

National Institute of Technology – Tiruchirappalli - 15
Mechanical Engineering

HEAT TRANSFER LABORATORY

LIST OF EQUIPMENT

Sl. No.	Description	Quantity
1	Surface Temperature Probe	2
2	Bench selector switch (6 way)	2
3	Digital bench temperature indicator with Miniature Connectors	2 (temp. indicator) 20 (connectors)
4	Radiation Errors in Temperature Measurement Instrument	1
5	Film and Dropwise Condensation Unit	1
6	Unsteady State Heat Transfer Unit	1
7	Digital Barometer (with temperature, weather forecast and relative humidity measurements)	1

DETAILED SPECIFICATIONS

1. Surface Temperature Probe:

Surface probe with type K thermocouple

Tip with metallic disc of 4-5 mm

SS sheath protection for thermocouple

Temperature range: - 100 to 700°C.

Calibration certificates, traceable to National / International standards.

2. Bench Selector Switch (6 Way):

Compatible with type K and type J thermocouples with thermocouple compensating cable inside

Miniature sockets to connect thermocouples

A front mounted rotary switch for easy selection

3. Digital Bench Temperature Indicator with Miniature Connectors:

For use with type K and type J thermocouples

Miniature sockets to connect input from selector switch

Range : -50 to 1200°C

Accuracy : $\pm 0.2\%$ of reading

Resolution : < 150°C - 0.1°C ; > 150°C - 1°C

Display : 3½ digits, LED

Cold Junction : automatic

Power supply : 220 V / 50 Hz

Sensor input : miniature thermocouple connector

Calibration certificates, traceable to National / International standards.

Miniature connectors to connect the thermocouple inputs to the selector switch and also to connect the selector switch and display unit.

4. Radiation Errors in Temperature Measurement Instrument

To show, how the temperature readings are affected when the thermometer sees the surrounding walls, the gas velocity variations, the physical size of the thermometer, etc. The equipment consists of,

A service unit to provide stabilized, variable voltage supply

A tubular metal duct with the following accessories:

An electric fan to draw air

200 – 250 W electric heater with outside insulation

A throttle plate at the duct inlet to vary the air flow

Anemometer to measure the air velocity (0 – 5 m/s)

A thermocouple to measure the heated wall temperature and 3 thermocouples with different styles of beads

Provision for measuring the temperature of heated air passing over the thermocouples

A movable radiation shield

Data logger

Calibration certificates, traceable to National / International standards.

5. Film and Dropwise Condensation Unit:

To visualize the filmwise and dropwise condensation, to estimate the heat fluxes in both and also to study the effect of air in condensers.

Steam chambers made of thick walled glass cylinders with SS/brass cylinder covers
2 water cooled condensers, mounted in upper cylinder. Condensers are fabricated from copper and brass. Dropwise condenser is gold plated while filmwise condenser has natural finish. Each condenser with 3 to 4 thermocouples to measure the average metal temperatures and 2 thermocouples to measure the water inlet and exit temperatures with temperature indicator
3–5 kW electric heater with thermal protection and control to vary the heat input
Air cooler, separator and water jet vacuum pump with valves
Pressure gage to measure chamber pressure. Range : -100 to 100 kPa.
2 flow meters for measuring the water flow rate through the condenser.
Calibration certificates, traceable to National / International standards.

6. Unsteady State Heat Transfer Unit:

To find the transient temperature distribution in various solids and estimate the rate of heat transfer
Heating bath of min. 25 lit. capacity
Electric heating element of 3 kW rating
Thermostat to control bath temperature
RCD / circuit breaker for safety
Circulating pump to vary the water velocity
J or K type thermocouples with digital display for temperature measurement
A service unit for providing regulated power supply for the heating element
Solids of different shapes and body holder
Calibration certificates, traceable to National / International standards.

7. Digital Barometer :

The instrument has the functions of temperature, weather forecast, atmospheric pressure and relative humidity measurements
Temperature range : -5 to 55°C
Accuracy : $\pm 1.5^\circ\text{C}$
Resolution & Sampling cycle : 0.5°C & 10 sec, respectively
Barometer range : 800 to 1050 mbar
Accuracy : ± 5 mb
Sampling cycle : 15 min.
Humidity range : 10 to 100%
Accuracy : $\pm 5\%$ with a resolution of 1 %
Sampling cycle : 10 sec
Calibration certificates, traceable to National / International standards.

