

**BHARAT HEAVY ELECTRICAL LIMITED****Boiler Auxillaries Plant, Indira Gandhi Industrial Complex, Ranipet, TN- 632406 , INDIA**Enquiry No. : 2700032EDue Date : 25-05-2020

Supplier _____

Qtn. No.: _____

CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE) DEPTT.)

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Date : _____

SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR CNC 3 AXIS CO-ORDINATE MEASURING MACHINE**NOTE:-**

1. Vendor (OEM) must submit complete information against clause no. **31.0** The offer meeting this clause would only be processed"
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along
3. 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 :					
SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	Scope				
	The Scope covers supply, erection & commissioning, Calibration and Training of a computer numerically controlled (CNC), Bridge or Gantry type 3 Axis Co-ordinate Measuring Machine (CMM) with continuous scanning features. CMM should be equipped to use both fixed and indexing probe head with the single controller. CMM shall be capable of checking high precision aerospace components.	Vendor to note			
2.0	Measuring Range (Minimum) in mm				
	X-axis : 5000	Vendor to confirm & specify			
	Y-axis : 5000	Vendor to confirm & specify			
	Z-axis : 3000	Vendor to confirm & specify			
3.0	Allowable Job Weight	Vendor to specify			

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4.0	Flooring: Suitable flooring compatible for carrying out measurements without any interference shall be provided. If at all any type of coating is required on flooring, vendor has to specify. Special flooring if required, cost will be loaded on the vendor	Vendor to confirm & specify			
5.0	Resolution: 0.1 Micron or better	Vendor to confirm & specify			
6.0	Measuring uncertainty for the Temperature range of 20±2°C and relative humidity 40-60%. (Machine will be kept in AC room)	Vendor to note			
6.1	Length Measuring error (For fixed probe head) as per ISO 10360-2: MPE_E = {8.0+ L/300} µm or better (L in mm) (and refer to 11.4 for indexing probe head)	Vendor to confirm			
6.2	Single stylus form probing error as per ISO 10360-5: MPE_PFTU = 8.0 µm or better	Vendor to confirm			
6.3	Scanning Probing error with time as per ISO 10360-4: MPE_THP = 8.0 µm in 68 seconds or less	Vendor to confirm			
6.4	Form Measuring error (Roundness) as per ISO 12181 (VDI/VDE 2617): RONt (MZCI) = 7.5 µm or better	Vendor to confirm			
6.5	Repeatability of R0 as per ISO 10360-2: 8.0 µm or better	Vendor to confirm			
6.6	Multi Stylus probing errors as per ISO 10360-5: ML (Location), MS (Size) and MF (Form) must be specified by Vendor and to be certified after installation; typical specs: Multi stylus Form (PFTM): 8.5 µm, Multi stylus size (PSTM): 8 µm , Multi stylus location (PLTM): 8 µm	Vendor to specify			
6.7	Note: I. Length of the probe to measure the above measuring uncertainties to be specified. II. Specify in details how the accuracies will be checked. III. The gauges used for proving accuracy shall be traceable to National /International standards. IV. MPE_E shall be proven at the maximum speed.	Vendor to note & specify			
7.0	Machine Capabilities:				
7.1	The 3 Axis co-ordinate measuring machine shall be capable of complete automatic inspection of precision components. It shall be able to perform inspection of all parameters of a component from start to finish without the Operator's intervention in between.	Vendor to confirm			
7.2	The system shall be capable of measurement in point to point as well in continuous scanning mode.	Vendor to confirm			
7.3	The machine shall be capable of measuring and processing of all geometric parameters including nominal / actual comparison and evaluation of all form and position errors like flatness, straightness, roundness, Cylindricity, parallelism etc., in accordance with ISO-1101 simultaneously after the same measuring run.	Vendor to confirm			

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7.4	For each individual job, the machine shall produce a printout detailing all the actual dimensions as inspected. Dimensions deviating from the laid out tolerances are to be indicated specifically, with the magnitude of deviations, including tolerance band utilization.	Vendor to confirm			
7.5	Machine to have capability to take up laser based non - contact sensor with ease of changing over from contact probing to non-contact probing and vice versa by operator.	Vendor to confirm			
8.0	Main Features:				
8.1	The machine shall be capable for carrying out high precision measurements of 3 dimensional co-ordinates in a single set up from all sides and at an angle in flat/box/spherical type components.	Vendor to confirm			
8.2	It should be possible to carry out the inspection without physical alignment of the work piece.	Vendor to confirm			
8.3	The machine should have rigid travelling bridge/gantry and movable table type of construction.	Vendor to confirm			
8.4	X/Y guideways should be covered with bellows to protect the surface and scales from contamination.	Vendor to confirm			
8.5	The machine should have precision maintenance free mechanical or air bearings in all axes. Machine should have automatic/semiautomatic lubricating system if necessary.	Vendor to confirm			
8.6	Motorized movement in all axes by joystick and CNC programmed measuring traverse for automatic measurements.	Vendor to confirm			
8.7	Drive system movements should be motorized, all the moving parts should slide on wear - proof guide to achieve minimum stick - slip ratio and long accuracy life.	Vendor to confirm			
8.7.1	It should be possible to vary the speed of movement of the axes from 0 to 60 mm per second or higher speed in manual mode with joystick.	Vendor to confirm & specify			
8.7.2	Travel speed should be up to 200 mm /sec in axial mode and up to 320 mm/sec in vectorial mode.	Vendor to confirm & specify			
8.7.3	Should also be able to select speeds from computer.	Vendor to confirm			
8.8	Portable operating panel with joystick and function keys with full control should be provided for motorized / manual movement in all axes.	Vendor to confirm			
8.9	All major components such as probe head, controller & software must be made by the same Original equipment manufacturer (OEM)	Vendor to confirm			
8.10	Measuring system: Glass/ ceramic/ Gold plated stainless steel scale with resolution of 0.1 μ m or better.	Vendor to confirm & specify			
8.11	Machine should have dual scales along the longest axis and single scale along the other axes for monitoring / correcting the axial error.	Vendor to confirm			
8.12	Should have minimum two integrated temperature sensors for measurement of Work piece temperature. Software should have temperature correction program.	Vendor to confirm			
8.13	Operator must be in a position to change between the fixed scanning sensor and the indexing sensors without the help of maintenance engineer.	Vendor to confirm			
8.14	Machine should have computer aided accuracy correction for all possible dynamics.	Vendor to confirm			

