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| **Dr.K.Srinivas Reddy** | **#204, Heat Transfer&Thermal Power Laboratory**  |
| **Professor** | **Department of Mechanical Engineering** |
|  | **Indian Institute of Technology Madras** |
|  | **Chennai-600 036** |

**Form for Inviting Quotations**

**Reference No. MEE/11-12/281/CSIR/KSRS /XIX** **Date:** 12-09-2014

**Subject: Supply of Test Setup for Thermal Loss of Photo Receiver tube along with Heater Control & Data Acquisition System for Project No: MEE/11-12/281/CSIR/KSRS**

**Due Date: 07 -10-2014**

Dear Sir,

1. Quotations are invited in **duplicate** for the supply of **Setup for Thermal Loss of Photo Receiver tube along with Heater Control & Data Acquisition System** and Specification of which are shown in overleaf.
2. The Quotations **duly sealed and super scribed on the envelope** with the reference No. and due date, should be addressed to the undersigned to reach him on or before the due date stipulated above.
3. The Quotations should be valid for sixty days from the due date and the period of delivery required should also be clearly indicated.
4. If the item is under DGS&D Rate Contract, Rate Contract Number and the price must be mentioned. It may also please be indicated whether the supply can be made direct to us at the Rate Contract price. If so, please send copy of the R. C. (Please note that we are not Direct Demanding Officers).
5. Relevant literature pertaining to the items quoted with full specifications (and drawing, if any) should be sent along with the Quotations, wherever applicable. Samples if called for should be submitted free of charges, and collected back at the supplier’s expenses.
6. **Local Firms**: Quotations should be free delivery to this Institute, if Quotations are for Ex-Godown delivery charges should be indicatedseparately.
7. **Firms outside Madras**: Quotations should be F.O.B. Madras. If F.O.B. consignor station, freight charges by passenger train / lorry transportmust be indicated.. If Ex-Godown, packing, forwarding and freight charges must be indicated. The following set of documents is required in all cases: a. complete set of Clean Bill of Lading / Airway Bill / Air or surface Parcel Receipt, showing that the goods have been shipped and freight prepaid. b. Insurance Policies / Certificates in duplicate covering Marine Insurance as per Institute Cargo Clauses (All risks) and perils as per Institute Strikes, Riots and Civil Commotion Clauses, War risks as per Institute, Clauses. Cover for CIF value plus 10 percent.
8. The rate of Sales / General Taxes and the percentage of such other taxes legally leviable and intended to be claimed should be distinctly shown along with the price quoted. Where this is not done, no claim for Sales / General Taxes will be admitted at any stage and on any ground whatsoever. **The taxes leviable should take into consideration that we are entitled to have Concessional Sales Tax applicable to non-**

**Government Educational Institutions run with no profit motive for which a concessional. Sales Tax Certificate will be issued at the time of final settlement of the bill.**

1. Goods should be supplied carriage paid and insured.
2. Goods shall not be supplied without an official supply order.
3. **Payment**: Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever islater.

Quotation can be sent addressing:

**“Dr.K.Srinivas Reddy**

**Professor**

**#204, Heat Transfer and Thermal Power Laboratory**

**Department of Mechanical Engineering**

**Indian Institute of Technology, Madras- 600 036”**

TEST SETUP FOR THERMAL LOSS IN 4 METRE LONG PHOTORECEIVER TUBE ALONG WITH HEATER CONTROL AND DATA ACQUISITION

**Technical specifications**

**1. Heaters and Power supply unit :**

a) Ceramic Isolated Heaters

 A Encapsulated Heater with proper Ceramic Isolation and uniform Heating Facility in tube length of 4060 mm . the Heaters should be single phase 230 volt operated and capable of reaching a steady temperature of 450° C . A Heating capacity of 5 Kwatt is envisaged for this temperature.

The Heaters are required to be inserted for every Test Cycle in the Photo receiver Tube and should rugged to undertake the above handling. Proper fixture to be provided for placement of Heater in the tube for Uniform Heating.

b) Heater Power Supply:

A High precision Constant Voltage Power Supply with continuous precise Voltage Control from 0-230 Volts ripple free DC with digital Voltage and Current Display .Provision should be made for remote output (preferable 0- 10 Volts) for Data acquisition and control.

The Heater Power Supply should be capable of both Manual Control of Voltage from a 10 turn potentiometer (local front panel control ) as well as remote control using control output

From a PID controller specified.

**2. Closed Loop Temperature PID Control ,Data Acquisition ,Thermocouple & Temperature Scanner**

1. PID Controller

A neuro fuzzy logic based PID controller should be provided with remote settable set value and a control output in 0-10 Volt range . This PID control output should be able to control the Heater

Power supply in the remote mode to achieve steady state feedback values of Voltage Applied

And current drawn by the Heater to maintain a specific set temperature from 0- 450 ͦ C.

1. Thermocouples and Temperature Scanner

Six Thermocouples place at the following Locations :

Thermocouple 1 (TC1) : Placed at the left surface (internally) of the Photo receiver Tube

Thermocouple 2 (TC2) : Placed at the centre surface (internally) of the photo receiver Tube

Thermocouple 3 (TC3) : Placed at the right surface (internally) of the photo receiver Tube

Thermocouple 4 (TC4) : placed at the centre surface (internally) of the photo receiver Tube

Thermocouple 5 (TC5) : placed for Measurement of Ambient Temperature

Thermocouple 6 (TC6) : placed at the Outer Glass Envelope for Measurement of Glass Tube Temperature

Please see schematic of the set-up indicating the placement of Thermocouples. The thermocouple TC2 will be used as a control Thermocouple for the PID control along with the Heater Control Power Supply.

All Thermocouples should be K-type , Mineral Insulated with SS Sleeve and with proper end OMEGA connectors . The Thermocouples should be designed for placement at above locations without any modification , each time the experiment is conducted .

A 12 channel Temperature scanner with Digital display should also be provided.

All Thermocouples need to be calibrated and should be supplied along with calibration certificate.