

**DEPARTMENT OF PRODUCTION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY: TIRUCHIRAPPALLI – 620 015**

Date: 27.12.2013

Amendment of the specifications of Multi axis ultra-precision machining system

Tender notification no: NITT/F.NO:SIF015/PLAN2013-14 Dt.: 19.12.2013

With reference to the above tender notification, the pre-bid conference was held on 27.12.2013 at 10.00 am in the committee room of Physics Department, the following amendments are made. All other terms and conditions mentioned in the tender document remains same.

Specifications for multi axis ultra-precision machining system:

Sl. No	Specification on Tender document	Amendment specification
I	<u>MACHINE CAPCITY STRUCTURE & FEATURES</u>	
1	4 axis computer controlled aspheric contouring system: generation of high precision optical elements & ultra-precision components	No Amendment
2.	System configuration: ultra-precision 4 axis CNC contouring machine with swing capacity of > 200 mm over B-axis	
3.	Work piece capacity: (i) 5 – 250 mm diameter aspheric or spherical optical components (ii) up to 200 mm for diffractive components.	
4.	Base structure: natural granite to provide long term machine tool stability with vibration isolation	
5.	Slide ways: Hydrostatic oil bearing type with axial stiffness – 200 N/μm (minimum) @ 1.3x10 ⁶ lbs./in. and radial stiffness – 120 N/μm (minimum) @ 7.4x10 ⁵ lbs./in.	<i>Slide ways: Hydrostatic oil bearing type, Work piece/ Positioning Spindle: Axial stiffness – 200 N/μm (minimum) @ 1.3x10⁶ lbs./in. and Radial stiffness – 120 N/μm (minimum) @ 7.4x10⁵ lbs./in.</i>
6.	Programming resolution: Linear – 0.01 nm; Rotary – 0.0000001°	No Amendment
7.	File transfer & storage: USB, CD-RW, Ethernet, on board data storage backup	
8.	Functional performance: surface roughness (Ra), ≤ 1 nm ; Form accuracy (P-V) < 0.1 μm	<i>Functional performance: surface roughness (Ra) ≤ 2 nm (performance to be demonstrated under following test conditions in spherical geometry: Material – Electroless Ni or equivalent; Size – 12 mm diameter); Form accuracy (P-V) < 0.1 μm (performance to be demonstrated under following test conditions in spherical geometry: Material – Electroless Ni or equivalent; Size – 75 mm diameter)</i>
9.	Control system: PC based machine controller with real time operation, windows environment with 19” color flat panel touch screen display, minimum RAM 1 GP, Ethernet card, CD-RW/DVD Drive & 80 GB hard drive	No Amendment
10.	On machine – work piece balancing system (Reference position setting)	

11.	Venture based spray mist system – with two independent controls for oil & air)	No Amendment
12.	Work envelop: (fully enclose for safety & improved temperature control)	
13.	Storage drawer	
II	<u>WORK HOLDING SPIINDLE</u>	No Amendment
14.	High accuracy work holding spindle with heavy duty air bearing & liquid cooling	
15.	Coolant passages :to maintain thermal stability	
16.	Vacuum pressure or air pressure passage: for fixturing (to be supplied through the air bearing to the face of spindle)	
17.	Load capacity: 85 kg @ 145 psi	
18.	Maximum Speed: ≥ 7000 rpm	
19.	Motion accuracy: Both axial & radial ≤ 15 nm	
III	<u>LINEAR AXIS DESCRIPTION (X & Z AXIS)</u>	
20.	High stiffness hydrostatic oil bearing of box way slide design with liquid cooling capability: for extremely smooth, friction –free motion and to provide high degree of vibration damping	
21.	Slide travel : 200 mm (minimum)	
22.	Straightness: Horizontal - X axis : $\leq 0.2 \mu\text{m}$ (full travel); Z axis: $\leq 0.2 \mu\text{m}$ Vertical : $\leq 0.4 \mu\text{m}$ - full travel	
23.	Feedback type: non-contact encoder feed back	
24.	Feedback resolution: 40 Pico meter (max.)	
25.	Feed rate: Horizontal : 4000 mm/min (minimum) ; Vertical : 1500 mm/min (minimum)	<i>Feed rate: Linear axes : 4000 mm/min (minimum)</i>
IV	<u>C-AXIS</u>	No Amendment
26.	Feedback resolution: ≤ 0.07 arc-sec	
27.	Position accuracy: ± 2 arc-sec or better	
28.	Slow tool servo with encoder & software	
V	<u>ROTATIONAL AXIS (B-AXIS)</u>	No Amendment
29.	Axis features: direct drive, oil hydrostatic bearing, an integral high resolution encoder, brake switches, optional limit switches and optional hard stop	
30.	Provision to lock the axes when rotation is not needed	
31.	A tee slot plate and round tooling plate : to allow a traditional setup with multiple tools/front surface probe to be mounted in line on the locked B axis or tool normal cutting on the B axis	
32.	Position accuracy: ± 1 arc-sec compensated	
33.	Rotary B-axis virtual center software: to simplify setting up tooling on B axis	No Amendment

VI	SOFTWARE	
34.	Latest Windows operating system	No Amendment
35.	CAM software	
36.	Data store network interface	
VII	ACCESSORIES	
37 (a)	Vacuum chuck with flat front surface: to provide perfect flat surface for fixturing (to match fixture capacity 200mm)	No Amendment
37 (b)	Central dowel pin for initial alignment	
37 (c)	Stress free clamping of parts/fixtures	
38	Tool holder with fine adjustments in tool height up to 0.35 mm with remount adjustment	
39.	Integrated gauge amplified package: integrated gage amplifier for aligning work piece on the spindle & tool height adjustment. Electronic indicator and magnetic base for better flexibility with resolution 0.1micron/full range ± 0.25 mm	<i>Integrated gauge amplified package: integrated gage amplifier for aligning work piece on the spindle & tool height adjustment. Electronic indicator and magnetic base for better flexibility with resolution 0.1micron/full range ± 0.25 mm. Workpiece surface identification by contact type probe without operator intervention.</i>
40.	Spindle & Slide chiller	No Amendment
	Coolant shroud	
42.	Optical tool set station	
43.	Diamond cutting tools including roughing & finishing tools	

Note: Any other accessories apart from the mandatory accessories and systems mentioned above may be quoted separately.

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