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9.0	Foundation: a) If at all foundation is required for the machine, the vendor has to indicate type and details in offer. b) Vendor to offer suitable damping system for isolating the machine from external vibrations. c) The Vendor should indicate in offer the details of civil works for foundation and successful vendor has to provide all the drawings to BHEL Ranipet to carry out the foundation work. d) The Vendor should provide complete civil drawing for the same within a month of release of PO. The layout should consist of all requirements pertaining to complete machine. e) BHEL will approve the drawing within three weeks time from date of submission/clarification. Tentative Soil bearing capacity of BHEL Ranipet is 50KN/sqm. f) Interface compatibility of civil works shall be inspected & cleared by the Vendor prior to dispatch of the machine. g) BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Supervision by supplier is at supplier's cost.	Vendor to confirm& specify			
10.0	Operating Panel:				
10.1	Operating Panel: PC data system graphic dialog control panel with alphanumeric key board on a movable stand shall be provided with minimum following features .	Vendor to confirm			
10.2	Minimum 14" Colour LCD screen parallel to the computer screen.	Vendor to confirm			
10.3	Alphanumeric Key board with Mouse .	Vendor to confirm			
10.4	Two joysticks for controlling all the three axes	Vendor to confirm			
10.5	Have Additional Knob for speed control.	Vendor to confirm			
10.6	Emergency switch.	Vendor to confirm			
10.7	Operator must be able to call all the important functions from the operating panel.	Vendor to confirm			
11.0	Fixed Continuous Scanning Probe Head. Qty. 1 No.				
11.1	Universal type of probe head with single point & self-centering scanning system (Vendor to specify the latest probe system)	Vendor to confirm & specify			
11.2	Shall be capable of fast continuous / uninterrupted scanning measurement, including scanning on inclined planes and spherical surfaces.	Vendor to confirm			
11.3	Other features				
11.3.1	Minimum Probe head deflection range ± 2 mm or higher for collision Protection.	Vendor to confirm & specify			
11.3.2	Weight carrying capacity of the Probe Head should be 500 grams or more. Should have active weight balance mechanism to balance the probe head according to probe / styli weights.	Vendor to confirm & specify			
11.3.3	Maximum length of Probe extension to be used should be 500 mm or more	Vendor to confirm & specify			
11.3.4	Data acquisition rate shall be 200 points per second or better in continuous scanning mode.	Vendor to confirm & specify			
11.3.4	Scanning speed upto 100 mm / sec or better.	Vendor to confirm & specify			

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11.3.5	Probe bending correction for all the calibrated probe configurations	Vendor to confirm			
11.3.6	Should have provision for self -centering mode	Vendor to confirm			
11.3.7	The Probe body shall be collision protected.	Vendor to confirm			
11.3.8	Smallest probe diameter that can be used on the machine shall be less than or equal to 0.5 mm	Vendor to confirm & specify			
11.3.9	Measuring force continuously variable from 0.1 to 1.0 Newton with direction selection and should be able to change measuring force from computer entry.	Vendor to confirm			
11.4	Indexing Probe Head & non-contact laser sensors having following details to be quoted:				
	A) Indexing Probe Head: a) Each articulating axis features A & B +/- 180 deg setting range, b) Angular increments of 2.5 deg which corresponds to 20736 angular possible positions. c) Indexing probe head should have compatibility for high accuracy Laser scanning Probe head attachments. <u>ACCURACIES WITH the indexing Probe Head:</u> MPE_E = {8.0 + L/200} microns (L in mm) or better at 20±2 deg C Single stylus from Probing error: MPE_PFTU = 8.0 microns or better Scanning probing error: MPE_THP = 8.0 microns in 68 seconds or less Quantity: 1 No. B) Optical Laser Scanner Laser Class: 2M 50 mm Min Measuring range Working distance to be specified by vendor Probing error as per ISO 10360-8; Point spacing 10 micron or better PF(OT) : 20 µm or better Quantity: 1 No.	Vendor to confirm & specify			
12	Manual and Auto probe changing				
12.1	Probe head must have manual and automatic probe change facility enabling the operator to use different probe combinations without recalibration.	Vendor to confirm			
12.2	The probe change repeatability of position shall be less than 1 micron over 200 mm.	Vendor to confirm			
12.3	Software must allow storing minimum 1000 calibration data of probe configurations.	Vendor to confirm & specify			
12.4	Auto Probe change magazine with 5 positions for fixed probe head and 3 positions for indexing probe head shall be provided for automatic probe change of different pre-calibrated and pre-selected probe configurations during CNC run, for fast and uninterrupted measurements.	Vendor to confirm			
12.5	User must be able to change Pre-calibrated probe configurations without recalibration of probe.	Vendor to confirm			

