

FREE & FORCED CONVECTION HEAT EXCHANGER

MODEL: HE 106



THE Free & Forced Convection Heat Exchanger (Model: HE 106) has been designed for students to study the phenomena of natural (free) and forced convection. The unit consists of mainly a bench mounted vertical air duct and a control panel. Demonstration of convection is achieved in this apparatus by studying temperature profiles and heat flux in the air duct with three alternative heat transfer surfaces, i.e. vertical flat plate, array of cylindrical pins and finned surface.

DESCRIPTION

Each of these surfaces may be installed separately in the wall of the vertical duct. The surfaces incorporate an electrical heating element, with protective thermal cut-out, and a temperature sensor for accurate

temperature measurement. An acrylic window is provided in the duct wall opposite the mounted exchange surface to allow flow pattern visualisation.

For forced convection, a variable speed fan at the top of the duct draws ambient air upwards through a flow

straightener and over the exchange surface. The air velocity, whether occurring by free or forced convection, is indicated on a velocity detector probe of which is inserted in the tunnel up-stream of the exchanger. A separate temperature probe measures the in-going and out-going air temperature of the selected exchanger.

An instrument panel provides for:

- a) Variable control of power input to the exchanger surface with direct readout in Watts.
- b) Direct readout of temperature in Deg C.
- c) Fan speed variation and control.

EXPERIMENTAL CAPABILITES

- ◆ Free convection heat transfer from a horizontal flat surface.
- ◆ Free and force convection from:
 - a) vertical flat surface
 - b) extended surface of constant cross section (cylinders)
 - c) extended surface of varying cross section (fins)
- ◆ Relationship between air velocity and surface temperature.
- ◆ Relationship between power dissipated and surface temperature.

SPECIFICATIONS

The unit comes complete with the followings:

- i) Air duct:**
Epoxy coated air duct with transparent window.
Dimension (m): 1.02 (H)x 0.122 (W) x 0.07(D)
- ii) Fan:**
DC motor, 6V
4 blades impeller
Velocity: 0 to 1.5 m/sec
- iii) Heat transfer surfaces:**
 - a) Vertical flat plate
 - b) An array of cylindrical pins
 - c) Finned surface

iv) Control Panel:

- Digital display for heater power output
- Digital display for temperatures
- Digital display air velocity
- Controller for variable heater power output
- Controller for variable DC output for fan

OPTIONAL ITEMS

- EI

DIGITAL INSTRUMENTATIONS

- i) 3 units of digital indicator
- ii) 5 units of thermistor sensor
- iii) 1 unit of air flow anemometer
- iv) 1 unit of power transducer

-DAS

SOLDAS DATA ACQUISITION SYSTEM

- i) A PC with latest Pentium Processor
- ii) An electronic signal conditioning system
- iii) Stand alone data acquisition modules
- iv) Windows based software
 - ◆ Data Logging
 - ◆ Signal Analysis
 - ◆ Process Control
 - ◆ Real-Time Display
 - ◆ Tabulated Results
 - ◆ Graph of Experimental Results

- CAL

SOLCAL COMPUTER AIDED LEARNING SOFTWARE

- i) Interactive multimedia features
- ii) Graphical simulation
- iii) Experiment results samples
- iv) Full experiment manuals

