BHARAT HEAVY ELECTRICAL LIMITED
UNIT'S ADDRESS:

Enquiry No. :
Due Date :
Supplier Qtn. No.:
Date :

CONTACT PERSON FROM PURCHASE DEPTT.:
NAME: MR. KAUSHIK ROY
DESIGNATION: M (PPX-CAP)
PHONE NO.: 0091 - 1334 - 281147
E-MAIL: kroy@bhelhwr.co.in
FAX NO. : 0091 - 1334 - 226462

SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC VERTICAL BORER

NOTE :-

1. Vendor (OEM) must submit complete information against clause at Sl.No. 26.0 (Qualifying condition). The offer meeting this clause would only be processed (OEM : Original Equipment Manufacturer).

2. The vendor(OEM) should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is any deviation from the requirement. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.

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

4. Total Two no. of machines with same technical specifications, as below, are to be offered. Scope of supply & work shall be same separately for both the machines however, proveout component (with related requirements) shall be different for both the machines , as specified below with Sl.Nos 7.3 & 16.2 for Machine-1 & Sl Nos 7.4 & 16.3 for Machine-2.

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

SCOPE:	SUPPLY, ERECTION & COMMISSIONING OF CNC VERTICAL BORERS COMPLYING WITH SPECIFICATIONS AS BELOW.				
SL. NO.	**DESCRIPTION OF BHEL REQUIREMENT**	**REQUIRED**	**OFFERED**	**DEVIATION**	**REMARKS**
1.0	**PURPOSE & WORKPIECE MATERIAL**				
1.1	**Purpose:** This machine is required for carrying out rough & finish machining operations on casings and other components of SteamTurbines/Gas Turbines etc. demanding high accuracies & surface finish. The machine shall be used for all types of turning, grooving, boring operations on diameters & faces including threading operations.	Vendor to note & accept			
1.2	**Work Piece Material**: are forgings / castings of High Alloy Steels, Nimonic Steel, Stainless Steel, Inconel, Cast Iron and similar other materials which are generally used in power producing equipments having hardness 150 to 500 BHN.	Vendor to note & accept			
2.0	**SPECIFICATIONS**				
2.1	**MACHINE CONFIGURATION**				
2.1.1	**Double Column CNC Vertical Borer with single Ram**	Vendor to offer			
2.2	**CAPACITY & SIZE**				
2.2.1	Maximum Height for Turning & Facing	7000 mm or more			
2.2.2	Maximum Turning Diameter	8500 mm or more			
2.2.3	Maximum Workpiece Weight	200000 Kg or more			
2.2.4	Maximum Swing Diameter	8500 mm or more			
2.2.5	Minimum Boring Diameter (using standard turning tool holder & tool clamped on the ram)	Vendor to inform - It should suit requirement at Sl No 16.2.2.2			
2.3	**TABLE**				
2.3.1	Table Diameter	7000 mm			
2.3.2	Load Capacity	200000Kg or more			
2.3.3	Table Speed (Infinitely Variable)	Min. 1rpm or less, Max. 50rpm or more			
2.3.3.1	Speed Ranges	Vendor to inform			
2.3.4	Power of Main Drive (S1 - Continuous Rating) AC	150 kw or more			
2.3.5	Details of Main Drive viz.Type, Make, Model etc.	Vendor to inform			
2.3.6	No. of Jaws/Vices (With Force Multiplier Mechanism)	8			
2.3.7	Maximum External Clamping Diameter	Vendor to inform			
2.3.8	Minimum External Clamping Diameter	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.3.9	Maximum Internal Clamping Diameter	Vendor to inform			
2.3.10	Minimum Internal Clamping Diameter	Vendor to inform			
2.3.11	Clamping Force of each Jaw.	Vendor to inform			
2.3.12	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	Vendor to inform & submit			
2.3.13	Type of Force Multiplier Mechanism used in Jaws.	Vendor to inform & submit			
2.3.14	Maximum permissible Cutting Force	Vendor to inform			
2.3.15	Maximum permissible Torque	Vendor to inform			
2.3.16	RPM at which Max. Torque is available.	Vendor to inform			
2.3.17	Table Torque - Speed diagram	Vendor to submit			
2.3.18	Type of Bearing for the Table : Hydrostatic (should be confirmed by Vendor) . Complete details like bearing diameters, sizes of pockets etc. should be furnished.	Vendor to inform			
2.3.19	Size of T - slots, their position and accuracy. Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to submit			
2.3.20	Two perpendicular accurate Slots should be provided at the Center of the table to use for alignment purposes. Sizes (Width & Depth), accuracy etc. of these slots should be furnished along with a Drawing.	Vendor to confirm			
2.3.21	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	Vendor to submit			
2.3.22	Diameter, Depth and Accuracy of Center Bore on Table Top Surface.	Vendor to inform			
2.3.23	Construction of machine table	Vendor to inform			
2.3.24	Height of machine table top - with ref. to shop floor	Vendor to inform			
2.4	**CROSS RAIL**				
2.4.1	Vertical Travel.	Vendor to inform			
2.4.2	Vertical Traverse Rate.	Vendor to inform			
2.4.3	Crossrail movement : Full CNC Programmable Continuous Axis for Crossrail's Vertical Movement. Details to be informed.	Vendor to offer			
2.4.7	Maximum Height of Cross Rail bottom from Table Top	Vendor to inform			
2.4.8	Minimum Height of Cross Rail bottom from Table Top	Vendor to inform			
2.4.9	Movement of Cross Rail : Through NC Program as well as manually by Push Buttons/Keys	Vendor to offer			
2.4.10	Machine Reference Point should be at Ram Reference Point and it should be updated automatically with movement of Cross Rail	Vendor to offer			
2.4.11	Details of crossrail movement/positioning/locking mechanism	Vendor to submit			
2.5	**TOOL HEAD and RAM**				
2.5.1	No. of Columns	2			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.5.2	No. of Rams	1			
2.5.3	Cross - Section of Ram	Vendor to inform, to suit requirement specified at Sl No 2.2.5			
2.5.3.1	Ram & its supporting/guiding mechanism should be ***rigid enough*** for troublefree machining (turning & grooving) with maximum projection of ram. ***Provisions incorporated for the same are to be informed*** .	Vendor to confirm & inform			
2.5.4	Provision for Thread Cutting (Maximum pitch limitation, if any)	Vendor to inform			
2.5.5	Clamping / Mounting Mechanism of Turning Tool Holders/Attachments on ram.	Vendor to submit			
2.5.6	Clamping Force Available for clamping of Turning Tool Holders/Attachments.	Vendor to inform			
2.5.7	Mounting of Turning Tool Holders and Attachments should be automatic through Program as well as manually through push buttons.	Vendor to confirm			
2.6	**MAIN TRAVERSES**				
2.6.1	Vertical Travel of Ram (Z-Axis)	4000mm or more			
2.6.2	Horizontal Travel of Ram (+ve X-Axis)	Vendor to inform			
2.6.3	Horizontal Travel of Ram beyond Center of the Table (-ve X-Axis) : Minimum1000mm	Vendor to inform			
2.6.4	Maximum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
2.6.5	Minimum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
2.7	**MACHINE GUIDEWAYS**				
2.7.1	Width of Cross Rail guideways	Vendor to inform			
2.7.2	Width of column guideways	Vendor to inform			
2.7.3	X & Z guide ways should be hydrostatic (Details should be submitted)	Vendor to confirm			
2.7.4	Hardness of guideways	Vendor to inform			
2.7.5	**Metallic Telescopic Covers:** Waterproof Telescopic Covers of rust resistant steel should be provided with pads/wipers on both left and right sides of tool head on the crossrail and also above & below the crossrail on both columns covering the guide ways. Joints of telescopic covers should be sealed **to avoid seepage of coolant on the guideways** . Bellow type Covers to be provided under the Metallic Telescopic Covers. The movement of telescopic covers should be troublefree and requiring minimum maintenance.	Vendor to offer			
2.8	**FEEDS AND DRIVE SYSTEM**				
2.8.1	Cutting feed in X & Z Axes (Infinitely Variable)	0 - 10000mm/min			
2.8.2	Rapid feed in X & Z Axes	0 - 10000mm/min			
2.8.3	Feed drives/motors X & Z axes [AC servo motors] of Siemens or Fanuc digital type (detail of model, make, type, rating etc. should be submitted)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.8.4	Maximum cutting force permissible on Ram & at what extension	Vendor to inform			
2.8.5	Maximum permissible Cutting Force at Maximum Ram extension	Vendor to inform			