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12.6	Built in protection shall be provided in the system against the damages caused by the collision of the entire probing system with the component under inspection.	Vendor to confirm			
13.0	A large probe kit with various extensions up to length of 500 mm shall be made available for fixed probe head and details of items in the probe kit must be given in the quotation. A probe kit for indexing probe head must also to be quoted and details of items in the probe kit must be given in the quotation. Any probes and extensions which are not part of the probe kit to be quoted extra. Quantity : 1 each. Vendor shall quote prices for the probe kits along with the machine, which will be taken for the price bid evaluation. Any items which are not part of probe kit shall be quoted extra and it will not be taken for price bid evaluation.	Vendor to confirm			
14.0	Machine Safety Provision:				
14.1	Machine should have built-in safety provision for instantaneous automatic stopping without any damage for control system electronics. It should also have built- in safety provision against voltage fluctuations.	Vendor to confirm			
14.2	The machine should save the measured data in the event of power interruption or malfunction / collision.	Vendor to confirm			
14.3	Protection devices are to be incorporated for the entire electrical system, control circuits and power distribution system and software.	Vendor to confirm			
15.0	Air Filter System:				
15.1	Supply and integration of air filter system along with the machine.	Vendor to confirm			
15.2	The complete specification of the air filtering system must be furnished by the Bidder, including Air Drier, Oil filter etc.	Vendor to specify			
15.3	BHEL, BAP Air pressure is 5 to 6 bar. Required FLR (Filter, Lubricator and Regulator) units to be supplied by the vendor.	Vendor to specify& confirm			
16.0	Computer System: Quantity : 1 No.				
16.1	Latest/high end workstation compatible with the equipment and latest software to give the best performance shall be provided along with the machine supply.	Vendor to confirm			
16.2	The supplied computer shall have all the measurement software and diagnostic software preinstalled and tested in factory by OEM before supply.	Vendor to confirm			
16.3	LED 24" monitor shall be provided along with the machine supply.	Vendor to confirm			
16.4	Computer table and accessories shall be provided along with the machine supply.	Vendor to confirm			
17.0	Printer Quantity: 1 No.				
17.1	High speed Laser jet colour printer of HP make of models available in India with network enabled, duplex printing to print in A4 size or bigger depending upon the machine outputs shall be provided along with the machine supply.	Vendor to confirm			
18.0	Measurement and Application Software Features:				

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18.1	The machine must be capable of complete automatic inspection and measuring of precision machined parts within the above specified measuring range.	Vendor to confirm			
18.2	The machine must be able to perform inspection of all parameters on 5 faces of component from start to finish without the operator's intervention in between CNC mode of operation. However, the operator shall be able to interrupt the inspection process and to proceed the inspection in manual mode.	Vendor to confirm			
18.3	Machine must be able to carry out the inspection without physical alignment of the work piece.	Vendor to confirm			
18.4	All necessary provisions to be provided for "OFF LINE" programming like separate identical computer from local sources with same measurement software, licenses if required, etc. shall be provided.	Vendor to confirm			
18.5	Windows based system to control the operation of the machine as well as DATA backup for analysis must be provided.	Vendor to confirm			
18.6	Data retrieval facility to be provided in case of collision/ crash. Periodic Auto saving facility shall be incorporated without operator's intervention in order to not to lose the programmed measured data.	Vendor to confirm			
18.7	Real time computer interface must be provided.	Vendor to confirm			
18.8	User friendly controls with menu driven system.	Vendor to confirm			
18.9	Actual measurements shall be available on the screen.	Vendor to confirm			
18.10	Direct joystick measurement.	Vendor to confirm			
18.11	Self-teach programming.	Vendor to confirm			
18.12	3D CNC programming.	Vendor to confirm			
18.13	Offline programming without CAD model.	Vendor to confirm			
18.14	Offline programming with CAD model including probe path simulation and verification.	Vendor to confirm			
18.15	Single page icon-based software.	Vendor to confirm			
18.16	3D Solid model part representation	Vendor to confirm			
18.17	The measurement software should have the advanced CAD capability of importing, designing, and reversing features as a whole, in addition to the following features. Detailed catalogue/ demo CD consisting of common features and advanced features also to be given by the Bidder.	Vendor to confirm			
18.18	Basic geometric shape features	Vendor to confirm			
18.19	Direct measurements of standard geometric elements such as point, line, plane, circle, cylinder, cone, ellipse, arc of circle etc.,	Vendor to confirm			
18.20	Projection planes and direction cosines (i,j,k) for standard geometric elements to be displayed simultaneously.	Vendor to confirm			
18.21	Maximum, Minimum, Standard deviations and number of points measured for geometric elements should be given with the output of the measured element for all the geometric shapes.	Vendor to confirm			

