

BHARAT HEAVY ELECTRICAL LIMITED**UNIT'S ADDRESS:**

HEEP, RANIPUR,
HARIDWAR - 249403
UTTARANCHAL, INDIA

Indent No. 20171285

Date: 15-07-2017

SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR SINGLE SPINDLE CNC 5 AXIS MILLING MACHINE: 1 NUMBER**NOTE :-**

1. Vendor must submit complete information against clause no. 4. The offer would only be considered if this clause is complied with.

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. Any changes made to the clauses of the specification cum compliance certificate will be treated as non-compliance and may lead to rejection of the offer.

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

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF SINGLE SPINDLE CNC 5 AXIS MACHINING CELL COMPLYING WITH SPECIFICATIONS AS BELOW.

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL:				
1.1	Purpose: The machine is required for complete finish machining of Steam Turbines Blades of length from 75 mm up to length 500 mm having intricate aerofoil shape from hot rolled/ forged rectangular bars, envelop forging of blades or semi-finished blades. The machine should be capable of doing centre hole drilling at tip end of the bar necessary for clamping the bar at tip end at tail stock for complete machining in one set up. Achievable surface quality on finish blade should be about 1.6 μ Ra or better in optimized condition.	Vendor to Accept			
1.2	Work Piece Material: Blade materials are Nickel and chromium based super alloys such as Inconel 617 M , Nimonic 80A etc. having Tensile Strength 1300 N/mm2, Hardness $\geq$ 260 BHN and heavy work hardening characteristics. Material standards are attached (HW12784, Annexure: Inconel spec). Documents will be provided to the vendor only after the vendor has signed a non disclosure agreement with BHEL.	Vendor to confirm			
2.0	The machine's axis configuration rotary station (A-Axis) and the swivelling axis shall be so designed to permit the shortest possible distance between spindle gauge line and the work piece.	Vendor to inform with details			
2.1	TRAVERSES:				
2.1.1	Longitudinal Axis X (Suitable for machining finished blade of length from 75 mm up to length 500 mm)	Vendor to furnish dimension & details.			
2.1.2	Transverse Axis Y	400 mm or more, Vendor to confirm and furnish details.			
2.1.3	Vertical Axis Z comprising of two synchronous vertical sliding carriages (up and down movement) for head-stock and tail-stock respectively).	400 mm or more, Vendor to confirm and furnish details.			

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2.1.4	Swivel - Axis B (Spindle Head) : (suitable to accurately machine the blades mentioned at Point Nos 2.32, 2.44, 2.46)	+/- 50° or more , Vendor to confirm and furnish details.			
2.1.5	Part Rotary Axis 'A' (Head stock station and tail stock station with two separate synchronous running rotary drives)	360 degree Continuous			
2.1.6	Swing Diameter	>=400 mm, Vendor to confirm and furnish details.			
2.2	AXIS FEEDS AND RAPID TRAVERSES:				
2.2.1	Linear X,Y &Z	0 to 50 Meter /Min. or more, Vendor to confirm and furnish details.			
2.2.2	Rotary Axis 'A'	0 to 200 rpm or more, Vendor to confirm and furnish details.			
2.2.3	Swivel Axis 'B'(Suitable for High Speed machining of blades)	0 to 50 rpm or more, Vendor to confirm and furnish details.			
2.3	MILLING SPINDLE:				
2.3.1	No. of Milling Spindle for simultaneous operation	1			
2.3.2	High Speed integrated motor Milling Spindle for roughing and finishing.	Vendor to confirm and submit details			
2.3.3	Spindle Position/ Orientation.	Vendor to inform with details			
2.3.4	Maximum Spindle Speed	19000 rpm or more, Vendor to confirm and furnish details.			
2.3.5	Spindle Power(S1)	28 KW (S1) or more, Vendor to confirm and furnish details.			
2.3.6	Spindle Torque	200 NM or more, Vendor to confirm and furnish details.			
2.3.7	Spindle Taper for clamping tools	HSK 63A, Vendor to confirm			
2.3.8	Spindle Front Bearing Diameter	Vendor to inform			
2.3.9	Spindle diameter	Vendor to inform			
2.3.10	Spindle Motor make Model etc. (Should comply with IEC / IS specification).	Vendor to inform			
2.3.11	Range of spindle speed at constant power.	Vendor to inform			
2.3.12	Torque/power/Speed diagram of spindle motor is to be submitted with the offer.	Vendor to inform			
2.3.13	Balancing quality of tool holder: DIN /ISO 1940 G2.5 or better.	Vendor to inform			

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2.3.14	External coolant and external air supply through adjustable nozzles, mounted on spindle front wall periphery, pointing towards tool tip: 6 numbers or more.	Vendor to confirm and submit details			
2.3.15	Through spindle water miscible coolant and through spindle compressed air supply for cooling of milling cutter during machining. The maximum spindle speed with through spindle compressed air cooling should be ≥ 10000 rpm . Vendor to inform air pressure for cooling through spindle, suitable for INCONEL 617M machining.	Vendor to confirm and submit details			
2.3.16	Maximum tool weight carrying capacity in spindle.	Vendor to inform			
2.3.17	Power chuck device (OTT Make or equivalent reputed manufacturer) to measure spindle clamping force is to be offered.	Vendor to offer			
2.4	AUTOMATIC TOOL CHANGER (ATC):				
2.4.1	No. of Tool Deposit	60 or more, Vendor to confirm and furnish details.			
2.4.2	Tool Length	290 mm or more, Vendor to confirm and furnish details.			
2.4.3	Tool Diameter (with all pockets full)	75 mm or more, Vendor to confirm and furnish details.			
2.4.4	Tool Diameter (with adjacent pocket free)	150 mm or more, Vendor to confirm and furnish details.			
2.4.5	Weight of each tool	8 Kg. or more. , Vendor to confirm and furnish details.			
2.4.6	Tool Change Time (chip to chip)	Vendor to intimate			
2.4.7	Vendor shall provide a separate hand pendant/custom built screen with proper safety interlocks for manual management of ATC. Manual operation of ATC should be possible with Hand-Pendant during aborted tool change auto cycle.	Vendor to confirm			
2.4.8	Machine operation should be possible with or without referencing ATC	Vendor to confirm			
2.4.9	Automatic Tool Changer will have following features:				
2.4.10	Provision of cleaning of spindle taper by compressed air blow during ATC cycle	Vendor to confirm and submit details.			
2.4.11	Provision of automatic compressed air blow for cleaning spindle taper during manual tool change.	Vendor to confirm and submit details.			
2.4.12	Provision of manual tool loading and unloading with push button mounted at convenient location.	Vendor to confirm			
2.4.13	Tool changing position should be at a convenient height from floor, which will be mutually agreed, so that it remains at an approachable position in order to work manually in case of emergency. Vendor to submit layout of ATC with offer.	Vendor to confirm			
2.4.14	Type: Chain type/ Drum Type magazine with tool changer with double gripper.	Vendor to confirm and submit details.			
2.4.15	Tool Selection method	Random & Shortest path, Vendor to submit details.			

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2.4.16	Access door for loading of tools in ATC	Vendor to confirm and submit details			
2.5	WORK PIECE HANDLING:				
2.5.1	AUTOMATIC PART CHANGER:				
2.5.1.1	For uninterrupted operation of the machine, a suitable automatic part changer to be offered for clamping the billet blanks without any pre-machining (raw bar stock) as well as Envelope forging for automatic cyclic transportation of blade blank (Bar and envelop forging) and finished blade to and from machining station respectively. The automatic part changer should have easily accessible part loading/unloading station. The maximum cross-section of Bar Stock of the work piece shall be 150 mmX 100 mm and approximate weight 60 Kg. Part changer magazine should be accessible from front and side as well as from top for easy access of overhead crane for loading and unloading directly in work piece magazine. Parts / Jobs will be loaded vertically in the workpiece magazine. A two-fold gripper arm shall load the job from workpiece magazine and carry the same to machining area and vice versa. The complete Automatic Part Changer system (Magazine, Gripper arm etc.) should be capable of carrying the load of workpiece blanks and chucks/adaptor in full load condition.	Vendor to confirm and submit details of offered system			
2.5.1.1.1	Vendor to specify & provide system for indenting and subsequent gripping of blanks as per clause 1.2 within/outside the machine for holding of rectangular blanks in work piece adaptors and offer the same with details. Vendor to provide 10 numbers extra pieces of indenting jaws as used in indenting system and gripping jaws as used in adaptor chucks each.	Vendor to inform, offer and submit details.			
2.5.1.2	No. of pallet Station with complete arrangement including pallet & Work piece chucks/ adaptors to be supplied	15 or more, Vendor to confirm			
2.5.1.3	Part change time	Vendor to inform			
2.5.1.4	Maximum work piece weight (raw material as well as finished part) and weight of adaptor (pallet and chuck).	Vendor to inform			
2.5.1.5	Maximum work piece length (raw material as well as finished part)	Vendor to inform			
2.5.1.6	Manual operation of Work piece Changer (WPC) should be possible. Vendor shall provide a separate hand pendant for manual management of WPC.	Vendor to confirm and submit details			
2.5.1.7	Machine operation should be possible with WPC in automatic or in manual mode.	Vendor to confirm and submit details			
2.5.1.8	The clamping allowances in blank at tailstock side should be ≤10 mm. Clamping at head stock adaptor chuck jaws should be very rigid and clamping length should be 5 mm approximately.	Vendor to confirm and submit details of chucks, work piece adaptors.			
2.5.2	Suitable Part alignment station/fixture to be offered along with the machine with all technical details.	Vendor to offer			
2.5.3	Different arrangements for clamping at tailstock end (Fixed tip, Root end driven floating chuck, Direct motorised synchronous rotary drive) to be offered with full technical details. The arrangement for clamping at tailstock end shall be finalised during technical discussion.	Vendor to confirm and submit details			
2.6	WORK PIECE CENTRE DRILLING AND CLAMPING:				