2.8.6	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to submit			
2.8.7	Feed back system for X & Z axes should be Heidenhain linear scales with pressurised compressed air cleaning (Details should be submitted)	Vendor to offer			
2.8.8	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to submit			
2.8.9	Mechanism for locking X & Z axis	Vendor to inform			
2.9	**CONSTRUCTION**				
2.9.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various components/ assemblies like Column, Cross Rail, Ram head, Table, Guideways/slides, Feed Transmission system, Ram, Hydraulic and Lubrication system, Feedback system etc .of the machine.	Vendor to submit			
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 submit			
2.10	**OPERATOR'S PLATFORM**				
2.10.1	It should be independent motorised type, movable / adjustable in vertical and horizontal directions. It should be able to reach almost to center of the Table in horizontal direction. Interlocks should be provided for its horizontal / downward movement against rotating Table and against the job (rotating or stationary) to avoid collision / accident. A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform. Suitable ladder is to be provided with the coloumn of platform.	Vendor to offer			
2.10.2	Horizontal movement of complete Platform.	Vendor to inform			
2.10.3	Vertical movement of complete Platform to cover total turning height.	Vendor to inform			
2.10.4	Height of Platform Railing.	Vendor to inform			
2.10.5	Weight Capacity of the Platform.	Vendor to inform			
2.10.6	Minimum Position of Platform from Shop Floor.	Vendor to inform			
2.11	**OPERATION AND CONTROL SYSTEM**				
2.11.1	**OPERATOR'S PANEL :** Swiveling type operator's panel having complete CNC and machine control system with all displays of required configuration shall be provided and suitably located on operator's platform for convenient, efficient & safe operation of the machine. All switches, keys & display should be within reach of operator of average height (5' 5") for easy & safe operation. All displays/indications should also be conveniently placed accordingly. A protection cover made of steel sheet or equivalent should be provided above the operator's panel.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.11.2	**CNC SYSTEM & FEATURES**				
2.11.2.1	Make : Fanuc / Siemens.	Siemens or Fanuc			
2.11.2.2	Type : PC based latest version	PC based latest version			
2.11.2.3	Model (Latest version, as available at the time of ordering, should be supplied).	Vendor to inform and submit details			
2.11.2.4	Details of optional features, recommended by vendor.	Vendor to inform			
2.11.2.5	The system should have full alphanumeric keyboard, TFT colour display (15" or more), additional draw-out type Qwerty Key Board and optical mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for telediagnostics, network ready with LAN, hard disk of sufficient capacity (Largest size available at the time of order shall be supplied), graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor) The CNC System shall also have Electronic hand wheels selectable for X & Z axes, USB Port with Pen drive for data input/output, In case, only USB ports (separate port for each of above function - total min. 4 USB ports) are provided, suitable hardware/connectors shall be provided to ensure above functionalities	Vendor to offer and submit details			
2.11.2.6	Provision for automatic safe shut down of CNC System in case of Power Failure and Loading of S7 on hard disk & provision of ON screen PLC ladder display and servo wave forms display on the CNC System.	Vendor to offer			
2.11.3	**HAND HELD UNIT:**				
2.11.3.1	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 table for job setting and similar other purposes.	Vendor to offer			
2.11.4	**MANUAL CONTROL**				
2.11.4.1	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, table rpm, cutting feed on/off, display of axis position values etc, for manual machining operations **without** using CNC program,/ CNC option MANUAL TURN (of Siemens control or equivalent from Fanuc control) / MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor to offer			
2.12	**UPS FOR CNC SYSTEM**				
2.12.1	UPS unit (similar to Siemens UPS module/feature 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 or Table/Feed stoppage due to any alarm generation to avoid damage to job/tool.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.13	**MACHINE LIGHTS**				
2.13.1	Machine Lights for sufficient illumination of complete working area on the table, on the ram housing to view tool inside long casing type jobs and also on/near to operator's panel & area below crossrail should be provided for clear visibility.	Vendor to offer			
2.13.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer			
2.13.3	Lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to offer			
2.13.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to offer			
2.13.5	Flashing/Rotary type light indicating end of cutting, program stop, alarm etc. at a easily visible &suitable place.	Vendor to offer			
2.14	**AIR CONDITIONERS**				
2.14.1	Door/ side mounted Air Conditioners of reputed make with Dehumidifiers of suitable/ sufficient capacity and proper drainage pipes for condensate, are to be provided for all Electrical/ Electronic Panels/ Cabinets including operator's Panel (if provided by CNC System Manufacurer) considering specified ambient conditions. The Air Conditioners are to be preferably mounted on doors of panels and not on top of the panels.				
2.14.2	In case of order, Vendor to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine: Type Refrigeration/ Chiller unit (refrigerant conforming to environment norms). Capacity of the chiller unit. Type of compressor with complete specifications. Type of Thermostatic Expansion Valve with complete specifications. Fan size and flow in CFM (cubic feet meter) of the Condenser unit. Specifications of the Evaporator Unit (Width Plate type/ Coil type) Functional requirement of temperature of Cooling Oil to be maintained between range T1 to T2. Type of temperature indicator/ controller used in the chiller unit with complete specifications.	Vendor to confirm			
2.15	**HYDRAULIC SYSTEM** (Details should be Submitted by the Vendor)	Vendor to submit.			
2.15.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor.	Vendor to offer and confirm			
2.15.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Parker / Hawe/ Vickers / Vickers Sperry.	Vendor to offer and confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.15.3	Filtration System: Sufficient no. of filters (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hydac.	Vendor to offer and confirm			
2.15.4	Failure indication	Vendor to offer			
2.15.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			
2.15.6	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			
2.15.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform			
2.15.8	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to confirm & offer			
2.16	**FIRST FILLING OF OILS**				
2.16.1	First filling of all required Oils & Grease etc. for the machine, voltage stabilizer, isolation transformer & air-compressor including coolant for test piece & proveout machining 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			
2.17	**COOLANT SYSTEM**				
2.17.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons as well.	Vendor to offer			
	a) Recirculating Type Flood Coolant System	Vendor to offer			
	b) Air coolant system (only pressurised air)	Vendor to offer			
2.17.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to offer			
2.17.3	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.	Vendor to offer & confirm			
2.17.4	**Coolant Filtration System:** Recirculating type coolant system with Vacuum Rotary drum type Coolant Filtration System and magnetic separator. The filtration system should be mounted at shop floor level, if possible with provision to avoid leakage/spillage of coolant.	Vendor to confirm and submit details.			
