

	BHARAT HEAVY ELECTRICAL LIMITED	Enquiry No. :	
	UNIT'S ADDRESS: BHARAT HEAVY ELECTRICALS LTD., HEAVY ELECTRICAL EQUIPMENT PLANT (HEEP) HARIDWAR - 249403 UTTARAKHAND,	Due Date :	
	UNIT'S PHONE NOS.: (0091)(01334) 227350-227359	Supplier Qtn. No.:	
	CONTACT PERSON'S NAME/DESIGNATION/PHONE NO./E-MAIL (FROM PURCHASE DEPTT.):	Date :	

SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC LATHE

NOTE:-	
1. Vendor (OEM) must submit complete information against Qualifying Conditions at SI.No. 24.0 (Qualifying condition). The offer meeting this clause would only be processed. (OEM - Original Equipment Manufacturer)	
2. This tender is for two machines of identical configuration. However, proveout components will be different for both the machines as specified at clause no. 19.0	
3. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.	
4. The offer and all documents enclosed with offer should be in English language only.	

ADDRESS OF THE SUPPLIER :	
TELEPHONE NOS.:	
FAX NOS.:	
E-MAIL ADDRESS :	

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC LATHE COMPLYING WITH REQUIREMENTS AS BELOW :

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & WORK PIECE MATERIAL			
1.1	Purpose: The CNC Lathe is required for rough and finish machining of high precision Steam Turbine Governing Components of different designs & sizes. These components require internal & external turning/facing/grooving/threading operations & drilling at center with high accuracy and surface finish. The machine shall also be used for internal cylindrical grinding on Stellite bush fitted inside the Valve Covers.	Vendor to note & accept		
1.2	Work Piece Material: Work Piece Material shall be Forgings, Castings of high alloy steels of grade G17CrMoV5-10, GX23CRMOV12-1, Carbon Steel, Nimonic Steel, Alloy Steel, Stainless Steel, Inconel, Cast Iron, Centrifugal Cast Cobalt Alloy Stellite (Hardness 45HRC) and other materials like Aluminium Alloys, Bronze, Copper, Babbit material, Stellite 306, NiCro82 etc. having Hardness up to 500 BHN, which are generally used in power producing equipment.	Vendor to note & accept		
2.0	SPECIFICATION:			
2.1	CAPACITY & SIZE :			
2.1.1	Max.Turning Diameter	1000mm		
2.1.2	Max. Turning Length	4000mm		
2.1.3	Max. Weight of Work-piece between centers without steady	15000Kg		
2.1.4	Max. Weight of Work-piece:			
2.1.4.1	In head stock with one steady rest	15000Kg		
2.1.4.2	Only in Chuck (At least 3000Kg)	Vendor to inform		
2.1.5	Center Distance	4000mm		
2.1.6	Center Height	Vendor to inform		
2.1.7	Swing Over Bed (SOB)	Vendor to inform		
2.1.8	Swing Over Carriage (SOC) to suit max. turning diameter of 1000mm	1000mm or more (Vendor to inform)		
2.1.9	Distance of center of gravity from face plate, in case the work piece is held only in chuck. { Ref. Sl.No. 2.1.4.2 }	Vendor to inform		
2.1.10	Face plate Diameter	Vendor to inform		
2.1.11	No. of Hard Jaws (equipped with inbuilt force multipliers for rigid clamping with lesser effort)	4		
2.1.12	Chucking Diameters (with single set of jaws and single screw for each jaw for complete clamping range)	Vendor to offer		
2.1.12.1	External (Minimum)	100mm		

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		OFFERED	DEVIATIONS	REMARKS
2.1.12.2	External (Maximum)	1000mm		
2.1.12.3	Internal (Minimum)	Vendor to inform		
2.1.12.4	Internal (Maximum)	Vendor to inform		
2.1.13	Minimum distance between Head stock & Tail stock	Vendor to inform		
2.2	HEAD STOCK :			
2.2.1	Spindle Motor Rating (Minimum) AC, S1 Continuous Duty (Suitable for deep drilling from solid for diameters 60mm-120mm)	Minimum 75KW		
2.2.2	Spindle Motor Make (Either Siemens or Fanuc), Model etc.	Vendor to inform		
2.2.3	Spindle Bearing Type & Diameters (Radial & Axial)	Vendor to inform		
2.2.4	Spindle nose & Center flange - size & details (Drawing or copy of relevant page of standard to be submitted)	Vendor to submit		
2.2.5	Spindle speed (Infinitely variable)	0 - 600 rpm		
2.2.6	Detail of speed ranges (Selectable through program & manually as well)	Vendor to inform		
2.2.7	Range of spindle speed at constant power.	Vendor to inform		
2.2.8	Max permissible torque at face plate	Vendor to inform		
2.2.9	RPM at which max. permissible torque is available	Vendor to inform		
2.2.10	Torque/Power/Speed diagram of spindle motor	Vendor to submit		
2.2.11	Head stock center, 60 degrees, with cover plate to cover the space when headstock center is removed.	Vendor to offer		
2.2.12	Spindle bore diameter and its depth from chuck face	Vendor to inform		
2.2.13	Drawing of Hard Jaws, Detail of its Force Multipliers & jaws movement/clamping, Drawing of Face plate showing jaws/T-slots etc.	Vendor to submit		
2.2.14	Clamping force on each jaw	Vendor to inform		
2.2.15	Chuck Guard (made of steel sheet) of suitable length to cover the complete chuck for the length more than jaw's height (sufficient for safety of operator) with motorized / hydraulic movement through push buttons (on operator's panel side) & suitable interlocks to prevent chuck rotation at different guard positions. Its size & shape should suit to guide spilling coolant from face plate side to chip conveyor through bed ways considering coolant requirements for deep drilling & grinding etc. at high pressure and discharge rate.	Vendor to offer		
2.3	MACHINE BED :			
2.3.1	No. of Guide ways	Vendor to inform		
2.3.2	Bed width across ways	Vendor to inform		
2.3.3	Hardened (60 HRC or more) and Ground Guide ways for complete X and Z axes, equipped with automatic self lubrication. Details to be submitted.	Vendor to confirm & submit		
2.3.4	Hardness of guide ways	Vendor to inform		

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2.3.5	Slanting Type Metallic Telescopic Covers of rust resistant material should be provided with wipers for complete X axis (on front & rear sides of tool post) & Z axis (on left and right sides of carriage) guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & hydrostatic oil is to be provided. Part of covers, just adjacent to left and right sides of carriage, should be rigid enough for operator's movement as and when required.	Vendor to offer		
2.4	FEEDS AND DRIVE SYSTEM :			
2.4.1	Feed range in X & Z axes (Infinitely variable)	0-5000mm/min or more		
2.4.2	Rapid traverse in X & Z axes (Infinitely variable)	0-5000mm/min or more		
2.4.3	Feed drives/motors for X & Z axes (Digital AC servo motors of Siemens or Fanuc make). Detail of model, make, type, rating etc. should be submitted.	Vendor to offer & submit.		
2.4.4	Feed back system for X & Z axes - Heidenhain linear scales with pressurized compressed air cleaning (Details should be submitted)	Vendor to offer & submit.		
2.4.5	Details of System to ensure zero backlash for X & Z axis	Vendor to offer		
2.4.6	Mechanism for locking X & Z axis	Vendor to offer		
2.4.7	Maximum feed force in X and Z axes	Vendor to inform		
2.4.8	Maximum Torque in X and Z axes	Vendor to inform		
2.4.9	Detail of X and Z axes feed mechanism	Vendor to offer & submit.		
2.5	STEADY RESTS (ROLLER STEADIES) : "C" type or equivalent roller steadies shall be offered to suit specified range & application.	Vendor to offer		
2.5.1	Range of supporting dia for Roller Steady Rests	100mm to 900mm		
2.5.2	Weight capacity of each steady rest to suit requirement at Sl.No. 2.1.4.1	Vendor to inform		
2.5.3	No. of common bases, top portions and range of each combination of Roller Steady Rest to cover the specified range. The dia range on single unit should be covered with single movement screw without any extension pieces. Different ranges should have overlapping of around 50mm in supporting dia values.	Vendor to inform		
2.5.4	Swiveling type (Hydraulically operated or Motorized) upper portion of steady rests for job loading/unloading (Details should be submitted)	Vendor to offer & submit.		
2.5.5	Mounting of Steady Rest on Base shall be through quick-clamping fasteners (Details should be submitted)	Vendor to offer		
2.5.6	Motorized movement on bed ways with positive clamping (Details should be submitted)	Vendor to offer		