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18.22	Computation of geometrical tolerances like Angularity, Axial run-out, co-axiality, concentricity, conicity, cylindricity, flatness, parallelism, position tolerance (input may be Cartesian / polar). Radial run-out, roundness, sphericity, squareness, straightness, symmetry.	Vendor to confirm			
18.23	Computation of geometric relations between geometric elements like distance, projections, mid-elements, bisector normal piece, intersections, angles, tangents etc.	Vendor to confirm			
18.24	Database of measured points for geometrical features. If required, some points may be deleted and should be possible to recalculate the feature without re-measuring the geometric feature.	Vendor to confirm			
18.25	Capable to measure point coordinates of objects at particular cross section.	Vendor to confirm			
18.26	Conversion of coordinates systems (Cartesian to polar and vice-versa). User should be able to see geometric feature in the polar/ Cartesian coordinates.	Vendor to confirm			
18.27	Geometric construction features	Vendor to confirm			
18.28	Standard geometric features to be created with standard input data. The created geometric features to be used for measurement analysis.	Vendor to confirm			
18.29	Intersection capability between all possible geometrical elements such as (a) Line to Line, (b) Line to Circle, (c) Circle to circle (d) Line to Plane (e) Plane to Plane, (f) Sphere to Plane, (g) Sphere to Line, (h) Line to Cone Surface, (i) Line to Cone Axis, (j) Line to Cylinder Surface, (k) Line to Cylinder Axis, (l) Plane to Cone Surface and etc.	Vendor to confirm			
18.30	Option for viewing the intersections of geometrical constructions graphically. If required, intersections to be zoomed. Intersection coordinates (X, Y, Z) to be displayed.	Vendor to confirm			
18.31	Option for viewing the measurement output of geometrical / absolute parameter graphically. If required, graphical representation to be Zoomed and measured value/ label should be displayed.	Vendor to confirm			
18.32	Projection - software should support projection of basic geometric shapes to selected plane.	Vendor to confirm			
18.33	Displacement				
18.33.1	Displacement of a point into a point - the starting point is to be displaced into a target point. By this means, it receives the coordinates of a target point.	Vendor to confirm			
18.33.2	Displacement of a line into a point - the line is to be displaced into a target point (parallel displacement). By this means, its position changes in the space, but direction maintained.	Vendor to confirm			
18.33.3	Displacement of a plane into a point - the plane is to be displaced into a target point (parallel & perpendicular displacement).	Vendor to confirm			
18.33.4	Displacement of a point in any direction of perpendicular vector of a plane by a certain distance in direction.	Vendor to confirm			
18.33.5	Displacement of a point by certain distance in direction of line.	Vendor to confirm			
18.34	Mathematical Alignment/ Transformation Features	Vendor to confirm			
18.35	3-2-1 alignment (feature based), best fit alignment, points to surface fitting.	Vendor to confirm			
18.36	Shifting of origin of the coordinate system to a point/ feature centre/ absolute value.	Vendor to confirm			
18.37	Creation of multiple coordinate systems with different alignment and switching between multiple co-ordinate systems should be possible.	Vendor to confirm			

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18.38	Rotation and Translation of the object/ feature about any axis or plane. The input may be also in the form of matrix.	Vendor to confirm			
18.39	2D curve / 3D surface measurement Features	Vendor to confirm			
18.40	Input of 2D/3D nominal profile through Import/ Export in various format like IGES, DXF,IDEA, CATIA,STEP, ASCII,etc.,	Vendor to confirm			
18.41	During unknown 2D curve measurement, software to be capable of taking coordinate points of unknown curve at fixed coordinate axis. It should be possible to give coordinates of unknown curve at required grid station (after probe/reflector compensation in curve normal vector direction).	Vendor to confirm			
18.42	Transformation of measured profile.	Vendor to confirm			
18.43	Best fitting of measured profiles to nominal profile.	Vendor to confirm			
18.44	2D/3D profile measurement and probe radius compensation through software.	Vendor to confirm			
18.45	Graphical representation of profile results rendering by colour plot with desired grid intervals on screen.	Vendor to confirm			
18.46	Software should be capable of handling scan data of any complex 3D measured surfaces. During unknown 3D surface measurement, coordinate points to be given compensation for probe in actual surface normal vector direction.	Vendor to confirm			
18.47	The Software should be capable of analysing measured features on real time for on screen analysis.	Vendor to confirm			
18.48	The controller and Software should be capable of Variable High speed Scanning i.e Scan Speed Automatically controlled depending on Curve Radius.	Vendor to confirm			
18.49	CAD assisted inspection features.	Vendor to confirm			
18.50	Fully integrated support (export and import) for the following CAD file formats IGES, DXF,IDEA, CATIA,STEP, ASCII,etc.,	Vendor to confirm			
18.51	Should allow user defined features to be created as a separate layer in the CAD model.	Vendor to confirm			
18.52	Automatic feature and vector recognition.	Vendor to confirm			
18.53	Offline comparison between CAD model & Probed points, to report deviations between CAD model and measured points with extensive analysis feature.	Vendor to confirm			
18.54	Create general solid model from measured data or nominal point input.	Vendor to confirm			
18.55	User should be able to set unique names, tolerances, GD&T parameters in the model for any surface, feature or any other critical inspection item.	Vendor to confirm			
18.56	Probe compensation - The software should automatically compensate for the probe offsets during the measurement of geometric elements including curves/ profiles.	Vendor to confirm			
18.57	Measurement software should have graphical interface based on icons and pop up windows and pull down menus.	Vendor to confirm			