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2.6.1	Work-piece will be clamped at head stock by clamping jaws and at tail stock, their shall be provision to hold and clamp the work piece by tail stock centre pin and floating jaws as well as only with floating jaws. Machine shall have feature of centre drilling at the tip end (Tail stock side) of clamped work piece in the rotary station (Head stock). Tail stock for this purpose shall be automatically adjustable. Further, the work piece pressure at the tail stock end should be adjustable through program as well as manually and a suitable gauge may be provided for visualization of clamping pressure. The range of variable clamping pressure to be specified. For purpose of drilling at raw material at tail stock side, an automatic adjustable drilling unit should be mounted on tail stock itself and for drilling operation at tailstock side of work piece, no work piece rotation is allowed. Additionally 2 numbers of slim type angle heads will be installed in the machine for centering and recentering at tail stock side of blank end along with tooling (drill bits, collets etc.). Vendor to offer and supply 50 numbers of spare drill bits Tail stock should be able to unclamp work piece and move accordingly for centering/ recentering purpose in between operation cycle and again clamp the job in initial holding position. Tail stock side should be having a rotary drive powered by a separate motor which runs synchronously with the head stock drive through the CNC control.	Vendor to confirm and submit details & inform the length up to which drilling can be done			
2.6.2	Maximum finished blade length (excluding technological clamping allowance)	500 mm , Vendor to confirm			
2.7	COOLANT SYSTEM (WATER MISCIBLE COOLANT AND AIR COOLING):				
2.7.1	Turbo filter System/Vacuum Rotary Coolant supply system comprising External system (nozzles around the spindle), an internal system (through the tool) and a work piece shower suspended from the ceiling shall be offered. It should have coolant collecting system at the base and recycling of coolant after proper filtration for which vacuum type coolant filtration unit comprising of coolant tank, vacuum rotational filter, filter drum (made of high quality steel net) vacuum pump, coolant pump, flushing pump, tube type oil separator (Oil skimmer) etc. shall be offered.	Vendor to confirm and provide details of coolant system offered			
2.7.1.1	Vendor to offer and give details of through spindle and external air cooling system and associated systems as mentioned in clause no. 2.3.14 and 2.3.15.	Vendor to inform details of system offered			
2.7.2	Following parameters of coolant system to confirm and submit details:				
2.7.2.1	Coolant storage and Tank Capacity.	Vendor to inform			
2.7.2.2	Discharge Rate for External Coolant and air supply	Vendor to inform			
2.7.2.3	Pump pressure for external coolant and air supply	Vendor to inform			
2.7.2.4	Discharge Rate for Internal Coolant and air supply through spindle	Vendor to inform			
2.7.2.5	Pump pressure for internal coolant and air supply through spindle	Vendor to inform			
2.7.2.6	Filtration details.	Vendor to inform			
2.7.2.7	The External coolant system should be switchable through program (M code) as well as through push button provided on the operator panel. However, the internal coolant system, if programmed, can then be switched OFF and ON through a push button on the operator panel.	Vendor to inform			
2.7.2.8	The Coolant collection and recirculation system should be leak-proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to confirm			
2.7.2.9	Coolant Flow diagram showing filters, pumps, valves, float switches, pressure switches, tanks etc.to be submitted with the offer.	Vendor to confirm and submit details			

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2.7.2.10	For finer control of Pressure and Coolant Flow Rate, After its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to confirm and submit details			
2.7.2.11	Coolant Pump and Motor details for all variants. Additional coolant pump shall be connected in the circuit to build in redundancy in the event of failure.	Vendor to confirm and submit details			
2.7.2.12	The Coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm and submit details			
2.7.2.13	First filling water miscible coolant for the machine is to be supplied by vendor. Indigenous (Indian) source or Indian equivalent supplier and specifications is also to be provided by the vendor. The vendor shall also submit estimated annual consumption of the coolant on 7000 hours per year working basis.	Vendor to confirm			
2.7.2.14	Coolant tank shall be provided with manholes for ease of cleaning of tank. Also, a coolant discharge valve shall be provided at ground level for the purpose of emptying the coolant tank completely during tank cleaning. Vendor to submit details of the same.	Vendor to confirm			
2.8	HYDRAULIC SYSTEM:				
2.8.1	Hydraulic System should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to confirm and submit details			
2.8.2	Make Rexroth / Vickers/ Hawe or equivalent reputed manufacturer. (Details to be submitted),	Vendor to confirm and submit details			
2.8.3	Failure indication	Vendor to confirm and submit details			
2.8.4	Hydraulic pump capacity (flow/pressure)	Vendor to inform			
2.8.5	Analogue Flow Indicator after Pump for Indicating Volume of Discharge	Vendor to confirm and submit details			
2.8.6	Each pump should have an independent motor. Tandem pumps should not be used.	Vendor to confirm and submit details			
2.8.7	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 and submit details			
2.8.8	Display of Hydraulic oil level during machining should be incorporated in operator's control panel with proper indication for requirement of top up in time. Relevant alarms should be displayed in operator's panel for oil level.	Vendor to confirm and submit details			
2.9	CHIP CONVEYOR:				
2.9.1	Elevated Scraper type chip conveyor integrated with coolant system located at side of the machine.	Vendor to offer			
2.9.2	Following technical details of chip conveyor shall be submitted				
2.9.2.1	Width of conveyor	Vendor to inform			
2.9.2.2	Elevation of chip conveyor for chip bin	Vendor to inform			
2.9.2.3	Material of chip conveyor	Vendor to inform			

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2.9.2.4	Complete arrangement for transportation of chips up to the centralised chip conveyor system in BHEL Hardwar to be offered with optimised layout. The trenches of centralised chip conveyor system are available on one side of machine along the length of the bay. Details can be discussed during technical discussion. Vendor shall supply one number of chip bin of suitable volume with suitable caster wheels for manual movement of chips in case our centralised chip conveyor fails.	Vendor to offer			
2.10	COMPRESSOR COOLING SYSTEM:				
2.10.1	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 offer			
2.10.1.1	Type of Refrigerant (Preferably R134 A)	Vendor to inform			
2.10.1.2	Refrigerating Capacity	Vendor to inform			
2.10.1.3	Cooling Medium	Vendor to inform			
2.11	MACHINE ENCLOSURE WITH ACCESS DOOR:				
2.11.1	Machine shall have sound dampening enclosure with interlocked doors in the tool and work piece area and access door at operator's panel. Enclosure shall have large safety glass viewing window like ROTOCLEAR or Visiport or equivalent camera firmly mounted in work area with suitable operator panel display for viewing the job and ongoing process.	Vendor to confirm and submit details			
2.12	MACHINE LIGHTS:				
2.12.1	Machine light for illumination of complete encapsulated working area for clear visibility.	Vendor to confirm			
2.12.2	Tube lights in electrical cabinets/operator pendant/service area rooms (wherever required) for maintenance purposes.	Vendor to confirm and submit details			
2.12.3	Multi-coloured signal light (4 or more color indicating lamp/LED) displaying operational status of the machine and visible from distance.	Vendor to confirm and submit details			
2.13	ELECTRICAL CONTROL CABINET & OPERATOR'S PENDANT:				
2.13.1	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 & Operator pendant shall be provided with wiring for 220V, 5 Amp socket for maintenance purpose.	Vendor to confirm and submit details			
2.14	HAND HELD PENDANT:				
2.14.1	A Siemens BMPI or equivalent Hand Held Pendant along with sufficient length of interfacing cable shall be supplied for distant machine operation.	Vendor to offer			
2.15	MIST / FLUE GAS EXTRACTION SYSTEM:				
2.15.1	Machine shall have Mist Extraction System/ Flue Gas Extraction System with all connections and installation at convenient location.	Vendor to confirm and submit details			
2.16	OTHER TECHNICAL FEATURES:				
2.16.1	Centralized Automatic Lubrication System for lubrication of all moving and rotating parts (except sealed bearings) with alarm/ interlocks in case of lubrication failure.	Vendor to confirm and submit details			
2.16.2	FLR & Air Dryer Unit of appropriate capacity to arrest moisture and other suspended particles etc. at the input point of machine in order to provide dry and clean air for machine operation.	Vendor to confirm and submit details	This clause is omitted.		

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2.16.3	Compressed air point with provision of manually adjustable pressure valve, manually operated ON/OFF valve and sufficient length of flexible piping and air gun for cleaning of chips while changing/ indexing carbide inserts on operator's work area (Near machining chamber, ATC, WPC).	Vendor to confirm and submit details			
2.16.4	Coolant Flushing Gun with sufficient length of pipe for manual cleaning of work piece near machining chamber.	Vendor to confirm and submit details			
2.16.5	Percentage type spindle load meter (either in software or with hardware).	Vendor to confirm and submit details			
2.16.6	In cycle hour counter with reset facility (either in software or with hardware) & with on-screen display, spindle temperature, hydraulic oil level indication and all necessary alarms and parameters with on screen display and monitoring.	Vendor to confirm and submit details			
2.16.7	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.	Vendor to confirm and submit details			
2.16.8	One set of special maintenance/ calibration tools for geometrical accuracy tests including calibration mandrel, granite block, cylinder dial gauges, Universal Dial stand (03 Nos.) with dial having 2 micron resolution (03 Nos.) and other special tools as required for service and maintenance of the machine shall be offered. Fixture is required for replacement of spindle (if any). Also, tools for accuracy tests after replacement of spindle are required.	Vendor to confirm and submit details			
2.16.9	Lifting yoke to lift and position the machine.(Returnable)	Vendor to confirm.			
2.16.10	First filling of all required Oils, lubricants, & Grease etc. for the machine and auxillary 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 and submit details.			
2.16.11	Machine shall be able to mark/ engrave different alphanumeric characters, numbers on the blade within the machine itself through program. Vendor shall demonstrate use of the feature and corresponding programming during PDI as per clause 2.44 and Prove out at BHEL as per clause 2.46. Vendor to provide details of adaptor and tool with ordering code and dimensional details for this purpose along with the offer. Vendor to supply 2 number of adaptor and 10 numbers of tools with the supply.	Vendor to confirm and submit details.			
2.16.12	Blade wise report of operation wise time taken, machine stoppage time along with date and time shall be available. The same can be exported and stored in external PC for taking print out.	Vendor to confirm and submit details.			
2.17	CNC SYSTEMS & FEATURES				

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2.17.1	The machine shall be equipped with latest Siemens SINUMERIK 840D SL CNC Control with latest Windows based Operating system. The CNC control 840D SL will have PCU 50.5 or higher version with intel technology 2.4 GHz or higher, 8 GB RAM or higher & NCU 720.3B PN or higher (with BOP). Numerical control extension NX15.3 or higher (if needed). It should consist of OP 015AT Operating panel having 15 inches or higher TFT colour display and Machine control panel (MCP) 483C PN or higher. It shall have MF-II PC key board (equivalent or higher) or the latest available successor with mouse on a folding / sliding tray or Full CNC Keyboard with Qwerty keys and Mouse/Trackball. The operator Panel configuration will be as per Rittal VIP6000 or equivalent. Layout showing complete details of the panel should be submitted. All standard features should be listed in technical offer. Also all available optional features of CNC 840D SL system shall be offered & item wise price to be indicated in commercial offer.	Vendor to offer and confirm and submit details			
2.17.2	The CNC system should have following features:				
2.17.2.1	Intel i5 processor, 2.4 GHz clock speed (or higher), 8 GB RAM (or higher), 3GB cache or higher rating available with Siemens at the time of submission of offer.	Vendor to confirm and submit details			
2.17.2.2	Hard disk of 80 GB (easily replaceable) or of higher rating available with Siemens at the time of submission of offer.	Vendor to confirm and submit details			
2.17.2.3	DDR3 (8 GB) RAM or of higher rating available with Siemens at the time of submission of offer.	Vendor to confirm and submit details			
2.17.2.4	RS232-C interface for I/O device, Port COM1(V.24), COM2 (V.24), LPT1 Parallel Interface for Printer, 4 Nos. USB PORTS (min.) for I/O devices, VGA, MPI interface & 32GB memory stick (2 Nos.) along with necessary driver CDs, 2 Channels and Expansion slots. In case of non-availability of COM1(V.24), COM2(V.24), LPT1 parallel interface, RS232-C etc., if not provided by CNC system manufacturer at the time of supply, suitable separate ports/connectors/convertors for networking with LAN, data input/ output, telediagnosics, printer shall be provided to ensure functionalities as per tender specifications.	Vendor to offer & confirm and submit details			
2.17.2.5	Access lock.	Vendor to confirm and submit details			
2.17.2.6	Co-ordinate system transformation.	Vendor to confirm and submit details			
2.17.2.7	Co-ordinate system rotation.	Vendor to confirm and submit details			
2.17.2.8	Look ahead of 70 blocks .	Vendor to confirm and submit details			
2.17.2.9	Scaling	Vendor to confirm and submit details			
2.17.2.10	Programmable mirror image matching.	Vendor to confirm and submit details			
2.17.2.11	Standard Simulation feature.	Vendor to confirm and submit details			
2.17.2.12	Background editing.	Vendor to confirm and submit details			
2.17.2.13	Tool management.	Vendor to confirm and submit details			
2.17.2.14	Vacuum -ventilated steel sheet built-in housing.	Vendor to confirm and submit details			