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2.5.7	Clamping force of base on bed ways	Vendor to inform		
2.5.8	Each unit of Roller Steady rest should be equipped with completely independent, automatic, refrigerated type (with heating, if required) and recirculating type (with provision to avoid mixing of oil with coolant) lubrication system, fixed on steady's base. Tank for lubricating oil fixed with steady should have provision to display alarm on control panel in case of low oil level (Details should be submitted)	Vendor to offer & submit.		
2.5.9	Adjustable Chip Protection Guards on rollers of steady rests to avoid falling of small chips between rollers & supporting diameters.	Vendor to offer		
2.5.10	Minimum distance from face plate (up to middle of roller of steady), at which the steady rest can be placed on bed ways for supporting the component.	Vendor to inform		
2.5.11	One spare set of Rollers of each type	Vendor to offer		
2.5.12	Provision to avoid going of grinding slurry/dust between roller & supporting dia, inside the roller bearing and steady lubrication system while carrying out grinding operation when the job is supported on steady (near job's end towards tailstock).	Vendor to offer		
2.6	TAIL STOCK :			
2.6.1	Motorized movement on bed by Push Buttons on Tail Stock.	Vendor to offer		
2.6.2	Quill stroke	Vendor to inform		
2.6.3	Quill Movement :			
2.6.3.1	Presetting, Display & Automatic control of thrust applied.	Vendor to offer		
2.6.3.2	Compensation for thermal expansion of work piece	Vendor to offer		
2.6.3.3	Motorized Drive	Vendor to offer		
2.6.4	Quill diameter	Vendor to inform		
2.6.5	Rapid Traverse rate of tail stock body on bed	Vendor to inform		
2.6.6	Traverse of quill with traverse rate	Vendor to inform		
2.6.7	Tail stock centre - 60 degree, Center flange - size & details (Drawing or copy of relevant page of standard to be submitted)	Vendor to inform & submit		
2.6.8	Detail of Positive Clamping & Unclamping of tail stock on bed	Vendor to inform & submit		
2.6.9	Max thrust on the Quill	Vendor to inform		
2.6.10	Provision should be there to avoid shifting of job towards headstock during job machining, when the job is in jaws at one side and supported on tailstock center at other end.	Vendor to confirm and explain		
2.6.11	Quill diameter & stroke should suit to hold proveout component for setup-1 as per SI.No. 19.1.2.1	Vendor to confirm		

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2.6.12	Additional face plate with 4 jaws, mountable on tailstock quickly and easily, for clamping range 200mm-700mm. The faceplate shall be used for straightening of proveout component for setup-3 (Sl.No.19.1.2.1) and similar other components for their alignment and setting, as and when required.	Vendor to offer		
2.7	CARRIAGE/ CROSS SLIDE :			
2.7.1	Z-axis travel	Vendor to inform		
2.7.2	X-axis travel (specify movement beyond center i.e. X -negative side)	Vendor to inform		
2.7.3	Cutting force available at the carriage	Vendor to inform		
2.7.4	Layout showing extreme positions of the all axes movements	Vendor to submit		
2.7.5	Carriage with Tool Post to clear chuck, tailstock and all steady rests.	Vendor to confirm		
2.8	TOOL POST : Vendor to offer a swiveling type composite tool post comprising of provisions for all turning operations (internal & external turning/facing/grooving/threading/drilling-at center etc.) using tools clamped in turret & boring bar holder and also grinding operations using internal cylindrical grinding spindle mounted on boring bar holder. Turret & Boring Bar Holder should be part of tool post. Tool Post should have a rigid turret on one side and a boring bar holder on the other side. It should be equipped with power operated automatic swiveling at 90 degrees, clamping and unclamping through push buttons on main Operator's Panel.Vendor to offer as per following configuration of tool post or may recommend a different superior arrangement/configuration for the specified applications.	Vendor to offer		
2.8.1	Turret : Turret should have minimum 6 positions with suitable width for its rigidity. The turret's disc face should reach up to the face of the chuck. Turret should have provision for rigid clamping of different tools on periphery of turret for all the positions. Additionally, provision for radial clamping of same holders at certain positions (wherever possible) of turret face should be provided. It should be possible to mount and clamp all offered tool holders easily and quickly on the different pockets of turret. There should not be any trouble in indexing of turret with unbalanced load of holders mounted on it. Center line of standard boring bar holders (dia 60 & dia 40), clamped on turret periphery , should be able to reach beyond center line of machine (negative X axis) by some distance (approx. 50mm) which should be informed by vendor. Details to be submitted by vendor.	Vendor to offer & submit.		
2.8.1.1	No. of Positions	Vendor to inform		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
2.8.1.2	Detail of recommended & offered Tool Holders for clamping of square shank tools in radial & axial directions, Boring Bar Holders (dia 60 & dia 40) including detail of clamping on turret etc.	Vendor to inform & submit		
2.8.1.3	Tool shank size for different holders for square shank tools.	32mm x 32mm		
2.8.1.4	Model, make & type of turret.	Vendor to inform & submit		
2.8.1.5	All pockets of turret should have built in coolant system to provide coolant directly on the cutting tip of different tools clamped in all types of tool holders.	Vendor to confirm		
2.8.1.6	Mechanism for indexing / selection of tool location	Vendor to inform		
2.8.1.7	Automatic operation / selection / indexing of turret through CNC program	Vendor to offer		
2.8.1.8	Additional manual operation / selection through push buttons	Vendor to offer		
2.8.1.9	Drawing of Turret	Vendor to submit		
2.8.1.10	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation	Vendor to inform		
2.8.1.11	Minimum & Maximum diameters & position along Z-axis w.r.t. chuck for tools clamped in radial and facial directions in tool holders mounted on turret.	Vendor to inform		
2.8.1.12	The overhang of turret disc with tool holder (Sl.Nos. 7.1.1 & 7.1.2) from the tool post body should be atleast 250mm. If required, special tool holder (having larger length) for the requirement specified at Sl.Nos. 7.1.1 & 7.1.2 should be offered in addition to tool holders offered at Sl.Nos. 7.1.1 & 7.1.2.	Vendor to confirm & offer		
2.8.1.13	The body of steady should not obstruct in any way while machining near steady support dia using tools clamped in turret, when the component is supported on steady with other end in chuck considering attached component drawings. Any limitation in this regard should be informed by vendor.	Vendor to inform		
2.8.2	Boring Bar Holder : A rigid Boring Bar Holder / Attachment to be suitably located on Tool Post to use long Boring Bars of different diameters. Supporting length of Boring Bar Holder should be sufficient to ensure rigidity and vibration free deep boring operation. The boring bar holder supports should be designed to enable quick and easier loading/unloading of the boring bars. Center line of boring bars clamped on boring bar holder should be able to reach beyond center line of machine (negative X axis) by some distance (approx. 50mm) which should be informed by vendor. Details to be submitted.	Vendor to offer & submit.		

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2.8.2.1	The boring bar holder should be suitable for machining , as per requirement, using following offered items clamped on it using different sets of reduction sleeves/clamping elements/coolant connections etc. provided by the vendor. 1. Pre-turned Anti-vibration Boring Bars of different diameters 60mm - 100mm for boring lengths up to 800mm. Required clamping length of boring bars should also be considered to ensure rigidity and vibration free deep boring operation with desired accuracy. 2. Drilling tool to perform drilling at center for holes of diameters range 10mm - 100mm upto depth 600mm. 3. Internal Grinding Attachment.	Vendor to offer		
2.8.2.2	The Boring Bar Holder should have built in provision to provide coolant directly on the cutting tip of different tools & drills clamped in boring bar holder.	Vendor to offer		
2.8.2.3	Drawing of Boring Bar Holder	Vendor to submit		
2.8.2.4	Limitation regarding length & weight of tool / tool holder clamped in boring bar holder for trouble free operation	Vendor to inform		
2.8.2.5	Provision for direct placing of boring bars on boring bar holder ensuring tool shank horizontal and tool tip exactly at center height.	Vendor to offer		
2.8.2.6	Provision to avoid rotation of boring bar during machining.	Vendor to offer		
2.8.3	Electronic X-axis lock should be provided as a function of CNC. Additionally a switch should be provided on operator's panel for X-axis lock to ensure fixed position in X axis while drilling at center by Turret or Boring Bar Holder. Provision should also be there to ensure direct positioning of center line of boring bar clamped on boring bar holder & turret as well to center axis i.e. X = 0 from X-axis reference/home position for the drilling operations.	Vendor to offer		
2.8.4	Rigidity and achievable accuracies of the tool post are to be guaranteed by the vendor.	Vendor to confirm		
2.8.5	Drawing showing complete configuration of tool post.	Vendor to submit		
2.8.6	In case of power failure or interruption due to any reason during operation of cycle for indexing of Turret, swiveling of tool post etc., revival of cycle should be possible.	Vendor to offer		
2.8.7	Tool post should be so designed to ensure clear visibility of the tool to the operator, standing on operator's platform, while operating operator's panel for machining very near to chuck.	Vendor to confirm		
2.8.8	Width of tool post which shall be required to bring between job and tailstock for carrying out boring operations using boring bars clamped in boring bar holder.	Vendor to inform		
2.9	CONSTRUCTION :			