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18.58	Element naming - Software should allow the user to give names to measured and constructed elements. If the user does not enter a name for an element, the system should automatically generate a default name based on type of the object. Software should allow rename the element, if required.	Vendor to confirm			
18.59	Software should allow all information pertaining to a measurement session to be saved at any point during the measurement process.	Vendor to confirm			
18.60	Provision for Digital Read Out of coordinates in Cartesian and polar coordinate systems.	Vendor to confirm			
18.61	The user should be allowed to retrieve all the information about the previously saved session.	Vendor to confirm			
18.62	Visual representation of measured results & geometry relationship of features (colour coded) with online graphics output in screen/printers. Also real time output of text results. Graphical appearance of deviations should be in form of arrows, spikes, spheres, colour faces or cones, etc.,	Vendor to confirm			
18.63	Storage of multiple probe and utilisation in measurement process.	Vendor to confirm			
18.64	Option for customizing the report i.e. header, graphic view, labels, pages etc. The machine shall be capable of producing PRINT OUT detailing of all dimensions as inspected for each job. The dimensions deviating from the laid out tolerance shall be indicated specifically with magnitude of deviations.	Vendor to confirm			
18.65	Graphical interface to include workspace to be configured and saved to meet individual needs.	Vendor to confirm			
18.66	Provision for model based inspection plan creation and automated inspection routines.	Vendor to confirm			
18.67	Graphical display of measuring device on screen plus automatically recognise and display features that are being measured.	Vendor to confirm			
18.68	Support for internal/external temperature sensors (temperature compensation).	Vendor to confirm			
18.69	Automatic probe/stylus re-qualification routines.	Vendor to confirm			
18.70	Sufficient computer storage for CNC programs.	Vendor to confirm			
18.71	Reverse Engineering software for generating CAD models.	Vendor to confirm			
18.72	Software to be capable of generating 3D solid CAD models from cloud of points generated by high precision CMM system/ any other measuring system (with minimum data loss).	Vendor to confirm			
18.73	Software should be capable of constructing any type of complex solid 3D surfaces and curves from cloud of points generated by high precision CMM system.	Vendor to confirm			
18.74	Macro script facility	Vendor to specify			
18.75	Shall be compatible with Industry 4.0 smart factory.	Vendor to specify			
18.76	Bidder shall offer latest version of PTB certified Software only.	Vendor to confirm			
18.77	DIAGNOSTIC SYSTEM				
18.77.1	TELE-DIAGNOSTIC SERVICE :				

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18.77.1.1	Tele-diagnostic service should be provided through International telephone lines/ Internet/ 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. Terms and conditions for the service after guarantee period should be informed by vendor.	Vendor to specify			
18.77.2	Diagnostic Software for Fault Identification:				
18.77.2.1	Diagnostic software should be provided to check the various elements of the system. Extensive diagnostic check with required messages should be provided to check the complete system in offline mode.	Vendor to confirm			
18.77.2.2	In the event of failure of the system hardware/ software, user should be in a position to identify the fault through diagnostic software check.	Vendor to confirm			
19.0	Supply Conditions:				
19.1	The CMM must be operational using on-line UPS connected to the Mains. Electrical power supply will be at single phase 230 V $\pm$ 10%, or 3 Phase 440V $\pm$ 10 % , 50Hz $\pm$ 5%. Bidder shall indicate requirement in KVA rating. The machine is to be installed in M/s BHEL Ranipet.	Vendor to confirm			
19.1.1	UPS of 10 minutes for CNC system with inbuilt cooling and charge status display (Battery charging /discharging time should be specified by vendor)	Vendor to specify			
19.2	The required lifting tackles for installation & commissioning such as cranes etc, to be arranged by BHEL. The vendor has to inform the requirements to BHEL in advance.	Vendor to confirm			
19.3	Special tools and equipment required for erection of the machine shall be brought by the vendor. Foundation kit such as bolts, dampers and other necessary items should be supplied by the Vendor.	Vendor to confirm			
19.4	Original Equipment Manufacturer & Country of Origin Certificates are to be attached. Quotation shall be from OEM /OEM-authorized agent only.	Vendor to confirm			
19.5	The vendor has to provide standard tool kit for smooth and interruption free running/operation of the machine.	Vendor to specify& confirm			
19.6	In addition, any other item / critical spares considered essential for smooth and interruption free running/operation of the machine should also be quoted separately. These Not to be evaluated in the price bid	Vendor to specify			
19.7	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			
19.8	Machine Lights				
19.8.1	Machine Lights if anyrequired for sufficient illumination of complete working area should be provided for clear visibility.	Vendor to specify			
19.8.2	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to specify			
19.8.3	The machine lighting shall be low voltage so as to prevent any hazard to the operator.	Vendor to Confirm			

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19.9	Air Conditioners with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets/ CNC Sytem panel considering specified ambient conditions. Detailed specifications of the same are to be submitted.	Vendor to specify			
20.0	Standard Accessories				
20.1	Table: Granite surface table of size 2000x2000mm is required with suitable threaded inserts for clamping of components. Table should have suitable provision for movement, for facilitating inspection of smaller components.	Vendor to specify & confirm			
20.2	Calibration sphere shall be provided for calibration of probe tips. The minimum diameter to be calibrated is 0.50 mm	Vendor to confirm			
20.3	Standard fixture should be provided.	Vendor to confirm			
21.0	Details of after sales service support in India shall be provided. Following points to be covered:	Vendor to confirm			
	(a) Installation Experience.	Vendor to confirm			
	(b) Application training.	Vendor to confirm			
	(c) Part programming capabilities.	Vendor to confirm			
	(d) After Sales Maintenance.	Vendor to confirm			
22.0	Acceptance Criteria:				
22.1	The vendor shall prove the specified accuracies of the CMM as per our technical specification at the manufacturing place (in front of purchaser) and submit the test certificate.	Vendor to confirm			
22.2	Machine accuracies MPE(E), MPE(P) shall be proved and demonstrated as per ISO 10360 (as in Technical specification under measuring accuracy) based on the program and standard cycles at manufacturer's site as well as at BHEL Ranipet site for machine acceptance. All the accuracies shall be guaranteed in the preferred operating temperature of 20 ± 2 deg C with a humidity level of $50 \pm 10\%$.	Vendor to confirm			
22.3	All the axes should be independently calibrated and certified for compliance to accuracies as per ISO 10360-2 & ISO 10360-4.	Vendor to confirm			
22.4	BHEL shall inspect the machine before shipment at the manufacturing facility of vendor. Vendor to organize free training to get fully conversant with machine and software part for visiting team of BHEL training must be in English language only.	Vendor to confirm			
22.5	After the installation and commissioning of the machine, the vendor shall calibrate the machine by accredited agency and prove the specified accuracies of the CMM as per ISO-10360. Vendor must submit the detailed test procedure for acceptance. Mandatory Inspection parameters: i) Compliance to all points mentioned in technical specs of CMM ii) Verification of list of delivered/installed items w.r.t. list of deliverables.	Vendor to confirm			

