SHELL and TUBE HEAT EXCHANGER

H102C

Year 1
study

Features

- Thick walled glass shell with 2 baffles and 7 stainless steel tubes
- Four thermocouples measure hot and cold fluid entry and exit temperatures
- Self-sealing quick release connections enable rapid connection to the H102
- Conversion from parallel to counter-current flow.
- Cross-connection prevention.

Description

The H102C Shell and tube exchanger is a simple model that demonstrates the basic principles of heat transfer. The H102C is designed for use with the Heat Exchanger Service Unit H102. The miniature heat exchanger is mounted on the H102 front panel.

The miniature heat exchanger supplied consists of a clear glass shell with end plates through which pass a bundle of seven equally spaced stainless steel tubes. 'O' ring seals in the end plates allow the stainless steel tubes to be removed for cleaning if necessary. Coupled to the end plates are end caps that allow hot water from the heater/circulator to pass through all seven tubes and then re-combine to return to the heater/circulator in a closed loop. Cold water from the mains supply passes through the clear glass outer shell and heat is transferred to this from the hot stream. Two baffles are located in the shell to promote turbulence and increase the cold fluid velocity.

In normal operation hot water from the heater/circulator passes into the end cap via a stainless steel braided hose and self-sealing coupling. Its temperature at entry to the heat exchanger is measured by a thermocouple. It then flows through the seven heat exchanger tubes to the opposite end cap and leaves. Its temperature on exit is

measured by a similar thermocouple.

The cold water is fed into and out of the heat exchanger via plastic reinforced hoses with self-sealing couplings. Thermocouples measure the cold water inlet and exit temperatures.

Related laws

- Mechanical Engineering
- Nuclear Engineering
- Chemical Engineering
- Control and Instrumentation
- Plant and Process Engineering
- Building Services
- Engineering Physics
- Refrigeration
- Marine Engineering

Learning capabilities

- To demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer).
- To perform an energy balance across a shell and tube heat exchanger and calculate the overall efficiency at different fluid flow rates.
- To demonstrate the differences between counter-current flow (flows in opposing directions) and co-current flows (flows in the same direction) and the effect on heat transferred, temperature efficiencies and temperature profiles through a shell and tube heat exchanger.
- To determine the overall heat transfer coefficient for a shell and tube heat exchanger using the logarithmic mean temperature difference to perform the calculations (for counter-current and co-current flows).
- To investigate the effect of changes in hot fluid and cold fluid flow rate on the temperature efficiencies and overall heat transfer coefficient.
- To investigate the effect of driving force (difference between hot stream and cold stream temperature) with counter-current and co-current flow.

Technical Specification

- Tube Material: Stainless steel
- Tube outside Diameter: Ø4.76mm
- Tube Wall Thickness: 0.6mm
- Number of tubes in bundle: 7
- Effective length of tube bundle: 205mm
- Effective heat transfer area: 18700mm2
- Shell Material: Clear Borosilicate (Pyrex type glass)
- Shell Inside Diameter: Ø75mm
- Shell Wall Thickness: 10mm
- Number of baffles: 2

Essential Ancillaries

- H102

What's in the Box?

- 1 x H102C
- Instruction manual
- Packing List
- Test sheet

Essential Services

- H102

Ordering information

To order this product, please call PA Hilton quoting the following code:
H102C