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2.9.1	Vendor to furnish details of material, hardness & constructional details including explanatory drawings of various components/assemblies like Headstock, Steady Rest, Chuck, Tailstock, Carriage, Tool post, Machine bed, Feed Transmission system, Feedback system etc.of the machine.	Vendor to explain & submit, as applicable.		
2.9.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer	Vendor to explain & submit, as applicable.		
2.10	OPERATOR'S PLATFORM :			
2.10.1	Independent operator's platform should be provided on both sides , i.e. left & right , of the tool post with staircases and having sufficient space for safe left to right or vice versa movement of operator without any obstruction & without stepping down . The platform should provide sufficient space for convenient and safe operation of the machine and its control from both sides of tool post for external & internal turning operations using turret & boring bar holder as well as grinding operations. It should be provided with two different staircases (parallel to z-axis) for left and right portions of platform.	Vendor to offer		
2.10.2	The platform should clear all steady rests, tailstock and also headstock while working near chuck.	Vendor to confirm		
2.10.3	Operator's platform should have suitably located sufficient illumination (for clear view of tool, job, operator's panel, drawing display area etc.), 2 nos. power plug point (Indian type) of 220Volts, 15 Amp AC with on/off switch for connecting 2000W electric heater (BHEL's supply), fans (pedestal type or wall-hanging type) and a board for display of component drawing (A2 size) for ease of operator while working on both left and right side of the platform.	Vendor to offer		
2.10.4	Sliding door type Splash / Chip guards of sufficient height shall be provided on operator platform with glass windows on the guards (including fixed guards to support sliding door) for protection of operator, operator's panel and to avoid spillage of coolant & chips on shop floor and operator's platform. Any other arrangement, as recommended by the vendor, may be discussed and mutually agreed.	Vendor to offer		

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2.10.5	Additionally, Movable Splash / Chip guard (L or C shaped) of sufficient length (minimum 1.0 m) & height (to suit tangential spillage of coolant at max. turning dia of 1.0 m) should also be provided on rear side of machine to avoid spillage of coolant & chips on shop floor and control cabinets etc.. These guards should be traversing with wheels on rails provided parallel to bed ways for full turning length. These guards should have provision like tapered bottom part for smooth flow of coolant , spilled over them, towards chip conveyer to avoid spillage of coolant on shop floor.	Vendor to offer		
2.11	OPERATION AND CONTROL SYSTEM :			
2.11.1	OPERATOR'S PANEL :			
2.11.1.1	Swiveling and Sliding type operator's panel having complete CNC and machine control system with display of specified configuration should be provided on the operators platform for safe, convenient and efficient operation from both left and right sides of tool post. All switches should be within reach of operator of average height (5' 5") for easy operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details should be submitted.	Vendor to offer		
2.11.2	CNC SYSTEM & FEATURES :			
2.11.2.1	Make : Fanuc / Siemens.	Vendor to confirm		
2.11.2.2	Type : PC based latest version	Vendor to confirm		
2.11.2.3	Model: Sinumerik 840D with PC Version PCU 50, NCU 573.5 or higher with Intel Pentium III, 1GHz, 512 MB SDRAM (or higher), Windows XP Operating System or equivalent Fanuc system. (Latest version, as available at the time of ordering, should be supplied	Vendor to offer and submit details		
2.11.2.4	The system should have Operator's Panel with TFT colour display (12 inch or more), 19 Inch Machine Control Panel , Full CNC Keyboard with Qwerty keys and Mouse/Trackball or equivalent for Fanuc system, RS232-C interface for I/O devices, COM1(V.24), COM (V.24), LPT1 Parrallel Interface for Printer, VGA, MPI interface & USB, 2 Channels and Expansion slots. The operator Panel configuration will be as per Rittal VIP6000 or equivalent. The CNC System shall also have Electronic hand wheels selectable for all axes, USB Port with 1 GB Pen drive (for each machine) for data input/output, Hard disk of 10 GB or higher (Largest size available at the time of order shall be supplied), Graphic Simulation, COM port for tediagnosics, Network ready with LAN and preinstalled system software & other required softwares etc. (Details should be submitted by Vendor)	Vendor to offer and submit details		

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2.11.2.5	The CNC System should necessarily have the following features: Access locks on the operator panel, Look Ahead of Minimum 70 blocks, Process oriented Canned Cycles for Drilling, Turning & Grinding operations. The system shall also have SITOP Power, DC-UPS Module 15 with AKKU module to ensure automatic unattended shutdown of the system in case of power failure or even in normal machine shutdown, Display of PLC ladder on 840D monitor & Simatic S-7 loaded on the hard disk and Display of servo-waveforms on 840D monitor or equivalent features in Fanuc system.	Vendor to offer and confirm		
2.11.2.6	Details of other optional features to suit specified requirements.	Vendor to inform		
2.11.2.7	Fast & user-friendly Graphic Simulation for checking of program prior to actual running, Block-search with calculation while running the program & Automatic retraction of tool during threading (in case of power failure) should be pre-installed in the CNC system in addition to all other required/recommended software & features.	Vendor to confirm		
2.11.2.8	Additionally, a QWERTY keyboard and optical mouse, properly interfaced and suitably in-housed in the system's panel on covered sliding type tray for editing/input of programs by programmer.	Vendor to offer		
2.11.3	MANUAL CONTROL :			
2.11.3.1	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, spindle rpm, cutting feed on/off, display of axis position values etc, for manual turning operation without using CNC program, CNC option MANUAL TURN (of Siemens or equivalent) & MDI mode. Sketch showing switches / keys provided on operators panel should be submitted.	Vendor to confirm. Layout of panel showing requisite switches to be submitted.		
2.11.4	HAND HELD UNIT:			
2.11.4.1	Hand Held unit (auxiliary pendant) Type B-MPI of Siemens make or equivalent, with jog axes/spindle inching/ hand-wheel and sufficient length of interfacing cable), which can be taken near to the chuck for job setting and similar other purposes.	Vendor to offer		
2.11.5	UPS FOR CNC SYSTEM :			
2.11.5.1	UPS unit including Siemens UPS module SITOP with rechargeable battery of sufficient time and having provision for unattended automatic shutdown feature for Windows operating system & also to suit feature for automatic retraction of tool during threading in case of power failure to avoid damage to job/tool.	Vendor to offer		
2.12	MACHINE LIGHTS :			

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2.12.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform for clear visibility.	Vendor to offer		
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer		
2.12.3	Lights required in the foundation / pit area.	Vendor to offer		
2.12.4	All light fittings, consumables, adapters / receptacles should have compatibility with Indian equivalents.	Vendor to confirm		
2.12.5	Flashing / Rotary type light (indicating end of cutting, program stop, alarm etc.)	Vendor to offer		
2.13	AIR CONDITIONERS :			
2.13.1	Door mounted Air Conditioners of reputed make with Dehumidifiers for all Electrical / Electronic Panels / Cabinets including Operator's Panel (One no. of sufficient capacity for each cabinet / panel considering specified ambient & operating conditions). The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/modules. Detailed specifications of the same are to be submitted.	Vendor to offer & submit		
2.13.2	In case of order, vendor shall provide following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Refrigeration/ Chiller unit, Capacity of the chiller unit, Type of compressor with complete specifications, Type of Thermostatic Expansion Valve with complete specifications, Fan size and flow in CFM (cubic feet meter) of the Condenser unit, Specifications of the Evaporator Unit (Width Plate type/ Coil type), Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2, Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to offer and confirm		
2.14	HYDRAULIC SYSTEM :			
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm		
2.14.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm		
2.14.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hyda	Vendor to offer and confirm		
2.14.4	Failure indication	Vendor to offer		
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor to offer		

