per attached sketch of centring &amp; step milling) and Root &amp; Shroud end machining ( as per Annexure A &amp; B).Technological step is to be machined on unmachined rolled rectangular flat for technological holding on 5 axis machine. Root &amp; Shroud radius machining will be carried out on the same blades on the tendered machine after machining of complete blade on the 5 axis machine. The fixtures should be universal type (one base and body for both type of applications for all the blades) with changeable parts etc. for accomodating about 67 different types of blades as mentioned at Annexure-I. The clamping of fixture shall be hydraulic and integrated with machine control as indicated at point no 1.15.11. Vendor to offer tooling package for 3 number of machines consisting of total six hydraulic fixtures and six sets of changable parts(for blades mentioned at Annexure-I) to be used on the pallets of machines, 6 sets of cutter bodies &amp; tool holders and sufficient number of consumables(inserts etc.) for machining the quantities of blades mentioned at clauses 1.28A.2 to 1.28A.8. All relevant drawings &amp; details of cutters, tool holders, consumables, fixture assembly &amp; changeable parts will be supplied by the vendor after the order.</p> <p>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 and detailed manufacturing drawings of fixtures , change parts (for all items to be supplied by Vendor ) in 3 sets in the event of ordering.</p>	Vendor to Confirm and offer. Details to be finalized during technical discussion			
1.28A.2	Drawing No. 11030641003- Qty. 120 Nos. F Blade: Blank Size- 100x69	Vendor to offer			
1.28A.3	Drawing No. 11030641006- Qty. 120 Nos. F Blade : Blank Size- 100x69	Vendor to offer			
1.28A.4	Drawing No. 11010241013- Qty. 80 Nos. 3DS Blade : Blank Size- 84x43	Vendor to offer			
1.28A.5	Drawing No. 11010241014- Qty. 90 Nos. 3DS Blade : Blank Size- 84x43	Vendor to offer			
1.28A.6	Drawing No. 11010241015- Qty.80 Nos. 3DS Blade : Blank Size- 93x48	Vendor to offer			
1.28A.7	Drawing No. 11010241016- Qty. 80 Nos. 3DS Blade : Blank Size- 93x 48	Vendor to offer			
1.28A.8	Drawing No. 11051841013- Qty. 100 Nos. 3DS Blade : Blank Size- 72x46	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.28A.9	Drawing No. 11051841014- Qty. 110 Nos. 3DS Blade : Blank Size- 75x40	Vendor to offer			
1.28A.10	Drawing No. 11051841015- Qty. 110 Nos. 3DS Blade: Blank Size- 72x46	Vendor to offer			
1.28A.11	Drawing No. 11051841016- Qty. 100 Nos. 3DS Blade : Blank Size- 80x50	Vendor to offer			
1.28 B	<b>TOOLING PACKAGE -II</b>				
1.28B.1	The Vendor to offer tooling package consisting of all toolings ( excluding fixture) i.e. cutting tools , tool holders with sister tooling concept for machining Fir Tree root of following blades on 3 machines i.e total 6 sets of cutter bodies(including screws,wedges) & tool holders and sufficient number of consumables for machining the quantities of blades mentioned at clauses 1.28B.2 & 1.28B.3 are required to be quoted. 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 (in 3 sets).	Vendor to Confirm and offer. Details to be finalized during technical discussion			
	The schematic blade holding arrangement to be provided by BHEL during Prove-out of Fir-Tree root machining will be as per Annexure No: II, III				
1.28B.2	Drawing No. 01030746002 (LP2L-250 MW) - Qty. 50 Nos. Fir tree	Vendor to offer			
1.28B.3	Drawing No. 01030746005 (LP 2R- 250MW)- Qty.50 Nos. Fir Tree	Vendor to offer			
1.29	<b>TIME CYCLE</b>				
1.29.1	Vendor to indicate time cycle for machining the blades mentioned at 1.28A.2 to 1.28A.11 and 1.28B.2 to 1.28B.3 ( Total 10+2= 12 types of Blade). The time cycle should include all components of time viz. job change time, tool change time, machining time etc.Vendor has to prove the offered timing as per point no 1.42.1 on offered machines during final acceptance of the machine at BHEL Hardwar. Vendor shall indicate proving charges (if any) blade drawing number and quantity wise indicated at 1.28A.2 to 1.28A.11 and 1.28B.2 to 1.28B.3	Vendor to submit			
1.30	<b>TROPICALISATION</b>				
1.30.1	All electrical / electronic equipment shall be tropicalized.	Vendor to confirm			
1.30.2	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm			
1.30.3	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm			
1.30.4	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			
1.30.5	All motors shall conform to IEC or Indian Standards	Vendor to confirm			
1.30.6	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays/chains etc. required for laying of cables should be included in the offer.	Vendor to confirm			
1.30.7	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			
1.31	<b>OPERATING CONDITION:</b>				



SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
	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 Confirm			
1.31.1	Total machine including all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. <b>Ambient Conditions:</b> Temperature up to 30 degree Celsius in Air Conditioned Hall Relative Humidity About 70%				
1.32	<b>SAFETY ARRANGEMENTS</b>				
1.32.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm			
1.32.2	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			
1.32.3	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm			
1.32.4	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			
1.32.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm			
1.32.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm			
1.32.7	Oil & water pipe lines should not run with electrical cable in the same tray/trench.	Vendor to confirm			
1.33	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE</b>				
1.33.1	The Machine should conform to following factors related to environment :				
1.33.2	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			
1.33.3	There shall not be any emissions from the machine. All fumes etc. during machining shall be arrested by Fume extraction system mentioned at point 1.15 and 1.15.1	Vendor to confirm			
1.33.4	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			
1.33.5	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.33.6	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
1.33.7	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			
1.34	<b>ACCURACY TESTS</b>				
1.34.1	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.			
1.34.2	All the Geometrical accuracies including test pieces machining, NAS test piece machining, etc. should be demonstrated to BHEL engineers during pre-acceptance at Supplier's works. The repeat test of the geometrical accuracies shall also be demonstrated at BHEL Hardwar, the same shall have to be arranged by the vendor. Test pieces are to be supplied by vendor. Drawings of test pieces to be submitted with the offer.	Vendor to confirm and submit.			
1.35	<b>GEOMETRICAL ACCURACIES :</b>				
1.35.1	Submit test chart for all accuracies as per DIN 8609/ ISO 10791 standard or equivalent applicable standard.	Vendor to confirm			
1.35.2	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			
1.35.3	<b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY:Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.</b>	Vendor to confirm			
1.35.4	Positioning accuracy in X / Y axis (Pa) per 1000 mm	Vendor to inform			
1.35.5	Positioning accuracy in Z axis (Pa) per 1000 mm	Vendor to inform			
1.35.6	Repeatability in X / Y/Z axis (Ps)	[Approx =1/2 the positional accuracy] ; Vendor to inform			
1.35.7	NAS- Test Piece machining	Vendor to confirm			
1.35.8	Positioning accuracy over entire traverse in X / Y axis (Pa)	vendor to inform			
1.35.9	Positioning accuracy over entire traverse in Z axis (Pa)	vendor to inform			
1.35.10	Positioning accuracy in Rotary table (Pa)	Vendor to inform			
1.35.11	Repeatability in Rotary table (Ps)	Vendor to inform			
1.35.12	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works.	Vendor to confirm			
1.36	<b>LEVELING &amp; ANCHORING SYSTEM</b>				
	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 offer)			
1.37	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE</b>				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.37.1	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 offer)			
1.37.2	Set of Test Mandrels/Special Gauge for checking spindle run-out & alignment of headstock/tailstock etc. should be brought by the vendor.	Vendor to confirm			
1.38	<b>FOUNDATION</b>				
1.38.1	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 accept & offer.			
1.38.2	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" = $3.0 \text{ Kg/cm}^3$ - (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	For vendor's information.			
1.39	<b>TRAINING</b>				