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2.17.2.15	SITOP power, DC-UPS Module 40 with AKKU module to ensure automatic unattended shutdown of the CNC system in case of power failure or even in normal machine shutdown.	Vendor to confirm and submit details			
2.17.2.16	Latest version of Step-7 pre-loaded on PCU for on-screen diagnostic along with licensed copy of installation CD of Latest version of Step-7/ Simatic Manager (with comments in English language only).	Vendor to confirm and submit details			
2.17.2.17	Display of PLC AWL format on Note book for PLC Diagnostic (with comments in English language only).	Vendor to confirm and submit details			
2.17.2.18	2 TB USB Hard disk (1 No.) with driver softwares for CNC System back-up and restoration in case of Hard disk failure.	Vendor to confirm and submit details			
2.17.2.19	Machine should have provision for axes positioning via motor encoders also. Additionally Linear scales for Linear axes (to be used for normal operation) may also be offered.	Vendor to confirm and submit details			
2.17.2.20	Details of Standard features. List to be submitted.	Vendor to specify			
2.17.2.21	Features of CNC System required for prove out jobs or foreseen by the vendor as required.	Vendor to specify			
2.17.2.22	Details of optional features, recommended by vendor, to be submitted.	Vendor to submit			
2.17.2.23	Details of other optional features.	Vendor to specify			
2.17.3	The CNC system shall also have all other features required for:				
2.17.3.1	Programming, machining & measurement of prove out components as mentioned at point no. 2.44, 2.46 below.	Vendor to confirm and submit details			
2.17.3.2	Machine Networking at point no. 2.22 below.	Vendor to confirm and submit details			
2.17.3.3	System of Automatic generation of NC program generation mentioned at point no. 2.21 below.	Vendor to confirm and submit details			
2.17.3.4	In process / Post process Gauging & its customized report generation as mentioned at point no. 2.18 below.	Vendor to confirm and submit details			
2.17.3.5	Tool Monitoring as mentioned at point no. 2.19 below.	Vendor to confirm and submit details			
2.17.3.6	Machine Monitoring system as mentioned at point no. 2.23 below.	Vendor to confirm and submit details			
2.17.3.7	The selected probing results file shall be sent by the operator from the CNC screen of the machine (after ensuring correct measurement result) to the printer via Automation PC through commands/soft Keys. The file shall be also automatically stored in the Automation PC in respective machine wise folder (with file name as Drg. No. of blade along with serial no. of blade which shall be entered by the operator on the machine at some predefined place for e.g.. 01010241001_1) upon execution of above mentioned printing through commands/soft keys. In this way, files will not be overwritten and shall be deleted by the operator/supervisor from time to time as required. The printed as well as stored measured result file shall be in proper format as mentioned at point no. 2.18.2 c) with proper font sizes, spacing etc. so that it can be directly presented to inspection department. All necessary hardware & software including Hub (with possibility of 10 connections), Printer, all types of cables, communication software, CNC features required for above mentioned setup shall be provided by the party. A suitable enclosure for protection to Printer, Automation system with suitable facilities for this setup shall also be provided by the party. The system shall be completely demonstrated & established on all the supplied machines by the vendor during pre-acceptance at suppliers works as well as during commissioning of the machine at BHEL, Hardwar.	Vendor to confirm and submit details			
2.18	IN PROCESS & POST PROCESS GAUGING SYSTEM:				

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2.18.1	In process & post process gauging system comprising Latest RENISHAW probe system interfaced to CNC system shall be offered. Vendor to specify the type of signal transmission. It should have following items/features:	Vendor to confirm and submit details			
2.18.1.1	Latest RENISHAW probe.	Vendor to confirm and submit details			
2.18.1.2	Holder for probe with taper suitable to the machine	Vendor to confirm and submit details			
2.18.1.3	Probe stylus (2 sets)	Vendor to confirm and submit details			
2.18.1.4	Calibration master including the calibrating programs.	Vendor to confirm and submit details			
2.18.1.5	Requisite electronic interface .	Vendor to confirm and submit details			
2.18.1.6	Receiver module .	Vendor to confirm and submit details			
2.18.1.7	Service Kit.	Vendor to confirm and submit details			
2.18.2	Measurement				
a)	For In Process measurement: The In-process gauging shall be done for following features of blades with automatic correction of Tool/ work offsets. - Blades with Rhomboidal shaped Hub and Rhomboidal/Z shaped Shroud as well as TX/T4/T2/3DS/F blades i) Hub width & Pitch width of Hub Face ii) Shroud width & Pitch width of Shroud Face iii) Neck width of Hub during Slot machining In-process gauging for Hub and Shroud width shall be done independently so that correction of tool offset is also independent for Hub & shroud width. The pitch angle (wedge angle) as well as width for Hub and Shroud shall be tested & established during pre-acceptance at the works of the vendor as well as during commissioning of the machines at BHEL.	Vendor to confirm			
b)	For Post process measurement (Ref attached blade drawings): The post process gauging of the blade shall include measurements of following features of blade after complete machining. The probing shall be done by probe touching the respective blade perpendicular to the surface from the top and not from the sides. a) Blades with Rhomboidal shaped Hub and Shroud i) Half Hub Rhomboid width from center towards Leading edge ii) Half Hub Rhomboid width from center towards Trailing edge iii) Total Hub Rhomboidal width (addition of i & ii) iv) Half Hub pitch width from center towards suction side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade) v) Half Hub pitch width from center towards pressure side at bottom radius (for moving blades) and at top radius (for Guide blade) vi) Total Hub pitch width (addition of iv & v) vii) Half Parallel distance from center for hub face facing pressure side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade)	Vendor to confirm			

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	viii) Total Parallel distance between two hub faces facing suction and pressure side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade) ix) Half Wedge Taper angle on Hub face towards suction side (to be established during pre-acceptance) x) Half Wedge Taper angle on Hub face towards pressure side (to be established during pre-acceptance) xi) Total Wedge Taper angle on two hub faces (addition of ix & x) - to be established during pre-acceptance xii) Hub Slot Neck width (Neck left on Hub after slot m/cing)				
	xiii) Hub Slot Size (checking for both slots) xiv) Hub Rhomboidal Angle xv) Half Shroud Rhomboid width from center towards Leading edge xvi) Half Shroud Rhomboid width from center towards Trailing edge xvii) Total Shroud Rhomboidal width (addition of xv & xvi) xviii) Half Shroud pitch width from center towards suction side at top radius Rmax (for moving blades) xix) Half Shroud pitch width towards pressure side at top radius Rmax (for moving blades) xx) Total Shroud pitch width (addition of xviii & xix) xxi) Half Parallel distance from center for shroud face facing pressure side at top radius Rmax (for moving blades) and at bottom radius Rmin (for Guide blade) xxii) Total Parallel distance between two Shroud faces facing suction and pressure side at top radius Rmax (for moving blades) and at bottom radius Rmin (for Guide blade) xxiii) Half Wedge Taper angle on Shroud face towards suction side (to be established during pre-acceptance) xxiv) Half Wedge Taper angle on Shroud face towards pressure side (to be established during pre-acceptance) xxv) Total Wedge Taper angle on two shroud faces (addition of xxiii & xxiv) - to be established during pre-acceptance xxvi) Shroud Rhomboidal Angle				
	b) Blades with Rhomboidal shaped Hub and Z shaped Shroud i) Half Hub Rhomboid width from center towards Leading edge ii) Half Hub Rhomboid width from center towards Trailing edge iii) Total Hub Rhomboidal width (addition of i & ii) iv) Half Hub pitch width from center towards suction side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade) v) Half Hub pitch width from center towards pressure side at bottom radius (for moving blades) and at top radius (for Guide blade) vi) Total Hub pitch width (addition of iv & v) vii) Half Parallel distance from center for hub face facing pressure side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade) viii) Total Parallel distance between two hub faces facing suction and pressure side at bottom radius Rmin (for moving blades) and at top radius Rmax (for Guide blade) ix) Half Wedge Taper angle on Hub face towards suction side x) Half Wedge Taper angle on Hub face towards pressure side xi) Total Wedge Taper angle on two hub faces (addition of ix & x)				

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	xii) Hub Slot Neck width (Neck left on Hub after slot m/cing) xiii) Hub Slot Size (checking for both slots) xiv) Hub Rhomboidal Angle xv) Half Shroud Rhomboid width from center towards Leading edge xvi) Half Shroud Rhomboid width from center towards Trailing edge xvii) Total Shroud Rhomboidal width (addition of xv& xvi) xviii) Half Wedge Taper angle on Shroud face towards suction side (to be established during pre-acceptance) xix) Half Wedge Taper angle on Shroud face towards pressure side (to be established during pre-acceptance) xx) Total Wedge Taper angle on two shroud faces (addition of xviii & xix) - to be established during pre-acceptance xxi) For other dimensions of shroud to be probed refer to sketch enclosed at Annexure-A c) TX/T4/T2 Blades i) Similar checking for TX blades as for blades with Rhomboidal shaped Hub and Shroud.				
c)	The measured result file shall be generated on the machine only (not dependent on any external software/PC) & shall contain all relevant information such as nominal values, measured values, tolerances along with project details & serial no. of measured blade as per format at Annexure-I . Further , all the measurements done on the blade except the profile shall appear in a single file in the above format so that it can be presented to the inspection department directly. The measured result of the blade profile shall be stored in a different file with deviation values (in normal direction) of the measured points only with project details , serial no. of measured blade & the drawing location / section where profile was measured as per format at Annexure-II . The printing of the file and other details shall be as per point no. 2.17.3.7	Vendor to confirm			
2.18.3	All programs / software including customization required for In-process gauging & Post-process measurement of complete blade (Hub, shroud,&profile) after machining & its report generation on the machine as per above mentioned format shall be supplied along with the machine.	Vendor to confirm			
2.18.4	The probing system shall be completely demonstrated & established on supplied machine during pre-acceptance at supplier's works as well as during commissioning of the machines at BHEL, Hardwar by using it for In-process measurements with automatic correction of tool/ work offsets & post process measurement of complete prove out blades after machining as per point no. 2.18.2).	Vendor to confirm			
2.18.5	The backup of all programs/ installation copy of softwares (if any) for the above probing system shall be supplied on CDs.	Vendor to confirm			
2.18.6	The calibration procedure shall be completely demonstrated & established on supplied machine by the vendor during pre-acceptance at supplier's works as well as during commissioning of the machines at BHEL, Hardwar.	Vendor to confirm			
2.18.7	Complete trials & test shall be conducted at BHEL, Hardwar on the machine by the vendor to demonstrate & establish full capability of the probing system during commissioning of machine.	Vendor to confirm			
2.18.8	Complete technical support for its smooth usage during the warranty period of the machines shall be provided by the vendor.	Vendor to confirm			
2.19	TOOL LIFE MONITORING :				
2.19.1	The system should be capable of following features :				