2.17.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.	Vendor to submit			
2.17.6	Coolant pumps & motor details etc. for all types of coolant variants	Vendor to inform			
2.17.7	Coolant Tank Capacity	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.17.8	Pressure & rate of flow of coolant should be furnished in the offer. The coolant should be able to reach tool tip at full pressure.	Vendor to inform			
2.17.9	All types of coolant variants should be switchable through program as well as manually by push buttons provided on the Operator's control panel.	Vendor to offer			
2.17.10	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to offer			
2.17.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer			
2.18	**REQUIREMENT FOR ELECTRICAL EQUIPMENT**				
2.18.1	415V (fluctuation ±10%), 50HZ (fluctuation ±3%), 3 Phase AC (3 wire system with out neutral) Power Supply Voltage will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of switches, cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets including Voltage Stabilizer, Isolation Transformer & Air Compressor etc. , shall be supplied by the vendor & shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to accept & offer			
2.18.2	**Tropicalisation:** All electrical / electronic equipment shall be tropicalized.	Vendor to offer			
2.18.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to offer			
2.18.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to offer			
2.18.5	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be Indian or should have compatibility with Indian equivalents.	Vendor to offer			
2.18.6	All motors shall conform to IEC or Indian Standards	Vendor to offer			
2.18.7	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 offer			
2.18.8	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.19	**SAFETY ARRANGEMENTS** Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to offer			
2.19.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to offer			
2.19.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to submit			
2.19.3	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.	As offered & agreed			
2.19.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	As offered & agreed			
2.19.5	Emergency Switches at suitable locations as per International Norms should be provided.	As offered & agreed			
2.19.6	Oil & water pipe lines should not run with electrical cable in the same trench.	As offered & agreed			
2.20	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE :** The Machine should conform to following factors related to environment :	Vendor to offer			
2.20.1	Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16, if required. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm			
2.20.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.20.3	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			
2.20.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			
2.20.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.20.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
2.21	**In-cycle hour counter** with reset facility for counting table running time, in-feed motion of ram, 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			
3.0	**CHIP CONVEYOR**				
3.1	An elevating type chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on shop floor (on either side of the machine) should be provided at appropriate location. Metallic chutes should be provided all around the table for smooth collection of chips upto opening of chip conveyor.	Vendor to offer			
3.2	Type of chip conveyor	Hinged type or superior			
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 collection of chips from all-around table to the conveyor and for avoiding clogging of chips should be provided. Removable Grill/Mesh type rigid covers should be provided above some portion of the chip conveyor, to enable machine operator's access to chip conveyor from shop floor for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor.	Vendor to offer			
3.7	Operation of chip conveyor (forward & reverse) should be possible through push buttons on operator's panel and also near chips disposal point/chip bin on the chip conveyor.	Vendor to offer			
3.8	Layout showing location of chip conveyor should be submitted.	Vendor to submit			
3.9	**CHIP BINS (two nos.)** of appropriate size, with wheels, lifting hooks & handle for movement.	Vendor to offer			
4.0	**SERVO VOLTAGE STABILIZER**				
4.1	Oil **/** Air Cooled Servo Controlled Voltage Stabilizer (of reputed Indian make) suitable for complete machine, its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer with details			
4.2	Make	NEEL / Aplab / Auto Electric / Servomax			
4.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
4.4	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
4.5	**Spares Package for Servo Voltage Stabilizer (Sl.No.4.0):** 1.) Control Cards - 01 Set (one no. of each type) 2.) Monitoring PCBs - 01 Set (one no. of each type) 3.) Servo Motor - 01 Set	Vendor to offer			
5.0	**ULTRA ISOLATION TRANSFORMER**				
5.1	Ultra Isolation Transformer (of reputed Indian make) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
5.2	Make	NEEL or Aplab or Auto Electric or Servomax			
5.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
5.4	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection.	Vendor to offer			
6.0	**PNEUMATIC SYSTEM**				
6.1	**AIR COMPRESSOR**				
6.1.1	Independent Air/Oil cooled, Screw Type Air Compressor (make Elgi , Ingersol Rand or of other reputed Indian make) with refrigerated type Dryer & Filter of suitable/sufficient capacity with all required accessories for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply (having pressure 5-6 bar with little moisture/dirt content) could be used as and when required. The compressor unit should be suitable for continuous duty considering specified power supply & ambient conditions..	Vendor to offer			
6.1.2	Capacity (Discharge Air Flow & Pressure, Motor Power etc.)	Vendor to inform			
6.1.3	Refrigerant used	Vendor to inform			
6.1.4	Output Air Quality (Pressure Dew Point in degree Celsius, Residual mist/oil content in ppm etc.). It should be odor-free.	Vendor to inform			
6.1.5	Noise level (Maximum 80db)	Vendor to inform			
6.1.6	Flow diagram	Vendor to submit			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
6.1.7	**Spares Package for Air Compressor & Dryer (Sl.No.6.1):** 1.) Air Filter - 06 Nos. 2.) Oil Filter - 15 Nos. 3.) Oil - 50 Ltrs. 4.) Air - Oil Separator Element - 06 Nos. 5.) Belt - 04 Nos. 6.) Flexible Hose Kit - 01 Set	Vendor to offer			
6.2	**COMPRESSED AIR POINTS**				
6.2.1	Compressed Air Point with connections for Air Coolant System mentioned at Sl. No. 2.16.1	Vendor to offer			
6.2.2	Suitably located Compressed Air Point near machine table with manually operated ON/ OFF Valve and flexible pipe of suitable length for cleaning of workpiece, tools and work area etc.	Vendor to offer			
7.0	**TOOLINGS :** ***** Individual package prices against each Sl.No. shall be quoted by Vendor. * Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering.	Vendor to confirm			
7.1	**TOOL HOLDERS** All tool holders & boring bars shall be available on ATC for direct clamping in ram through ATC cycle. All tool holders & boring bars should have holes for lifting by suitable eye-bolts. Each tool holder/boring bar is to be offered complete with clamping screws, eye-bolt for lifting and packing plate (for clamping of 32x32mm shank tool instead of 40*40mm tool), as applicable. Final drawings for offered items shall be submitted by vendor to BHEL after PO, in case of order, for BHEL's approval prior to their manufacturing & supply. **Quantity :** One no. of each type (Sl No 7.1.1 to 7.1.7), complete in all respects. (LH - Left Hand / RH - Right Hand)	Vendor to offer			
7.1.1	Tool holder for external turning having provision for rigid cassette type clamping.	Vendor to offer			
7.1.2	Tool holder for internal turning having provision for rigid cassette type clamping.	Vendor to offer			
7.1.3	Tool holder, having provision for both LH and RH facing using rigid cassette type clamping.	Vendor to offer			
7.1.4	Standard (Conventional) tool holder for 40*40mm tool shank with direct clamping of tools for internal / external turning and LH/RH facing operations with provision for clamping 32*32mm shank tools with packing pieces.	Vendor to offer			
7.1.5	Eccentric Boring Bar dia. 400 boring bar with length. 800mm with conventional type of tool holding for 40*40mm shank tools and with provision of 32*32mm shank tool both for turning and facing positions.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.1.6	Centric Boring Bar dia. 300 boring bar with length. 500mm with conventional type of tool holding for 40*40mm shank tools and with provision of 32*32mm shank tool both for turning and facing positions..	Vendor to offer			
7.1.7	Centric Boring Bar dia. 400 boring bar with length. 1200mm with conventional type of tool holding for 40*40mm shank tools and with provision of 32*32mm shank tool both for turning and facing positions..	Vendor to offer			
7.2	**PRESETTABLE CASSETTES (to suite above cassette type holders).** Drg. No. R6300-0965 of RH Cassette is enclosed for vendor's reference. Each cassette is to be offered complete with clamping screws and packing plate (for clamping of 32x32mm shank tool instead of 40*40mm tool), as applicable. Final drawings for offered items shall be submitted by vendor to BHEL after PO, in case of order, for BHEL's approval prior to their manufacturing & supply. **Quantity : Two no. of each type(Sl No 7.2.1 to 7.2.4), complete in all respects.** (LH - Left Hand / RH - Right Hand)	Vendor to offer			