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22.6	Bidder shall bring all necessary calibration standards, slip gauge blocks, fixtures, and calibration equipment's for proving machine performance with valid traceability certificates at our site.	Vendor to confirm			
23.0	ERECTION & COMMISSIONING				
23.1	ERECTION				
23.1.1	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 shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm			
23.1.2	Machine shall be transported in disassembled condition with Sea worthy packing and erected & commissioned at BHEL-Ranipet. Arrangements of Unloading and storage of same at BHEL work will only be under BHEL scope.However Vendor has to depute their representative during unloading at BHEL work for verifying the quantity and conditions of the items inside the container. BHEL will not pay any damage charge for missing or damaged item during transit.	Vendor to confirm			
23.1.3	Manufacturer shall depute/hire necessary skilled engineer/technicians for erection and commissioning.	Vendor to confirm			
23.1.4	Bidder shall be solely responsible for arrangement of additional material handling equipment/tools/accessories if necessary at their expenses.	Vendor to confirm			
23.1.5	Foundation plan, general arrangement plan showing layout with accessories and indicative drawings shall be enclosed as a part of technical bid.	Vendor to confirm			
23.1.6	Detailed foundation design requirements, final foundation drawings, final layout drawings etc shall be provided by the bidder to BHEL well in advance before machine erection. BHEL will approve the drawing within three weeks time from date of submission/clarification	Vendor to confirm			
23.1.7	The Bidder or their agent would be required to carry out a joint check at the consignee's end along with BHEL, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that the joint receipt inspection be done immediately on the receipt of the machine.	Vendor to confirm			
23.1.8	The Bidder is responsible for any breakage / damage to the machine or its equipment / accessories / controllers etc.during erection / commissioning done. Bidder shall rectify / replace such damage parts free of cost at site with original parts.	Vendor to confirm			
23.1.9	The scope of foundation as per bidder's drawing is under BHEL scope	Vendor to confirm			
23.1.10	Max weight and dimension of individual packings/parts shall be specified.	Vendor to confirm			
23.1.11	Vendor representative at BHEL during Erection should be well verse in communicating in English.Otherwise Vendor should hire translator(to speak in English) for the same at his expense.	Vendor to confirm			

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23.2	<u>COMMISSIONING</u>				
23.2.1	The Vendor shall take full responsibility of installation and commissioning of the machine, Vendor if required may inspect the site at his own cost prior to quoting for the enquiry.	Vendor to confirm			
23.2.2	Special tools and equipment required for erection and commissioning of the machine and necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance for Mechanical, Electrical, Electronics of the machine, Straight edge, parallelism checking equipment, tools & tackles, Instruments and other necessary equipment including Laser equipment and other latest optical instrument if any required to carry out all above activities shall be brought by the bidder on returnable basis.	Vendor to confirm			
23.2.3	All Cover Plates / chequered plates required for the machine and for covering its peripherals including pits, if any, shall be supplied and installed by the bidder.	Vendor to confirm			
23.2.4	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
23.2.5	Damaged surface, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection shall be repainted and merged with the original surrounding paint by the bidder. For this purpose, the bidder shall bring / supply sufficient quantity of touch-up paint of various colours of paint used at Bidder's expense.	Vendor to confirm			
23.2.6	Vendor representative at BHEL during Commissioning should be well verse in communicating in English. Otherwise Vendor should hire translator (to speak in English) for the same at his expense.	Vendor to confirm			
23.2.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm			
23.2.8	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm			
24.0	<u>Operator Training:</u>				
24.1	Training for Application Software, operation, Trouble Shooting, day to day maintenance etc. for minimum 10 (Ten) days along with training material for up to 3 engineers at our site (BHEL Ranipet). Vendor may specify the need for more no. of days for training if required. Training shall be in English language only.	Vendor to confirm& specify			