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2.14.6	Refrigerated type cooling and electric heating (Electric heating, only if required) system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. keeping in view the specified ambient conditions to be offered with complete details. The temperature of Hydraulic Oil should not go beyond 40 deg. C.	Vendor to offer & submit		
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform		
2.14.8	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.	Vendor to confirm & offer		
2.14.9	First filling of all required Oils & Grease etc. to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to offer & submit		
2.15	COOLANT SYSTEM :			
2.15.1	Recirculating type Flood Coolant System with all accessories suitable for all types of turning, drilling & grinding operations using turret, boring bar holder and grinding attachment etc. selectable through program and push buttons as well (available on operator's panel). Emulsion with oil content, as recommended by vendor, should be used. Provision should also be there to use air coolant (only pressurised air) instead of flood coolant through same outlet using program.	Vendor to offer		
2.15.2	All tool holders (clamped on turret and boring bar holder) & grinding system etc. should have the provision so that coolant is available directly at the tool-cutting tip or grinding wheel.	Vendor to confirm		
2.15.3	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. In case, any leakage is found, it shall be corrected by vendor. Additionally, suitable equipment should be provided at deepest point of foundation pit to pump out collected oil/coolant up to shop floor.	Vendor to confirm & offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
2.15.4	Vacuum Rotary drum type Coolant Filtration System with Magnetic Separator for all machining operations. Additional Paper Filter (Indian make consumable paper) should be used only for grinding. For turning and drilling operations, the coolant should be collected through the chip conveyor and re-circulated through a vacuum filter & magnetic separator. In case of grinding operation, after the vacuum filter & magnetic separator, the coolant should also pass through a paper filter. The selection should be automatic or through program. Details to be submitted.	Vendor to confirm and submit details.		
2.15.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.to be submitted with the offer.	Vendor to submit		
2.15.6	Coolant pump & motor details etc.	Vendor to inform		
2.15.7	Coolant Tank Capacity	Vendor to inform		
2.15.8	Pressure of coolant for Turning/Grooving/Boring/Drilling operations	Vendor to inform		
2.15.9	Pressure of coolant for Grinding to suit offered grinding attachment.	Vendor to inform		
2.15.10	Flow of coolant for Turning/Grooving/Boring/Drilling operations.	Vendor to inform		
2.15.11	Flow of coolant for Grinding to suit offered grinding attachment.	Vendor to inform		
2.15.12	One mechanical flow control valve, accessible to operator with ease, should also be provided in the pipe line for coolant on the carriage.	Vendor to confirm		
2.15.13	The system should be able to provide coolant to reach the tool tip at full pressure.	Vendor to confirm		
2.15.14	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches should be provided on the Operator's Panel.	Vendor to offer		
2.15.15	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer		
2.16	ELECTRICAL :			
2.16.1	Voltage = 415V +10% / -10% , Frequency= 50Hz +3 / -3 , No. of phases = 3 phase with neutral. Power Supply source, as above, will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets including Voltage Stabilizer, Transformer & Air-Compressor etc. shall be the responsibility of vendor. Requirement of grounding/earthing with required material details should be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to accept.		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
2.16.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized to suit specified ambient & operating conditions.	Vendor to confirm		
2.16.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm		
2.16.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to confirm		
2.16.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm		
2.16.6	Motors shall conform to IEC or Indian Standards.	Vendor to confirm		
2.16.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain . Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm		
2.16.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm		
2.17	In-cycle hour counter with reset facility for counting spindle & carriage running time, machine idle time, machine under maintenance time etc. and display the counted data on CNC display on video pages created by vendor.	Vendor to offer		
2.18	Tool Storage Cabinets (3 nos.) of reputed (Indian) make having covered heavy duty drawers of suitable sizes with lock facility to store offered tooling items etc.	Vendor to offer		
2.19	Portable Data Input Output Device : Portable floppy drive unit or its equivalent for bi-directional program & data transfer between the offered unit & supplied system and as well as standard PC available at BHEL works, should be offered with all required hardware, software, interfaces, cables, protection cover etc.	Vendor to offer		
2.20	Storage Facility for Boring Bars/Accessories/Attachments : Suitably located, effective and safe storage stations/stands are to be provided for adequate storage of the offered long anti-vibration boring bars, Grinding attachment etc., when they are not in use. These stations/stands shall be placed within range of arm of offered Jib Crane which shall be used to load/unload these items on/from tool post. Similar stations are to be provided for safe storage of steady rest units, when they are not in use. BHEL's overhead crane shall be used for their loading/unloading.	Vendor to offer		
2.21	SAFETY ARRANGEMENTS : Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
2.21.1	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 and panels) should be available.	Vendor to confirm		
2.21.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier, in case of order.	Vendor to confirm		
2.21.3	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		
2.21.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to confirm		
2.21.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm		
2.21.6	Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm		
2.22	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :			
	The Machine should conform to following factors related to environment :	Vendor to confirm		
2.22.1	Maximum noise level shall be 85 dB(A) at normal load condition, 1meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to confirm		
2.22.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm		
2.22.3	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		
2.22.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm		
2.22.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm		
2.22.6	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm		
3.0	CHIP CONVEYOR :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
3.1	One chip conveyor (elevated on tailstock side) to carry both short and curly chips efficiently and effectively should be provided on rear side of machine along bed ways with trouble free chip flow through chutes under the bed ways up to chip bin at shop floor.	Vendor to offer		
3.2	Type of chip conveyor (Hinged Type or superior)	Vendor to inform		
3.3	Width of conveyor	Vendor to inform		
3.4	Elevation of chip conveyor for chip bin	Vendor to inform		
3.5	Material of chip conveyor (should be rust resistant)	Vendor to inform		
3.6	Provision for smooth flow of chips through chutes under bed ways to the conveyor and for avoiding clogging of chips should be provided. Grill/Mesh type rigid covers should be provided above the chip conveyor, to enable machine operator to use the access to chip conveyor from shop floor as and when required for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor. There should not be any gap (left uncovered of metallic sheet chutes) on both sides of chip conveyor along its length to avoid scattering & collection of chips & coolant in foundation pit.	Vendor to offer & confirm		
3.7	In case of grinding, provision for flushing out grinding dust/slurry to avoid clogging of conveyor's holes should be provided.	Vendor to confirm		
3.8	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and also at Chip Conveyor's disposal end.	Vendor to offer		
3.9	Layout showing location of chip conveyor should be submitted.	Vendor to submit		
3.10	One no. Chip Bin of appropriate size of Indian make, with wheels, lifting hooks & handle for movement, should also be supplied.	Vendor to offer		
4.0	SERVO VOLTAGE STABILIZER :			
4.1	Indian make Oil / Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabilizer output for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer		
4.2	Make	NEEL, Aplab or Auto Electric		
4.3	Model & Rating	Vendor to inform		
4.4	Spares Package for the Voltage Stabilizer for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit		
4.5	Catalogue of the Voltage Stabilizer shall be submitted with the offer.	Vendor to submit		
5.0	ULTRA ISOLATION TRANSFORMER :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
5.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer		
5.2	Make (Neel, Mumbai or equivalent)	Vendor to inform		
5.3	Model and Rating	Vendor to inform		
5.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to submit		
6.0	PNEUMATIC SYSTEM :			
6.1	AIR COMPRESSOR :			
6.1.1	Independent Air Compressor (of reputed Indian make Elgi, Chicago Pneumatic or Ingersol Rand) with refrigerated type Dryers & Filters of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be offered. The system should be so designed to have additional provision and required accessories so that BHEL's centralized compressed air supply having pressure (around 4-5 bar) with certain moisture/oil contents could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to offer		
6.1.2	Make & Model of Air Compressor	Vendor to inform		
6.1.3	Capacity (Flow, Pressure & KW)	Vendor to inform		
6.1.4	Output Air Quality : Pressure dew point, Residual Mist and oil content in ppm.	Vendor to inform		
6.1.5	Noise level (Maximum 80 db)	Vendor to inform		
6.1.6	Availability of suitable compressed air supply, if required, for offered grinding unit. Discharge/Leakage of air through any part of grinding unit is to be taken into consideration.	Vendor to confirm		
6.1.7	Spares Package for the Air Compressor and Refrigerator type Dryer etc. for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit		
6.2	COMPRESSED AIR POINTS :			
6.2.1	Compressed Air Point with manually ON/ OFF Valve and flexible pipe of required length for work piece cleaning should be suitably provided on carriage near tool post.	Vendor to offer		
7.0	TOOLINGS : * Quantity- one no. of each item should be offered, unless specified. * Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering. * LH - Left Hand / RH - Right Hand. * All tool holders & boring bars to have holes for lifting by offered jib crane and suitable no. of eye-bolts are to be offered for the same.	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
7.1	Tool Holders for Turret : Vendor to offer suitable tool holders (one no. of each type) for following application with their drawings / catalogue. The applications may be combined to reduce variety of tool holders. Tool shank 32x32mm. Packing plates to be provided to clamp tools with shank 25x25mm.	Vendor to offer & submit		
7.1.1	LH Tool Holder for external turning with radial clamping of square shank tools.	Vendor to offer		
7.1.2	LH Tool Holder for external turning with axial clamping of square shank tools.	Vendor to offer		
7.1.3	RH Tool Holder for external turning with radial clamping of square shank tools.	Vendor to offer		
7.1.4	RH Tool Holder for external turning with axial clamping of square shank tools.	Vendor to offer		
7.1.5	Conventional type Tool Holder for external turning with both axial & radial axial clamping of square shank tools on both LH & RH sides.	Vendor to offer		
7.1.6	Long Conventional type Tool Holder for external turning with both axial & radial axial clamping of square shank tools on both LH & RH sides (Total length - approx. 100mm more than standard length).	Vendor to offer		
7.1.7	Long LH Tool Holder for external turning with radial & axial clamping of square shank tools (Total length - approx. 100mm more than standard length).	Vendor to offer		
7.1.8	Long RH Tool Holder for external turning with radial & axial clamping of square shank tools (Total length - approx. 100mm more than standard length).	Vendor to offer		
7.1.9	Dia 60mm boring bar holder (having through hole dia 60mm) with suitable length so that the center line of this boring bar holder could cross machine center line by around 50mm.	Vendor to offer		
7.1.10	Dia 40mm boring bar holder (having through hole dia 40mm) with suitable length so that the center line of this boring bar holder could cross machine center line by around 50 mm.	Vendor to offer		
7.1.11	Set of Reduction Sleeves to suit above Boring Bar Holders (at Sl.No. 7.1.9 & 7.1.10). Reduction Sleeves to have slots for clamping and external collars for easy removal of sleeve from holder. (one no. each) * Sleeve dia 60mm - dia 50mm * Sleeve dia 40mm - dia 32mm * Sleeve dia 60mm - MT 5 * Sleeve dia 60mm - MT 4 * Sleeve dia 40mm - MT 1 * Sleeve dia 40mm - MT 2 * Sleeve dia 40mm - MT 3	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
7.2	Tool Holders for Boring Bar Holder : Vendor to offer following boring bars with suitable tool holders (one no. of each type) for the specified application with their drawings or copies of relevant pages of catalogue comprising of major dimensions of the boring bars and holders. The requirement of boring bars & holders may be combined to reduce variety of boring bars/tool holders.	Vendor to offer & submit		
7.2.1	Pre-tuned Anti-vibration Boring Bar (Dia around 100mm) of reputed make for maximum boring depth = 800mm and minimum bore dia= 150mm. Rigidity of the boring bar for vibration free rough & finish boring is to be ensured.	Vendor to offer		
7.2.1.1	Tool Holder for boring bar (at Sl.No. 7.2.1) for boring with radial clamping of square shank tools 25x25mm.	Vendor to offer		
7.2.1.2	Tool Holder for boring bar (at Sl.No. 7.2.1) for boring with axial clamping of square shank tools 25x25mm.	Vendor to offer		
7.2.1.3	Tool Holder for boring bar (at Sl.No. 7.2.1) for boring with standard dia 40mm boring bar (clamping length - around 200mm).	Vendor to offer		
7.2.1.4	Set of Reduction Sleeves to suit tool holders (at Sl.No. 7.2.1.3) for above Boring Bar (at Sl.No. 7.2.1). Reduction Sleeves to have slots for clamping and external collars for easy removal of sleeve from holder. (one no. each) * Sleeve dia 40mm - dia 32mm * Sleeve dia 40mm - MT 1 * Sleeve dia 40mm - MT 2 * Sleeve dia 40mm - MT 3 * Sleeve dia 40mm - MT 4	Vendor to offer		
7.2.2	Pre-tuned Anti-vibration Boring Bar (Dia around 80mm) of reputed make for maximum boring depth = 500mm and minimum bore dia= 100mm.	Vendor to offer		
7.2.2.1	Tool Holder for boring bar (at Sl.No. 7.2.2) for boring with radial clamping of square shank tools 25x25mm.	Vendor to offer		
7.2.2.2	Tool Holder for boring bar (at Sl.No. 7.2.2) for boring with axial clamping of square shank tools 25x25mm.	Vendor to offer		
7.2.3	Complete set of necessary sleeves / adapters , 1 no. of each type , to clamp all above boring bars on Boring bar Holder.	Vendor to offer		
7.2.4	Pre-tuned Anti-vibration Boring Bar (Dia around 60mm) of reputed make for maximum boring depth = 600mm and minimum bore dia= 80mm.	Vendor to offer		
7.2.4.1	Tool Holder/Boring Head for boring bar (at Sl.No. 7.2.2) for boring with radial clamping of square shank tools 25x25mm.	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
7.3	Tools for Proveout Machining : The vendor should offer complete package including tools, inserts, holders, adapters, drills, boring bars, grinding wheels etc. in sufficient quantity for all types of operations like internal / external turning, grooving, turning & grinding on stellite bush, drilling at center etc. for complete machining proveout components (at Sl.No. 19.0) to meet required drawing accuracy & surface finish and to suit specified tender requirements. These tools/items should be in addition to tools offered above, however, tool holders for turret & anti-vibration boring bars with holders, offered above (at Sl.No. 7.1 & 7.2) need not to be included & offered here again. Vendor to quote as package for each component separately. List with item's nomenclature, quantity & copies of relevant pages of catalogue to be submitted by vendor.	Vendor to offer & submit		
7.3.1	Suitable job holding fixture parts, clamping elements etc. to hold proveout components in different setups for complete proveout machining.	Vendor to offer		
7.4	One additional set of standard jaws offered with chuck.	Vendor to offer		
7.5	Set of 4 special Long Hard Jaws with additional (w.r.t. standard jaw's length) clamping length of at least 100 mm suitable for offered chuck and clamping ranges.	Vendor to offer		
8.0	DIAGNOSTIC SYSTEM			
8.1	TELE-DIAGNOSTIC SERVICE :			
8.1.1	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future.	Vendor to offer & inform		
8.2	FAULT DIAGNOSTIC SYSTEM :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
8.2.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book along with Simatic S7 software (licensed copy), necessary cables, PCMCIA card / Adaptor (for Communication with MPI port) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer & submit		
8.2.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the turret and tool post to its initial/nearest position in case of interruption of their positioning / rotation/ swivelling cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of these cycles manually. Required switches/ push buttons should be provided on the operator's panel.	Vendor to offer		
8.2.3	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer		
8.2.4	Help guide should be provided to use both diagnostic systems	Vendor to offer & submit		
9.0	LEVELING & ANCHORING SYSTEM :			
	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to offer		
10.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :			
10.1	Special tools and equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to offer & submit		
10.2	Test mandrels for checking spindle run-out & alignment of headstock/tailstock etc. should be supplied. List to be submitted.	Vendor to offer & submit		
11.0	ACCESSORIES :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
11.1	INTERNAL GRINDING SPINDLE : Suitable Motorized Internal Grinding Spindle is to be offered for the grinding of deep bores using CNC program & grinding cycles at high speeds. Grinding is to be done inside the bore of Stellite Bush fitted in Steam Turbine component Valve Covers. Some of the Bushes may have grooves (width 2mm, depth 1.5mm) on bore at small regular pitch. Grinding wheel (minimum dia) should clear the spindle body in all conditions. It should generate surface finish better than 0.8 microns Ra value without any chatter or line marks. Details/ catalogue to be submitted.	Vendor to offer & submit		
11.1.1	This spindle should be mounted on the boring bar holder using suitable set of split sleeves to suit outer dia of clamping portion of the spindle. The clamping length i.e. length of sleeves should be sufficient for rigidity required for the specified application. The sleeves should be clamped in front end (towards chuck) of supporting length of boring bar holder. The motor should also be housed in the boring bar holder. So maximum dia of clamping portion of spindle and motor should not be more than bore dia available in boring bar attachment. Mounting details to be submitted.	Vendor to offer & submit		
11.1.2	Provision with quick clamp/unclamp end connections should be there to use flood coolant supply up to grinding wheel.	Vendor to confirm		
11.1.3	Separate Static Balancing Unit for Grinding wheel should be offered, if recommended by vendor.	Vendor to offer		
11.1.4	Wheel Dressing Device, programmable for its auto-operation through M-codes, suitably located on Tailstock or headstock for dressing of wheels for accurate alignment of the wheel with working axis considering specified grinding applications should be offered.	Vendor to offer		
11.1.5	Provision for manual grinding i.e. without CNC program, for grinding on bores should be there.	Vendor to offer		
11.1.6	Programmable grinding cycles, ready for use for CNC controlled grinding & wheel dressing.	Vendor to offer		
11.1.7	Maximum bore dia to be ground	500mm		
11.1.8	Minimum bore dia to be ground	150mm		
11.1.9	Maximum depth of bore to be ground { Protrusion of the spindle from extreme face (towards headstock) of tool post should suit required grinding depth }	600mm		
11.1.10	Peripheral speed of grinding wheel (minimum 30 m/sec)	Vendor to inform		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
11.1.11	Details of grinding spindle motor - rating, make etc.	Vendor to inform		
11.1.12	RPM at the spindle (infinitely variable)	Vendor to inform		
11.1.13	Max. and Min. dia of Grinding Wheels which can be clamped on the spindle.	Vendor to inform		
11.1.14	Width of Grinding Wheel	Vendor to inform		
11.1.15	Specifications & source of offered grinding wheels and paper filter shall be informed by vendor for future procurement of same by BHEL.	Vendor to confirm		
11.1.16	Sufficient protection to spindle bearing and guide ways from ground dust / slurry shall be provided.	Vendor to confirm		
11.1.17	Additional grinding wheels (2 nos. of each type) should also be offered by vendor.	Vendor to offer		
11.1.18	Drg. of Grinding Attachment showing dimensional details and weight.	Vendor to submit		
11.1.19	The Grinding Spindle should suit for the grinding on Stellite Bush in proveout component in view of chances of collision with material at distance 416mm while grinding on dia 280 (Valve Cover Drg No 11120205001) and similarly on Valve Cover Drg No. 11122305001	Vendor to confirm		
11.1.20	Possibility of external cylindrical grinding with same spindle. If possible, any limitations in this regard are to be informed.	Vendor to inform		
11.1.21	Spare package for grinding attachment. List to be submitted.	Vendor to offer & submit		
11.2	JIB CRANE : Jib Crane to suit heaviest holder/attachment/boring bar supplied with the machine should be offered. This should be suitably located with all power operated movements (including swivel motion) through push buttons for mounting & dismounting of different tool holders, boring bars and grinding attachment etc. on the tool post and also replacement of jaws whenever required, if possible.	Vendor to offer		
11.2.1	Load Capacity of the Jib Crane	Vendor to inform		
11.2.2	Length of Jib Crane arm	Vendor to inform		
11.2.3	Height of Jib Crane Column	Vendor to inform		
11.2.4	Swiveling Range to cover complete area to suit the requirement.	Vendor to inform		
11.2.5	Spare package for Jib Crane, if any. List to be submitted.	Vendor to offer		
11.2.6	Model, make, specifications etc.	Vendor to inform		
11.2.7	Manufacturer's catalogue to be submitted.	Vendor to submit		
11.2.8	Layout showing location of Jib Crane	Vendor to submit		
12.0	SPARES :			