7.2.1	LH cassette for 40*40mm tool shank, Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
7.2.2	RH cassette for 40*40mm tool shank, Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
7.2.3	LH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
7.2.4	RH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
7.3 (For Machine-1)	**TOOLING FOR MACHINING OF PROVE-OUT COMPONENTS**	Vendor to offer			
7.3.1 (For Machine-1)	**TOOLS FOR MACHINING OF PROVE-OUT COMPONENTS (AT SL. No. 16.2 For Machine-1) - IP Outer Casing & Threaded Ring:** Separate Packages for the two components, as specified below at Sl.No. 7.3.1.1 , 7.3.1.2, 7.3.1.3 and 7.3.1.4 (For Machine-1) Vendor shall submit final list of offered items against Sl.Nos. 7.3.1.1 to 7.3.1.4 within two months or mutually agreed period after PO, in case of order. In case of any addition/change in offered items (at Sl.Nos. 7.3.1.1 to 7.3.1.4) after order or during actual proveout (in case of order), the total requirement shall be replenished by vendor without any financial implications to BHEL.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.3.1.1 (For Machine-1)	All types of cassettes, tools, inserts, holders, special measuring instruments (if required) etc. in sufficient quantity, as recommended & required by vendor for carrying out all types of turning, grooving, boring operations for complete machining of proveout component as per its drawing to meet required drawing accuracy & surface finish. The package should include all types of cassettes required for proveout machining in addition to cassettes offered at Sl.Nos. 7.2.1 to 7.2.4. Tool holders & boring bars offered at Sl.Nos. 7.1.1 to 7.1.7 need not to be offered here again, if required to be used. In case, any other type of tool holders, different from tool holders at Sl.Nos. 7.1.1. to 7.1.7 are required to be used, same should be included in package offered here.	Vendor to offer			
7.3.1.2 (For Machine-1)	Complete fixture & set of required clamping elements & fasteners, in sufficient quantity, with setting scheme as recommended & required by vendor for clamping/setting of component on machine table in different setups and for carrying out complete machining of proveout component as per Sl.No. 16.2 (For Machine-1). Quantity: total two sets (one for proveout machining+one additional) of all offered items.	Vendor to offer			
7.3.1.3 (For Machine-1)	Attachement / Accessary/ Device, complete in all respects including required indicating instruments & fasteners etc., required by vendor to check runout & concentricity of both sides simultaneously i.e. detail "C2" side at top & finished detail "C1" side at bottom of IP Outer Casing for its perfect vertical alignment in all setups as mentioned at Sl No 16.2.2.2 (For Machine-1). Quantity: **Total Two sets** (one for proveout machining + one additional) of all offered items.	Vendor to offer			
7.3.1.4 (For Machine-1)	In addition to package offer at 7.3.1.1, set of all types of tools, inserts, holders, consumables & tooling spares like shims , cartiridges, screws, clamp etc, as shall be established by vendor during proveout machining of both components (ref. Sl.No. 7.3.1.1 for Machine-1) as per quantity given below: Tools of each type : **2 Nos** for each item Inserts of each type : **30 Nos.** for each item. Screw Drivers, Torque Wrench, Wrench etc. of each type : **2 Nos.** of each item Consumables & tooling spares like shims , cartiridges, screws, clamp etc : **10 Nos**. of each type	Vendor to offer			
7.4 (For Machine-2)	**TOOLING FOR MACHINING OF PROVE-OUT COMPONENTS**	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.4.1 (For Machine-2)	**TOOLS FOR MACHINING OF PROVE-OUT COMPONENTS (AT SL.NO. 16.3 - For Machine-2) - IP Inner Casing & Threaded Ring-Test Piece:** Separate Packages for the two components, as specified below at Sl.No. 7.4.1.1, 7.4.1.2 & 7.4.1.3 (For Machine-2) Vendor shall submit final list of offered items against Sl.Nos. 7.4.1.1 to 7.4.1.3 within two months or mutually agreed period after PO, in case of order. In case of any addition/change in offered items (at Sl.Nos. 7.4.1.1 to 7.4.1.3) after order or during actual proveout (in case of order), the total requirement shall be replenished by vendor without any financial implications to BHEL.	Vendor to confirm			
7.4.1.1 (For Machine-2)	All types of cassettes, tools, inserts, holders, special measuring instruments (if required) etc. in sufficient quantity, as recommended & required by vendor for carrying out all types of turning, grooving, boring operations for complete machining of proveout component as per its drawing to meet required drawing accuracy & surface finish. The package should include all types of cassettes required for proveout machining in addition to cassettes offered at Sl.Nos. 7.2.1 to 7.2.4. Tool holders & boring bars offered at Sl.Nos. 7.1.1 to 7.1.7 need not to be offered here again, if required to be used. In case, any other type of tool holders, different from tool holders at Sl.Nos. 7.1.1. to 7.1.7 are required to be used, same should be included in package offered here.	Vendor to offer			
7.4.1.2 (For Machine-2)	Complete fixture & set of required clamping elements & fasteners, in sufficient quantity, with setting scheme as recommended & required by vendor for clamping/setting of component on machine table in different setups and for carrying out complete machining of proveout component as per Sl.No. 16.3 (For Machine-2). Quantity: **Total Two Sets** (one for proveout machining + one additional) of all offered items.	Vendor to offer			
7.4.1.3 (For Machine-2)	In addition to package offer at 7.4.1.1, set of all types of tools, inserts, holders, consumables & tooling spares like shims , cartiridges, screws, clamp etc, as shall be established by vendor during proveout machining of both components (ref. Sl.No. 7.4.1.1 for Machine-2) as per quantity given below: Tools of each type : **2 Nos.** for each item Inserts of each type : **30 Nos**. for each item. Screw Drivers, Torque Wrench, Wrench etc. of each type : **2 Nos**. of each item Consumables & tooling spares like shims , cartiridges, screws, clamp etc : **10 Nos**. of each type	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
7.5	**Set of Extension Blocks**: Four Nos. of Extension Blocks of height 1200mm & Four Nos. of Extension Blocks of height 600mm matching with offered Jaw-Boxes/Vices for clamping of different Jobs at height on the machine table. The set should be complete in all respects with all required fasteners. The extension blocks shall be directly clamped on machine table using T-slots provided for vices/jaws and the vices/jaws shall be clamped on the top faces of these extension blocks which shall have matching T-slots. These blocks are independent of tooling packages offered by vendor for proveout machining.	Vendor to offer			
7.6	**ADDITIONAL TOOLING REQUIREMENTS**				
7.6.1	Mounting details of each type of toolings.	Vendor to submit			
7.6.2	Offered tooling system to be **rigid to carryout machining without undue vibration**, which can effect job accuracy and surface finish in extreme machining conditions like max. overhang of ram etc. .	**Vendor to confirm**			
7.6.3	In case of order, manufacturing drgs., catalogues & source of all tooling items (Tool Holders, Cassettes, Extension Blocks etc.) should be submitted by vendor.	Vendor to confirm			
7.6.4	Supplier should offer all tools & inserts with latest cutting geometries & grades to achieve high productivity and cutting parameters. Tools with indexable carbide inserts should only be offered. No brazed, HSS or form tool should be offered.	Vendor to confirm			
7.6.5	All supplied tool holders, boring bars, cassettes etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations like grooving, turning etc. Provision for external coolant should also be provided.	Vendor to offer			
7.7	**Tool Storage Cabinets** (set of four 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			
8.0	**DIAGNOSTIC SYSTEMS**				
8.1	**TELE-DIAGNOSTIC SERVICE**				
	Tele-diagnostic service should be provided through Internet or ISDN 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. Help guide should be provided for use of the system/service. Terms and conditions for the service after guarantee period should be informed by vendor.	Vendor to offer			
8.2	**FAULT DIAGNOSTIC SYSTEM :**				

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	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/pictoral** diagnostics indicating the element /device causing the fault.	Vendor to offer			
8.2.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the ATC to its initial/nearest position in case of interruption of positioning cycle of ATC due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of positioning cycle of ATC, manually. Separate Pendent should also be provided to retrieve the ATC to it's initial position. Similarly, provision shall also be there to bring back the crossrail to its initial/nearest position in case of interruption of positioning cycle of crossrail due to alarm on the machine or power failure.	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			
8.3	Help guide should be provided to use both diagnostic systems.	Vendor to offer			
9.0	**LEVELING & ANCHORING SYSTEM**				