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25.0	Technical Documentation:				
25.1	Documents: 2 sets of the following in English to be supplied along with machine (in soft and hard copy)				
25.1	(a) Operation manual	Vendor to confirm& specify			
	(b) Service manual				
	(c) Maintenance manual including relevant Circuit Diagrams				
	(d) Calibration Certificate (traceable to National / International standard)				
	(e) Warranty Certificate				
	(f) Spare Parts catalogue				
	(g) List and quotation for minimum essential spare parts required for un-interrupted operation of Machine				
25.2	Bidder should provide required perpetual licences for all the softwares.	Vendor to confirm			
25.3	Software shall be supplied in CD / USB with operating instruction	Vendor to confirm			
26.0	Warranty of the Machine:				
26.1	Warranty of the Machine shall be for a period of one year from the day of Installation and commissioning, prove out and acceptance, for defect- free operation with specified accuracies.	Vendor to confirm			
26.2	Any defect observed during the warranty period shall be repaired/ replaced at free of cost.	Vendor to confirm			
26.3	The repair of any unit during warranty period which disturbs measuring system must follow with calibration.	Vendor to confirm			
26.4	Software updates during the warranty period shall be supplied and installed at free of cost on real time basis at our site.	Vendor to confirm			
26.5	During warranty period Bidder has to carry out quarterly preventive maintenance to ensure the smooth operation of the machine with specified accuracies.	Vendor to confirm			
26.6	In the last quarter of warranty period (before the expiry of warranty period) machine has to be calibrated and necessary correction has to be done to meet the specified accuracy at free of cost and any spares/ consumables/ accessories required to meet specified accuracy/ operation of the machine has to be carried out by the Bidder on free of cost.	Vendor to confirm			
26.7	Customer support facility including availability of spares shall be made available for at least 10 years or more after expiry of the warranty period.	Vendor to confirm			
26.8	Service facilities and personnel availability with Indian office or Indian agent details shall be provided.	Vendor to confirm			
26.9	Time required for service personnel to attend any fault after receipt of the information shall be provided	Vendor to confirm			
26.10	Willingness to enter service contract by the supplier directly or through the Indian agent shall be provided.	Vendor to confirm			

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27.0	Annual Maintenance Contract. (To be quoted separately - Not to be evaluated for the price bid.)				
27.1	Bidder shall include under his quote for Non-comprehensive AMC for a period of 3 (three) years after the warranty period. The scope shall be 4 (four) preventive maintenance visits per year including one Calibration in every year.	Vendor to specify & confirm			
27.2	Bidder shall attend any number of breakdown calls during the contract period.	Vendor to confirm			
27.3	Bidder shall include Break down call visit charges along with the quote for a period of 3 (three) years after the warranty period.	Vendor to confirm			
27.4	Bidder shall bring all necessary calibration standards, slip gauge blocks, fixtures, and calibration equipment's for proving machine performance with valid traceability certificates at our site.	Vendor to confirm			
27.5	Scope of first quarterly visit of every year (1 st year, 2 nd year, 3 rd year after the warranty period) includes preventive maintenance shall be carried out as per OEM's recommended check list and procedure and Machine calibration shall be carried out as per ISO 10360 every year.	Vendor to confirm			
27.6	Scope of Second, Third, Fourth quarterly visit of every year (1 st year, 2 nd year, 3 rd year after the warranty period), preventive maintenance shall be carried out as per OEM's recommended check list and procedure.	Vendor to confirm			
28.0	Pre-delivery inspection:				
28.1	Pre dispatch inspection shall be carried out by the BHEL Ranipet personnel prior to the system shipment from the (OEM) Original Equipment Manufacturer's works. The scope of the inspection shall be to ascertain conformance to the specifications, prove-out and calibration.	Vendor to confirm			
28.2	Bidder has to provide the complete details of Factory Acceptance Test plan, Customer Acceptance Test plan, including specified values and method of test.	Vendor to confirm			
28.3	All the performance test and accuracy results of the machine to be sent to BHEL Ranipet prior to pre delivery inspection for review at our end.	Vendor to confirm			
28.4	Performance test, accuracy demonstration and Machine performance trials for one (1) week should be carried out at the supplier's site in presence of BHEL Ranipet representative. The machine has to be fully assembled and erected for this purpose.	Vendor to confirm			
29	PACKING:				
29.1	Sea worthy & rigid packing for all items of complete machine, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to confirm			
30	OTHERS:				
30.1	The bidder shall have requisite facilities for manufacture/testing and inspection as per international standards.	Vendor to specify			
30.2	Details of the foundation of the company, its financial stability and its turnover shall be provided.	Vendor to specify			
30.3	Complete address, contact person, telephone number and fax number of original manufacturer of the equipment.	Vendor to specify			

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30.4	The bidders shall provide a comprehensive list of the OEM components used in the machine. The offer shall include the technical brochure indicating clearly the model used for each part / component.	Vendor to specify			
30.5	Technical leaflet and write-up of equipment system must be furnished by the applicant along with the quotation. Bids without catalogue for the offered machine shall not be considered.	Vendor to confirm			
30.6	In case there is a mismatch between technical offer and standard catalogue value, BHEL reserve right to choose the final value for the comparison.	Vendor to confirm			
30.7	The manufacturer has to provide a compliance matrix mentioning point by point given in the specification. It will be assumed that points are acceptable to you if not given an objection/clarification on the point. Final specification in the purchase order will be based on the compliance matrix provided by the Bidder and the Bidder have to satisfy all the points in the specification at the time of supply and installation of the machine.	Vendor to confirm			
30.8	The bid MUST contain clear, direct, required, actual information with respect to the tender specification/clauses. Descriptive data or words viz complied, confirmed are not acceptable for the numerical data. Offers violating these will be treated as rejected.	Vendor to confirm			
30.9	Relevant proof / supplementary document for the compliances shall be furnished along with the offer. Bidder have to satisfy all these points in the specification at the time of supply and installation of the machine.	Vendor to confirm			
30.10	The price bid shall be quoted for basic machine, standard accessories, optional accessories, etc explicitly. Split-up cost details may be inside each section of quoted price. Optional accessories cost not to be taken for price bid evaluation.	Vendor to confirm			

