

## **Specification of Thin Film Thickness Measuring Equipment**

### **A. Main Features :**

1. Spectrometer, A / D converter, reflection probe and suitable software.  
The software should operate under latest Windows XP environment.
2. Wave length of halogen light source - 400 – 1100 nm
3. Thickness range - 50 nm – 100  $\mu$ m
4. Absolute accuracy - < 1 % ( 100 nm – 100  $\mu$ m )
5. Number of layers - 1 to 4 ( with the help of suitable software )
6. Angle of incidence - 90° ( normal incidence )
7. Fiber length - 2 m or more
8. Interface - USB / RS232
9. Input power - 230 V + / - 15 %, A.C. 50 + / - 1 % Hz , single phase.

### **B. Test requirements :**

1. The equipment should be capable of measuring thickness of layers in the range 50 nm to 100  $\mu$ m. Standard **sample** substrates with layers in this thickness range should be supplied along with the equipment. These should be used to demonstrate the use of equipment as well as its calibration at site at Corporate R&D, BHEL, Hyderabad, India.
2. Typical substrate materials to be used by us: a) Glass, b) Polymer films, c) Metal foils
3. Typical layer materials: a) Molybdenum (0.9  $\mu$ m),  
(with thickness) b) Copper-Indium-Gallium-Selenide(CIGS)(2.5  $\mu$ m),  
c) Cadmium Sulphide (CdS)(70 nm)  
d) Zinc Oxide (ZnO) ( 250 nm ) or ITO(250nm)

### **C. Software :** Suitable software for measurement of thicknesses of different layers to be provided.

1. The software should be compatible with Microsoft Office products and it should operate under **Latest Windows XP Environment**.
2. **Latest PC along with LCD monitor (17") and printer** to be provided with details. All catalogues related to Software / Hardware to be provided. It is preferable to supply PC available in India with software loaded and integrated with the system. PC equivalent to or better than Dell / HP Desktop, Intel dual core CPU, 2.8 GHz, 2 GB DDR3, 320 GB HDD, DVD RW, 17" or 18.5" TFT Colour Monitor, Key Board, Optical Scroll Mouse, and HP PSC F 4488 Printer to be provided.

### **D. Power Input :**

1. The complete system comprising of spectrometer, computer, printer, UPS etc. should be designed for use with 230 V  $\pm$  15% A.C.(1 phase) with a mains frequency of 50  $\pm$  1% Hz.
2. **Suitable UPS (reputed make)** with backup power of up to 30 minutes to be quoted with details. Maintenance schedule and warranty details to be provided.

**E. Qualification Criteria & Other aspects:**

1. The vendor **should have supplied minimum two such equipments in India or elsewhere and working satisfactorily. Details should be furnished.**
2. Should have agents in India to provide after sales service and maintenance.
3. The equipment should be Guaranteed for a period of **2 years** from the date of commissioning. During warranty period, if there is any repair to be carried out at the suppliers works, transportation cost of equipment / component besides repair / replacement charges, if any, should be borne by the supplier.
4. **Catalogue related to each and every item should be enclosed.**
5. Dimensions of equipment, weight and space requirements to be given
6. **Pre-installation requirements should be furnished.**
7. Installation & commissioning of the equipment to be carried out by supplier at site at Corporate R&D, BHEL, Hyderabad, India. Training to be provided at Corp. R&D, BHEL, Hyderabad.
8. Commissioning charges, if any, to be indicated.
9. Compliance statement of specification to be submitted along with the offer. Without compliance statement, the offer is liable to be rejected. All tender specifications to be compared with equipment offered line by line and documentary evidence must be enclosed by the supplier along with quotation.
10. Two copies of operating manual to be provided.

**F. Technical & Commercial bid submission :**

- A. **Technical offer with all catalogues should be provided.**
- B. **Compliance statement meeting the specification line by line should be provided.**
- C. **UNPRICED PRICE BID (no price)** should be submitted.
- D. **Commercial bid (PRICED BID)** in the format given above also with terms and conditions to be submitted in a separate Sealed Cover

**Note : All covers should be clearly marked indicating the contents and should be SEALED.**

**For any Technical Clarifications please contact :  
Shri RV Phadke, AGM(CNT) email ID : [phadke@bhelrnd.co.in](mailto:phadke@bhelrnd.co.in)**

## COMPLIANCE STATEMENT

Item: Thin Film Thickness Measuring Equipment

Page 1 of 3

Sl. No.	BHEL Specification / requirement	Supplier's offer	Meets BHEL specification or not	Remarks
A1	Spectrometer, A / D converter, reflection probe and suitable software to operate under Windows XP environment			
A2	Wavelength of halogen light source – 400 – 1100 nm			
A3	Thickness range - 50 nm – 100 $\mu$ m ( to be measured )			
A4	Absolute accuracy - < 1 % ( 100 nm – 100 $\mu$ m )			
A5	Number of layers – 1 to 4 (with the help of suitable software)			
A6	Angle of incidence - 90° ( normal incidence )			
A7	Fiber length – 2 m or more			
A8	Interface - USB / RS232			
A9	Input power - 230V + / - 15 % A.C. 50 Hz + / - 1 % , 1 phase			
B1	Standard test sample to be provided for demonstration and calibration			

**COMPLIANCE STATEMENT** ( Thin Film thickness measuring equipment ) :  
( **Continued** ) Page 2 of 3

Sl. No.	BHEL Specification / Requirement	Supplier's offer	Meets BHEL specification or not	Remarks
B2	Thickness measurement of thin film layers on the substrates such as a) Glass, b) Polymer films, c) Metal foils should be possible			
B3	Thickness measurement of thin film layers of Mo, CIGS, CdS, ZnO, ITO should be possible			
C1	The software compatible with MS Office should operate under Windows XP Environment			
C2	Latest PC along with LCD Monitor ( 17" ) and Printer with details. PC equivalent to or better than Dell / HP Desktop, Intel dual core CPU, 2.8 GHz, 2 GB DDR3, 320 GB HDD, DVD RW, 17" or 18.5" TFT Colour Monitor, key Board, Optical Scroll Mouse, and HP PSC F 4488 Printer to be provided.			
D1	The complete system should be designed for use with 230 V +/- 15 % A.C.( 1 Phase ), 50 +/- 1 % Hz.			
D2	Suitable UPS ( reputed make ) with 30 minutes back up			
E1	The vendor should have supplied minimum two such equipments in India or elsewhere. Details to be furnished.			
E2	Should have agents in India to provide after sales service and maintenance.			

	<b>COMPLIANCE STATEMENT</b> ( Thin Film thickness measuring equipment ) : <b>( Continued )</b> Page 3 of 3			
Sl. No.	BHEL Specification / Requirement	Supplier's offer	Meets BHEL specification or not	Remarks
E3	Equipment should be guaranteed for a period of 2 years			
E4	Catalogue related to each and every item should be enclosed			
E5	Dimensions of equipment, weight and space requirements to be given			
E6	Pre-installation requirements should be furnished			
E7	Installation & commissioning to be carried out by supplier. Training to be provided at Corp. R&D, BHEL, Hyderabad			
E8	Commissioning charges, if any, to be indicated			
E9	Compliance statement of specification to be Submitted along with the offer			
E10	Two copies of operating manual to be provided			