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2.19.1.1	The expected tool life entered for the tool by the operator is monitored	Vendor to confirm			
2.19.1.2	When the end life of tool is nearing , the machine shall finish cycle in progress & then change tool by bringing in the sister tools from the magazine .	Vendor to confirm			
2.19.2	BLUM LASER SYSTEM FOR TOOL SETTING & TOOL BREAKAGE DETECTION:	Vendor to offer			
	The system shall be capable of measuring tool length , tool radius & load these values into tool offset memory of the machine for tools in spindle. The system shall also have following capability/ features:	Vendor to offer			
2.19.2.1	Runout Monitoring of tool	Vendor to offer			
2.19.2.2	Tool breakage detection.	Vendor to offer			
2.19.2.3	Cutting edge monitoring at straight & round edges .	Vendor to offer			
2.19.2.4	The vendor shall provide a suitable user friendly program in the machine for automatic checking (picking of tool from magazine, measurement of tool length, radius & loading of these values into offset memory of the machine) for all the tools in spindle at one time or some of the tools as specified by operator in that program for the offered Laser system. The program must run the measurement cycle 3 or 4 times (as required) for each tool with automatic adjustment of offset values till the values are within specified tolerance mentioned in the program. The operator shall only enter once the approximate length and radius values for each tool (after every physical change of tool) at appropriate location of length offset in the machine and load the tool back in the magazine.	Vendor to offer			
2.19.2.5	All programs / software required to run the system shall be supplied & established on the supplied machine by the vendor. The backup/ installation software for all programs shall supplied on CDs.	Vendor to offer			
2.19.2.6	The party shall conduct complete trials & test during pre- acceptance at supplier's works as well as during commissioning of the machines at BHEL, Hardwar on the machine to demonstrate & establish full capabilities of the system.	Vendor to offer			
2.19.2.7	The system shall be supplied with the complete calibration system including calibration master, calibration program. The calibration procedure shall be completely demonstrated & established on all the supplied machines by the vendor during pre-acceptance at supplier's works as well as during commissioning of machines at BHEL, Hardwar.	Vendor to confirm			
2.19.2.8	Complete technical support for its smooth usage during the warranty period of the machines shall be provided by the vendor.	Vendor to offer			
2.20	CAM SOFTWARE:				
	PC based latest version CAM Software working on Windows latest Operating system to be offered with complete details (Detailed brochures, writeup).For this purpose, vendor to provide a suitable PC with latest configuration. A suitable enclosure/ cabinet for PC to be provided. The software shall have following features:	Vendor to confirm and submit details			
2.20.1	A suitable PC based CAM software capable of generating blade model, tool path of complete turbine blades, simulation along with integrated customised post processor to generate the NC program of the complete blade (Profile , Hub & Shroud) for the offered machine. Further, a STRAK-UEB interface of the offered CAM software shall be supplied capable of automatic input of BHEL Supplied Geometrical data of blades and consequent automatic generation of blade model in the offered CAM software. The CAM software shall also be capable for definition of raw material in the form of rectangular Bar Stock as well as in the form of Forging.	Vendor to confirm and submit details			

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SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.20.2	The software should be capable of accepting the profile data of the blade in the following ways for generation of tool path & part program.	Vendor to confirm and submit details			
2.20.2.1	BHEL supplied STRAK data format through the supplied interface.	Vendor to confirm and submit details			
2.20.2.2	Neutral exchange format such as IGES, STEP etc. from leading CAD system such as IDEAS , Pro-Engineer, UGNX, AUTOCAD etc.	Vendor to confirm and submit details			
2.20.2.3	Provision for accepting profile coordinates in simple & suitable ASCII (Text) file.	Vendor to confirm and submit details			
2.20.3	The software should be capable of accepting the Hub (Root) & Shroud data of the blade in the following ways for generation of Tool path/Part Program.	Vendor to confirm and submit details			
2.20.3.1	BHEL Supplied Hub & Shroud Data in UEB data format through the supplied interface.	Vendor to confirm and submit details			
2.20.3.2	Provision of manual definition of complete Hub & Shroud portion of the blade in the CAM software itself.	Vendor to confirm and submit details			
2.20.4	The STRAK-UEB interface of the CAM software shall be capable of automatic generation of Blade model using BHEL Supplied data (in STRAK & UEB format) for following types of blades	Vendor to confirm and submit details			
2.20.4.1	- Moving blade with Rhomboidal shaped HUB & SHROUD with T-Slot / Double T-Slot in Hub (Left & Right Hand, symmetric and asymmetric hub/shroud about blade axis) and it's corresponding Locking blade	Vendor to confirm and submit details			
2.20.4.2	- Guide Blade with Rhomboidal shaped HUB & SHROUD with T-Slot / Hook slot, double slot in Hub (Left & Right Hand, symmetric and asymmetric hub/shroud about blade axis) and it's corresponding Joint blade.	Vendor to confirm and submit details			
2.20.4.3	- Moving Blade with Rhomboidal shaped HUB, Semi Z shaped & Z shaped SHROUD (Left & Right Hand, symmetric and asymmetric hub/shroud about blade axis) and it's corresponding Locking blade.	Vendor to confirm and submit details			
2.20.4.4	- Moving & Guide Blade with Rhomboidal shaped HUB & Stepped SHROUD (Left & Right Hand).	Vendor to confirm and submit details			
2.20.4.5	Locking and Joint blade (left & right hand) with rhomboidal shaped HUB and rhomboidal / Z shaped SHROUD & all types of TX/T4/T2 Blades.	Vendor to confirm and submit details			
2.20.4.6	Thick Blades (Left & Right Hand) with rhomboidal shaped HUB and rhomboidal / Z shaped SHROUD & all types of TX/T4/T2 Blades.	Vendor to confirm and submit details			
2.20.4.7	The vendor shall demonstrate the system of automatic generation of blade model for one variety of blade using BHEL provided STRAK data and UEB data of a sample blade (Drawing, UEB & STAK data of a blade shall be provided by BHEL) in their offered CAM software during technical discussion or before as a part of compliance to this point". Data of another similar variety of blade will be used to verify the correctness of system of automatic generation of blade model in the offered CAM software. Non-demonstration or generation of inaccurate blade model will be treated as non-compliance.	Vendor to demonstrate and accept			
2.20.4.8	Further , the correctness of the STRAK-UEB interface for all varieties of blade shall be demonstrated by the vendor through input of one blade of each type as listed above (point no. 2.20.4.1, 2.20.4.2, 2.20.4.3, 2.20.4.4, 2.20.4.5, 2.20.4.6) in their offered CAM software (using BHEL supplied data) during pre-acceptance at vendor's works as well as at BHEL, Hardwar during commissioning of machine.	Vendor to confirm and submit details			

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SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.20.5	The CAM software shall be capable of manual modelling of complete Blade geometry, definition of raw material (Rectangular Bar Stock as well as Forging) and generation of the NC programs for machining of following types of blades from blade & profile drawings.	Vendor to confirm and submit details			
2.20.5.1	Moving and Guide blades (left & right hand) with rhomboidal shaped HUB and rhomboidal / half Z shaped/ Z shaped SHROUD.	Vendor to confirm and submit details			
2.20.5.2	Moving and Guide Blades of all types of TX/T4/T2 Profile Blades	Vendor to confirm and submit details			
2.20.5.3	Locking and Joint blade (left & right hand) with rhomboidal shaped HUB and rhomboidal / Z shaped SHROUD & all types of TX/T4/T2 Blades.	Vendor to confirm and submit details			
2.20.5.4	Thick Blades (Left & Right Hand) with rhomboidal shaped HUB and rhomboidal / Z shaped SHROUD & all types of TX/T4/T2 Blades.	Vendor to confirm and submit details			
2.20.5.5	Further, this capability of the CAM software (as per point no. 2.20.5) shall be demonstrated by the vendor through manual modelling of complete blade geometry, preparation of Tool path, generation of NC program for the following type of blade during training period at vendors work as well as at BHEL, Hardwar during commissioning of machine. - Guide and Moving Blade (Right & Left hand) with Rhomboidal Hub and Shroud. - Guide & Moving blade (TX profile), Right & Left hand with Rhomboidal Hub & Shroud. - Locking & Joint blade for the above two examples from sample blade & profile drawings of BHEL to be provided after placement of PO.	Vendor to confirm and submit details			
2.20.6	The software shall include graphical display of blade profile & simulation of tool path on screen.	Vendor to confirm and submit details			
2.20.7	The software should be capable of generating NC program for measurement of individual surface points over the profile along a section, different Hub & Shroud dimensions of the blade by means of probing system provided on the machine. Evaluation & Handling of the measured data shall be as per point no. 2.17.3.7 & 2.18.2.c	Vendor to confirm and submit details			
2.20.8	The software shall be installed on four separate PCs to be provided by BHEL having matching hardware requirements for the offered software with four licenses/Dongle for generation of the programs.	Vendor to confirm and submit details			
2.20.9	In case of breakdown of any BHEL PCs on which the CAM software shall be loaded , the supplier shall provide help in loading of software on another BHEL PC or facilitate downloading of the software from supplier's server after intimation of IP address of the new PC by M/s BHEL.	Vendor to confirm and submit details			
2.20.10	All necessary modules/Interface of the CAM software required to meet the above capabilities of CAM software & for generation of part programs for machining as well as measurement of all varieties of blades mentioned at point no. 2.20.4, 2.20.5, prove out blades mentioned as well as Automatic generation of NC Programs at point no. 2.20 & 2.21 shall be supplied along with the machine.	Vendor to confirm and submit details			
2.20.11	The party shall provide full technical support & Upgradation of the offered CAM software during the warranty period. The technical support shall include trouble shooting through telephone , E-mails & visit of their experts if required.	Vendor to confirm and submit details			
2.20.12	The backup of the all the software shall be provided on CDs.	Vendor to confirm and submit details			
2.21	SYSTEM OF AUTOMATIC ACCESS , GENERATION , STORAGE & RETREIVAL OF NC PROGRAMS:				

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SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.21.1	The vendor to offer a complete fool proof system of Automatic access of Geometrical data of blade from Network, Automatic processing and generation of NC programs without programmer intervention, Automatic Storage of NC programs on the Network & its retrieval by the operator from the machine. It shall have following features:	Vendor to confirm and submit details			
	1. Project Master Page: For each blade which should be calculated with the Automatic system, a project master page shall be defined with all necessary information required for calculating the NC Data, sample page as per annexure III . The project master page will be identified by the drawing number and the status of the calculated NC Data can be checked by the revision number. The project master pages will be stored in a database. The master page will also have provision to process the operation using the operation template or without template using existing technological data for already processed blade earlier.	Vendor to confirm and submit details			
	2. Geometry Input Data: The blade types mentioned at point 2.20.4.1 to 2.20.4.6 and 2.20.5.1 to 2.20.5.4 of the Tender specification as well as their thick blades (as per requirement) will be supported by the system. The Geometry data can be defined through the STRAK – UEB definition or manually from drawings taking help from geometrical sketches as mentioned at point no. 2 (b). The raw material definition shall be in the form of rectangular Bar Stock as well as in the form of Forging and shall be defined in a special file format provided by the vendor.	Vendor to confirm and submit details			
	a) Input through STRAK – UEB Interface (2.20.4) : The STRAK & UEB file name along with path will be defined in full length by BHEL on the Project Master Page. The blades with input definition as "data type" will be automatically converted into model internally based on the STRAK & UEB files. At the pre-defined folder there has to be also a file named "1.rev", which defines the actual version of the geometry data and has to be increased manual by every change in the geometry data. The content of this file is not relevant for the automatic system. The corresponding Revision number on the project page will be updated after processing the project with the new geometry data.	Vendor to confirm and submit details			
	b) Manual Input from Drawing (2.20.5) : The blades with input definition as "drawing type " will be defined here. The blade profile with its name & full path shall be defined by BHEL. The profile data file (manually keyed in from drawing) shall be in a user friendly format, which will be mutually decided, and then automatically converted internally into CAM Format. The Hub and Shroud data shall be defined manually by entering required values from drawings, guided & helped by a parametric drawing/sketches to be provided by the vendor for all types of blades. The sketches to be provided by the vendor shall be similar to the data as it is presented in actual blade drawing without the need of any calculation by BHEL. Only those parameter of the drawing can be used which are necessary for modelling in CAM system.	Vendor to confirm and submit details			
	c) Raw material definition (2.20.5) in the form of rectangular Bar stock as well as in the form of forging : The file name along with path will be defined by BHEL on the project master page. The rotation of the blank will be calculated by the system. The file format will be defined by the vendor and it will accept varying number of spaces between keywords and parameters. The blank will not be checked for any revision number changes. If there is any changes in the blank geometry, BHEL shall be responsible for recalculating the project.	Vendor to confirm and submit details			

