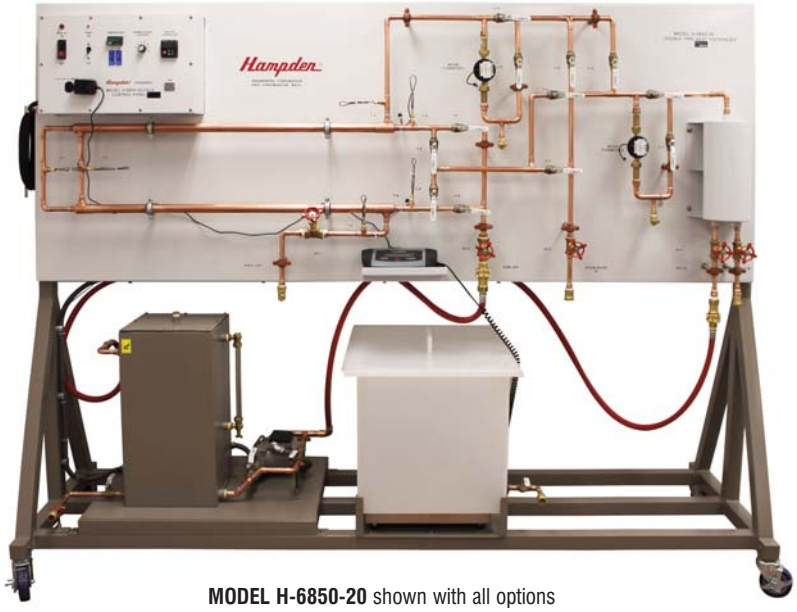
H-6850-20

Double-Pipe Heat Exchanger

Purpose

The Hampden **Model H-6850-20** Double-Pipe Heat Exchanger is used to investigate the fundamental principles of heat transfer as applied to a tube-in-tube heat exchanger. The apparatus permits the student to move from classroom theory to a hands-on application with all of the practical training. The student shall measure the variables that affect the overall heat transfer coefficient. The "cold" and "hot" fluid temperatures and flow rates are monitored at strategic locations. The unit can be configured to operate as either a parallel flow or counterflow heat exchanger. By varying the fluid flow rates, laminar, transitional or turbulent flow conditions can be created.



MODEL H-6850-20 shown with all options
Dimensions: 35½"H x 95½"W x 12"D
Shipping Weight: 342 lbs

Description

Thermocouples are located in the fluid streams for accurate measurement of the fluid temperatures. Both the shell and tube side temperatures are monitored. Furthermore, the surface temperature of the shell-side tube is provided for in both passes. The unit is equipped with a mixing vessel which allows either the temperature of the "hot" or "cold" fluid to be accurately controlled.

This, in effect, allows the temperature gradient between the two fluids to be varied over a wide range. The Reynolds number can be varied from laminar regime, through the transition region (2,300 to 10,000), and into the turbulent regime (40,000/50,000). The apparatus is designed for operation with liquids, steam and air, or with any combination of them. The system is compatible with other fluids which do not adversely affect the materials used in the trainer.

The apparatus is designed to be mounted to a sturdy, rigid wall. The fluid inlets and outlets to the unit are conveniently located at the bottom. The fluid flow rates are controlled with four needle valves. Two (2) control the flow rate into the mixer vessel and two (2) control the outlet flow rate from the heat exchanger. There are a total of twelve (12) ball valves used to configure the heat exchanger per the experiment being conducted.

The trainer requires only water at normal mains pressure. Other liquid coolants can be utilized if they are compatible with the materials used on the unit. Steam (or other compatible vapors) from laboratory service lines can also be utilized.

The trainer is constructed out of copper tubing with copper fittings and brass valves mounted securely to the panel with insulated supports. External fluid connections to the trainer are made with quick connect fittings. The fluid lines on the unit are tested to withstand 60 psig water/steam.