1.39.1	BHEL Persons should be trained at vendor's works for mutually agreed period in the area of (a) CNC Part Programming, Use of all CNC Features, Programming for Measuring Systems & supplied accessories, Machining Technology of the Proveout Component etc. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipment. Vendor should provide training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for Advanced features and specialized training. Party should arrange 840 D Advance system training for CNC Service personnel at Siemens training centre in India.	Vendor (to offer)			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.39.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	For vendor's information.			
1.39.3	Competent, English speaking experts shall be arranged by the vendor for satisfactory & effective training of BHEL personnel.	Vendor to accept & confirm			
1.40	<b>MACHINE PRE-ACCEPTANCE AT VENDOR'S WORKS</b>				
1.40.1	BHEL persons deputed for training will be doing pre-acceptance at vendor's works and give dispatch clearance after satisfaction from all angles. During pre-acceptance, all accuracy tests mentioned at point number 1.35 (1.35.1 to 1.35.12) shall be witnessed by the team. Also during pre-acceptance, vendor shall have to machine any one type of blade (2 Nos) for tooling ordered per machine from the list of drawings mentioned at 1.28B.2 to 1.28B.3 ( Fir tree Root ) on a steel block (Material of steel block to be similar to material indicated blade Drawing (Point no 1.28B.2 to 1.28B.3) in the presence of BHEL representatives and submit 3D Co-ordinate Measuring Machine reports for machined blades. Blade Material to for pre-acceptance be arranged by the Vendor.	Vendor to accept & confirm			
1.40.2	Raw material , Fixturing , Consumables for cutting tools for machining of Blades during Pre-acceptance shall be supplied by the Vendor. Consumables used for pre-acceptance shall be quoted separately.	Vendor to accept & confirm			
1.41	<b>ERECTION &amp; COMMISSIONING</b>				
1.41.1	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 confirm & offer			
1.41.2	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 offer			
1.41.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Sl. No. 1.34, 1.35 and testing/demonstration of tele-diagnostic service shall also be part of the commissioning activity.	Vendor to confirm			
1.41.4	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 confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.41.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
1.41.6	Broad Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
1.41.7	Charges, duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to offer			
1.41.8	Portion, if any, of the machine, accessories and other supplied items where paint got rubbed or peeled off 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 confirm			
1.42	<b>PROVE OUT OF BHEL COMPONENTS</b>				
1.42.1	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, equipment and CNC programs etc. supplied by the vendor. The time study submitted at point number 1.29 & 1.29.1 shall have to be adhered. Raw material for prove out component shall be given by BHEL at BHEL Hardwar.35. Vendor shall have to machine F & 3DS blades one type (one set) of blades mentioned at 1.28A.2 to 1.28A.11 on 3 machines. Different type for each of the 3 machines. On the remaining 3 machines - 25 numbers of Fir Tree roots mentioned at 1.28B.2 & 1.28B.3 will have to be machined on each machine i.e total 75 blades (38 Right & 37 Left blades) will be machined.	Vendor to confirm & offer			
1.42.2	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 accept & confirm.			
1.42.3	Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc.. Any change in tooling 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'. Incase fir tree blade is rejected during job proving, vendor will have to reimburse forging cost.	Vendor to accept & confirm.			
1.43	<b>FINAL MACHINE ACCEPTANCE</b>				