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	d) Locking and Joint blades : The system shall have provision for entering data, if required, to automatically generate program for Joint blade (in case of Guide blades) and Locking blade (in case of moving blade).	Vendor to confirm and submit details			
	e) Thick blades : The system shall have provision for entering data required to automatically generate program for thick blades.	Vendor to confirm and submit details			
	3. Tool library: There will be a tool library, initially containing all tools supplied by the vendor. The tool library can be updated by BHEL through addition of new tools as well as modification of existing one. The spindle speed and feed rate for each tool shall be defined in the tool library, corresponding to the CAM technology parameter. For every solid carbide tool, there will be a additional second set of technology cutting parameters (spindle speed & Feed rate) to be used with regreinded tools.	Vendor to confirm and submit details			
	4. Operation Templates: Different templates for machining of all types of blades mentioned at 2.20.4 & 2.20.5 will be defined and supplied by the vendor and their correctness demonstrated through machining of proveout components using the program generated through the offered Automation system during the pre-acceptance & Final machine acceptance at BHEL, Haridwar. The templates shall be stored in a defined folder and shall be open to modification/editing by BHEL. The templates for a blade shall be selected based on the blade type and the blade length in the project master page. There could be more than one set of templates for one blade type depending on the length of blade & other factors. The tools which has to be used for each operations for blade machining will be selected automatically from the tool library, based on logic provided like corner radii, fillet radii and other things as defined. There shall also be additional capability to edit the existing template, create new templates and save them at some pre-defined folder and select one of these operation templates on the project master page. The NC Program for each operation shall have description of tool and diameter of tool wherever tool is called in the program.	Vendor to confirm and submit details			
	5. Post processor : It shall be possible to select different machine post processors (more than one machine for a particular blade) with provision of entering Fixture rotation and fixture translation for each machine to generate NC output suitable for the selected machines. The methodology of incorporating this feature in master page shall be decided by the vendor.	Vendor to confirm and submit details			
	6. Running the Automation NC Programming system: The Automation system will run regularly under a defined schedule, which shall be defined by BHEL (e.g. every morning 8:00, every Monday....). All projects which have a mismatch between the revision file number and the revision number on the project master page will be recalculated and the new NC output data will be stored at the predefined path.	Vendor to confirm and submit details			

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	The starting screen of Automation NC Programming System will have following Options: • Add a new project master page • Modify existing project master page • Show Model • Execute selected projects • Execute All (All projects are recalculated without checking the revision number) • Define schedule • Exit After executing if errors have occurred, the errors will be displayed in a log file with information about the type of error and which can be saved/retained. Some of the possible errors are for e.g.. files not available because a PC is switched off or there is a wrong input in the master project page. The master project page can then be opened for modifications and re-executed manually.	Vendor to confirm and submit details			
	7. Storage of Data: The created NC Data will be stored in a predefined folder to be defined by BHEL in the project master page. For each blade, there will be three different types of NC Data valid for each type of machines (one for new cutters, one with regrinded cutters and another for Locking/Joint blades). For the regrinded tools, the additional regrinded cutting parameters defined in the tool library shall be used. The initial cutting parameters for regrinded cutters will be defined by the vendor (for e.g.. reduction of 30%) which can then be modified by BHEL as per actual shop practice. The NC data files for different blades and different machines can be generated and stored similar to following structure. The actual structure covering all aspects can be mutually decided & finalised during technical discussion.	Vendor to confirm and submit details			
	<pre> -----Machine 1 -----Drawing number_N NC -----Summary -----Drawing number_R NC Drg. number - -----Summary -----Drawing number_JT NC -----Summary -----Machine 2 -----Drawing number_N NC -----Summary -----Drawing number_R NC -----Summary -----Drawing number_JT NC -----Summary .</pre>	Vendor to confirm and submit details			
	The Summary folder will contain an operation summary file, special created or customized for BHEL, whose sample file as attached at annexure IV .	Vendor to confirm and submit details			
	8. Measuring Program: The NC measuring programs (post process measurement of blade) will be included in the regular NC Data file at the end for every blade and can be switched on by an R-Parameter on the machine by the operator. By default it, will be switched off.	Vendor to confirm and submit details			

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	9. General : a) For the Stepped Shroud, only the geometric modelling (from UEB file and manually from Drawing) will be fulfilled in automation system as there are no examples for programming the operation templates and prove them by machining. The correct operation order will be defined later on by BHEL.	Vendor to confirm and submit details			
	b) All blades to be machined during pre-acceptance and during prove out at BHEL, Haridwar shall use NC programs generated through the offered Automation system of NC programme generation.	Vendor to confirm and submit details			
	c) A detailed write-up/user manual about the Automation system shall be provided having details about installation procedure of the software, it's setup, description of various parameters used in project master page, model creator, operation template creator, directory structure and other details which will help in understanding and using the system.	Vendor to confirm and submit details			
	d) If the vendor has previously supplied any CNC 5 Axes Machining centers to BHEL, Haridwar for Blade machining & which is working under different or older version of Automatic NC Program generation system, those machines shall be taken under this new Automatic NC Programming System for automatic generation of program.	Vendor to confirm and submit details			
2.21.2	The machine operator shall download these NC programs stored at predefined path in the Automation PC or on the network (all the programs in single drawing no. wise folder) to the specified folder in the work piece directory of the machine in CNC mode after specifying the drawing no. of the blade.	Vendor to confirm and submit details			
2.21.3	The party shall conduct complete trials during pre- acceptance at supplier's works as well as during commissioning of machines at BHEL,Haridwar on all machines to demonstrate successful implementation of full capabilities of the offered Automation system.	Vendor to confirm and submit details			
2.21.4	The vendor shall carry out complete customization, prepare all the required operation templates, provide all necessary logics so that the access of geometrical data, successful conversion , processing & generation of NC programs suitable for machining , programs storage is carried out automatically without human intervention as mentioned above at point no. 2.21.1	Vendor to confirm and submit details			
2.22	MACHINE NETWORKING:				
2.22.1	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. It should cover following features:	Vendor to confirm and submit details			
2.22.1.1	The machine should appear as a node just as any other PC in the entire network (Network Neighbourhood).	Vendor to confirm and submit details			
2.22.1.2	The program transfer should be simple copy & paste method just as it is done in case of PCs.	Vendor to confirm and submit details			
2.22.1.3	The networking should be capable to transfer programs from/to machine across the network in CNC mode of the CNC system.	Vendor to confirm and submit details			
2.22.1.4	All necessary Anti-Virus measures shall be incorporated.	Vendor to confirm and submit details			
2.22.1.5	The above Networking features shall be completely demonstrated and established on supplied machine by the vendor during pre-acceptance at vendor's works as well as at BHEL, Haridwar during commissioning of the machines.	Vendor to confirm and submit details			
2.23	MACHINE MONITORING SYSTEM (MMS) SIGNALS:				

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2.23.1	Following MMS signals would be made available on a specifically earmarked terminal strip . These MMS signals would be sourced from a separate SIMATIC S-7 PLC output card.	Vendor to offer			
2.23.1.1	Control ON	Vendor to confirm and submit details			
2.23.1.2	Cycle ON	Vendor to confirm and submit details			
2.23.1.3	Spindle running (in all modes)	Vendor to confirm and submit details			
2.23.1.4	Feed Active (Any of the axes running in all modes)	Vendor to confirm and submit details			
2.23.1.5	M30 Program Stop.	Vendor to confirm and submit details			
2.24	SIGNALS FOR AREA MANAGER SYSTEM:				
2.24.1	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 & outputs should be left unprogrammed for use with the Area Manager System	Vendor to offer			
2.25	TELE DIAGNOSTIC SERVICE:				
2.25.1	Tele-diagnostic service/ Remote Diagnosis should be provided through International analog telephone lines/Internet along with required Hardware / Software for the supplied CNC system to access both CNC and PLC. This service should be provided free of charge for the guarantee period.	Vendor to offer			
2.26	FAULT DIAGNOSTIC SYSTEM:				
2.26.1	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 indicating the element /device causing the fault. Vendor should also offer a PC note book along with Simatic S7 software (licensed copy), Ghost software, necessary communication cables, PCMCIA card / Adaptor (for Communication with MPI port) for diagnostic/ back-up & restoration purpose. The Note Book PCs should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer & submit			
2.26.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the ATC/WPC to its initial/home position in case of interruption of ATC/WPC cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of ATC/WPC positioning cycle manually. Separate Hand Held Pendant should also be provided to retrieve the ATC/WPC to it's initial position.	Vendor to offer			
2.26.3	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program/ HMI screen (for service personnel only).	Vendor to offer			
2.26.4	Help guide to use both diagnostic systems shall be provided.	Vendor to offer			
2.27	SERVO VOLTAGE STABILIZER:				
2.27.1	Oil / Air Cooled Servo Controlled Voltage Stabilizer (of reputed Indian make) suitable for complete machine, its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			

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2.27.2	The offer should be submitted with spares package (Variacs-2 nos., Correcting servomotors- 4 nos., Control cards-2 nos, Control transformers used in stabiliser-4 nos. each type) required for long term maintenance of this stabilizer.	Vendor to offer			
2.27.3	Make	NEEL or Servomax			
2.27.4	Model, Rating & Input/ Output Voltage etc.	Vendor to inform			
2.27.5	Monitoring device with cut-off 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			
2.27.6	Detailed Maintenance manual of stabilizer with all drawings of assemblies/sub-assemblies including Electrical circuit diagrams and items part list shall be provided.	Vendor to offer			
2.28	ULTRA ISOLATION TRANSFORMER:				
2.28.1	Ultra Isolation Transformer (of reputed Indian make) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
2.28.2	Make	NEEL or Servomax			
2.28.3	Model, Rating & Input/output Voltage etc.	Vendor to inform			
2.28.4	Monitoring device with cut-off 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			
2.28.5	Catalogue of the Isolation Transformer shall be submitted with the offer.	Vendor to submit			
2.28.6	Spares Package for Isolation Transformer, 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 submit			
2.28.7	Detailed Maintenance manual of transformer with all drawings of assemblies/sub-assemblies including Electrical circuit diagrams and items part list shall be provided.	Vendor to offer			
2.29	SPARES:				
2.29.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares as below are to be offered. The list to include following spares: (Unit Price of each item of spare should be offered)	Vendor to offer			
2.29.2	Mechanical & Hydraulic spares: The following spares are to be included.				
2.29.2.1	All types of pumps used on machines (1 No. each type)	Vendor to offer			
2.29.2.2	All types of D.C. Control valves (1 No.. each type)	Vendor to offer			
2.29.2.3	All types of flow control used on m/c. (1 No. each type)	Vendor to offer			
2.29.2.4	All types of pressure regulators used on m/c. (1 No. each type)	Vendor to offer			
2.29.2.5	All types of relief valves used on m/c. (1 No. each type)	Vendor to offer			
2.29.2.6	Coolant Gun - 1 No.	Vendor to offer			
2.29.2.7	All types of pressure switches (1 No.. each type)	Vendor to offer			
2.29.2.8	All types of flow switches (1 No.. each type)	Vendor to offer			
2.29.2.9	All types of float switches (1 No.. each type)	Vendor to offer			
2.29.2.10	All types of Pressure Gauges (1 No. each type)	Vendor to offer			
2.29.2.11	All types of regenerative type filter inserts (2 nos. each type)	Vendor to offer			
2.29.2.12	All types of disposal type filter inserts (5 nos. each type)	Vendor to offer			
2.29.2.13	Oil seals and O-Rings (1 set each type)	Vendor to offer			
2.29.2.14	Accumulator used in the m/c (1 No. each Type)	Vendor to offer			
2.29.2.15	All types of Belts (2 Nos. each type)	Vendor to offer			
2.29.2.16	Coiled flexible pipes (1 No. each type)	Vendor to offer			