The unit comes equipped with the following instruments:

1. Instrument Control Panel complete with:
   - one circuit protector power switch with pilot light
   - one power cord
   - one thermocouple selector switch
   - one digital temperature display with ±1°F resolution
   - two aux. thermocouple type T receptacles
2. Flowmeters - rotameter type: maximum flow rate of 10 gpm
3. Thermocouple Probe Set (2 types)

All Hampden units are available for operation at any voltage or frequency

Hampden® ENGINEERING CORPORATION

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Heat Transfer Training Systems

Educational Training Equipment for the 21st Century

H-6850-20

Double-Pipe Heat Exchanger

Experiment Capabilities

A. Heat Exchanger Configuration:
1. Parallel flow tube-in-tube heat exchangers
2. Counterflow tube-in-tube heat exchangers
3. Free convection crossflow heat exchanger for horizontal tubes

B. Flow Regimes:
1. Laminar
2. Transitional
3. Turbulent

C. Experimental Fluids:
1. Water-to-water
2. Water-to-air
3. Steam-to-water
4. Steam-to-air

D. Experimental Results:
1. Overall heat balance
2. Heat transfer coefficient for:
   a) liquid-to-liquid
   b) steam-to-liquid/gas
   c) liquid-to-gas
3. Film coefficient for:
   a) liquids
   b) vapors with phase change
   c) gases
4. Heat exchanger efficiency for:
   a) parallel flow
   b) counterflow
   c) crossflow
5. Tube wall effects
6. Tube-entrance effects
7. Analytical techniques:
   a) logarithmic mean temperature difference method
   b) heat exchanger effectiveness method
8. Temperature diagrams

E. Experimental Results With Steam (or other vapors)
1. Enthalpy of steam
2. Pressure effects
3. Composition effects
4. Vapor phase effects
5. Effects of condensation on tube inner or outer surface

F. Advanced Capabilities
1. Unsteady state heat transfer
2. Tube entrance effects
3. Effects of viscosity on film coefficients

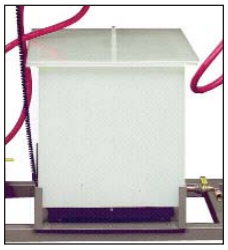
With steam, other vapors, or other fluids; the experimental capabilities of the trainer can be extended.

Options

MODEL H-6850-20a Hot Water System

The Hampden **Model H-6850-20a** Hot Water System consists of a 10 gallon tank with 2.5KW heater, heater control, pump with starter, quick-disconnect fittings for hot and cold water feed and return connections, interconnection hose set, main 1-pole ground fault interrupter circuit breaker with 6-ft. 3/c power cord, cold water connection ball valve, tank drain ball valve, and system drain ball valve. Input 120V. AC-1Ø-60Hz-30A.

MODEL H-6850-20b Weight Tank



The Hampden **Model H-6850-20b** Weight Tank is constructed out of non-corrosive materials. When used with the Hampden **Model H-6850-20c** Platform Scale and a stopwatch, the mass flow rate of the fluid can be determined.

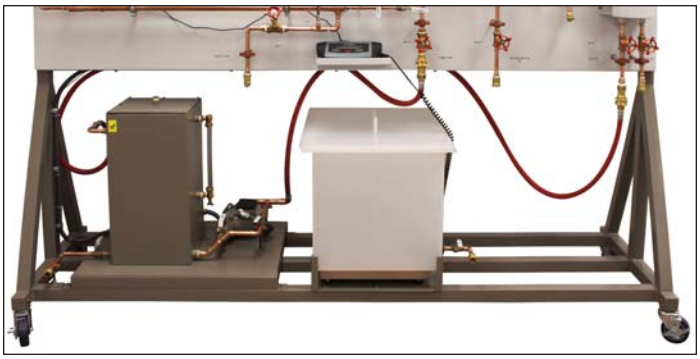
MODEL H-6850-20c Platform Scale

The Hampden **Model H-6850-20c** Platform Scale is used to weigh the contents of the **Model H-6850-20b** Weight Tank in order to determine the mass flow rate of a liquid used. The scale has a capacity of 200 pounds. The readability is 0.5 pounds and the repeatability is ±0.4% FS. The scale features a removable readout module which allows the readout to be placed in a convenient location remote from the scale. The readout also has a recall button to recall the last reading.

MODEL H-6850-20d Mobile Stand

The Hampden **Model H-6850-20d** Mobile Stand is single faced, mounted on four rubber tired swivel casters, constructed of steel mechanical tubing, finished in instrument tan texture. It is designed to support the **Model H-6850-20** double-pipe heat exchanger, as well as the option scale and weight tank, and hot water system.

A power cord and electrical outlet are included as part of this unit.



All Hampden units are available for operation at any voltage or frequency

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