SL.NO.	DESCRIPTION FOR REQUIREMENT		FOR VENDOR		
			OFFERED	DEVIATIONS	REMARKS
12.1	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to offer			
12.1.1	Mechanical & Hydraulic Spares : Following Spares are to be offered.	Vendor to offer			
12.1.1.1	Pumps used on machine i.e. Hydraulic, Hydrostatic, Lubrication, Coolant and Oil Cooling etc. recirculating system (1 no. each type).	Vendor to offer			
12.1.1.2	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 no. of each type)	Vendor to offer			
12.1.1.3	Pressure switches, flow switches used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 No. of each type)	Vendor to offer			
12.1.1.4	All types of regenerative type filter inserts (10 No. of each type)	Vendor to offer			
12.1.1.5	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer			
12.1.1.6	All types of Accumulators with charging kit (1 no. of each type)	Vendor to offer			
12.1.1.7	One set of belts (including timing belt) used in the machine.	Vendor to offer			
12.1.1.8	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer			
12.1.1.9	One set of hose pipe with end connection used in the machine.	Vendor to offer			
12.1.1.10	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.	Vendor to offer			
12.1.1.11	All types of shaft seals (2 no. of each type), O-rings & Piston Rings (5 nos. of each type) used in the machine.	Vendor to offer			
12.1.1.12	One set of pneumatic filtration / condensate drain system.	Vendor to offer			
12.1.2	Electrical /Electronic / CNC Spares : Following Spares are to be offered.	Vendor to offer			
12.1.2.1	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			
12.1.2.2	Relays (2 Nos each type)	Vendor to offer			
12.1.2.3	Contactors (2 Nos each type)	Vendor to offer			
12.1.2.4	RTD temperature transmitter (1 No each type)	Vendor to offer			
12.1.2.5	Proximity Switches (5 Nos each type)	Vendor to offer			
12.1.2.6	Push Buttons (5 Nos each type)	Vendor to offer			
12.1.2.7	Indicating Lamps (10 Nos each type)	Vendor to offer			
12.1.2.8	Semiconductor Fuses (5 Nos each type)	Vendor to offer			
12.1.2.9	Special Fuses (5 Nos each type)	Vendor to offer			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
12.1.2.10	Circuit Breakers (1 No each type)	Vendor to offer		
12.1.2.11	Main Power Switch (1 No each type)	Vendor to offer		
12.1.2.12	Encoders (1 No each type)	Vendor to offer		
12.1.2.13	Scanning Heads for Linear Scales (1 No each type)	Vendor to offer		
12.1.2.14	Wave shape unit/ EXE unit (1 No each type)			
12.1.2.15	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer		
12.1.2.16	NCU module	Vendor to offer		
12.1.2.17	Operator's panel with Display Unit	Vendor to offer		
12.1.2.18	I/O Cards for PLC (1 No each type)	Vendor to offer		
12.1.2.19	Servo Motors for Feed Drives (1 No each type)	Vendor to offer		
12.1.2.20	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type)	Vendor to offer		
12.1.2.21	One each of the following items : CNC Power Supply, I/R Module, NCU BOX, Machine Control Panel, Hand Held Unit/ B-MPI, Any other auxiliary drive , if used, Complete Proportional Valve Controller, if used.	Vendor to offer		
12.2	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 confirm		
12.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm		
12.4	Repair service contract with supplier of offered CNC system for service & spares for motor drives & CNC Unit etc.	Vendor to offer		
13.0	DOCUMENTATION : 3 sets of following documents (Hard copies with Soft Copies wherever specified) in English language should be supplied along with the machine	Vendor to offer		
13.1	Operating manuals of Machine & CNC system	Vendor to offer		
13.2	Programming Manuals of Machine & CNC system	Vendor to offer		
13.3	Detailed Maintenance manual of machine and supplied systems.	Vendor to offer		
13.4	Maintenance Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for spindle ,feed drives and auxiliary drive.	Vendor to offer		
13.5	Manufacturing drawings for all supplied clamping jaws and its lead screws, tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
13.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer		
13.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer		
13.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor, Grinding Attachment, Rolling Device etc.	Vendor to offer		
13.9	Program print-outs (hard copy) with comments in English for PLC of main machine and auxiliary systems (if used) alongwith cross reference list and Input/Output list.	Vendor to offer		
13.10	PLC program, NC data & PLC data on CD.	Vendor to offer		
13.11	Complete back-up of PCU-50 or equivalent (in case of Fanuc) hard disk on GHOST CD and clear written Instructions to take back-up and reloading on a new hard disk.	Vendor to offer		
13.12	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer		
13.13	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer		
13.14	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer		
13.15	Drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list marked on it in English.	Vendor to offer		
14.0	TRAINING :			
14.1	Four BHEL Persons should be trained at vendor's works for the area & period given below: (a) CNC Programming for the machine, measuring system, grinding attachment, rolling device etc. (Period 3 weeks) (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (Period 2 weeks) (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (Period 2 weeks) (d) Operation of the machine & other supplied equipments (Period 2 weeks) Pre-dispatch inspection (ref. SI.No. 20.1) of the machine shall also be carried out by the team during their stay at vendor's works for the training. Vendor may specify days required for pre-dispatch inspection. BHEL reserves the right to choose no. of persons, field & period of training, out of above, while deputing their engineers for training.	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
14.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to note		
14.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm		
14.4	Vendor should commit & offer to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works/training school for advanced features and specialized training, if so required by BHEL.	Vendor to offer		
14.5	Training charges, if any, for training requirement at SI.No. 14.1 & 14.4 should also be quoted on per Man-day basis so that training charges can be derived for the agreed period & persons, in case of any change.	Vendor to offer		
15.0	FOUNDATION :			
15.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. Complete Foundation Design including details viz. static / dynamic load details etc. and final Layout drawings shall be submitted by the supplier within two months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of vendor and at vendor's responsibility. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Vendor should arrange equipments required for the testing of foundation, if required.	Vendor to offer		
15.2	Tenatative Soil condition data at BHEL, Hardwar is as detailed below: a) The value of allowable bearing capacity is 11 ton/sq.m (Lowest obtained from shear and settlement criteria at 4.2m depth). The gross value of bearing capacity may be adopted as 17 ton/sq.m for an assumed footing size of 4m x 6m at a depth of 4.2m. b) The value of Angle of Internal Friction may be adopted as 32deg at 4.2m depth. c) The Coefficient of Elastic Uniform Compression (Cu) may be adopted as 3.0 kg/cubic cm at 4.2m depth for 10 sq.m or more contact area of foundation.	Vendor to note		
16.0	ERECTION & COMMISSIONING :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
16.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to offer		
16.2	Erection & Commissioning of indigenously supplied items like Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to offer		
16.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause no. 20.0 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to offer		
16.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be arranged and brought by the supplier. Out of the complete supply, all tools, tackles, mandrels etc. which may be required by BHEL to maintain the machine, after commissioning, shall not be taken back by vendor. Other equipment including Laser equipment shall be arranged by vendor on returnable basis. Vendor to offer accordingly.	Vendor to offer		
16.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to offer		
16.6	All Cover Plates, sheets/plates for chutes for chips flow through bed ways etc. required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor to offer		
16.7	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer		
16.8	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit		
16.9	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to submit		
17.0	ACCURACY TESTS :			
17.1	GEOMETRICAL ACCURACIES :			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
17.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 1708 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be submitted with the offer.	Vendor to confirm & submit		
17.1.2	Head Stock Spindle run out: (Radial & Axial)	Vendor to inform		
17.1.3	Tail stock Quill run-out	Vendor to inform		
17.1.4	Cylindricity of turning	Vendor to inform		
17.1.5	True roundness of turning	Vendor to inform		
17.1.6	Facial run-outs	Vendor to inform		
17.1.7	Axial Float of Headstock	Vendor to inform		
17.1.8	All other accuracies to confirm to ISO 1708 (Latest Revision) or Suppliers Test chart whichever is finer.	Should be tested by Vendor		
17.1.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works under specified ambient and operating conditions.	Vendor to confirm		
17.1.10	It should be possible to achieve offered accuracies on the components in all types of setups i.e. job held in chuck & supported on steady at other end, job held in chuck & tailstock center at other end and job held in chuck only.	Vendor to confirm		
17.2	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER. (To be arranged by vendor on returnable basis)	Vendor to confirm		
17.2.1	Positioning accuracy in X axis (Pa) per 1000 mm (Bi-directional)	= 0.015 mm		
17.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm (Bi-directional)	= 0.015 mm		
17.2.3	Repeatability in X axis (Ps) per 1000 mm (Bi-directional)	= 0.008 mm		
17.2.4	Repeatability in Z axis (Ps) per 1000 mm (Bi-directional)	= 0.008 mm		
17.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform		
17.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform		
17.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform		
17.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform		
17.2.9	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works under specified ambient and operating conditions.	Vendor to confirm		
18.0	OPERATING CONDITIONS & THERMAL STABILITY : Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies.	Vendor to offer & confirm		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
18.1	<p>Power Supply (AC): Voltage = 415V +10% / -10% , Frequency= 50Hz +3 / -3 , No. of phases = 3 phase with neutral.</p> <p>Ambient Operating Conditions: Temperature = 5 to 45 degree Celsius , Relative Humidity = 95% max.</p>	Vendor to accept & confirm		
18.2	Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor.	Vendor to accept & confirm		
18.3	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor.	Vendor to accept & confirm		
18.4	The machine, including attachments and accessories, should be suitable for continuous operation to its full capacity for 24 hour a day and 7 days a week throughout the year. Vendor to ensure and confirm the same.	Vendor to accept & confirm		
18.5	Provision should be there in Headstock Assembly to compensate for thermal expansion in it during continuous running of the machine for specified applications and to have its axial float within specified limits as per SI.No.17.1.7.	Vendor to accept & confirm		
19.0	PROVEOUT OF BHEL COMPONENTS :			
19.1	Drawings of proveout components are enclosed. Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor (Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing). Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.	Vendor to accept and offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
	Vendor shall be fully responsible for machining of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.			
19.1.1	<p>Following drawings pertaining to proveout components are attached :</p> <p>For Machine No 1 :</p> <p>1. Valve Cone drg no 11132227002- sheet 1 & 2</p> <p>2. Valve Seat drg no 31122205001 - sheet 1 & 2</p> <p>3. Valve Cover drg no 11120205001</p> <p>For Machine No 2 :</p> <p>4. Valve Cone drg no 21132027002- sheet 1 & 2</p> <p>5. Valve Seat drg no 21230325002</p> <p>6. Valve Cover drg no 11122305001</p>	Vendor to note & confirm		
19.1.2	<p>Proveout Component no. 1 - "Valve Cone" :</p> <p>Rough machined casting as per Stelliting Sketch Stage-II, shown in drg no 11132227002 - sheet 2, shall be provided by BHEL to vendor for carrying out all types of Turning, Grooving, Threading, Drilling (only at center) and Boring operations as per BHEL Drg. No. 11132227002 - sheet 1 in different setups, as given below. NiCro82 and Stellite 306 are special materials which shall be deposited by manual welding process & submerged arc welding process respectively by BHEL in blank material supplied by BHEL and shown in Stelliting Sketch Stage-II in drg no 11132227002 - sheet 2.</p>	Vendor to offer		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR			
		OFFERED	DEVIATIONS	REMARKS	
19.1.2.1	<p>Recommended setups for machining Valve Cone :</p> <p>Setup-1 : Dia 582 side in chuck & dia 150 held in tailstock using suitable plug. Operations : Dia 544.2 shall be machined with 0.5mm allowance for grinding. (External grinding shall be done by BHEL on other machine.)</p> <p>Setup-2 : Dia 582 side in chuck & dia 544.2 (with allowance) supported on steady. Operations : Rough drilling for M16 hole, Flat drilling for face at distance 194.5, boring operations for dia 90/100/140/160.5/220, threading m160x3, turning dia 280/480, facing at upper surface (to make length 1245-970), dia 192 with detail-I. Tapping for M16 hole shall not be done on this machine.</p> <p>Setup-3 : Dia 220 side in chuck using some round fixture part clamped with component using 4 holes (M36 at PCD350) already available in blank material supplied by BHEL and shown in sheet 2. Dia 544.2 (with allowance) supported on steady at other end. Operations : Dia 567.5 with detail-II, R0.6-R40-R125 contour, 45deg-R20-bore dia 450 upto depth 750.</p>	Vendor to note & confirm			
19.1.2.2	All types of holding fixture parts used in machining of Valve Cone shall be supplied by vendor as per SI.No.7.3.1.	Vendor to note & confirm			
19.1.2.3	<p>Material of Valve Cone :</p> <p>Steel Casting in Material Grade G17CrMoV5-10, 0.2% Proof Stress = 440 N/Sq.mm, UTS 590-780 N/Sq.mm, %EI (l=5d) = 15%, %Ra = 40%, Impact = 27J Chemical Composition (Heat Analysis as per EN 10213) : C 0.15 - 0.20%, P = 0.02%, Mo 0.90 - 1.10%, Sn = 0.025%, Al = 0.04%, Si = 0.6%, S = 0.015%, V = 0.2-0.3%, Cu = 0.3%, Mn 0.5-0.9%, Cr 1.2-1.5%, Ni = 0.7, Ti = 0.025%</p>	Vendor to note			
19.1.2.4	<p>Detail of material NiCro82 :</p> <p>Material EN 1SO 14172-E NiCr82 (NiCr20Mn3N6), Tensile Strength 620MPA, Yield Strength 390MPA Chemical Composition : C = 0.08%, Mn 5.0-7.0%, Fe (Iron) = 4.0%, Si = 0.5%, Ni = 67.0%, Ti = 0.5%, Cr 18.0-22.0%, Co 2.0-2.5%, P = 0.03%, S = 0.015%, Cu = 0.2%, Other elements = 0.5%.</p>	Vendor to note			