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2.29.2.17	Coolant Filters (10 Nos..)	Vendor to offer			
2.29.2.18	Tool changer pocket :10 Nos.	Vendor to offer			
2.29.2.19	Set of filters for mist extraction for 1 year.	Vendor to offer			
2.29.2.20	Hydraulic pressure gauge of different range as used in machine- 1 number each type.	Vendor to offer			
2.29.2.21	Heat exchangers: 1 number each type	Vendor to offer			
2.29.2.22	Pulley: 1 number each type	Vendor to offer			
2.29.2.23	Coupling 1 number each type	Vendor to offer			
2.29.2.24	Bearing: 1 number each type	Vendor to offer			
2.29.2.25	Spindle, work piece, adaptor clamping collet: One number each type.	Vendor to offer			
2.29.2.26	Rotary union of spindle One number each type.	Vendor to offer			
2.29.2.27	Telescopic/ bellow cover One number each type.	Vendor to offer			
2.29.2.28	Wiper One number each type.	Vendor to offer			
2.29.2.29	Lubrication cartridge One set each type.	Vendor to offer			
2.29.2.30	Visiport: One number as supplied.	Vendor to offer			
2.29.2.31	Lubrication & hydraulic oil, grease quantity to be supplied for 1 year running.	Vendor to offer			
2.29.2.32	Flexible drag chain used in machining area: 1 set.	Vendor to offer			
2.29.2.33	Piston cylinder: One number each type.	Vendor to offer			
2.29.2.34	Sprocket: One number each type.	Vendor to offer			
2.29.2.35	Device for clamping force checking for spindle: One number.	Vendor to offer			
2.29.2.36	Device for clamping force checking of work piece adaptor: One number.	Vendor to offer			
2.29.2.37	Magnetic dial stand with dial gauge of least count 2 micron and 10 micron: 1 number each	Vendor to offer			
2.29.3	Spare motor spindle : 1 Nos.	Vendor to offer			
2.29.4	Following Spares parts of electrical/electronics and CNC system shall be offered item wise :				
2.29.4.1	PCU with system software and hard disk- 1 No. of the type as used on machine	Vendor to offer			
2.29.4.2	Operator panel with display unit- 1 No. of the type as used on machine	Vendor to offer			
2.29.4.3	Portable 2 TB or more hard disk with USB interface- 1 No.	Vendor to offer			
2.29.4.4	NCU module with NCU box having fan and battery- 1 No. of the type as used on machine	Vendor to offer			
2.29.4.5	NC/ PLC Input & Output cards (Digital, fast I/O & analogue), CPU, Power supply, Interface board - 1 No. of each type as used on machine	Vendor to offer			
2.29.4.6	Machine Control Panel- 1 No. of the type as used on machine	Vendor to offer			
2.29.4.7	ALM/AIM/CSM/SMM/DMM/Power modules for Spindle, X-axis, Y-axis, Z-axis, A-axis and B-axis, Auxiliary axes in Tool changer, Pallet changer etc - 1 No. of each type as used on the machine	Vendor to offer			
2.29.4.8	SIEMENS UPS SITOP DC-USV-Module 40 with AKKU -1 No. of the type used on machine	Vendor to offer			
2.29.4.9	Complete position feed back system including linear scales & Heidenhain Transducer (Scanning Head) for X axis, Y-axis, Z-axis, Heidenhain encoder for the rotary axes, Direct Measuring system for all auxiliary axes, in-built motor Encoders for Axes & Spindle Motors - 1 No. each type as used on machine.	Vendor to offer			
2.29.4.10	Profibus control components including ET200 modules, Profibus connectors, ASI master/ controller, ASI modules - 1 No. of each type as used on the machine	Vendor to offer			
2.29.4.11	Filter and Choke Module: Filter and throttle, High Current noise filter - 1 No. of each type as used on the machine	Vendor to offer			
2.29.4.12	Simatic net card used for external PLC (if applicable) - 1 No. of each type as used on the machine	Vendor to offer			
2.29.4.13	External PLC CPU, Interface module, Input & Output cards (if External PLC is used in the machine)- 1 No. of each type as used on the machine	Vendor to offer			
2.29.5	Following spare parts shall be offered as essential spares for the machine	Vendor to offer			

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2.29.5.1	Inductive proximity switch, Reed proximity switch, plugable, Light barrier switch, Door safety switch, Magnetic proximity switch, Positioning switch, Sensors connectors with cables, Optical sensors, Analog sensors, Grease sensors etc. 2 Nos. of each type as used on the machine.	Vendor to offer			
2.29.5.2	Set of Push Buttons- 1 No. of each type as used on the machine.	Vendor to offer			
2.29.5.3	Set of Indicating Lamp- 20 Nos. each type as used on the machine	Vendor to offer			
2.29.5.4	Set of Special Purpose units including Emergency relays, Safety relays, Time monitoring devices - 1 No. of each type as used on the machine	Vendor to offer			
2.29.5.5	Set of Contactors- 2 Nos. of each type as used on the machine	Vendor to offer			
2.29.5.6	Semiconductor Fuses -10 Nos. each type as used on the machine	Vendor to offer			
2.29.5.7	Special Fuses -5 Nos. each type as used on the machine	Vendor to offer			
2.29.5.8	Circuit Breakers - 1 No. each type as used on the machine	Vendor to offer			
2.29.5.9	Main Power Switch - 1 No. each type as used on the machine	Vendor to offer			
2.29.5.10	Set of Overloads/ Automats- 1 No. of each type as used on the machine	Vendor to offer			
2.29.5.11	Machine Status Indicating Lamp (Complete unit) -6 Nos. of each type as used on the machine	Vendor to offer			
2.29.5.12	Proportional Control Valve Controller 2 Nos. each type (if applicable) as used on the machine	Vendor to offer			
2.29.5.13	Spares Package for In process gauging System and Tool Monitoring System (Renishaw probe unit) including Blum Laser unit, Electronic Machine interfaces, OMI etc. 1 No. of each type as used on the machine	Vendor to offer			
2.29.5.14	01 set of spares like compressor, controller, sensors, fan motor assembly will be supplied with each unit of Refrigerant based cooling unit.	Vendor to offer			
2.29.5.15	Spares Package for coolant supply system including Analog & Digital Sensors, Control unit, PLC (I/O Board, CPU, Interface, Net Module), Contactors, Overloads, Special purpose units, Operator panel on Coolant unit (pre-loaded with software) 1 No. of each type as used on the machine	Vendor to offer			
2.29.5.16	Spare parts package for Mist Extraction System/ Flue Gas Extraction System including ionisation wires, electrical motor fan, electrical switch gears etc. of the type as used on the machine.	Vendor to offer			
2.29.5.17	Spare parts package for Work piece changer.	Vendor to offer			
2.29.5.18	All types of spares for total machine and accessories should be available for at least 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			
2.29.5.19	Complete list of spares for machine and accessories, along with specification / type / model shall be furnished along with documentation to be supplied with the machine	Vendor to offer			
2.29.5.20	Wear and tear parts (if not offered above)	Vendor to offer			
2.30	DOCUMENTATION:	Standard Document.			
	Four sets of following documents (Hard copies) in English language should be supplied along with the machine.				
2.30.1	Operating & Maintenance manuals of Machine & CNC system	Vendor to offer			
2.30.2	Maintenance manual of the Machine & CNC which includes various service screens & their navigation procedures, displays, Alarm list & Fault diagnostic manuals, Maintenance of the Electronics & Software/ Manufacturer cycle related information. Help guides for tele-diagnostic service and fault diagnostic systems.	Vendor to offer			
2.30.3	Programming Manuals (Advanced & Standard) of Machine & CNC system	Vendor to offer			
2.30.4	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams.	Vendor to offer			

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2.30.5	Detailed maintenance manual of chiller unit used in the machine should include : Capacity of the chiller unit, type of compressor with complete specifications of : thermostatic expansion valve , fan size, flow rate of the condenser unit, 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.	Vendor to confirm and submit details			
2.30.6	Assembly drawing of Spindle	Vendor to confirm and submit details			
2.30.7	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to offer			
2.30.8	Drawings/ catalogues for all supplied tool holders, cassettes, adapters, sleeves, fixtures, coolant connections, tailstock centre, etc.	Vendor to offer			
2.30.9	Catalogues, Drawings and Operation & Maintenance Manuals of all bought out items in condition available from sub-vendors	Vendor to offer			
2.30.10	Operating and User Manuals, Maintenance Manuals & Catalogues for supplied Tool Monitoring System , Laser System for tool breakage Detection, In-process & Post Process Gauging System, Voltage Stabilizer, Isolation Transformer, Job Loader, Automatic Tool Changer etc. in condition available from Sub-vendors.	Vendor to offer			
2.30.11	Three sets of following documents in English language should be supplied along with the machine.	Vendor to offer			
2.30.11.1	Final PLC program, NC data & PLC data should be provided on hard disk mentioned at clause no. 2.29.4.3. The data should also be provided in hard copies.	Vendor to offer			
2.30.11.2	Complete back-up of hard disk on GHOST CD and clear written Instructions to take back-up and reloading of a new hard disk.	Vendor to offer			
2.30.11.3	Complete Operating Guide, User and Programming manual of offered PC windows based CAM Software for Blade machining.	Vendor to offer			
2.30.11.4	Complete Operating Guide and User manual of In-process & Post process Gauging of blades as per point no. 2.18	Vendor to offer			
2.30.11.5	Complete Operating Guide, User manual of Automatic NC Program Generation system as per point no. 2.21	Vendor to offer			
2.30.11.6	Complete backup of installed software including CNC features on external hard disk (mentioned at clause no.2.29.4.3) for re-installation as and when required. Set of instructions /Help guide for re-installation should also be provided.	Vendor to offer			
2.30.11.7	Sinumerik Operator's Guide (HMI Advanced)	Vendor to offer			
2.30.11.8	Sinumerik Diagnostics Guide	Vendor to offer			
2.30.11.9	Sinumerik Programming Guide (Fundamentals)	Vendor to offer			
2.30.11.10	Sinumerik Programming Guide (Advanced)	Vendor to offer			
2.30.11.11	Sinumerik Programming Guide (Cycles)	Vendor to offer			
2.30.11.12	User and Manufacturer Documentation on CD ROM, with help tool	Vendor to offer			
2.30.11.13	Functional Block Diagram for S7-300 & S7-400 (if applicable) programming	Vendor to offer			
2.30.11.14	Manual NCU Planning SINUMERIK 840 D SL	Vendor to offer			
2.30.11.15	Manual Operator Components SINUMERIK FM-NC / 810 D / 840D SL	Vendor to offer			
2.30.11.16	Description of Functions SINUMERIK FM-NC / 810D / 840D SL Basic Machine	Vendor to offer			
2.30.11.17	Description of Functions SINUMERIK / 810D / 840D SL Tool Management	Vendor to offer			
2.30.11.18	Installation 4 Start up guide SINUMERIK 840D SL & SINAMICS	Vendor to offer			
2.30.11.19	Installation Guide Lists	Vendor to offer			
2.30.11.20	Statement List for S7-300 & S7-400 (if applicable) programming	Vendor to offer			