9.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment of table, columns etc. and to fix the machine to the foundation should be supplied.	Vendor to offer			
10.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE**				
10.1	Tools and Equipment required for erection of the machine shall be brought by the vendor (on returnable basis).	Vendor to accept			
10.2	Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied by the vendor. List of such tools should be submitted with offer.	Vendor to offer			
10.3	Set of Test Mandrels/Cylindrical Bars for checking table run-out & alignment of ram etc. should be supplied with protection boxes.	Vendor to offer			
11.0	**AUTOMATIC TOOL CHANGER (ATC)**	Vendor to offer			
11.1	Type	Vendor to inform			
11.2	No. of storage locations (to suit all the tool holders and boring bars, offered at Sl.no. 7.1) All tool holders/boring bars (Sl.No. 7.1) shall be mounted on ATC and shall be clamped in ram through CNC program for automatic ATC cycle. In case, any other type of tool holders is foreseen by vendor for proveout machining (Sl.No. 7.3.1.1 & 7.4.1.1), same should also be mounted on ATC.	Vendor to inform			
11.3	Tool selection method - Random	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
11.4	Maximum Tool Overhang out of different Holders in both directions i.e. radial & axial.	Vendor to inform			
11.5	Maximum Permissible Weight on each Pocket.	Vendor to inform			
11.6	Maximum Permissible Weight on Complete ATC.	Vendor to inform			
11.7	The Machine operation should be possible with or without referencing ATC.	Vendor to confirm			
11.8	ATC Drawing (preliminary) should be submitted with the offer.	Vendor to submit			
11.9	Provision for loading/unloading of different holders on ATC using (BHEL's) overhead crane, if required.	Vendor to offer			
12.0	**CHIP & SPLASH GUARD**				
12.1	Chip / Splash Guards of sufficient height and made of rust resistant material (painted), shall be provided all around the Table (on front side of columns) to avoid spilling of Coolant and scattering of Chips on Operator's Panel and Shop Floor. Front part of splash guards shall be movable provided with safety glass for clear visibility of job to the operator.	Vendor to offer			
12.2	Additionally a fixed type of splash/ chip guard of atleast full turning height should be provided on rear side of machine i.e. around rear portion of table between columns .	Vendor to offer			
12.3	Movable splash guard should have interlock for table rotation. Opening of guards on front side of table should suit maximum possible size of the job which can be loaded on the table. The guards should not provide any hindrance with complete vertical movement of crossrail/ATC on both sides of the table.	Vendor to confirm			
12.4	Drawing of Chip/Splash Guards (pre-liminary) showing total height, layout and other details of the same should be submitted.	Vendor to submit			
13.0	**ACCESSORIES**				
13.1	**Auto Focus Video Camera System :** Complete system having Auto Focus Video Camera with zoom facility & its accessories & connections is to be offered. The camera, mounted inside its enclosure, shall be mounted on the ram or tool holders (Sl.No.7.1) with internally connected & concealed electrical connections. In case, the mounting on tool holders is offered, all tool holders/boring bars (at Sl.No. 7.1) should have provision for the same and suitable electrical connections. Freely hanging or unsupported/unprotected cables are to be avoided. Color monitor should be suitably located on operator's panel to view tool while machining and also as an aid for setting of casings/long cylindrical jobs using dial indicator. Camera eyes/lens and connecting cables shall be safe guarded against heat, chips, coolant, dust etc. to maintain clear visibility of the tool in these conditions. Suitable sockets for power connections shall be provided for both positions(ram and tool holders). Clamping details of camera on different tool holders shall be shown on drawings of tool holders.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
13.2	**Spare Package for Video Camera System (Sl.No. 13.1) :** Complete System, as offered against Sl.no. 13.1, in spare.	Vendor to offer			
14.0	**SPARES :**	--			
14.1	Individual package prices against each Sl.No. (i.e. against each of Sl.No. 14.1.1.1 to 14.1.1.7 & 14.1.2.1 to 14.1.2.14) shall be quoted by Vendor.	Vendor to confirm			
14.1.1	**Mechanical & Hydraulic Spares :** Following Spares are to be offered.	--			
14.1.1.1	All types of Pumps used on machine i.e. Hydraulic, Hydrostatic, Lubrication, coolant and oil cooling system (1 no. each type)	Vendor to offer			
14.1.1.2	All types of 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			
14.1.1.3	All types of pressure switches, flow switches and pressure transducers used in Hydraulic, Lubrication, Pneumatic & Coolant circuit. (1 no. of each type)	Vendor to offer			
14.1.1.4	All types of filter inserts of regenerative type (5 nos. of each type)	Vendor to offer			
14.1.1.5	All types of filter inserts of disposal type & size (10 nos. each type)	Vendor to offer			
14.1.1.6	One set of belts (including timing belt) used in the machine.	Vendor to offer			
14.1.1.7	All types of Seals (2 no. of each type), Wipers & O-rings (5 nos. of each type) used in the machine.	Vendor to offer			
14.1.2	**Electrical /Electronic / CNC Spares :** Following Spares are to be offered.	Vendor to offer			
14.1.2.1	Relays (2 Nos each type)	Vendor to offer			
14.1.2.2	Contactors (2 Nos each type)	Vendor to offer			
14.1.2.3	Semi-conductor Fuses (2 No each type & rating)	Vendor to offer			
14.1.2.4	Proximity Switches (2 Nos each type)	Vendor to offer			
14.1.2.5	Push Buttons (10 Nos each type)	Vendor to offer			
14.1.2.6	Indicating Lamps (10 Nos each type)	Vendor to offer			
14.1.2.7	Circuit Breakers (2 Nos each type)	Vendor to offer			
14.1.2.8	Encoder for spindle (1 No)	Vendor to offer			
14.1.2.9	Encoders & Scanning Heads for Linear Scales (1 No each type)	Vendor to offer			
14.1.2.10	PCU module (Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
14.1.2.11	NCU module	Vendor to offer			
14.1.2.12	I/O Cards for PLC & I/R Module (1 No each type)	Vendor to offer			
14.1.2.13	Power Module & Control Cards for Main Drive as well as Feed Drives (1 Nos each type) with Main Power Switch	Vendor to offer			
14.1.2.14	Limit Switches/ Micro Switches (2 Nos each type)	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
14.2	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			
14.3	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			
14.4	Repair service contract with supplier of offered CNC system for service & spares for motor drives & CNC Unit etc.	Vendor to confirm			
15.0	**DOCUMENTATION :** Three sets of following documents, hard copies (with Soft Copies wherever specified), in English language should be supplied along with the machine. Each set consists of one no. of each document (Hard copy & Soft copy, as specified)	Vendor to offer			
15.1	Operating manuals of Machine & CNC system	Vendor to offer			
15.2	Programming Manuals of Machine & CNC system	Vendor to offer			
15.3	Detailed Maintenance manual of machine and supplied systems**.**	Vendor to offer			
15.4	Maintenance Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for table, feed drives and auxiliary drive .	Vendor to offer			
15.5	Drawings for all supplied clamping jaws and its lead screws, coolant connections adapters, tool holders, boring bars, cassettes, adapters, sleeves, fixtures etc**.**	Vendor to offer			
15.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable .	Vendor to offer			
15.7	Detailed specification of all rubber items and hydraulic/lube fittings.	Vendor to offer			
15.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor, Video Camera System etc.	Vendor to offer			
15.9	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			
15.10	PLC program, NC data & PLC data on CD.	Vendor to offer			
15.11	Complete back-up of PCU-50 hard disk on GHOST CD and clear written Instructions to take back-up and reloading of a new hard disk.	Vendor to offer			
15.12	Complete list of parts/items(Bill of materials) used in the machine in English language.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
15.13	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer			
15.14	Drawings of machine assemblies/sub-assemblies/parts including 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			
15.15	Additional set of all the above documentation on CD ROM, wherever possible including complete backup (on CD) of all cycles/subroutines (provided by both vendor and supplier of CNC System) and any other special programs pertaining to different applications/machining processes/accessories etc. and CNC programs for proveout machining.	Vendor to offer			
16.0	**PROVEOUT MACHINING OF BHEL COMPONENTS**	Vendor to offer			
16.1	Drawings of proveout component are enclosed. Job Setting & Machining Process Plan & Requirement of Tools etc. for machining of proveout component shall be finally mutually agreed with vendor after the order, in case of order, without any financial implications. Final proveout component drawing no. may change, however, the machining features shall be in line with the original component drawing. Complete machining of prove out component shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools & CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout component 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 three months of placement of order, in case of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.	Vendor to accept & offer			