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
19.1.2.5	<p>Detail of material Stellite 306 : Hardness 350 HV10 (minimum) Chemical Composition : C = 0.5-0.57%, Mn 1.0-1.3%, Si 1.0-1.25%, Ni 4.3-4.9%, Cr 24.0-26.0%, Tn 2.8-3.25%, Fe (Iron) 6.0-7.3%, Niobium 6.0-7.3%, Co balance. Stellite 306 is a cobalt-base alloy. Stellite is trade name of M/s Deloro Stellite.</p>	Vendor to note		
19.1.3	<p>Component no. 2 - "Valve Seat" : All types of Turning, Grooving and Boring operations as per BHEL Drg. No. 31122205001 sheet-1 are to be performed in two setups. Rough machined forging as per Drg. no.31122205001 sheet-2 after deposition of NiCro82 material as shown in drg shall be provided by BHEL.</p>	Vendor to offer		
19.1.3.1	<p>Material of Valve Seat : Heat treated Forgings in Material Grade 21CrMoNiV47, 0.2% Proof Stress 550-700 N/Sq.mm, Tensile Strength minimum 700 N/Sq.mm, %EI (l=5d) = 15%, %Ra = 40%, Impact = 27J Chemical Composition (Heat Analysis as per EN 10213) : C 0.17 - 0.25%, Si = 0.3%, Mn 0.35-0.85%, Mo 0.65-0.8%, Cr 1.1-1.4%, Ni 0.5-0.75%, Vanadium 0.25-0.35%, S = 0.015%, P = 0.015%.</p>	Vendor to note		
19.1.4	<p>Component no. 3 - "Valve Cover" : Only for internal Grinding using supplied internal Grinding Spindle (Sl.No.11.1) Completely finish machined component as per drg. no. 11120205001 with Stellite bush fitted inside it, having allowance on its bore dia 280 for grinding shall be supplied by BHEL to vendor. Dia 280 is to be finished using grinding operation by supplied grinding spindle. Dia 209.7 shall be clamped in chuck and dia 460 shall be supported on steady.</p>	Vendor to offer		
19.1.4.1	<p>Material of Stellite Bush fitted in Valve Cover :</p> <ul style="list-style-type: none"> • Centrifugal Cast Cobalt Alloy Stellite Bush • Rough-machined casting shall be heated at 1150°C for 3 hours. Cooling rate shall be = 50°C/hour. • Hardness = 42±3 HRC • Chemical Composition : <p>Cobalt - Balance, Carbon 1.0 - 1.15%, Chromium 26.00 - 30.00%, Tungsten 3.50 - 5.50 %, Silicon = 2.00%, Iron = 3.00%, Nickel = 3.00%, Manganese = 1.00%, Molybdenum = 1.00%, Other Trace Elements = 0.10%</p>	Vendor to note		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
19.1.4.2	Detail of Grinding Operation: <ul style="list-style-type: none"> Wet Grinding with offered flood coolant. Material to be removed by grinding = 0.3-0.5mm (radial value). Vendor may recommend process comprising of turning with suitable tool to reduce allowance for grinding prior to carrying out grinding operation. In this case, vendor should recommend & offer suitable tools in package for tools for proveout machining in view of material of stellite bush. Bore Diameter within required tolerance maintaining its straightness within 0.02mm and ovality & run-out within 0.02mm and surface finish better than 0.8μ (Ra) (without any chatter & line marks) to be achieved all along total length of the bore. 	Vendor to note & confirm		
19.1.5	Component no. 4 - "Valve Cone" : Machining sequence and related requirement shall be similar to component no. 1 as per SI No 19.1.2 (19.1.2.1, 19.1.2.2, 19.1.2.3, 19.1.2.4 , 9.1.2.5)	Vendor to note & confirm		
19.1.6	Component no. 5 - "Valve Seat" : Machining sequence and related requirement shall be similar to component no. 2 as per SI No 19.1.3 (19.1.3.1)	Vendor to note & confirm		
19.1.7	Component no. 6 - "Valve Cover" : for Grinding Machining sequence and related requirement shall be similar to component no. 3 as per SI No 19.1.4 (19.1.4.1, 19.1.4.2)	Vendor to note & confirm		
19.2	Vendor shall be responsible, financially or otherwise, for any deviation/ rejection in proveout component to the extent of cost of Casting/Forging, due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc..The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.	Vendor to accept & confirm		
20.0	MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)			
20.1	Tests/Activities to be carried out at supplier's works on the machine before dispatch : All these activities shall be part of pre-dispatch inspection of the machine which shall be carried out by BHEL's team during their stay at vendor's works for the training (Ref. SL.No. 14.1). Report of the same shall be submitted to BHEL.	Vendor to accept & offer		
20.1.1	Geometrical accuracies as per SI.No.17.1	Vendor to accept		
20.1.2	Positioning accuracies as per SI.No. 17.2	Vendor to accept		
20.1.3	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept		
20.1.4	Demonstration of all features of the machine, control system & accessories	Vendor to accept		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
20.1.5	Machining of test piece as per AFNOR/ISO. Vendor to supply test pieces and tools for their machining. Drawing of test pieces to be submitted.	Vendor to accept & submit		
20.2	Tests/Activities to be carried out at BHEL works while commissioning the machine :	Vendor to accept & offer		
20.2.1	Geometrical accuracies as per SI.No.17.1	Vendor to accept		
20.2.2	Positioning accuracies as per SI.No. 17.2	Vendor to accept		
20.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept		
20.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept		
20.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to accept		
20.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to accept		
20.2.7	Machining of test piece as per AFNOR/ISO. Vendor to supply test pieces and required tools for their machining. Drawing of test pieces & list of offered tools to be submitted.	Vendor to accept & submit		
20.2.8	Job Proveout machining as per SI.No. 19.0.	Vendor to accept		
20.2.9	Two weeks supervision, by vendor's expert, of independent operation of machine by BHEL after job proveout	Vendor to accept		
20.2.10	Training of BHEL's machine operators in operation of complete machine & accessories etc. by the supplier's experts during their stay at BHEL works for commissioning of the machine. This training is in addition to training requirements at SI.No.14.0	Vendor to accept		
21.0	PACKING :			
21.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to accept & offer		
22.0	GUARANTEE :			
22.1	24 months from the date of acceptance of the machine.	Vendor to offer		
23.0	GENERAL :			
23.1	Machine Model No.	Vendor to inform		
23.2	Total connected load (KVA)	Vendor to inform		
23.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to inform		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
23.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer		
23.5	Total weight of the machine	Vendor to inform		
23.6	Weight of heaviest part of machine	Vendor to inform		
23.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to inform		
23.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to inform		
23.9	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Swing Over Carriage, Center Distance, Load Carrying Capacity, Main Drive Rating, CNC System, Application etc	Vendor to submit		
23.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm		
23.11	Hydraulic, Pneumatic & oil piping should be preferably metallic except places where flexible piping are essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm		
24.0	QUALIFYING CONDITIONS :			
24.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC LATHE of same (Swing Over Carriage 1000mm, Load Carrying Capacity 15000Kg, Admit Between Centers/Center Distance 2000mm) or higher sizes in the past ten years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year (on the date of opening of Tender) after commissioning, should quote. However, if referred machine (s) has/had been supplied to BHEL, then the machine should be presently working satisfactorily for more than six months (on the date of opening of Tender) after its commissioning and acceptance in BHEL. The following information should be submitted by the vendor about the companies where referred machine (s) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept & confirm		
24.2	Name of the customer / company where referred machine is installed.	Vendor to inform		
24.3	Complete postal address of the customer.	Vendor to inform		
24.4	Month & Year of commissioning.	Vendor to inform		
24.5	Parameters of machine(s) supplied (Swing Over Carriage, Load Carrying Capacity, Admit Between Centers/Center Distance) and application for which the machine is supplied.	Vendor to inform		
24.6	Name and designation of the contact person of the customer.	Vendor to inform		
24.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform		