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2.30.11.21	SIMATIC configuring Hardware and Communication Connections Step 7 V 5.2	Vendor to offer			
2.30.11.22	User and Manufacturer Documentation on CD ROM, with help tool	Vendor to offer			
2.30.11.23	One complete set of documents in best available condition shall be supplied one month prior to start of training date for study by BHEL engineers.	Vendor to offer			
2.30.11.24	PLC hard copy (including Internal, External PLC & Coolant unit PLC) with comments in English language- 3 sets	Vendor to offer			
2.30.11.25	PLC hard copy with comments in English language for Work Piece Changer Automation System- 3 sets	Vendor to offer			
2.30.11.26	One additional set of all the above documentation/machine drawings/machine manuals (from clause no. 2.30.1 to 2.30.11.25) on portable hard disk (2 TB or more) mentioned at clause no. 2.29.4.3, wherever possible.	Vendor to offer			
2.30.11.27	Post processing Probing	Vendor to offer			
2.30.11.28	Software license fee	Vendor to offer			
2.31	PART FIXTURING:				
2.31.1	Part fixturing as mentioned in clause 2.5 & 2.6 arrangement with interchangeability of jaws and stops to accommodate various types of blanks (having cross section from 20mm X 20mm to 150mm X 100mm) shall be offered. Part fixturing shall include holding elements at root end and clamping as well as clamping and supporting the blade bar with floating clamping jaws and a tailstock centre at tip/ shroud end if required. It should take care of minimum material wastage needed for holding. Detailed manufacturing drawings of part fixturing to be supplied in the event of order. However, with the offer a scheme of holding arrangement with dimensional indication of clamping portion to be submitted. Quantity of part fixturing for machine should cover all the pallets of offered job changer. Same part fixturing will be used for blade forgings also, as blade forgings also will have rectangular ends for clamping. Work piece clamping chuck shall be manually actuated to clamp the blank material with jaws. Tail stock side jaws will clamp blank from tail stock side automatically (hydraulic) by program.	Vendor to offer			
2.32	TOOLING PACKAGE:				
2.32.1	Latest high performance ceramic and carbide tooling for complete rough and finish machining of blade of specified workpiece material as per clause no. 1.2 should be supplied as tooling package. Tooling package shall consist of all toolings including adaptors, cutter bodies, solid cutters, inserts, screws, key and other consumables & accessories for machining following blades with sister tooling concept. Tooling shall be supplied in such a manner that no indexing/change of inserts is required during running of manufacturing program cycle for one blade and instead sister tooling will be used, if required. The tooling package should be sufficient to machine the quantity of blades mentioned against each type of blade as per clause no. 2.32.2.1 to 2.32.2.4. No resharpener or recoating should be considered in the offered tooling package for machining below mentioned blades.	Vendor to offer with detailed tool list and unit prices.			

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SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.32.2	Following are the Quantity, Raw material & it's dimensions and Drawing numbers of blades for which tooling package is to be submitted. Vendor to mention description of tool, ordering number, make, item wise unit price, total qty. required for machining following blades in tabular format. Detailed drawing /catalogue of all the toolings (standard & special) are to be supplied within three months of placement of order. Drawings and other documents will be provided to the vendor only after the vendor has signed a non disclosure agreement with BHEL.	Vendor to offer			
2.32.2.1	DRAWING NUMBER: SKETCH 1, MATERIAL: NIMONIC 80A, BLANK CROSS SECTION: 60 MM X 26 MM, BLADE HEIGHT: 144 MM, BLADE QTY: 20	Vendor to offer			
2.32.2.2	DRAWING NUMBER: SKETCH 2, MATERIAL: NIMONIC 80A, BLANK CROSS SECTION: 62 MM X 28 MM, BLADE HEIGHT: 167 MM, BLADE QTY: 20	Vendor to offer			
2.32.2.3	DRAWING NUMBER: SKETCH 3, MATERIAL: INCONEL 617M, BLANK CROSS SECTION: 72 MM X 40 MM, BLADE HEIGHT: 205 MM, QTY: 500	Vendor to offer			
2.32.2.4	DRAWING NUMBER: SKETCH 4, MATERIAL: INCONEL 617M, BLANK CROSS SECTION: 72 MM X 40 MM, BLADE HEIGHT: 218 MM QTY: 500	Vendor to offer			
2.33	TIME CYCLE:				
2.33.1	Vendor to indicate separate cycle time in offer for machining each type of blade as mentioned at 2.32.2.1 to 2.32.2.4. However, amongst the blades mentioned above, cycle time for blade vide SKETCH 2 shall be less than 60 minutes. Vendor to ensure that cycle time offered by them in the offer for all other blades will be likewise. Cycle time quoted by vendor as above will be subjected to acceptance by BHEL during technical discussion. The cycle time shall include time viz., tool change time, machining time, In-process probing. Vendor shall have to prove the offered timing during final acceptance of the machine at BHEL Hardwar.	Vendor to confirm and submit details			
2.34	TROPICALISATION:				
2.34.1	All electrical / electronic equipment shall be tropicalized to work in mentioned operating condition.	Vendor to confirm and submit details			
2.34.2	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm and submit details			
2.34.3	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm and submit details			
2.34.4	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 offer			
2.34.5	All motors shall conform to CE standard.	Vendor to confirm and submit details			
2.34.6	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 and submit details			
2.34.7	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	Vendor to confirm and submit details			
2.35	OPERATING CONDITIONS				

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2.35.1	Total machine including all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply (AC): Voltage = 415 V +10% / -15% Frequency = 50 Hz +3% / -3% No. of phases = 3 Ambient Conditions: Temperature up to 45 degree Celsius Relative Humidity About 70%	Vendor to confirm and submit details			
2.36	SAFETY ARRANGEMENTS				
2.36.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm and submit details			
2.36.1.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece 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) should be available.	Vendor to confirm and submit details			
2.36.1.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm and submit details			
2.36.1.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to confirm and submit details			
2.36.1.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm and submit details			
2.36.1.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm and submit details			
2.36.1.6	Oil & water pipe lines should not run with electrical cable in the same trench.	Vendor to confirm and submit details			
2.37	ENVIRONMENTAL PERFORMANCE OF THE MACHINE				
2.37.1	The Machine should conform to following factors related to environment:				
2.37.1.1	Maximum noise level shall be 85 dB (A) at 1 meter away from the machine with correction factor for background 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 during commissioning and necessary measurement equipment will be arranged by BHEL at Hardwar.	Vendor to confirm and submit details			
2.37.1.2	There shall not be any emissions from the machine after installation of offered mist extraction system.	Vendor to confirm and submit details			
2.37.1.3	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 and submit details			
2.37.1.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm and submit details			
2.37.1.5	Machine should be built in line with international safety and environmental protection standard. A copy of confirm and detailisation certificate shall be given during pre-dispatch inspection.	Vendor to confirm and submit details			
2.37.1.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm and submit details			

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2.38	GEOMETRICAL ACCURACIES:				
2.38.1	Geometrical Accuracy Tests shall be in accordance with relevant & prevailing international standards viz. ISO 1701 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 accept			
2.38.2	All the Geometrical accuracies including 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. NAS/Test pieces and it's tooling for machining at vendor's works as well as at BHEL Hardwar are to be supplied by vendor. Drawings of NAS/Test piece to be submitted with the offer.	Vendor to accept			
2.39	POSITIONING & REPEATABILITY ACCURACIES:	Vendor to accept			
2.39.1	Positioning & repeatability accuracies shall be measured as per VDI/DGQ 3441 (Latest Revision). Checking by using laser interferometer.	Vendor to accept			
2.39.1.1	Positioning uncertainty over entire X axis (P)	Vendor to inform			
2.39.1.2	Positioning uncertainty over entire Y axis (P)	Vendor to inform			
2.39.1.3	Positioning uncertainty over entire Z axis (P)	Vendor to inform			
2.39.1.4	Positioning uncertainty over entire A axis (P)	Vendor to inform			
2.39.1.5	Positioning uncertainty over entire B axis (P)	Vendor to inform			
2.39.1.6	Positioning Scatter over entire traverse in X-axis (Ps)	Vendor to inform			
2.39.1.7	Positioning Scatter over entire traverse in Y axis (Ps)	Vendor to inform			
2.39.1.8	Positioning Scatter over entire traverse in Z-axis (Ps)	Vendor to inform			
2.39.1.9	Positioning Scatter over entire traverse in A axis (Ps)	Vendor to inform			
2.39.1.10	Positioning Scatter over entire traverse in B axis (Ps)	Vendor to inform			
2.39.1.11	NAS/ Test Piece machining	Vendor to confirm and submit details			
2.39.2	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works at BHEL, Haridwar.	Vendor to confirm and submit details			
2.40	LEVELING & ANCHORING SYSTEM:				
2.40.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, levelling shoes etc. for alignment and fixing of the machine on the floor should be supplied. Details to be submitted. In case any special equipment for drilling is foreseen, this has to be arranged by the vendor.	Vendor to offer & confirm and submit details			
2.41	TOOLS FOR ERECTION, OPERATION & MAINTENANCE:				
2.41.1	Tools and Equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench (02 Sets), Spanners (02 Sets), Allen Keys (02 Sets), Torx Keys (02 Sets), Electrical screw driver set (02 Sets), grease guns, Fluke make hand held digital multimeter (For Current & Voltage Measurements) and other special tools as 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			
2.41.2	Set of Test Mandrels/Special Gauge for checking spindle run-out & alignment of headstock/tailstock, WPC, ATC etc. and other geometrical alignment & its verification on the machine should be brought and provided by the vendor if not covered in offered scope of vendor.	Vendor to confirm and submit details			
2.42	FOUNDATION:				

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2.42.1	Vendor to confirm and submit details that floor details submitted along with tender enquiry is fit to install the machine. The machine will be located on the shop floor with a concrete slab of 250 mm thickness. The Binding foundation drawing to be provided by the vendor within one month of receipt of order / LOI. 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. 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. 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			
2.42.2	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 T/m ³ (c) Angle of internal friction = 35° (up to 3.0 m depth) (d) Coefficient of elastic uniform compression "Cu" = 3.0 Kg/cm ³ (at 7m depth for 10m ² base area and 1.0 Kg/cm ² confining pressure) (e) Bearing capacity at 1.5 meter depth = 10T/m ² (f) Water table = 25 meter below ground level	For Vendor's information			
2.43	TRAINING:				
2.43.1	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 Prove out 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. Vendor to confirm and submit details of the above trainings and it's duration and offer training charges on weekly basis.	Vendor to offer			
2.43.2	The training shall be imparted at the time of Machine Pre-acceptance tests at their works and suitable nos. of competent, English speaking experts for each area shall be pre-arranged and deputed to cover complete training as well as pre-acceptance during the stipulated period.	Vendor to accept & confirm and submit details			
2.43.3	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	For vendor's information.			
2.44	MACHINE PRE-ACCEPTANCE AT VENDOR'S WORKS:				

