




BHARAT HEAVY ELECTRICAL LIMITED		Indent No. :			
SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR PORTABLE COORDINATE MEASURING MACHINE -					
NOTE :-					
1. Vendor must submit complete information against clause at Sl.No. 18.0. The offer, complying this clause, would only be considered.					
2. The vendor should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/ requirements shall be treated as non-compliance.					
3. The offer and all documents enclosed with offer should be in English language only.					
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF PORTABLE COORDINATE MEASURING MACHINE CENTRE WITH SPECIFICATIONS AS BELOW :					
No of Machines : 1 No.					
SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.0	PURPOSE & WORK PIECE MATERIAL				
1.10	Purpose: This PORTABLE Computerised Coordinate Measuring machine is mainly intended for checking turbine blades profiles and precision components. The turbine blade checking includes complete dimensional and geometrical checking of blade profile, shroud & tip in line with drawing requirements of 210/250/500/600/660/700/800 MW Steam Turbines. The blade roots may be T-Root, curved fir tree root. etc. The profile may be aerofoil section with banana type bow and twisted profile in three dimensions.	Vendor to accept			
2.0.	Major Technical Specification: Measuring range, capability and accuracy requirements				
2.10	Measuring range:	1200 mm or more			
2.20	Single point articulation	Vendor to confirm			
2.30	Machine should be able to reach the intricate areas with easiness within the specified range	Vendor to confirm			
2.40	Accuracy as measuring uncertainty independent of position of spindle				
2.50	Volumetric Maximum Deviation	(5.0+L/40) ≤ 55 micron or better			
2.60	Single point Probing Error P	40 micron or better			

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  (T.K. Saha/Sr. Mgr-QC-B)
  (S.R. Choudhary Sr. MGR-Inst.)
  (N. Halder/Sr. MGR-FM-2)

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2.70	Environmental conditions:				
2.7.1	The machine shall be used on shop floor with working temperature of 5 deg C to 45 deg C	vendor to accept & confirm			
2.7.2	Relative Humidity 80±10% for temperature upto 32 deg C decreasing to 50% relative humidity at 45 deg C. Power supply 3 Ph AC 415 V + 10%, Universal worldwide voltage 110-240 V AC, Frequency 50+ 3 Hz. Compliant with low voltage directive 2006/95/EC applicable norm: EN61010-1(2001). All machine electricals, control instrumentation's and paints shall be suitably Tropicalised. The equipment should function for 3 shift working under above mentioned environmental and input conditions.	vendor to accept & confirm			
2.7.3	The machine should be capable of temperature sensor technology.	vendor to accept & confirm			
3.00	Machine Capabilities				
3.10	M/c should be capable of complete inspection of precision components. It should be able to perform inspection of all parameters on five faces of a component from start to finish.	Vendor to accept			
3.20	The system to be capable of measurement from point to point.	Vendor to accept			
3.30	The M/c should be capable of processing the measurement of all geometrical parameters including nominal/actual comparison and evaluation of all forms and position errors e.g. flatness, straightness, roundness, cylindricity, parallelism etc as per ISO-1101 simultaneously in the same measurement run.	Vendor to accept			
3.40	Reporting of results with a printout showing details of dimensions as inspected with deviations from tolerances indicated specifically indicating magnitude of deviation and tolerance band utilization.	Vendor to accept			
3.50	Machine to be capable of complete checking of turbines blades including blade height dimensions, profile, Profile orientation w.r.t. root and tip radius at different positions. Representative drawings of blades are enclosed as following:	Vendor to accept			
3.5.1	01030741002, 01030741005, 21030741031, 11030741032, 11030741034, 01030741022				
3.5.2	01030741003, 01030741006, 21030741031, 11030741033, 11030741035, 01030741023				
3.5.3	01030746002, 01030746005, 21030746035, 11030746031, 11030746033, 01030746022				
3.5.4	01030746003, 01030746006, 21030746035, 01030746032, 01030746034, 01030746023				
3.5.5	01030756001, 01030756003, 21030756031, 01030756032, 01030756034, 01030756021				



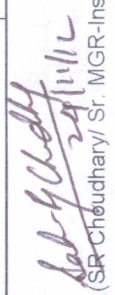
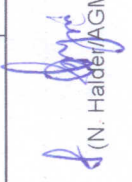
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 (N. Balder/AGM-FM-2)