16.1.1	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.. Against the cost of such deviation / rejection, if any, vendor shall be responsible as per respective commercial condition specified in tender documents.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
16.1.2	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.	Vendor to accept & confirm			
16.2 (For Machine-1)	**PROVE-OUT MACHINING OF TWO COMPONENTS - IP OUTER CASING and THREADED RING: as per Sl.No. 16.1**	Vendor to accept & offer			
16.2.1 (For Machine-1)	The proveout components shall be one IP Outer Casing & one Threaded Ring as per following drawing nos. or similar. a) The drawings of I.P. Outer Casing - Drg.No. 0-10501-56000 (4 sheets), Casting Drg No 0-10601-56901 (3 Sheets) are enclosed. b) The drawing of Threaded Ring - Drg.No. 1-10501-56001 (1 sheet) is enclosed., Forging Drg No 3-10501-56999 (1 Sheet) is enclosed. Above drawings should be treated as BHEL property. Strict confidentiality is to be maintained and under no circumstances these drawings or copy of these must be transferred to third party without permission of BHEL. These drawings must not be used directly or indirectly in any way detrimental to the interest of the BHEL.	Vendor to accept & offer			
16.2.2.1 (For Machine-1)	**Material of I.P. Outer Casing : Nodular Cast Iron** of Grad **EN-GJS-400-18U-RT** (GGG-40.3) according to EN 1563 (Material no: 0.7043) **Mechanical Properties** : 0.2% Proof Stress : ≥ 220-250 N/mm2 , Tensile Strength : ≥ 350-390 N/mm2 , Elongation (lo =5d0) : ≥ 10-15%	Vendor to accept			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
16.2.2.2 (For Machine-1)	**Machining of I.P. Outer Casing :** Prove out machining shall include all types of turning, grooving & boring operations as per different drawings of I.P. Outer Casing (at Sl.no. 16.2.1 a) ensuring required relative accuracies (concentricity, runouts etc) between detail C1 & C2 of drawing, including requirement specified at Sl No.20.1.2. All operations in proveout machining shall be performed using CNC Programs supplied by vendor. The CNC Programs should preferably consist of generalised parametric subroutines for repetitive type of operations like different operations of T-grooves etc. so that these subroutines could be adopted for other similar casing by using different parameter's values and calling same subroutines in other main-program. Two casting halves, having control milling points, in boxed up condition shall be clamped on machine table with detail "C2" side on machine's table in first set-up. It should be possible to check runout & concentricity of both sides i.e. detail "C1" side at top & detail "C2" side at bottom for perfect vertical alignment. After machining of detail "C1" in first setup, the casing shall be overturned for second setup. In second setup, finished detail"C1" side shall be on table. It should be possible to check runout & concentricity of both sides i.e. detail "C2" side at top & finished detail "C1" side at bottom for perfect vertical alignment again. This is required to achive relative accuracy requirements between detail "C1" and detail "C2". Detail "C2" side shall be finished in second setup.	Vendor to accept & offer			
16.2.3.1 (For Machine-1)	**Material of Threaded Ring :** Alloy Steel Forging for High Temperature Service (Grade: X22CrMoV12-1; material no 1.4923) in Hardened & Tempered condition according to EN10269 table B.1. **Chemical Composition** (in weight %) : C (0.18-0.24), Si (≤ 0.50), Mn (0.4-0.9), P (≤ 0.025), S (≤ 0.015), Cr (11.0-12.5), Mo (0.8-1.2), V (0.25-0.35), Ni (0.3-0.8) **Mechanical Properties:** 0.2%PS ≥ 600 N/mm2, UTS:800-950 N/mm2, El : L>=14%, T:≥40, %Ra : L>=14%, T:≥40, Impact ; L>=27J, T:≥15J . **Hardness** HB: 245-290	Vendor to accept			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
16.2.3.2 (For Machine-1)	**Machining of Threaded Ring** : Prove out machining shall include all types of turning, grooving & boring operations (***including Buttress Threading of pitch 50mm***) as per drawing of Threaded Ring (at Sl.no. 16.2.1 b) in two setups. All operations in proveout machining shall be performed using CNC Programs supplied by vendor. The CNC Programs should preferably consist of generalised parametric subroutines so that these subroutines could be adopted for other similar components by using different parameter's values and calling same subroutines in other main-program. The machining of Buttress Thread should not be carried out using form tool. Accuracy & surface finish of the buttress threads are critical.	Vendor to accept & offer			
16.3 (For Machine-2)	**PROVE-OUT MACHINING OF TWO COMPONENTS - IP INNER CASING and THREADED RING-TEST PIECE : as per Sl.No. 16.1**	Vendor to accept & offer			
16.3.1 (For Machine-2)	The proveout components shall be one IP inner Casing & one Threaded Ring-Test Piece as per following drawing nos. or similar. **c)** The drawings of I.P. Inner Casing, as listed below - are enclosed. i) IPIC Drg.No. 0-10602-56000 (3 Sheets) ii) Grove Plan Drg No -10204-56052 (2 Sheets) are enclosed iii) T-Grooves Drg No 4-10107-41012, 41013,41014, 4-10204-56011 (Total 4 sheets) are enclosed, Casting Drg No 0-10602-56901 (3 Sheets) are enclosed **d)** Threaded Ring-Test Piece - Ring shaped test piece of outer dia approx. 1500mm, inner dia approx. 1200mm and thickness 200-300mm approx. Above drawings should be treated as BHEL property. Strict confidentiality is to be maintained and under no circumstances these drawings or copy of these must be transferred to third party without permission of BHEL. These drawings must not be used directly or indirectly in any way detrimental to the interest of the BHEL.	Vendor to accept & offer			
16.3.2.1 (For Machine-2)	Material of **I.P. Inner Casing** : Steel Casting with Identification **Gx12CrMoVNbN 9-1** **Chemical Composition** (in weight %) : C (0.11-0.14), Si (0.2-0.5), Mn (0.4-0.8), P (≤ 0.02), S (≤ 0.01), Cr (8.0-9.5), Mo (0.9-1.05), V (0.18-0.25), Ni (≤ 0.4), Al (≤ 0.02), N (0,04-0.06) **Mechanical Properties**: 0.2%PS ≥ 500 N/mm2, UTS : 630-750 N/mm2, El (l=5d): :≥16%, Ra : ≥ 40 %, Impact : ≥35J . Hardening temp shall be between 1040 & 1070 deg C & tempering temp between 730 & 750 deg C.	Vendor to accept			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
16.3.2.2 (For Machine-2)	**Machining of I.P. Inner Casing :** Prove out machining shall include all types of turning, grooving & boring operations as per different drawings of I.P. Inner Casing (at Sl.no. 16.3.1 c) ensuring required accuracies including requirement specified at Sl No.20.1.2. All operations in proveout machining shall be performed using CNC Programs supplied by vendor. The CNC Programs should preferably consist of generalised parametric subroutines for repetitive type of operations like different operations of T-grooves etc. so that these subroutines could be adopted for other similar casing by using different parameter's values and calling same subroutines in other main-program. Two casting halves, having control milling points, in boxed up condition shall be clamped on machine table with TS side on machine's table in first set-up. After rough machining of all details of TS side (All diameters & faces with 2mm allowance and only straight grooving of all T-grooves with 2mm allowance on width and depth). The casing shall be overturned for second setup. In second setup, similar roughing operations shall be carried out for GS side details. After rough machining as above, the casing shall be removed from the machine and shall be taken for certain other milling/drilling operations on other machines, to be carried out by BHEL. Thereafter, the casing shall be put back on the machine's table in two setups,	Vendor to accept & offer			
16.3.3.1 (For Machine-2)	**Material of Threaded Ring-Test Piece :** Similar to as of Threaded Ring at Sl.No. 16.2.3.1 (For Machine-1)	Vendor to accept			
16.3.3.2 (For Machine-2)	**Machining of Threaded Ring-Test Piece** : Prove out machining shall include all types of turning operations on inner dia, outer dia & faces considering 5mm machining allowance on each surface. ***Buttress Threading of pitch 50mm, of same design as shown in*** drawing of Threaded Ring (at Sl.no. 16.2.1 b, For Machine-1) shall be machined on its bore instead of outer dia. All operations in proveout machining shall be performed using CNC Programs supplied by vendor. The CNC Programs should preferably consist of generalised parametric subroutines so that these subroutines could be adopted for other similar components by using different parameter's values and calling same subroutines in other main-program. The machining of Buttress Thread should not be carried out using form tool. Accuracy & surface finish of the buttress threads are critical.	Vendor to accept & offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
17.0	**TRAINING**				
17.1	Four BHEL Persons should be trained at vendor's works for a mutually agreed period in the following areas: (a) CNC Programming for the machine & supplied accessories. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments. (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments. (d) Operation of the machine & other supplied equipments. Pre-dispatch inspection (ref. Sl.No. 22.1) 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			
17.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	For vendor's information.			