REQUIREMENTS

Electricity supply : 240VAC/1-phase/50Hz

OVERALL DIMENSIONS

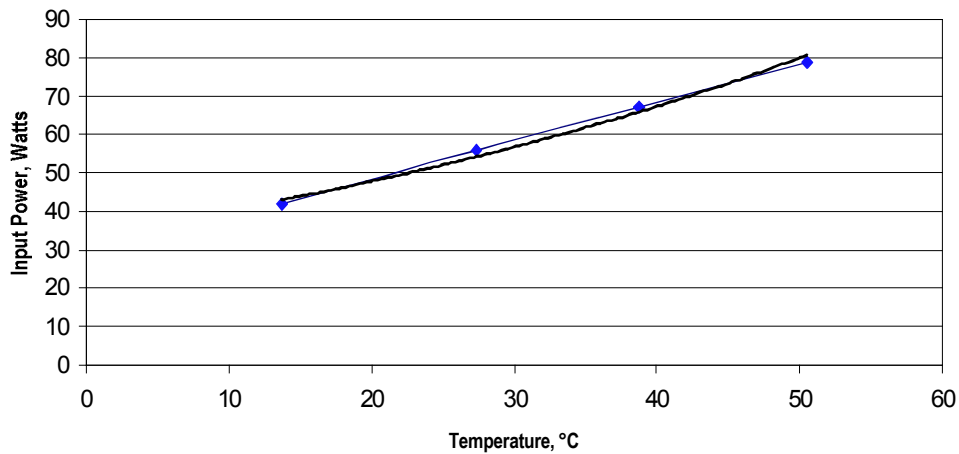
Height : 1.30 m
 Width : 0.35 m
 Depth : 0.50 m

MANUAL

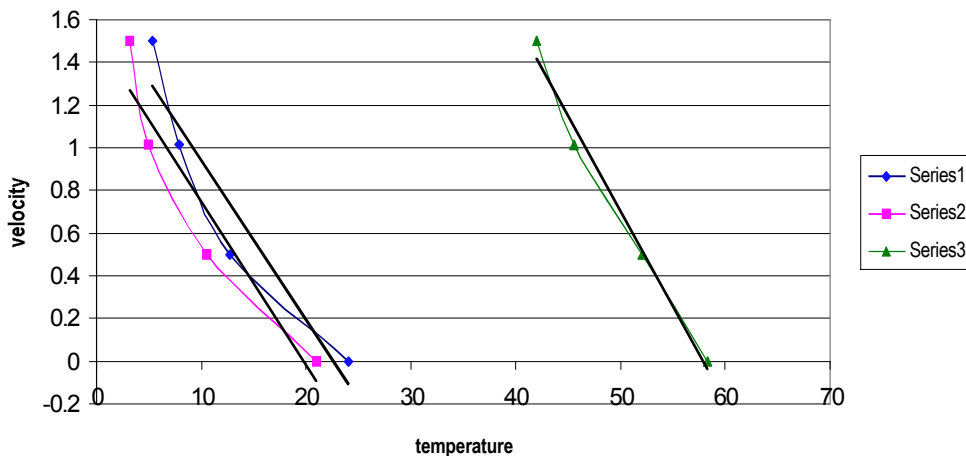
The unit is supplied with Operating and Experiment Manuals in English giving full descriptions of the unit, summary of theory, experimental procedures and typical experimental results.

TYPICAL EXPERIMENT RESULTS

Graph of Input Power, Watts vs Temperature (tH – tA), °C



velocity vs temperature

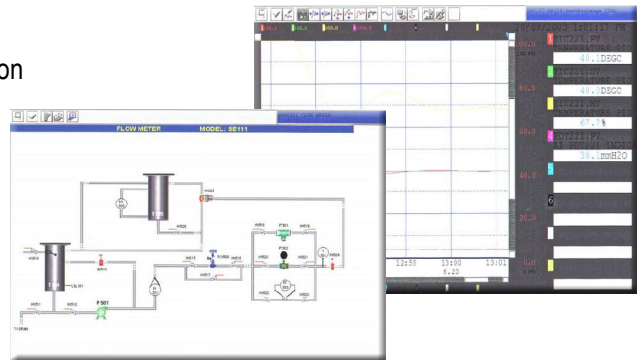


SOFTWARE & E - LEARNING

Our range of teaching equipment can be complemented with our SOLDAS and SOLCAL software.

SOLDAS™ - Supervisory Control & Data Acquisition

- Data Logging
- Signal Analysis
- Process Control
- Real-Time Display
- Tabulated Results
- Graph of Experimental Results



SOLCAL™ - Computer Aided Learning

- Multimedia Features
- Interactive
- Graphic Simulation
- Experiment Result Samples
- Full Experiment Manuals



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