1.43.1	Final acceptance shall be made by BHEL Hardwar after completion of following activities:				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.43.2	Demonstration of specified/offered Geometrical accuracies as per test chart/standard after machine commissioning	Vendor to accept & confirm.			
1.43.3	Demonstration of specified/offered Positioning accuracies as per VDI-DGQ/3441 and specified values after machine commissioning	Vendor to accept & confirm.			
1.43.4	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: 1.18.7	Vendor to accept & confirm.			
1.43.5	Machining of test piece as per international standard, NAS test piece machining. Vendor to supply test pieces.	Vendor to accept & confirm.			
1.43.6	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.	Vendor to accept & confirm.			
1.43.7	Prove out of BHEL components as per contract agreement.	Vendor to accept & confirm.			
1.43.8	Demonstration of measurement results.	Vendor to confirm			
1.43.9	One Week supervision after successful prove out.	Vendor to accept & confirm			
1.44	<b>PACKING</b>				
	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 offer			
1.45	<b>GUARANTEE</b>				
	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 confirm & offer			
1.46	<b>COLOUR OF THE MACHINE</b>				
	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer			
2.0	<b>ADDITIONAL INFORMATION</b>				
2.1	Following information shall be supplied with the offer:				
2.2	Machine Model No.	Vendor to inform			
2.3	Total connected load (KVA)	Vendor to inform			
2.4	Space required (Length, Width, Height) for complete machine & accessories	Vendor to inform			
2.5	Catalogue of the machine	Vendor to submit			
2.6	Total weight of the machine	Vendor to inform			
2.7	Weight of heaviest part of machine	Vendor to inform			
2.8	Weight of the heaviest assembly of the Machine	Vendor to inform			
2.9	Dimensions of largest part of the machine	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm			
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 confirm			
3.0	<b>OPERATION SAFETY</b>				
	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 for auto Pallet Changing cycles. Headstock, Spindle, Guide ways etc. to protect against fall in oil level, overloads or fall in compressed air pressure.	Vendor to confirm			
4.0	<b>GENERAL INFORMATION</b>				
	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, who have supplied and commissioned at least one CNC Horizontal Machining Center of same or higher sizes (Pallet size, Spindle power, Torque, Load Capacity & Max Job Envelop) for similar applications in the past ten years (on the date of opening of tender ) and such machine is presently working satisfactorily for more than one year after commissioning ( on the date of opening of tender ) should quote. However if such machine(s) has/had been supplied to BHEL,then such machine should be presently working satisfactorily for more than six months after is commissioning and acceptance (on the date of opening of tender ) in BHEL should quote. The following information should be submitted by the vendor about the companies where similar machines have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept & confirm.			
5.2	Name of the customer / company where similar 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	Parameters of machine(s) supplied (Pallet size, Spindle power & torque, Load Capacity & Max Job Envelop ) and application for which the machine is supplied.”	Vendor to inform			
5.6	Name and designation of the contact person of the customer	Vendor to inform			
5.7	Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
5.8	Performance certificate from the customer regarding satisfactory performance of machine supplied to them ( Original Certificate or Through E-mail directly from the customer ). The original performance certificate may be returned after verification by BHEL, if required.”	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
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.				
(V.K.Chugh/DGM-TBM) ( S K Shukla/SDGM-WEX-CNC) (N Halder/DGM-WEX-M) ( Sanjeev Kumar Gupta/Sr.Mgr-NCT) (T K Saha/D.Mgr-QC-B)					