17.3	Competent, English speaking experts shall be arranged by the vendor for satisfactory & effective training of BHEL personnel.	Vendor to accept & confirm			
17.4	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			
17.5	Vendor to quote for training on per man per day basis.	Vendor to offer			
18.0	**FOUNDATION**				
18.1	Vendor shall submit the preliminary layout drawings for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier. Complete Foundation Design including details viz. static / dynamic load details etc. and final layout drawings shall be submitted by the supplier within three months or mutually agreed period after getting BHEL's approval for Preliminary layout Drgs.. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & all other accessories/ attachments/ offered items. BHEL shall construct complete foundation for the machine under supervision of supplier and at vendor's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications/requirement of earthing material, grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to accept & offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
18.2	Tentatative Soil condition data at BHEL, Hardwar is as detailed below: Based on the Block Resonance Test, the Dynamic Soil Parameters may be taken as below: (i) Cu = 4.937 kg/cubic cm (for block size of 1.5m x 1m x 1m) Cu = 1.667 kg/cubic cm (for foundation size of 10square M or more, (ii) CΦ = 9.70 kg/cubic cm (iii) CΨ = 4.20 kg/cubic cm Bearing Capacity: Depth : 5 M From Shear consideration : 39 Tons/SquareM From Settlement consideration : 9-10 Tons/SquareM Recommended Bearing Capacity : 9 Tons/SquareM	For vendor's information.			
18.3	In case of any constraint due to height of overhead crane (height of crane's lowest beam, max height of crane hook from shop floor) the complete foundation of the machine shall be built below shop floor level as per requirement to avoid obstruction of ram at its highest position, with moving crane.	For vendor's information.			
19.0	**ERECTION & COMMISSIONING**				
	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control system & 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 overhead crane and unskilled helping personnel shall be provided by BHEL. Details of these requirements should be informed by vendor in advance. The available overhead crane capacity at the proposed location of the machine will be **100Tons.** The vendor will ensure to make requisite arrangement for lifting of heavier consignment/ items/ assembly of the machine not getting covered by this capacity. In case, any other crane due to higher capacity or any other constraint is required for erection of the machine the same (like mobile crane etc) shall be arranged by vendor.	Vendor to accept & offer			
19.1	Erection & Commissioning of Voltage stabilizer, Isolation Transformer , Air Compressor and other accessories/attachments with all electrical & mechanical connections shall also be responsibility of the vendor.	Vendor to offer			
19.2	Successful proving of BHEL components (Sl.No.16.0) by the supplier shall be considered as part of commissioning for the machine. All tests, as mentioned at Sl.No. 22.0 (Machine Acceptance) and testing/demonstration of tele-diagnostic service etc. shall also be part of the commissioning activity.	Vendor to offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
19.3	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be brought by the vendor. 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 accept			
19.4	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to accept			
19.5	All Cover Plates, sheets/plates for chutes for chips flow etc. required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor to accept			
19.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
19.7	Terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to submit			
19.8	Portion, if any, of the machine, accessories/attachments and other supplied items where paint got rubbed or peeled off during transit or erection should be repainted and matched with the original adjoining paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours/shades of paints used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer			
20.0	**ACCURACIES**				
20.1	**GEOMETRICAL ACCURACIES**				
20.1.1	Geometrical Accuracy Tests shall be in accordance with relevant & prevailing international standards viz. DIN 8609 / ISO 3655 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 offer			
20.1.2	The machine shall be suitable to achieve Facial and Radial runouts, within 15 microns, in the proveout component. Same shall be demonstrated by vendor on test piece during PDI (at vendor's works) and also during proveout machining (on proveout component at Sl No "16.2.1 a" and "16.3.1 c" at BHEL's works).	Vendor to confirm			
20.1.3	All other accuracies to conform to specified standard (Latest Revision) or Suppliers Test chart whichever is finer and more accurate.	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
20.1.4	All the Geometrical accuracies including test pieces machining etc. should be demonstrated to BHEL engineers during pre-acceptance at vendor's works and again during Erection & Commissioning at BHEL's Works. Test pieces & cutting tools are to be supplied by vendor for test pieces machining both at vendor's works & also at BHEL's works. Drawings of test pieces to be submitted with the offer.	Vendor to offer, confirm & submit			
20.2	**POSITIONING & REPEATABILITY ACCURACIES complying tender specifications including following:** (Should be measured as per VDI/DGQ 3441/ ISO 230-2 - Latest Revision) CHECKING BY USING LASER INTERFEROMETER.	Vendor to confirm			
20.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
20.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
20.2.3	Repeatability in X axis (Ps)	0.008mm			
20.2.4	Repeatability in Z axis (Ps)	0.008mm			
20.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform			
20.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform			
20.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform			
20.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform			
20.2.9	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
20.2.10	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at vendor's works and again during Erection & Commissioning at BHEL's Works.	Vendor to offer			
21.0	**OPERATING CONDITIONS & THERMAL STABILITY**				
21.1	Total machine including all supplied items should work trouble free and should give specified accuracies under existing power supply and ambient operating conditions, as mentioned below at Sl. Nos. 21.2 & 21.3.	Vendor to accept & confirm			
21.2	**Power Supply (AC):** Voltage = 415V +10% / -10% of fluctuations , Frequency= 50Hz +3% / -3% , No. of phases = 3 Phase (3 wire system with out neutral).	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
21.3	**Ambient Operating Conditions:** Temperature = 5 to 45 degree Celsius Relative Humidity = 95% max. 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 accept & confirm			
21.4	**Thermal Stability:** Thermal Stability of the complete machine and all supplied items keeping in view the specified Ambient Conditions at Sl.No. 21.3, specified accuracies, machining requirements of BHEL component and trouble free operation of the machine to be ensured by vendor. Since the machine shall be installed in shop with operating conditions as per Sl.No. 21.3, the vendor shall ensure to have provisions in the machine for achieving the drawing accuracies on the job under these conditions. Accordingly, Vendor to ensure that machine is suitable for above and provisions on the machine for the suitability should be included by Vendor.	Vendor to offer & confirm			
21.5	The machine, including attachments and accessories, should be suitable for continuous operation to its full capacity for 24 hours a day and 7 days a week throughout year. Vendor to ensure and confirm the same.	Vendor to offer & confirm			
22.0	**MACHINE ACCEPTANCE** **(Tests/Activities to be performed & demonstrated by Vendor)**	Vendor to accept & confirm			
22.1	**Tests/Activities to be carried out at vendor's works on the machine before dispatch :** All these activities (As per Sl.Nos. 22.1.1 to 22.1.5) shall be part of pre-dispatch inspection of the machine which shall be carried out by by vendor in presence of BHEL's team during their stay at vendor's works for the training (Ref. Sl.No. 17.1). Report of the same shall be submitted to BHEL by vendor.	Vendor to accept & confirm			
22.1.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values at Sl.No. 20.1	Vendor to accept & confirm			
22.1.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values at Sl.No. 20.2	Vendor to accept & confirm			
22.1.3	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 & confirm			
22.1.4	Demonstration of all features of the machine, control system & accessories.	Vendor to accept & confirm			
22.1.5	Machining of standard test pieces as per AFNOR/ISO/NAS & VDI 2851-2 for turning operations etc. for machining accuracy tests. Vendor to supply test pieces.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
22.2	**Tests/Activities to be carried out at BHEL works while commissioning the machine : as per Sl.Nos. 22.2.1 to 22.2.10**	Vendor to accept & confirm			
22.2.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values at Sl.No. 20.1	Vendor to accept & confirm			