SL.NO.	DESCRIPTION FOR REQUIREMENT	FOR VENDOR		
		OFFERED	DEVIATIONS	REMARKS
24.8	Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original Certificate or Through E-mail directly from the customer). The original performance certificate may be returned after verification by BHEL,	Vendor to submit		
24.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm		
25.0	OTHER FEATURES :			
25.1	NETWORKING : Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities.	Vendor to offer		
25.1.1	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm		
25.1.2	The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.	Vendor to confirm		
25.1.3	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm		
25.2	MACHINE MONITORING SYSTEM (MMS) SIGNALS : Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.	Vendor to offer		
25.2.1	Control ON	Vendor to confirm		
25.2.2	Cycle ON	Vendor to confirm		
25.2.3	Spindle Running	Vendor to confirm		
25.2.4	Feed Active (Any of the axes moving)	Vendor to confirm		
25.2.5	M30/M02 (Program Stop)	Vendor to confirm		
26.0	OPTIONAL ITEMS			
26.1	AUTOMATIC JOB MEASURING SYSTEM :			
26.1.1	Automatic Wireless Job Measuring System using electronic probes with measuring cycles, automatic programmable calibration system. The probe adapters should be clamped in tool holders mounted on turret . Calibration block should be fixed at suitable location. Details to be submitted.	Vendor to offer & submit		
26.1.2	All types of standard & special probes/styli & their adapters required to measure all machined surfaces & dimensions (external & internal) of the prove-out components.	Vendor to offer		