7

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
3.5.6	01030756002, 01030756004, 21030756031, 01030756033, 01030756035, 01030756022				
3.5.7	01030758001, 01030758003, 11030758031, 11030758033, 01030758021				
3.5.8	01030758002, 01030758004, 01030758032, 01030758034, 01030758022				
3.60	The machine should show the massage for using the wrong probe and should be capable enough for custom probes.	Vendor to accept			
3.70	The machine should work with battery as well as power supply. The machine should have the battery backup of at least 2 hours.	Vendor to accept			
4.00	Measuring System				
4.10	The machine must have the feature of homing point.	Vendor to confirm			
4.20	Storage of probe calibration data: Software must allow to store 99 probe configurations calibration data.	Vendor to confirm			
5.00	Laptop system: BHEL reserves the right to procure Laptop system and printer locally. Price of Laptop & Printer to be quoted separately mentioning make and detailed technical specifications. Both items should be of Indian make preferably. Vendor to submit the detailed technical specifications of LAPTOP required for offered system.	Vendor to accept			
5.10	Minimum Configuration: The IBM compatible (Preferably Indian make like HCL, Tata Elexi, Accel ICIM, INFOWORD) PC / workstation with minimum configuration, 4GB RAM, Speed 3.4 GHz or more, 250 GB IDE-Hard disk, 15" Colour screen, NVIDIA Quadro4 380XGL Graphics 64 MB or better, mouse, keyboard CD-RW/DVD, USB Port, USB pen Drive (8 GB Memory) Combo disc drive and 2 x LAN 10/100 connection for connecting the machine to our internal LAN network. The laptop and printer must be Indian make.	Vendor to confirm & provide-details			
5.20	Printer/ Plotter : High Speed Laser colour printer (Preferably Indian Make like HP, HCL, Tata Elexi, Accel ICIM, INFOWORD)	Vendor to confirm & provide details			
5.30	During technical discussion vendor to demonstrate the blade inspection mentioned at clause no 3.5. The blade shall be clamped by holding device provided by BHEL.	Vendor to confirm			
6.10	Application Software on Unix / PC. Base				
6.1.1	Vendor to submit the list of standard application software available on the system and special software that to be used on the system for blade measurement.				

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6.1.2	Vendor to offer and supply all the required software for blade measurement mentioned at clause 3.5.				
6.1.3	Vendor to provide the suitable CAD Model of the drawings mentioned at clause no 3.5 which are necessary for blade measurement.				
6.1.4	Vendor to supply the CAD Software for blade suitable to the machine and must be capable of making CAD Model of fir tree blade.	Vendor to confirm			
6.2.1	Auto recognition of standard Geometrical elements	Vendor to confirm			
6.2.2	Different evaluations such as distance, Intersection points and conical sections etc. should be possible.	Vendor to confirm			
6.2.3	Prepare the part programs for each and every part directly on the work piece.	Vendor to confirm			
6.2.4	Built in graphics / visual interface.	Vendor to confirm			
6.2.5	Movement of the machine should be possible in work piece co-ordinate system. In this case, the probe can be moved parallel to axis of the work piece for inspection of inclined holes, deep bores.	Vendor to confirm			
6.2.6	Intermediate results should be available with graphical / visual assistance and display in measured window.	Vendor to confirm			
6.2.7	It should be possible to evaluate form and position errors as per ISO standard 1101 including evaluation with Maximum Material Condition (MMC).	Vendor to confirm			
6.30	Software for Curve Measurement should have facility for/ to				
6.3.1	digitizing / Comparison of known / unknown 2D Curves & 3D Curves with CAD model and 2D drawing data.	Vendor to confirm			
6.3.2	Measurement of 2D Curves & 3D Curves against nominal data, analysis, evaluation. The nominal data of the curve can be input manually by keying in the data from the table given in the drawing or from the CAD files. Then the measurement is done against this data.	Vendor to confirm			
6.3.3	Deviation calculation from nominal & measured curves. The difference between the nominal and the measured data in the normal vector direction is calculated as deviation. Best fit calculation of measured curves and output of deviations. Graphical presentation of nominal curves, measured curves & deviations. Import of Curve data from CAD systems in various formats: VDA, ASCII, PAB & DXF formats. Export of Curve data in VDA and ASCII format.	Vendor to confirm			
6.3.4	Software for evaluation of turbine blades				

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6.3.5	Measurement of blade covers profile, profile orientation w.r.t. curved fir tree root, tip & shroud of LP Free standing blades of different design of fir-tree root blades. Measurement shall be as per BHEL drawing requirement of dimensions, profile and orientation to be reported in tabular as well as graphical format indicating comparison with accepted norms.	Vendor to accept & offer			
	a) Any suitable blade software shall be provided for measurement of twisted profile, Tip and Z Shroud of Fir tree blades.	Vendor to accept & offer			
	b) The software shall be capable of accepting the profile data of blade in following ways : (i) Profile coordinates in simple and suitable ASCII (Text) format by manual input (ii) IGES format from leading CAD system such as IDEAS, Unigraphics, Pro-Engineer, AUTO CAD etc.	Vendor to accept & offer			
	c) The vendor shall provide full technical support and modification / upgradation of the software during the warranty period of the machine. The technical support shall include trouble shooting through Telephone, E-mails & visit of their experts if required.	Vendor to accept & offer			
	d) The back-up of the software shall be provided on CDs.	Vendor to accept & offer			
7.00	Accuracy Tests				
7.10	Vendor to do maximum permissive volumetric length measurement error test as per ISO 10360-2. Maximum permissive probing error test as per ISO 10360-2 or any other equivalent standard at BHEL Haridwar.	Vendor to accept			
8.00	Installation, Commissioning, prove out and Inspection				
8.10	Installation & Commissioning : Installation & commissioning of the machine shall be arranged by the supplier or by the Indian Agent at their own responsibility. Commissioning, accuracy checks, proving out the components at BHEL's works shall be the responsibility of the supplier.	Vendor to confirm			
9.00	Proving Out :				