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31.0	QUALIFYING CONDITIONS :				
31.1	a) Only those vendors (OEMs) should quote who have commissioned in the past (5) years (on the date of opening of Tender) at least <u>one similar class of machine</u> of sizes 4m and above in any of the X, Y or Z axis to manufacturing industries like Aerospace/ Automotive/ Defence/Railways etc. b) The facility referred shall be installed in countries other than from where the facility was manufactured (Except for Indian Manufacturers having manufacturing facilities available in India). The referred facility shall be presently working satisfactorily for more than one years after commissioning (on the date of opening of Tender). References cited from countries within the war zone shall not be considered. c) The supplier shall be a regular CMM manufacturer, shall have proven service facilities in India and shall get involved until supply, installation, commissioning, testing, prove out and training is successfully completed. d) However, such Indian vendors (OEMs), who do not meet specified qualifying conditions, can quote if they have running Collaboration/ Joint Venture/ Joint Working Arrangement for manufacture of 3 Axis Co-ordinate Measuring Machine (CMM) of same or higher sizes (X, Y, or Z axes) with foreign manufacturer, who meets specified qualifying conditions. Such Indian vendors (OEMs) shall have to submit from their foreign partner a back to back guarantee for satisfactory performance of the offered machine in compliance to all specified tender requirements. e) BHEL reserves the right to accept or reject the OEMs based on the assessment of their technical and financial capability. f) Bidder should have Average annual financial turnover for last three years ending 31.03.2019 as INR 2 crore or equivalent amount.	Vendor to confirm			

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31.2	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.				
	1. Name of the customer / company where referred machine is installed.	Vendor to inform			
	2. Complete postal address of the customer.	Vendor to inform			
	3. Month & Year of commissioning	Vendor to inform			
	4.Parameters of machine(s) supplied (parameters specified in clause 2 to 6 for each machine to be mentioned here by vendor) and application for which the machine is supplied	Vendor to inform			
	5. Name and designation of the contact person of the customer.	Vendor to inform			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
	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			
	8. BHEL reserves the right to verify the information provided by the Vendor for the referred machine at their referred customer's works including measuring accuracies. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works .The Travel and Boarding expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	Vendor to accept & confirm			
32.0	Other terms and conditions:				
32.1	Either OEM / OEM authorized agents only should quote against this tender.	Vendor to confirm			
32.2	In case OEM authorized dealers submits the quote, then it should accompany the Authorization Letter from the OEM with validity and authorizing the dealer for the submission of quote against this tender on their behalf confirming the tender document reference.	Vendor to confirm			
32.3	Details of the bought-out items used in machine (make and specification) should be furnished. It should be ensured that the spare parts for the bought-out items are readily available.	Vendor to confirm			
32.4	Bidder shall mention the Make and Model of the Machine Controller, Probe head, and Application Software version.	Vendor to specify			
32.5	Bidder should provide cost break up for all the supply items and Scope of work items.	Vendor to specify			
32.6	BHEL will provide compressed air (5-6 Bar) point near the location. Required Filter Lubricator Regulator (FLR) units to be supplied by the vendor.	Vendor to specify			
32.7	Electrical power supply will be at single phase 230 V $\pm$ 10%, or 3 Phase 440V $\pm$ 10 % , 50Hz $\pm$ 5%. Bidder shall indicate requirement in KVA rating.	Vendor to specify			
32.8	Overall space requirement for installation and operation of CMM including control panels, computer etc. should be given along with machine layout diagram, door size for installation, weight of the heaviest module to be handled during installation.	Vendor to specify			
32.9	The civil requirements, including Foundation details if required, ceiling height of the proposed system shall be clearly specified and the scope of the Bidder and BHEL Ranipet shall be explicitly identified. Vendor to note that available ceiling height at BHEL works under the crane is 8.5 m.	Vendor to specify			

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32.10	The electrical interfacing requirements shall be clearly specified and the scope of the Bidder and BHEL Ranipet shall be explicitly identified. The available electrical inputs for India region shall be adopted. The required power port will be provided near the machine location.	Vendor to specify& confirm			
32.11	The Bidder shall mandatorily provide relevant brochures, technical documentation sheets to substantiate the conformance to the technical specifications. All data compliance wherever applicable shall be quantitative in nature and the compliance matrix shall be supplemented with necessary data wherever applicable.	Vendor to confirm			
32.12	All necessary documentation, including conformance to specifications shall be provided in hard form. The documentation shall be in English only.	Vendor to confirm			
32.13	This is two part tender basis, hence Bidder shall quote separately for (i)Technical and commercial bid (Part A) along with EMD (ii) Price bid (Part B)	Vendor to confirm			
32.14	The offer should include compliance matrix showing each & every specification / scope of work items and details of offer made. This is necessary to ensure that all the items are addressed by the parties without fail.	Vendor to confirm			
32.15	The offers received without compliance matrix (Techno commercial) from the Bidder will not be considered for evaluation.	Vendor to confirm			
32.16	Bidder should adhere all the terms and conditions as mentioned above, without which offers will not be considered.	Vendor to confirm			
33.0	OTHER FEATURES:				
33.1	NETWORKING:				
33.1.1	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 specify			
33.1.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to specify			
33.1.3	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 specify			
33.1.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to specify			