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		OFFERED	DEVIATIONS	REMARKS
26.1.2.1	Vendor to quote separately for the package of probes/styli & their adapters required for measurements, as above, of each of the proveout components specified at SI.Nos. 19.0. Component wise list of offered items with quantity is to be submitted.	Vendor to offer & submit		
26.1.3	The measurement system shall be customised so that the measured result file shall be generated in the CNC System only and shall contain all relevant information such as nominal values, measured values, tolerances along with project details of measured component as per sample format at Annexure-I. Further , all the measurements done on the component shall appear in a single file in the above sample format. The selected probing results output file shall be printable from the CNC screen of the machine on a printer through a single key command/soft Key. All necessary hardware & software including Printer, all types of cables, communication software, CNC features required for above mentioned setup shall be provided by the vendor.	Vendor to offer with details.		
26.1.4	Spares Package for the Measuring system for 2 years trouble free working should also be offered.The spares should include Tool Probes, Interface Unit & Special Probes if any. List to be submitted.	Vendor to offer & submit		
26.1.5	Details of Automatic calibration of the probes.	Vendor to submit		
26.1.6	Repeatability and accuracy of the probe	Vendor to inform		
26.1.9	Operating Manuals, Maintenance Manuals & Catalogues for offered Automatic Job Measuring System.	Vendor to offer		
26.1.10	During proveout machining, final inspection of the components shall be done by supplied Job Measuring System using required program supplied by vendor.	Vendor to accept & offer		
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