## **ANNEXURE - 1**

### **LIST OF DRAWINGS FOR WHICH CHANGEABLE PARTS ARE TO BE SUPPLIED FOR ROOT & SHROUD MACHINING**

#### **H.P. MOVING BLADE**

Stage	Blade Type	Rhomboid Angle	Rhomboid Size	DRG NO	Var No
1	3DS	29	45	11010236001	02
2	3DS	29	45	11010236002	02
3	3DS	29	45	11010236003	02
4	3DS	29	45	11010236004	02
5	3DS	29	45	11010236005	02
6	3DS	29	45	11010236006	02
7	3DS	29	45	11010236007	02
8	3DS	29	45	11010236008	02
9	3DS	29	45	11010236009	02
10	3DS	29	45	11010236011	02
11	F-BLADE	29	45	11010236012	02
12	F-BLADE	29	45	11010236013	02
13	F-BLADE	29	50	11010236018	02
14	F-BLADE	29	50	11010236014	02
15	F-BLADE	29	50	11010236015	02
16	F-BLADE	29	56	11010236016	02
17	F-BLADE	29	56	11010236017	02

#### **H.P. GUIDE BLADE**

Stage	Blade Type	RH ANGLE	RH SIZE	DRG NO	Var No
1	3DS	29	45	11051836001	01
2	3DS	29	36	11051836002	01
3	3DS	29	36	11051836003	01
4	3DS	29	36	11051836004	01
5	3DS	29	36	11051836005	01
6	3DS	29	36	11051836006	01
7	3DS	29	36	11051836007	01
8	3DS	29	36	11051836008	01
9	3DS	29	36	11051836009	01
10	3DS	29	36	11051836011	01
11	F-BLADE	29	36	11051836012	01
12	F-BLADE	29	36	11051836013	01
13	F-BLADE	29	40	11051836018	01
14	F-BLADE	29	40	11051836014	01
15	F-BLADE	29	40	11051836015	01
16	F-BLADE	29	40	11051836016	01
17	F-BLADE	29	45	11051836017	01

#### **I.P. GUIDE BLADE -Double Flow**

Stage	Blade Type	RH ANGLE	RH SIZE	DRG NO	Var No
1	3DS			11061636001	01, 03
2	3DS			11061636002	01, 03
3	3DS			11061636003	01, 03
11	F-BLADE			11061636007	01, 03

12	F-BLADE			11061636008	01, 03
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**NOTE:** ABOVE 5 TYPES OF BLADES WILL HAVE LEFT AND RIGHT HAND ROTATIONS

**L.P. MOVING BLADE - Double Flow**

Stage	Blade Type	RH ANGLE	RH SIZE	DRG NO	Var No
1	LM3		64	11030641003, 11030641006	00, 00
2	LM1		84	01030741001, 01030741004	00, 00

**L.P. MOVING BLADE - Double Flow(250 MW)**

Stage	Blade Type	RH ANGLE	RH SIZE	DRG NO	Var No
1	F Blade (Left Rotation)			01030746001	
1	F Blade (Right Rotation)			01030746004	

**H.P. MOVING BLADE**

Stage	Blade Type			DRG NO	Var No
1	3DS			11010241001	02
2	3DS			11010241002	02
3	3DS			11010241003	02
4	3DS			11010241004	02
5	3DS			11010241005	02
6	3DS			11010241006	02
7	3DS			11010241007	02
8	3DS			11010241008	02
14	F-blades			11010241013	02
15	F-blades			11010241014	02
16	F-blades			11010241015	02
17	F-blades			11010241016	02

**H.P. GUIDE BLADE**

Stage	Blade Type			DRG NO	Var No
1	3DS			11051841001	01
2	3DS			11051841002	01
3	3DS			11051841003	01
4	3DS			11051841004	01
5	3DS			11051841005	01
6	3DS			11051841006	01
7	3DS			11051841007	01
8	3DS			11051841008	01
14	F-blades			11051841013	01
15	F-blades			11051841014	01
16	F-blades			11051841015	01
17	F-blades			11051841016	01

### ANNEXURE - III

#### FIXTURE DETAILS FOR CNC HORIZONTAL MACHINING CENTER (PH-III)

BLADE DRAWING	ROOT DETAILS	PROFILE DETAILS	LH / RH	BOX DETAILS R7290-3016				FIXTURE DETAILS R7021-3036				DEPTH ALONG THE SPINDLE AXIS	BLADE DETAILS (±)		
				WIDTH (A)	CENTER HEIGHT (B)	HEIGHT ( C )	LENGTH (D)	E	HEIGHT OF BASE FROM TABLE (F)	WIDTH OF FIXTURE (G)	HEIGHT OF FIXTURE (H)		I	J	K
01030746002	21030746035 F14	01030746022	LH	249	80	200	279	270	130	600	280	310	39	39	11.85
01030746005	21030746035 F14	01030741022	RH	249	80	200	279	270	130	600	280	310	39	39	11.85

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