22.2.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values at Sl.No. 20.2	Vendor to accept & confirm			
22.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept & confirm			
22.2.4	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 & confirm			
22.2.5	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 & confirm			
22.2.6	Demonstration by actual use of all supplied accessories to their full capacity for required applications.	Vendor to accept & confirm			
22.2.7	Machining of standard test pieces as per AFNOR/ISO/NAS & VDI 2851-2 for turning operations for machining accuracy tests. Vendor to supply test pieces & required tools (on returnable basis) for their machining alongwith machine.	Vendor to accept & confirm			
22.2.8	Successful machining of proveout components to required drawing accuracies as per Sl. No. 16.0.	Vendor to accept & confirm			
22.2.9	Two weeks of supervision by Vendor of independent operation of machine by BHEL after job proveout.	Vendor to accept & confirm			
22.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works. This training is in addition of the training specified at Sl.No. 17.0	Vendor to accept & confirm			
23.0	**PACKING**				
	PACKING : *Sea worthy* (For shipment by Sea) / ***Road 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. Indigenous supply items like Voltage Stabiliser, Isolation Transformer, Air Compressor etc. should be fully packed in proper rigid boxes for safe transportation and avoiding pilferages.	As offered & agreed			
24.0	**GUARANTEE**				
	Guarantee for complete machine and all supplied accessories/equipments for 24 months from the date of acceptance of the machine.	Vendor to offer			
25.0	**GENERAL**				
25.1	Machine Model No.	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
25.2	Total connected load (KVA)	Vendor to inform			
25.3	Total Space required (Length, Width, Height) for complete machine, accessories/attachments and other supplied items like Voltage Stabilizer, Isolation Transformer & Air compressor etc.	Vendor to inform			
25.4	**Painting of Machine / Electrical Panels** : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to offer			
25.5	Total weight of the machine	Vendor to inform			
25.6	Weight of heaviest part of machine	Vendor to inform			
25.7	Weight of the heaviest assembly/sub assembly of the Machine	Vendor to inform			
25.8	Dimensions of largest part/assembly of the machine	Vendor to inform			
25.9	Vendor to submit, alongwith offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, CNC System, Table Dia, Max. Turning Dia, Max. Turning Height, RPM, Load Carrying Capacity, Main Drive Rating and detail of accessories/attachments, if any, etc.	Vendor to submit			
25.10	Detailed catalogues, sketches/drawings/photographs pertaining to the offered machines and accessories/attachments/items should be submitted with the offer.	Vendor to submit			
25.11	Hydraulic, Pneumatic & Oil piping should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be supplied by the vendor.	Vendor to confirm			
25.12	All Cables and Hoses etc. should be well supported & protected in trays/brackets/drag chains etc.	Vendor to confirm			
25.13	Ladder and Maintenance platform is to be provided to access the machine elements located at the top of the columns.	Vendor to offer & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
26.0	**QUALIFYING CONDITIONS**				
26(A)	Only those vendors (OEMs - Original Equipment Manufacturers) should quote, who have supplied and commissioned at least one Double Column CNC Vertical Boring Machine having Table Diameter 6M, Job Weight Capacity 170Tons & Maximum Turning Height 6M or higher sizes to their customer either in home country or other country in past ten years (on the date of opening of Tender). This machine should have following technical features (a, b, c & d) and should be presently working satisfactorily for more than one year (on the date of opening of Tender) after its commissioning. The machine should be in use for machining of accurate components like Proveout Component (IP Outer Casing). a) Hydrostatic Guideways on both X & Z axes. b) Hydrostatic Bearing in Table. c) Crossrail mounted Disc Type magazine for Tool Holders. d) Full CNC Programmable Continuous Axis for Crossrail's Vertical Movement	Vendor to provide reference and confirm			
26(B)	In case, the machine referred at “26(A)” above, is not equipped with full CNC Programmable Continuous Axis for Crossrail's Vertical Movement (“d” of “26(A)” above), the vendor (OEM) is required to provide reference of at least one CNC machine, in addition to above referred machine at “26(A)” (having features of a, b & c of “26(A)”), supplied and commissioned by them and having full CNC Programmable Continuous Axis for Crossrail's Vertical Movement between its two columns having clearance of at least 6M in-between. This machine also should have been supplied by vendor to their customer either in home country or other country in the past ten years (on the date of opening of Tender) and should be presently working satisfactorily for more than one year (on the date of opening of Tender) after its commissioning.	Vendor to provide reference and confirm			
26(C)	The following information should be submitted by the vendor about the company/companies where the machine(s) referred at “26(A)” and also at “26(B)” (if applicable) have been supplied.	Vendor to inform/submit			
26 (C).1	Name of the customer / company where similar machine is installed.	Vendor to inform			
26 (C).2	Complete postal address of the customer.	Vendor to inform			
26 (C).3	Month & Year of commissioning.	Vendor to inform			
26 (C).4	Parameters of machine(s) supplied (Table diameter, Max. Turning Height, Table Load Carrying Capacity, Confirmation for a, b, c & d mentioned above at “26(A)”) and application for which the machine is supplied.	Vendor to inform			
26 (C).5	Name and designation of the contact person of the customer.	Vendor to inform			
26 (C).6	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
26 (C).7	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, if required.	Vendor to submit			
26 (D)	In case, any of above referred machine(s) at "26(A)" and "26(B)" (if applicable), have been supplied to their customer(s) in their home country, the vendor (OEM), in addition to information provided at "26(C)", is also required to provide additional reference(s) of the machines specified at "26(A)" and "26(B)" (if applicable) supplied and commissioned by them to their customer in a country other than their home country. These machines also should be presently working satisfactorily (on the date of opening of Tender) after commissioning. Vendor is required to confirm same and submit copy of commissioning certificate(s) with following information.	Vendor to provide reference and confirm			
26 (D).1	Name of the customer / company where similar machine is installed.	Vendor to inform			
26 (D).2	Complete postal address of the customer.	Vendor to inform			
26 (D).3	Month & Year of commissioning.	Vendor to inform			
26 (D).4	Parameters of machine(s) supplied (Table diameter, Max. Turning Height, Table Load Carrying Capacity, Confirmation for a, b, c & d mentioned above at "26(A)") and application for which the machine is supplied.	Vendor to inform			
26 (D).5	Name and designation of the contact person of the customer.	Vendor to inform			
26 (D).6	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform			
26 (D).7	Commissioning Certificate of the referred machine from the customer.	Vendor to submit			
	Note: The clause "26(D)" will not be applicable in case the machines referred at "26(A)" & "26(B)" above, with information specified at "26(C)" above, have been supplied to a customer in a country other than their home country				
26 (E)	BHEL reserves the right to verify the information provided by vendor which may include visit of BHEL's team to referred customer's works for verification of performance of the machine(s) including machining accuracies, being achieved. It shall be responsibility of vendor to facilitate visit of BHEL's team at their referred customer works. In case, the visit, if so desired by BHEL, could not be organised by vendor or the information provided by vendor is found to be false/incorrect or accuracies being achieved are found inferior than what required in proveout component by BHEL's team, in case of their visit, the offer shall not be considered as qualified.	Vendor to accept & confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
27.0	**NETWORKING**				
27.1	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			
27.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to offer			
27.3	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 offer			
27.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to offer			
28.0	**MACHINE MONITORING SYSTEM (MMS) SIGNALS**				
28.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.	Vendor to offer			
28.2	Control ON	Vendor to offer			
28.3	Cycle ON	Vendor to offer			
28.4	Spindle Running	Vendor to offer			
28.5	Feed Active (Any of the axes moving)	Vendor to offer			
28.6	M30 (Program Stop)	Vendor to offer			
29.0	**OPTIONAL ITEMS**				
29.1	Complete solution with complete tooling/attachement package for machining of Detail C1 & C2 in IP Outer Casing in a single setup. Vendor to submit complete details.	Vendor to submit & offer			
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