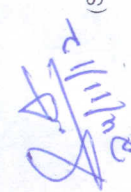
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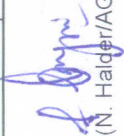
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9.10	After successful completion of installation and testing at BHEL, Haridwar, supplier shall carry out complete dimensional checking of components to their specified design accuracies using BHEL 2D AUTOCAD drawing, manual inputs, if available, in the supplied software for blade measurement as per point no. 7.3.1 Further, all the features of the software shall be completely demonstrated and established on the machine. Components to be included for proving are: profile orientation w.r.t. to curved Fir tree root, tip checking & Z-shroud of fir-tree checking w.r.t curved fir-tree root. Drawing references of blades to be included for proving are as per clause 3.5.1 to 3.5.6, the vendor has to demonstrate the checking of these blades to the full satisfaction of BHEL staff. Vendor shall be fully responsible for complete checking of blades as per drawing accuracies and other requirement specified by BHEL to the full satisfaction. BHEL will provide the control segment for holding the blade during checking. During measurement, holding of blade shall be done by holding arrangement provided by BHEL.	Vendor to accept			
10.00	Machine Acceptance				
10.10	Final acceptance shall be given at BHEL Haridwar following completion of Installation, Commissioning, accuracy tests and proving out as per clause no 9.00.	Vendor to accept			
10.20	Training of BHEL Personnel at BHEL, Haridwar works				
10.2.1	Training of BHEL personnel at BHEL, Haridwar works in the following field : Programming of CAD system and software operation, Electrical / Electronics maintenance, Mechanical maintenance, user interface. The training shall be in English / Hindi language.	Vendor to accept & confirm			
11.00	Spares				
12.00	Consumables				
12.10	The vendor should quote the following consumables: (i) Probes: Probe dia 3 mm & 6 mm two no of each type. (ii) USB cable: one no. (iii) Power Adaptor one no.	Vendor to offer			
13.00	Machine Manuals				
13.10	3 sets of all operation, programming / operating software manual along with complete set of Sets of CDs in English language.	Vendor to accept & offer			
14.00	Guarantee				


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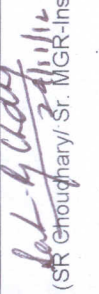

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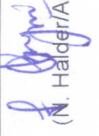
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14.10	Vendor should offer performance guarantee of 24 months for the total system from the date of successful commissioning / prove out and handing over. Any spare required during guarantee period shall be arranged by the vendor free of cost and duty levied is to be borne by the vendor.	Vendor to accept			
15.00	Annual maintenance Contract				
15.10	General Requirements				
15.1.1	After sales service: Details of local After sales service support in India should be provided. Following points to be covered : a) Reference list .b) Installation Experience.c) Application training .d) Part programming capabilities .e) After sales Maintenance	Vendor to submit			
15.20	ADDITIONAL INFORMATIONS: Following technical details are to be submitted within six weeks of ordering ;				
15.2.1	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Measuring range, accuracy, Max job Envelope, etc.	Required			
16.00	Safety Arrangements				
16.10	The machine must have the stress stop sensor and must have the internal counter balance.	Vendor to confirm			
17.00	Packing				
17.10	Seaworthy and rigid packing for all items of complete machine, CNC system , all accessories and other supplied items to avoid damage and loss in transit. When Machine is dispatched in containers , all small loose items shall be suitable packed in boxes.	Vendor to confirm			
18.00	Qualifying Conditions				
18.10	Only those vendors(OEMs), who have supplied and commissioned at least one number PORTABLE CMM of same or more measuring range and accuracy (1.2 m or more and <=55 microns or better) (from date of opening of tenders) and the referred machine is presently working satisfactorily for more than one year after commissioning, should quote. However, if referred machine has/ had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months(from date of opening of tenders) after its commissioning and acceptance in BHEL.	Vendor to accept and confirm			
18.20	The following information should be submitted by the vendor about the companies where referred machines have been supplied. This is required from all vendors for qualification of their offer.	Vendor to inform			


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18.30	Name of the customer / company, where referred machine(s) is(are) installed.	Vendor to inform			
18.40	Complete postal address of the customer.	Vendor to inform			
18.50	Month & Year of Commissioning.	Vendor to inform			
18.60	Parameters of machine supplied (working range, volumetric probing error) and application for which the machine is supplied.	Vendor to inform			
18.70	Name and designation of the contact person of the customer.	Vendor to inform			
18.80	Phone, FAX no. and email address of the contact person of the customer.	Vendor to inform			
18.90	Performance certificate from the customer regarding satisfactory performance of machine supplied to them (original certificate or through e-mail directly from the customer). Original certificate may be returned after verification by BHEL, if required.	Vendor to provide			
18.10	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept and confirm			
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	(T K Saha/SR. Mgr-QC-B)				
	(V. K. CHUGH /AGM-TBM)				
	(SR Choudhary/ SM-Inst.)				

Sanjiv Kumar
20/11/12

T K Saha
20/11/12

V. K. Chugh
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