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2.44.1	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 2.44 of tender specs. During pre-acceptance, all accuracy tests mentioned at point number 2.38 and 2.39 shall be witnessed by the team. Also during pre-acceptance, vendor shall carry out successful machining of 3 numbers of each blades as mentioned in clauses 2.32.1.1 and 2.32.1.4 from rectangular Bar Stock as mentioned in respective clauses. The Vendor shall also demonstrate achievement of cycle time as submitted in the offer for machining of above mentioned types of blades. The machining will be carried out as per drawing accuracies and Surface finish in the presence of BHEL representatives and submit 3D Co-ordinate Measuring Machine reports for machined blades.	Vendor to confirm			
	Further, 2 Nos. of Locking blades and 2 Nos of thick blades for above mentioned types of blades shall also be machined to specified design accuracies and surface finish. Toolings required for pre-acceptance at vendor's works shall be provided by the vendor and shall not be consumed from the tooling package offered against clause number 2.32. Apart from this, personnels from BHEL may visit vendor's factory premises for the purpose of monitoring the machine during manufacturing of machine itself and give feedbacks. For this purpose, BHEL shall ask the vendor for schedule of visit and manufacturing of machine at their works.	Vendor to confirm			
2.44.2	All the blades to be machined during pre-acceptance shall use NC programs generated through the Automation system being offered as per point no. 2.21 of tender specifications.	Vendor to confirm			
2.44.3	Raw material (blank) required for machining the blades for pre-acceptance shall be arranged by the vendor.	Vendor to confirm			
2.44.4	Demonstration of In-process and post process measurement of complete blade, it's report generation & storage as well as it's printing to the satisfaction of BHEL for efficient and smooth usage	Vendor to confirm			
2.44.5	Demonstration of System of Automatic access, generation, storage & retrieval of NC programs as per point no. 2.21 to the satisfaction of BHEL for efficient and smooth usage.	Vendor to confirm			
2.44.6	Demonstration of engraving different alphanumeric characters, numbers on the blade through program on any three blades as mentioned at clause no. 2.16.11	Vendor to confirm			
2.44.7	Training to BHEL person as per point no. 2.43	Vendor to confirm			
2.45	ERECTION & COMMISSIONING:				
2.45.1	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. In case crane of higher capacity is required, representative of vendor to hire mobile crane from local sources(at their own cost). Compressed air pressure available in the shop is 6.0 Kg/Cm ² . If the required compressed air pressure for operating of the machine is more that the stated pressure , the vendor to quote suitable compressor (of Indian make preferable) as an optional item.	Vendor to confirm & offer			
2.45.2	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			

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SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.45.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Sl. No. 2.38 and 2.39 and testing/demonstration of tele-diagnostic service shall also be part of the commissioning activity.	Vendor to confirm			
2.45.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment (including Laser equipment, if required) not covered in specifications/scope but require to carry out erection & commissioning activities should be arranged by the vendor.	Vendor to confirm			
2.45.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
2.45.6	Broad Schedule of project completion along with erection and commissioning shall be submitted immediately after order	Vendor to submit			
2.45.7	Charges (if applicable) for Erection & Commissioning along with detailed terms and condition shall be furnished in detail separately.	Vendor to offer			
2.45.8	If any portion 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			
2.45.9	Any spare required during commissioning period (before final acceptance of the machine) shall have to be arranged by the vendor free of cost and duty levied have to be borne by the vendor.	Vendor to Accept			
2.46	PROVE OUT OF BHEL COMPONENTS:				
2.46.1	The vendor shall carryout following proveout machining of blades, to the specified design accuracies and surface finish, after erection & start-up of the machine at BHEL works using tools, equipment and CNC programs etc. supplied by the vendor (Drawings of prove out components are enclosed) : i) Complete and successful machining of 5 nos. of each type of blades as per drawing numbers mentioned at point number 2.32.2.2 and 2.32.2.3 of tender specs from rectangular bar stock of material as specified against respective clauses. ii) Complete and successful machining of Z shroud blade (3 Nos.) vide SKETCH 5 from rectangular blank of cross section 120 x 92 mm, blade length 493 mm, material X20Cr13. iii) Complete and successful machining of Guide blade (3 Nos.) vide SKETCH 6 from rectangular Bar stock of cross section 75 x 46 mm, Blade length 307 mm, material X20Cr13. iv) Complete and successful machining of double hook root Guide blade (3 Nos.) vide SKETCH 7 from rectangular Bar stock of cross section 143 x 83 mm, Blade length 421 mm, material X20Cr13.	Vendor to confirm			
	v) 2 Nos. of Locking blades for each variety of Moving blades (2.32.2.2, 2.32.2.3 & SKETCH 5). vi) 2 Nos. of Thick blades for each variety of Moving blades (2.32.2.2, 2.32.2.3 & SKETCH 5). vii) 2 Nos. of Joint blades for Guide blade (SKETCH 6). viii) Engraving different alphaneumeric characters, numbers (as intimated by BHEL) through program on one blade of each type as mentioned above (2.32.2.2, 2.32.2.3, SKETCH 5, SKETCH 6). - The proveout machining shall be carried out as per drawing accuracies and surface finish and the vendor shall demonstrate achievement of time study submitted as per point number 2.33. - Raw material (blanks) for all the prove out components shall be provided by BHEL. - Tooling required for prove out of BHEL components shall be separate & provided by the vendor. It shall not be consumed from the tooling package offered against clause number 2.32. -Drawings and other documents will be provided to the vendor only after the vendor has signed a non disclosure agreement with BHEL same as mentioned in clause 2.32.2.				

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2.46.2	All the blades to be machined during prove out at BHEL, Haridwar shall use NC programs generated through the Automation system being offered as per point no. 2.21 of tender specifications.	Vendor to confirm			
2.46.3	Machine operators support shall be provided by BHEL during prove out of machines at BHEL, Haridwar and they will work under the supervision of vendor's experts. To carryout the task, the vendor shall provide one week of exclusive training to BHEL's operators after machine installation and before the start of prove out.	Vendor to confirm			
2.46.4	Vendor shall be fully responsible for machining of prove out components as per drawing accuracies and other requirements mentioned in this tender specifications.	Vendor to confirm			
2.46.5	Vendor shall be responsible for any deviation/rejection in prove out component due to wrong machining or malfunctioning of the machine during prove out machining and also for the delay in machining due to improper recommended tooling etc. Any change in tooling/tool holder during prove out shall be at the responsibility and cost of the vendor and the same shall be supplied in sufficient quantity as mentioned above and under the heading of 'Tooling Package'. Tooling required for prove out of BHEL components shall be separte from tooling package as required against clause number 2.32.	Vendor to confirm			
2.46.6	Prove out of blades at BHEL mentioned at point number 2.46.1 may get changed at the time of prove out at BHEL but size and shape of blades will be similar and within the size given in clause 1.1.	Vendor to confirm			
2.47	FINAL MACHINE ACCEPTANCE:				
2.47.1	Final acceptance shall be made by BHEL Hardwar after completion of following activities:	Vendor to confirm			
2.47.1.1	Demonstration of specified/offered geometrical accuracies as per test chart/standard after machine commissioning	Vendor to confirm			
2.47.1.2	Demonstration to verify some of the general accuracies of the machines after machine erection/commissioning.	Vendor to confirm			
2.47.1.3	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine.	Vendor to confirm			
2.47.1.4	Machining of NAS/ test piece as submitted in the offer. Vendor shall supply NAS/ test pieces as well as tooling required for machining.	Vendor to confirm			
2.47.1.5	Training of BHEL machine operators in operation of complete machine, software & accessories etc. by the supplier's experts / engineers before & during prove out at BHEL works.	Vendor to confirm			
2.47.1.6	Prove out of BHEL components as per point no. 2.46.1	Vendor to confirm			
2.47.1.7	Demonstration and establishment of In-process and post Process measurement of job, it's report generation as well as it's printing as per point no. 2.18 to the satisfaction of BHEL for efficient and smooth usage.	Vendor to confirm			
2.47.1.8	Demonstration and establishment of System of Automatic access, generation, storage & retrieval of NC program as per point no. 2.21 to the satisfaction of BHEL for efficient and smooth usage.	Vendor to confirm			
2.48	PACKING:				
2.48.1	Sea worthy & rigid packing for machine, control and other supplied items to avoid any damage/loss in transit.	Vendor to offer			
2.49	GUARANTEE:				

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2.49.1	Guarantee for complete machine, CNC Control, softwares and all supplied accessories /equipments for 24 months from the date of final acceptance of the machine. Guarantee of spindle shall be minimum 12000 working hours. Guaranteed life of rotating unions of min. 3000 Hrs. Any spare required during commissioning period (before final acceptance of the machine) shall have to be arranged by the vendor free of cost and duty levied have to be borne by the vendor. Repair service contract required, if any, with the manufacturer of CNC System for service and spares of complete CNC system to cover 24 months guarantee shall also be offered.	Vendor to confirm and offer			
2.50	COLOUR OF THE MACHINE:				
2.50.1	Painting of Machine including accessories like electrical panels, chip conveyor, coolant system, work piece handling system etc. shall be : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm			
3.0	ADDITIONAL INFORMATION:				
3.1	Following information shall be supplied with the offer:				
3.1.1	Machine Model No.	Vendor to inform			
3.1.2	Total connected load (KVA)	Vendor to inform			
3.1.3	Space required (Length, Width, Height) for complete machine & accessories (Max.Height permissible is 4.8 meter)	Vendor to inform			
3.1.4	Catalogue of the machine	Vendor to submit			
3.1.5	Total weight of the machine	Vendor to inform			
3.1.6	Weight of heaviest part of machine	Vendor to inform			
3.1.7	Weight of the heaviest assembly of the Machine	Vendor to inform			
3.1.8	Dimensions of largest part of the machine as well as complete layout of machine & peripherals.	Vendor to inform			
4.00	QUALIFYING CONDITIONS:				
4.1	Only those vendors (OEMs) should quote who have supplied and commissioned at least one CNC single spindle 5 axis milling machine of same or higher sizes (finished blade length 500mm or more, Spindle power 28KW or more S1 100% Duty Cycle) for manufacturing of finished turbine blades, in the past ten years (On the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender). The following information should be submitted by the vendor about the companies where referred machine(s) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept & submit details.			
4.2	1. Name of the customer / company where referred machine is installed.	Vendor to submit			
4.3	2. Complete postal address of the customer.	Vendor to submit			
4.4	3. Month & Year of commissioning of referred machine	Vendor to submit			
4.5	4. Broad specification, Parameters of machine(s) supplied and application for which the machine is supplied.	Vendor to submit			
4.6	5. Name and designation of the contact person of the customer.	Vendor to submit			
4.7	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to submit			
4.8	7. Performance certificate from any one 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 submit			
4.9	8. BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected	Vendor to accept			

ASHWINI KUMAR
E5, NBS-SHOP

RK RAJAK
E5, NBS-PEB

RISHABH GUPTA
E3, WEX-CNC

ADITYA KUMAR
E3, WEX-MECH.

RP SINGH
E3, NCT